CHAPTER 3: AFFECTED ENVIRONMENT

CENTER FACILITIES AND OPERATIONS

Chapter 3 provides a description of the Center and its setting. It identifies resources and elements of the human environment that could be affected by the Center disposition. Because the Center site is relatively small, it is discussed herein within the context of the Twin Cities area and the MNRRA, within which the site is located. Detailed information on the latter can be found in the *Mississippi National River and Recreation Area Comprehensive Management Plan* (NPS 1995).

LOCATION, SETTING, AND OPERATIONS

The federally owned, 27.32-acre Center site is located in Hennepin County, within the Twin Cities metropolitan area. It is situated northeast of the intersection of SH 62 and SH 55, on the west side of the Mississippi River. The property boundary is an irregularly shaped polygon with the long axis oriented approximately north-south (see figure 3). The physical address of the property is 5629 Minnehaha Avenue South, Minneapolis, Minnesota 55417. It is accessed by turning east from Hiawatha Avenue (SH 55) onto East 54th Street, then south on the frontage road.

The Center is set on a Mississippi River bluff top. The property slopes gently eastward toward the Mississippi River; however, just east of the site there is a steep drop to the river. Elevations range from about 810 feet mean sea level (MSL) in the northwest portion of the site, to 750 feet MSL in the southeastern portion. The river's elevation is about 685 feet mean sea level. A 6-foot chain-link perimeter fence closely corresponds to the property boundaries. The main entrance is located on the northwest corner of the property, and consists of a stone wall with a large iron gate. The stone wall and gate have been damaged and a chain-link fence and gate currently serve as the main entrance.

The property is bound on the north by a service road and land owned by the U.S. Department of Veterans Affairs, on the west by SH 55 (Hiawatha Avenue), and on the south by Fort Snelling State Park. To the east of the Center is property owed by the Minnesota Historical Society. Also to the east of the Center is an old railroad bed that has been converted to a paved pedestrian and bicycle trail administered by Fort Snelling State Park. East of the railroad bed is a steep slope running down to the Mississippi River and a 10-acre island (Island 108-01) owned and managed by the National Park Service.

The site's vegetation consists of a mix of grassy areas interspersed with mature trees and forest thickets. The eastern one-third of the Center is wooded. Much of the Center has experienced ground disturbance of some type. The site includes buildings, roads, parking lots, and other infrastructure associated with the USBM tenure. These features are discussed in the sections that follow.

Day-to-day administration of the Center, including administration of special uses and events, is the responsibility of the USFWS. Security (opening and closing gates, patrols, and responding to alarms) is provided by the Federal Protective Service under the direction of the

USFWS. Permits for special uses are granted through the USFWS after submittal and acceptance of a form explaining the date, time, and intended special use. Since the Center's closure in 1995, special uses for building interiors have included law enforcement training (Building 1) and equipment storage for private and government entities. The Center grounds are open from 9:00 a.m. to 3:00 p.m., Monday through Friday, excluding federal holidays.

The Center currently has no official full-time uses. Building use is available through special permit and several buildings are currently or have been used for storage or training by other government agencies on a short-term basis. Structures receive very minimal maintenance due to lack of funds. A few buildings (e.g., Building 2) have some broken windows, which have allowed pigeons to roost inside. Other buildings have experienced limited vandalism and are deteriorating. Grounds maintenance is limited to periodic mowing, boundary fence repair, and removal of downed limbs.

BUILDINGS AND OTHER STRUCTURES

There are 11 vacated buildings of various types on the Center (table 1). Some buildings display distinctive architecture dating from the 1950s to early 1960s (e.g., Buildings 1, 2, and 3), and others are simple metal out-buildings. Other notable site features include historic Camp Coldwater Spring and the associated spring house and reservoir (see the "Historic Overview" section of this chapter for details) located near the heart of the site.

TABLE 1. BUILDINGS OF THE CENTER SITE

ID No.	Size (sq ft)	Description	Original Uses
Building 1	106,000	4-Story Brick / Masonry	Offices and Laboratories with Warehouse Facility at South End
Building 2	10,692	3-Story Brick / Masonry	Ore Crushing, Laboratories and Storage
Building 3	1,997	1-Story Brick / Masonry	Garage
Building 4	5,673	1-Story Transite / Metal	Pilot Plant and Laboratories
Building 5	13,280	1-Story Metal	Core Storage and Miscellaneous Storage
Building 6	160	1-Story Metal	Flammable Materials Storage
Building 7	2,500	1-Story Metal / Wood	Miscellaneous Storage
Building 8	160	1-Story Metal	Explosives Storage
Building 9	9,800	1-Story Metal	Offices and Library
Building 10	420	1-Story Concrete / Metal	Laboratory
Building 11	14,000	1-Story Metal	Warehouse and Office Space

More details regarding individual buildings are provided below. Information on potentially hazardous materials associated with the buildings is provided in the "Health and Safety" section of this chapter.

Building 1 (sometimes referred to as the "main building") was constructed in 1959. It is located just inside the entrance gate (figure 8). It served as the main administration building, and included laboratories and pilot plants, in addition to offices. The building is multi-level and the tallest portion is four-stories high. Mechanical, electrical, and boiler rooms are located on the first floor. The southern end of the building is an annex that was constructed in 1981–1982. The annex included a machine shop on the ground floor, and drafting and facility services on the upper level. A large paved parking area is located on the eastern side of the building.

Building 1 is constructed of fabricated stone, blue colored glazed brick and tile, and concrete formed pilasters (figure 9). Power is active to the building to control the alarm system and to provide power to a sump pump to control sewer system backflow during high storm runoff periods. Past sewer system backups have caused a persistent foul odor to be present in the building, particularly during the warmer summer months. One active phone line exists for the building alarm system. There is no water service to the building.

Although Building 1 has remained mostly unused since the Center closed, it was used by the Federal Emergency Management Agency for office space in 1997, and more recently for law enforcement tactical training.

Building 2 was constructed in 1959. It is known as the Crusher Building because it housed facilities to crush ore to various sizes upon receipt for testing. The building is located south of Building 1 and northeast of Camp Coldwater Spring and Reservoir. It is a three-story rectangular building, and shares the same exterior finish (blue colored glazed brick and tile and concrete formed pilasters) as Building 1 (figure 10). It included crushing facilities, laboratories, and miscellaneous storage areas. The third floor was used as a staging and assembly area for mine fire-fighting equipment. Building 2 has no active power or water service. It has not been actively used since closure of the Center.

Building 3 was also built in 1959 and shares the same exterior architectural details as Buildings 1 and 2 (figure 11). It is a garage structure with seven bays for vehicle and maintenance equipment storage. Building 3 is located south of Building 1 and west of Building 2. It lacks active power and water service. Building 3 has not been used since closure of the Center.

Building 4 is a one-story structure located directly south of the Camp Coldwater Spring area and is surrounded by wetlands (e²M 2005) (figure 12). Its original use, in a different location, was as a World War I balloon hanger. At that time, it was owned by the Veterans Administration. The USBM purchased the building in 1951, dismantled it, and reconstructed the steel framework at its current location. Transite wallboard siding was then added. Transite is a composite material of concrete and asbestos that was commonly used in the 1950s and early 1960s; hence, the building was historically known as the Transite Building. At its current location, it was used first for metallurgical testing, and later for laboratories. Building 4 lacks active power and water service and has not been actively used since closure of the Center.

FIGURE 8. BUILDING 1

FIGURE 9. CLOSE-UP OF BUILDING 1 WITH VISIBLE BLUE BRICK

FIGURE 10. BUILDING 2

FIGURE 11. BUILDING 3

FIGURE 12. BUILDING 4

Building 5 was the first building to be constructed at the Center—it was completed in 1949. It is located at the south end of the property. It was designed to store mining core samples, and later served as a test facility for *in situ* leaching (leaching of minerals or other products from rock that remains in its original form and location and is not moved or crushed) and soils analysis laboratory for the EPA superfund work. It was also used for miscellaneous and overflow vehicle storage. Building 5 is a one-story, Quonset-style prefabricated building with a steel frame and aluminum siding (figure 13). Building 5 lacks active power and water service. Building 5 is not currently being used, but has been used in the past for storage for other federal agencies. The TCRC Closure Team moved two above-ground storage tanks to adjacent Building 5—one a 300-gallon gasoline tank and the other a 300-gallon diesel tank (figure 14). Both tanks were emptied by the TCRC Closure Team in 2000 (TCRC Closure Team 2000).

Building 6 was constructed in 1949–1950. It is a small, single-story, prefabricated steel frame and aluminum-sided building constructed to provide for storage of flammable materials away from active work areas (figure 15). It is located southwest of Building 5. Building 6 has not been used since closure of the Center.

Building 7 was constructed in 1949–1950 as a single-story gable-roofed warehouse for miscellaneous storage (figure 16). It is located east of Building 5. It was once known as "the black shed" because in the early years the only protective cover was black tarpaper. It was later covered with aluminum sheeting.

Building 8 is a concrete-formed explosives bunker that is partially buried into a hillside. It was constructed in the early 1960s. It is located west of Building 5. The entrance to Building 8 lies within a wetlands area (figure 17). The building has not been actively used since closure of the Center.

Building 9 is a one-story, flat-roofed building sided in fabricated steel sheeting (figure 18). It was moved to the Center site from Keewatin, Minnesota, where it had served as the USBM Iron Range Demonstration Plant. It was dismantled around 1970 and moved to the Center site, where it was stored disassembled for several years. In 1975–1976 it was reconstructed in its current location north of Building 1. The main floor includes offices, a library, and an electronics laboratory. The basement was used for archives and miscellaneous storage. The building has been determined unsafe for entry without protective equipment due to the presence of mold (from sewage backflow-related flooding).

Building 10 is a small rectangular concrete building with a steel-sided office on the west side (figure 19). Building 10 has not been actively used since closure of the Center.

Building 11 was the last one constructed at the site in 1989 (figure 20). It is a large building located near the western boundary of the property. It is made of fabricated steel. The northern part of the building contained offices, and the remainder served as storage. Building 11 has been periodically used for storage by other government agencies since the Center closed.

FIGURE 13. BUILDING 5

FIGURE 14. BUILDING 5 WITH ADJACENT FUEL TANKS

FIGURE 15. BUILDING 6

FIGURE 16. BUILDING 7

FIGURE 17. BUILDING 8

FIGURE 18. BUILDING 9

FIGURE 19. BUILDING 10

FIGURE 20. BUILDING 11

OTHER INFRASTRUCTURE

In addition to buildings, the Center contains support infrastructure and utilities such as powerlines, waterlines, wastewater lines, ore storage bins, parking areas, and roads for building access and circulation. Parking lots or spaces with a total capacity for 250 vehicles are associated with most, but not all, of the Center buildings. The largest lot is located immediately east of Building 1.

There is currently no city water supply connected to the Center. During construction work on SH 55, the water main for the Center was severed and has not been reconnected. The estimated cost of repairing and reconnecting the water main is $75,000.

Some of the smaller buildings (Buildings 6, 7, 8, and 10) never had wastewater systems. Buildings 2, 4, and 5 had individual septic systems. After being tested and pumped, the underground septic tanks were broken up in place and filled with sand in the late 1990s (TCRC Closure Team 2000). One aboveground septic tank was emptied, cleaned, and hauled offsite. Buildings 1, 9, and 11 are linked to the municipal sewer system; however, without water the sewer systems are not operational. As previously discussed, a sump pump associated with Building 1 operates to prevent sewer backups into the buildings serviced by sewer systems. The type of wastewater disposal system in place for Building 3 is unknown.

There is a series of one-story ore bins in three locations at the Center: south of Building 1 and east of Building 2. These are designed to store ore and rock materials, and occur in a series of four or five bins to each area. They are partially buried in the hillside so that ore can be dumped from above after opening metal doors, or scooped from ground level (figure 21).

FIGURE 21. ORE BINS

HISTORIC OVERVIEW

Prehistoric

Paleo-Indian (12,000 BP – 10,000 BP)

There is evidence, albeit limited, that the first people to inhabit the region in which the Center lies were in the area approximately 12,000 years ago. The mobile, dispersed population of Paleo-Indians pursued giant bison, great bears, and other animals that lived in the region. Minnesota's Paleo-Indian population was apparently derived largely from Great Plains cultures. Eventually, the populations of large animals the residents depended on declined from a combination of environmental factors and pressure from hunting. As the large animals disappeared, the Paleo-Indians modified their hunting styles to enable them to catch more agile animals such as moose, woodland caribou, and smaller, quicker animals.

The Paleo-Indians left little evidence of their passing. Abandoned campsites, quarries, stone tools (lithics), and other scattered remains are usually the only evidence of Paleo-Indian presence. Regional sites that include diagnostic point types (Clovis, Folsom, Agate, Basin, Cody, Plainview, Hell Gap, Alberta) have been located in Anoka, Hennepin, Ramsey, and Washington counties (Ollendorf and Godfrey 1996, Clouse 2001). While no definitive Paleo-Indian sites have been recorded within the MNRRA corridor, a Paleo-Indian point was found upstream at the Washington Avenue Bridge.

Archaic (10,000 BP – 2500 BP)

The Archaic period is typically divided into Early, Middle, and Late subperiods based on technological changes that are often manifested in projectile point styles. For most of this period, populations were dispersed and the people obtained food through hunting and gathering. It was during this period that the atlatl (spear thrower) came into widespread use.

The early archaic subperiod (10,000 BP – 8000 BP) is poorly understood and scarcely represented along the Mississippi River in Minnesota. Diagnostically, it is represented by notched projectile points. There are only a few known early archaic sites; in the Twin Cities area they consist mainly of surface finds of projectile points.

The Middle Archaic subperiod (8000 BP – 4500 BP) is characterized by side-notched projectile points found in surface collections throughout southeastern Minnesota. These sites are often located on high river terraces, alluvial fans, and uplands.

Late Archaic (4500 BP – 2500 BP) sites are larger and more numerous than earlier sites. This may suggest that population sizes were increasing, or that sites were being repeatedly occupied over a number of years. In any case, it is clear that people were staying longer in one general location. Archeological evidence also suggests that subsistence patterns were evolving to include a wider variety of resources. Material culture continued to develop too. Native copper became widespread as a component in tools, and tools themselves were more varied and

specialized than before. Concentrated habitation sites tend to be located on fairly high, well-drained ground overlooking lakes, lake-stream junctions, and stream-stream junctions. Smaller campsites associated with seasonal activities or travel have also been recorded (Harrison 1985). Late Archaic sites in eastern Minnesota include several rock shelters and open air occupations (Ollendorf and Godfrey 1996, Clouse 2001). There are Late Archaic sites within the MNRRA corridor. Some sites exist in the vicinity of the Center, especially in Mendota, southeast of the project area.

Woodland (2500 BP – 300 BP)

The Woodland period is marked by three new activities: the use of pottery vessels, burial mound and earthwork construction, and plant cultivation. Cultural materials and traditions that began to develop in the Late Archaic also continued to evolve during this period. Like the Archaic period, the Woodland period is divided into three subperiods: Early, Middle, and Late.

Early Woodland sites reflect the addition of pottery into Archaic traditions. Vessels of this subperiod are similar in shape to flat-bottomed woven baskets. Some archeologists believe there are Early Woodland sites in the Twin Cities area, but this has not been verified by diagnostic techniques for ceramic materials. Other literature suggests the Schilling site located on Lower Grey Could Island is the only known Early Woodland site recorded in the MNRRA corridor (Anfinson 2003). There are no Early Woodland sites north of the Twin Cities. Two well-known sites, La Moille Rockshelter and King Coulee, are located 90 to100 miles southeast of the Center.

The Middle Woodland subperiod is characterized by the clear beginning of horticultural economies (tobacco, rice, squash, barley), continued refinement and specialization of material culture, and the use of burial mounds. Regionally, sites are found along all major river drainages. Middle Woodland sites in the Twin Cities area are part of the Havana tradition and there is evidence that there was interaction with the Hopewell culture through long-distance exchange networks (Harrison 1985). Indian Mounds Park in St. Paul, and within the MNRRA corridor, is an example of a Middle Woodland site that reflects Havana Hopewell interaction (Anfinson 2003). Middle Woodland sites have been identified from the Anoka Sand Plain to Spring Lake, near Hastings, indicating the Middle Woodland peoples clearly used the Mississippi River through the MNRRA corridor (Anfinson 2003).

Late Woodland developments began about 1350 BP and are marked by less elaborate material culture and mortuary goods than the Middle Woodland. There is evidence, however, of the introduction of the bow and arrow during this subperiod. Settlement patterns shifted from large distinct settlement sites to small seasonal encampments around wetlands, lakes, and rivers. Late Woodland peoples continued to build burial mounds, and mound shapes generally were more varied and smaller than before. Two Late Woodland traditions are evident in the Twin Cities area: the Effigy Mound tradition peoples of southeastern Minnesota and the St. Croix-Onamia (Transitional Woodland) groups of central and southwest Minnesota. The demarcation between the two groups appears to be St. Anthony Falls. The Effigy Mound settlement pattern involved seasonal movement between major river valleys and smaller streams. Group size varied, often in correlation to the season and size of the river valley. Larger

groups aggregated in the major river valleys and dispersed into smaller family groups along streams in the winter. The St. Croix-Onamia settlements were typically small sites located on lake shores, or on streams near the outlets of lakes. Lifeways were dominated by hunter-gatherer traditions and foods included waterfowl, fish, and wild rice. There are a number of Late Woodland sites recorded within the MNRRA corridor, including the Sorg site, Lee Mill Cave, the Hamm site, and the Sibley House / American Fur Company sites (Anfinson 2003).

Late Pre-Contact (1,000 – Historic Contact)

Generally, the Late Pre-Contact period (represented by the Oneota tradition in the Twin Cities area) is characterized by villages and intensive food production manifested in horticultural and agricultural lifeways. Archeologists recognize six major trends of the Late Pre-Contact period:

1. cultivation of maize (southern Minnesota) and wild rice (central Minnesota)
2. introduction of new food production technologies
3. population increases and development of well-defined regional complexes
4. cultural contact with the highly developed Middle Mississippian cultures
5. relationship between human adaptations and changing climactic conditions
6. association with known American Indian groups of the Historic period`

Late Pre-Contact sites (villages and other sites) of the Oneota tradition exist in the Twin Cities region and within the MNRRA. The MNRRA sites are small and not fully understood, but it appears that they were hunting camps rather than actual settlements. Known sites within the MNRRA corridor with Oneota components include the Schilling site, the Lee Mill Cave site, the Point Douglas Townsite, and the Grey Cloud Mounds site (Anfinson 2003).

Historic Contact

When Europeans first entered Minnesota in the middle 1600s, a number of different American Indian groups occupied the region. Some had been forced into the area by European settlement to the east. Historic contact period tribes in Minnesota can be divided into two main groups: the Chiwere-Winnebago language group and the Eastern Dakota.

The Chiwere-Winnebago language group is actually a composite of several groups, including the Ioway, Oto, and Missouri, that shared language, beliefs, culture, and kinship. French contact with the Ioway was initiated in 1676 outside present-day Green Bay, Wisconsin. Initially, trade began through the use of Algonquin-speaking tribes as middlemen. Metal items, glass beads, guns, and ammunition were commonly exchanged for bison hides and beaver pelts. As the fur trade expanded westward, contact between the French and Ioway became more frequent and middlemen were no longer needed. This led to intertribal tension, and the resulting warfare forced the Ioway out of southeastern Minnesota and northeastern Iowa. They moved to northwestern Iowa, near the Oto group (Anfinson 2003).

The Eastern Dakota, which included the Mdewakanton, Wahpeton, Wahkpute, and Sisseton, inhabited much of Minnesota at the time of European contact. These people came to be known to the French as the Sioux (hereafter referred to as the "Eastern Dakota"). By the time of initial French contact in the mid-1600s, the Eastern Dakota had adapted their subsistence and settlement patterns to the prairie/forest border and occupied relatively permanent villages in forest areas. Following contact with the French, Eastern Dakota lifeways, material culture, and geographic distribution changed considerably. There is limited archeological knowledge about Eastern Dakota presence within the MNRRA corridor. The approximate locations of villages and other communities are known, but few sites have been recorded or excavated. Within the MNRRA corridor, communities where approximate locations are known include Kaposia, Shakopee, Pine Bend, Black Dog's village, and the Little Rapids site. Additionally, a Dakota internment camp where some 1,500 individuals were held following the Dakota Conflict of 1862 is located in the river bottom below Fort Snelling, but has never been archeologically investigated (Anfinson 2003). Pike Island, at the confluence of the Mississippi and Minnesota rivers, was frequented by the Eastern Dakota, but has never been investigated (Anfinson 2003).

Historic

French Period (ca. 1654 – 1763)

French penetration into the Upper Mississippi River region was fairly gradual. The French began to explore eastern Canada in the early 1500s, and by 1604, Samuel de Champlain had founded the settlement of Quebec. Explorers ventured farther inland over time and eventually reached the Great Lakes. They also contacted various tribes of the Ohio River Valley and elsewhere. Based on existing evidence, the French reached the Mississippi River by the 1670s. An expedition led by Louis Joliet and Father Jacques Marquette was prompted by rumors of the Mississippi River. The expedition departed for the fabled river on May 17, 1673, and a month later they were floating the Mississippi with the goal of following it to its mouth. They traveled downstream for about a month until turning around for fear of Spanish and Indian attacks (Anfinson 2003). This was the first well-documented French encounter with the Mississippi River. The region became a new outlet for French trade as merchants and traders developed relationships with regional tribes.

On March 19, 1680, an expedition including Michael Accualt, Antoine Auguelle, and Father Louis Hennepin departed for the Mississippi River. Nineteen days later, accompanied by a Dakota war party, the men left the river just upstream of what is now Indian Mounds Park (located on the river, east of downtown St. Paul) and traveled overland. On July 1, the men were back in the area with their Dakota escorts and this time they described and named St. Anthony Falls (Anfinson 2003). This was the first recorded case of Europeans visiting what is now the Twin Cities area.

As French presence in the Upper Mississippi River region increased, the French began building forts for trade centers and as bulwarks against Spanish and British expansion. Most of the forts were built south of what is now the Twin Cities area. By the end of the 1600s, however, French influence in the region was waning. Spurred by attacks from the Iroquois in

1696, the French consolidated their operations around Montreal. Shortly thereafter, the War of Spanish Succession (1702–1713) dominated French interests and drew attention away from North America. In the 1720s–1750s, the French focused their trade in the Great Lakes and Ohio River Valley region. By 1756, the French were involved in the French and Indian War (Seven Years War) with Great Britain. The Treaty of Paris ended the war on February 10, 1763, and stipulated that France cede her claims in Canada and all lands east of the Mississippi River (except New Orleans) to the British. This effectively brought the French period to an end.

British and Early American Period (1763 – 1819)

The Treaty of Paris did not mark an immediate change in the Upper Mississippi River region or in other ceded lands. The British were slow to enter the area, and as a result, French (and Spanish) traders continued to visit tribes in the western Great Lakes and in the Upper Mississippi River valley. When the British finally entered the regional trade network, they tried a different trading system. Instead of visiting the tribes, they built trading posts and expected the tribes to come to them. This policy failed, and in 1767 the British Crown began granting licenses to independent traders who rushed to the interior to conduct business with tribes. By 1780, English traders were working among the Dakota. Still, posts continued to serve as a hub of activity for the trade industry. There is no evidence that the British (or for that matter the French or Spanish) established any trading posts within the MNRRA corridor. It is likely, however, that British and French traders regularly journeyed along the corridor to trade with the Dakota and Chippewa (Anfinson 2003).

British sovereignty over the region ended with the conclusion of the American Revolution in 1783. The resulting treaty granted all lands east of the Mississippi to the new United States of America. However, just as with the conclusion of the French and Indian War 20 years earlier, not much changed immediately; the British continued to trade with tribes and build trading posts in the region. Meanwhile, intertribal warfare between the Dakota and Chippewa was intensifying. In an effort to end the conflict and prevent further disruption in trade, the British tried to convince the two tribes to accept the Mississippi River as a tribal boundary (Anfinson 2003). This was never fully accepted, as the Dakota still claimed both sides of the river.

The Americans' first entrance into the area that now contains the MNRRA and the Center occurred after the Louisiana Purchase (1803). The United States wished to eliminate British influence in the region, so it sent Zebulon Pike up the Mississippi River from St. Louis to identify possible sites for military posts. Pike was to secure land for the posts from the tribes. Pike was also directed to prepare the way for government trading posts, make alliances with the Chippewa and Dakota, stop intertribal fighting, and locate the Mississippi's source (Anfinson 2003). Pike visited the MNRRA region in the autumn (he portaged St. Anthony Falls on October 1, 1805) and recorded details about the area. He also acquired the site of the future Fort Snelling.

Growing tensions between the British and United States began to affect trade in the region. In 1807, President Thomas Jefferson placed an embargo on all British commerce and actively worked to prevent British traders from exchanging goods with the tribes. This had two predictable results. First, some British traders left the region, and second, the tribes (especially the Dakota) suffered from the lack of goods they had grown accustomed to. When the War of

1812 broke out, the Dakota, who had developed strong relationships with the British, fought against the Americans. British/Dakota trade continued, but at a diminished level. Only after the Treaty of Ghent ended the war in 1815 was there an official agreement that the British should leave the area (Anfinson 2003). American explorers and traders quickly rushed in to stake a share in the trading business.

Some British traders remained in the area, however, which was a source of concern to the Americans. The United States attempted to end British influence through passage of the Foreign Intercourse Act of 1816, which required foreign traders to either leave or become naturalized citizens. The act was ineffective, however, because it was essentially unenforceable. A year later, Secretary of War John C. Calhoun sent Stephen H. Long up the Mississippi River from St. Louis to map the river and ascertain potential sites for military posts. In the summer of 1817, Long recorded the Minneapolis/St. Paul area and recommended that a fort be built at the confluence of the Mississippi and Minnesota rivers. The recommendation was heeded, and two years later, an American military contingent established a fort near the confluence of the two rivers.

Fort Snelling (1820 – 1946)

In late summer 1819, Lieutenant Colonel Henry Leavenworth and a contingent of 200 soldiers arrived at the confluence of the Minnesota and Mississippi Rivers. They established a temporary camp on the south side of the Minnesota River and spent the winter of 1819–1820 there, but determined that the swampy location would not be practical for a summer encampment. As summer approached, Leavenworth directed the soldiers to relocate the camp to the west side of the Mississippi River (Anfinson 2003, Henning 2002). A clear running spring, known today as Camp Coldwater Spring, was the key reason they chose that site. Over the summer "Camp Coldwater" became a reality.

The United States Army was not in the region to build temporary camps; however, it intended to establish a fort in the area. Colonel Josiah Snelling replaced Leavenworth at Camp Coldwater in August 1820. Shortly thereafter, Snelling placed the cornerstone of what eventually became known as Fort Snelling, located to the south of Camp Coldwater. Soldiers continued to use Camp Coldwater as a base for summer operations for the next two to four years as they built the fort (Henning 2002). The fort was apparently completed and occupied by 1824 (Anfinson 2003).

Settlers began to filter into the area once the fort was completed. One group consisting of individuals from the Selkirk Colony (an agricultural settlement far to the northwest of the fort that was caught in the middle of conflicts between fur traders) arrived in 1821. Thirteen families from the Selkirk Colony arrived in the vicinity of the fort in 1823 and another group of 243 individuals arrived in 1826. With the settlers came limited economic growth associated with farming, the fur trade, the fort, or Indian agency employment (Henning 2002).

In 1837, Major Joseph Plympton assumed command of Fort Snelling and ordered that a survey of the fort be undertaken. Once the survey was complete, the boundaries of the military reservation and the number of settlers living there were known. On July 6, 1838, Major Plympton announced that the military would no longer allow settlers to build structures or cut

timber on the military reservation. By 1840, unauthorized settlers had been removed from the Camp Coldwater area (Henning 2002). Many of the structures were razed, but a large stone trading house remained at Camp Coldwater. This structure was used occasionally as temporary residence until 1853, when it was refurbished as the St. Louis Hotel (Henning 2002). The structure, which was likely within what became the Center's boundaries, burned down in 1862.

As settlement of the region continued, Fort Snelling's function evolved. By the mid-1850s, it was essentially a supply depot. Federal officials determined that the 12-square-mile military reservation was far larger than necessary, and took steps to dispose of excess land. On June 8, 1857, Franklin Steele, a permitted settler on fort land, purchased a portion of the reservation for $90,000. He platted the property as the town of Fort Snelling, which included Camp Coldwater Spring.

With the outbreak of the Civil War, however, Fort Snelling once again became a military installation. The fort served as the rendezvous point for the First Minnesota Infantry Regiment. At the fort, soldiers received training and were mustered and sent off to war. After the Civil War, Fort Snelling continued to serve martial roles in support of the Indian wars in the west. By the early 1880s, numerous improvements at the fort were undertaken, including development of a pressurized water system that delivered Camp Coldwater Spring water to the fort (prior to that, water was delivered to the fort by wagon). The water system consisted of an engineer's house, an open reservoir, a water tank, and a pumphouse. Another water tank was added in 1900 (Henning 2002). This system was used until 1920, when the fort began purchasing its water from the city of St. Paul. Most of the structures associated with the waterworks were either razed or converted to other uses over the next two decades (Henning 2002). During the late 1930s and into the 1940s, the area around the springs became known as Coldwater Park. A polo field, nine-hole golf course, baseball stadium, and game preserve are located on the Upper Bluff portion of the Fort Snelling property (Henning 2002).

The Fort Snelling era came to a close in 1946, when the fort was turned over to the Veterans Administration. The Veterans Administration transferred a portion of the property to the USBM in 1949. The rest of the original Veterans Administration property at Fort Snelling was donated in 1961 to the state of Minnesota. The portion of the reservation that included Camp Coldwater Spring was turned over to the USBM in 1957 (Henning 2002).

Urbanization and Industry (1823 – present)

The Twin Cities region changed dramatically after the establishment of Fort Snelling. What was once an isolated outpost evolved into an important industrial and commercial center. St. Paul developed as the northern terminus of Mississippi River steamboat traffic, and was the first locale to be settled in any numbers by civilians. The first steamboat arrived in the area in 1823. At first growth was slow, but in 1854, the St. Paul newspaper reported that passengers and cargo overflowed every ship that arrived and that there were not enough ships on the river to handle the trade emanating from the town. The population of Minnesota exploded from 6,077 to 172,023 between 1850 and 1860 (Anfinson 2003). The settlements of St. Anthony Falls and Minneapolis were established in 1849 and 1851, respectively. By 1890, Minneapolis had eclipsed St. Paul in population and had incorporated the town of St. Anthony Falls.

The industrial history of the Twin Cities is linked to the engineering of the Mississippi River, hydropower generated by St. Anthony Falls, and railroads. With the need to transport goods and individuals up the river, there arose a drive to engineer the Mississippi River into a readily navigable waterway. The shifting channel and ubiquitous snags made travel difficult. As such, beginning in 1866, local activists and politicians embarked on multiple campaigns to improve the navigability of the Mississippi River. These included the 4-, 4.5-, 6-, and 9-foot channel projects, locks and dams 1 and 2, lower and upper St. Anthony Falls locks and dams, and the Meeker Island lock and dam. These projects transformed the river's unpredictable changing nature into a thoroughly managed and manipulated waterway amenable to extensive boat traffic.

The use of power generated by St. Anthony Falls dates to the establishment of Fort Snelling, when the army built saw and grist mills at the falls. But it was not until 1848 that commercial exploitation of the falls' hydropower began in earnest. This first stage of development centered on sawmills. By 1855, sawmills at the falls were producing a daily output of 100,000 board feet of lumber. By 1869, there were 18 mills on either side of the river producing a total of 90 million board feet of lumber per year. The sawmill era at St. Anthony Falls drew to a close by 1880, but another industry was coming into its own—flour milling. In fact, between 1870 and 1880, flour production at St. Anthony Falls grist mills grew from just over $1 million (193,000 barrels) to over $20 million (2,051,840 barrels) annually. Flour production continued to surge until 1916, when it began to gradually decline. Despite this decline, flour was still being produced at the falls as late as the 1960s. In addition to the sawmill and gristmill activity, St. Anthony Falls was an important site for hydroelectric power production. As early as 1882, electricity generated by the first hydroelectric power central station in the nation at St. Anthony Falls was lighting local businesses (Anfinson 2003).

The post Civil War railroad boom is one of the most dramatic periods in the development of the midwestern and western United States, and the Twin Cities was an epicenter of this change. The Northern Pacific Railway (later to become the Great Northern Railroad, and eventually the Burlington Northern Railroad) was based in the region and as such, a vast network of rail lines sprang from here. The first train traveled along the first railroad in the state, between St. Anthony Falls and St. Paul, in 1862. By 1888, the Northern Pacific Railroad linked the Pacific Ocean to the Twin Cities. Five years later, another transcontinental line based in the Twin Cities was completed (Anfinson 2003). By the turn of the 20th century, at least nine lines converged in Minneapolis and St. Paul. Railroads and facilities supporting or supported by the railroads dominated local industry. The railroad industry is still evident in local commercial development, although not to the level it once was. A railroad spur is still present at the Center near the northeast corner of the site.

Today, the Twin Cities area remains an important commercial hub. As the largest urban center between Denver and Chicago, the Twin Cities still reflects its history as a center for transport, industry, and innovation.

Twin Cities Research Center Main Campus (1949 – 1996)

The USBM was established within the USDI in 1910. Its mission revolved around scientific research associated with the development of the nation's mineral resources. To this end,

experiment stations were established in important mining regions around the country. Establishment of the Lake Superior Station in 1917, at the University of Minnesota, marked the beginning of a long productive history of USBM facilities in the Twin Cities.

After World War II, the USBM grew in size and stature. To meet the demands of its expanded role, the agency was reorganized into regions in 1949. Region V was based in Minneapolis and served the states of Minnesota, Wisconsin, Michigan, North Dakota, South Dakota, Nebraska, and Iowa. The regional office was divided into six divisions, five of which were housed in the Buzza Building in Minneapolis; the sixth was located at the University of Minnesota. At the same time the agency was being reorganized, the Veterans Administration was attempting to dispose of excess land at the former Fort Snelling Military Reservation. The USBM officially acquired this land in 1951, but it began constructing a core storage library there even earlier, in 1949. This was the first USBM building at what eventually became the Center. By 1953, three more buildings had been built.

The scope and complexity of the USBM work in Minneapolis expanded quickly, and by 1957, it became clear that the agency needed more space. Senator Hubert Humphrey responded with introduction of a bill in Congress that provided for the establishment and operation of a mining and metallurgical research center. Congress appropriated the needed funds, more land was acquired from the Veterans Administration, and construction of what eventually became the Center (originally called the North Central Experiment Station) began in 1958. The research center was completed on October 21, 1959 (Ollendorf and Godfrey 1996).

Over the next three decades, the Center excelled in a wide range of basic and applied research programs in fragmentation, drilling technology, blasting, rock physics, in situ mining, mine hydrology, wastewater technology, health and safety, ore processing and palletizing, iron making, and steel making, among others. In the 1960s, the Center partnered with the National Atmospheric and Space Administration to study the possibility of mining the surface of the moon.

There were six specific areas, however, in which the Center made its most important contributions to the science and technology of mining. These were:

1. development of the Tilden Process, which allowed the exploitation of untapped iron ore
2. advances in diesel health and safety that included the use of water jackets and flame traps to prevent fires and filters to cut down on emissions
3. advances in equipment safety (both underground and aboveground)
4. development of procedures to significantly reduce the incidence of black lung disease through dust control
5. advances in mine fire control and detection
6. alternate fuels research in which ore kiln equipment was developed that could operate with coal, oil, or natural gas (Ollendorf and Godfrey 1996)

In 1993, the era of the Twin Cities Research Center was about to take a turn. The USDI directed the USBM to undergo a major reorganization that included formation of four focused

programs directed by four associated centers. The Center was selected as an associated center, but had to transform itself into an environmental remediation center. This effort was short lived. In January 1996, all funding for the USBM was eliminated as part of the Balanced Budget Downpayment Act. The Center officially closed three months later (Ollendorf and Godfrey 1996).

ARCHEOLOGICAL RESOURCES

Two projects involving archeological survey and testing have been completed at the Center. Ollendorf and Godfrey conducted the first in 1996, and Clouse conducted the second in 2001. Both studies found material evidence of post-European contact historic use of the area, but neither found materials dating to prehistoric American Indian use.

The 1996 effort focused on 10 areas within the site that were thought to have been minimally disturbed and, based on topography, location, and viewpoints, thought to be likely locations for American Indian or European use. This study found that several of the focus areas had, in fact, been previously disturbed (fill deposited). Six archeological test units containing post-European contact (historic) artifacts were identified. Of these, one unit was identified as containing information contributing to the Fort Snelling National Historic District due to its structural integrity and association with the military. A second test unit was determined potentially eligible for the NRHP and recommended for further study (Ollendorf and Godfrey 1996).

The subsequent study by Clouse (2001) was more comprehensive. It found that there has been substantial earth movement (cut, fill, and other disturbance) on the Center site; historical documents such as accounts, maps, and photos were used to determine which areas are likely to have been disturbed. Despite this earth movement, many areas of the property appear to contain buried, intact, undisturbed topsoils.

The 2001 study made two main recommendations, which were based on test excavations, stratigraphy, recovered material culture, historic documentation, and information from the 1996 study. The first recommendation was to organize the Center site into five distinct zones based on their potential to yield additional archeological information. Zones III, IV, and V were found to contain no important cultural materials and warrant no further archeological study, according to the author. Zone I was recommended for further testing to determine if the area contains cultural materials that would contribute to the Fort Snelling National Historic Landmark and National Historic District. Zone II was found to contain in situ cultural deposits that correspond to the period of significance of the national historic landmark and national historic district. The second main recommendation of this study was to revise the boundaries of the Fort Snelling National Historic Landmark to include Zone II (Clouse 2001).

HISTORIC STRUCTURES AND DISTRICTS

There are three historic districts and a national historic landmark that overlap in the area of the Center: the Fort Snelling National Historic District (designated in October 1966 and

expanded in 1970) and National Historic Landmark (designated in December 1960 and updated in 1978), Old Fort Snelling State Historic District (designated in 1971), and the USBM Twin Cities Research Center Historic District (determined eligible for listing on the NRHP by consensus determination with the Minnesota SHPO in 1996).

The Fort Snelling National Historic District and Old Fort Snelling State Historic District share almost identical boundaries. The national historic district is bounded by Minnehaha Park, the Mississippi River, Minneapolis/St. Paul International Airport, and Bloomington Road. The national historic landmark includes Fort Snelling proper and land along the Mississippi River included in the other districts (see figure 7).

The USBM Twin Cities Research Center Historic District is bounded by the Center campus, and consists of 11 contributing buildings and 3 ore bins that represent an important period in the history of science and technology related to mineral production (Ollendorf and Godfry 1996).

A historical study completed in 2002 by Barbara J. Henning focused on the Center and also made a determination as to whether Camp Coldwater Spring is independently eligible for the NRHP. The author concluded that neither the spring nor associated features are independently eligible for the NRHP. However, she did conclude that Camp Coldwater Spring does contribute to the significance of the Fort Snelling National Historic District, the Fort Snelling National Historic Landmark, and the Old Fort Snelling State Historic District.

Camp Coldwater Reservoir (which includes a spring house) is the only remaining physical structure from the Fort Snelling history in the Camp Coldwater area. The reservoir and the flow of Camp Coldwater Spring (a natural feature directly associated with the reservoir) are integral components of the historic character of the national historic landmark and national historic district. Clouse (2001) has recommended that Fort Snelling National Historic Landmark be revised to include more of the Center site.

There are no independently NRHP-eligible buildings or structures located at or near the Center.

ETHNOGRAPHY

An ethnographic resources study was conducted of the Center property in 2005 (Terrell et al. 2005). The purpose of the study was to identify any relationships of the Dakota and Ojibwe people with the resources located within the boundaries of the Center property. During the course of that study, some participants identified springs as a general category of culturally important resources due to spirit entities that inhabit such water sources, and the ceremonial use of the water for various purposes.

Although no historical documentation of American Indian use of Camp Coldwater Spring was found, the oral traditions and histories collected during the investigation suggest that natural springs like Camp Coldwater Spring are associated with sacred healing ceremonies. Camp Coldwater Spring is currently used by some members of federally recognized Dakota and

Ojibwe communities, and by other American Indians as a source of water for ceremonies. Camp Coldwater Spring was also identified as important in relationship to the Mdote Minnesota, or the confluence of the Minnesota and Mississippi Rivers. While the confluence is not located within the area of the proposed action, the interviewees stressed the importance of considering Camp Coldwater Spring within this larger context (Terrell et al. 2005).

The primary American Indian communities that have been identified as having an association with the area surrounding the spring are the Mdewakanton Dakota, who currently reside at the federally recognized Lower Sioux Indian Community; Prairie Island Indian Community; Shakopee Mdewakanton Sioux Community; and Upper Sioux Indian Community. Other federally recognized Eastern Dakota communities have historical ties to the Fort Snelling area. In addition, there are American Indian residents of the Twin Cites who are not members of a federally recognized tribe that claim cultural ties to the confluence region. After European American contact, the presence of fur traders and the Indian agency at Fort Snelling caused some Ojibwe to frequent the confluence area.

NATURAL RESOURCES

Soils

The Center site contains the following soil series and types, which are described in more detail below: Dorset, Forada, Sandberg, Urban Land-Hubbard, and Urban Land-Udipsamments (NRCS 2005). Figure 22 presents the distribution of soil map units on the Center site. Platteville limestone underlies surficial soils 10 to 50 feet below the ground surface. Table 2 presents selected building limitations for Center soils. It is important to note, however, that recent archeological testing suggests that soils over much of the Center site have been disturbed (buried, cut and filled, etc.) during construction of facilities and roads. Thus, figure 22 should be considered an approximation at best.

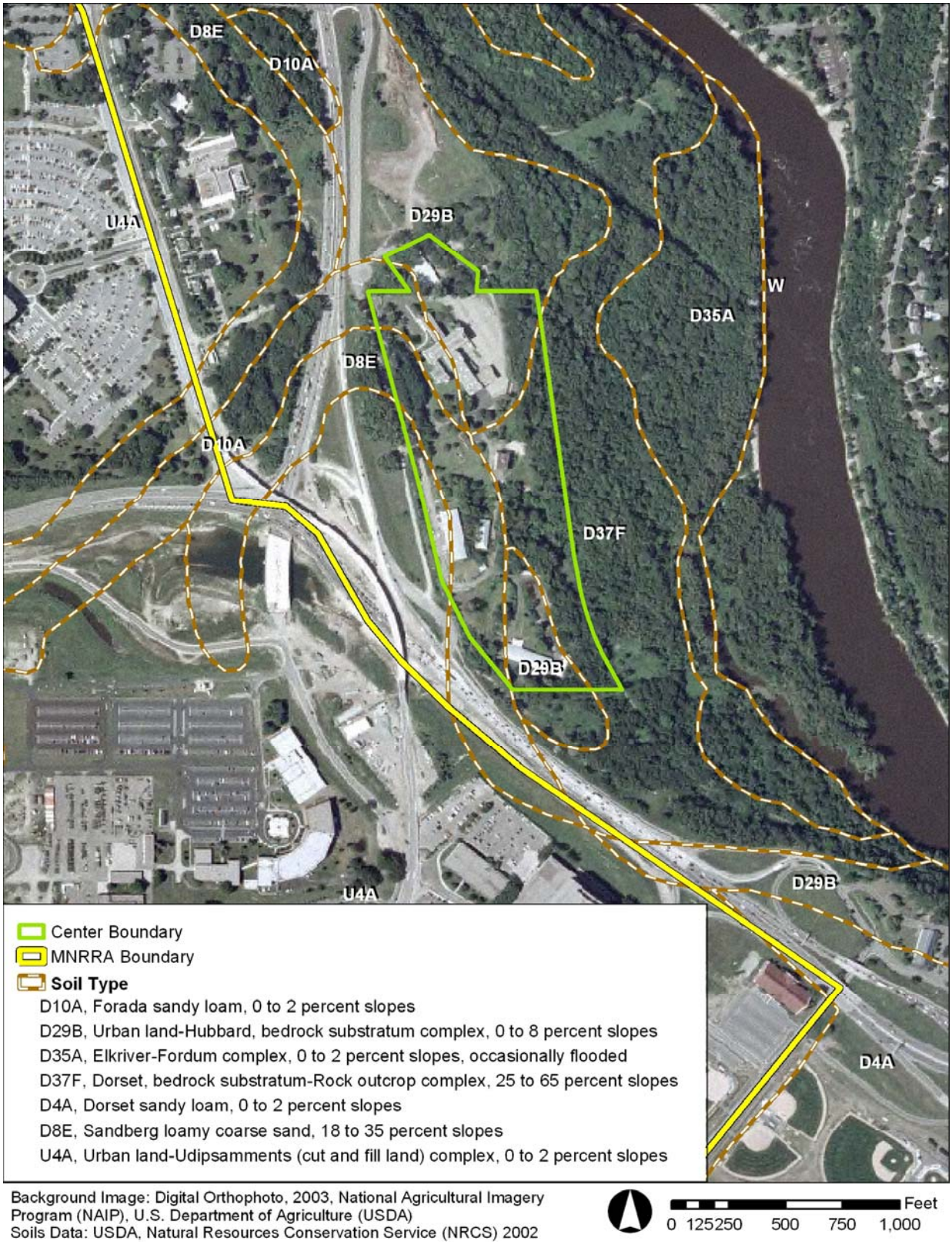

FIGURE 22. SOILS OF THE CENTER SITE AND VICINITY

TABLE 2. SOILS LIMITATIONS FOR BUILDING SITE DEVELOPMENT—SOILS FOUND ON THE CENTER SITE[1]

Soil Type	Limitations for dwellings without basements	Limitations for dwellings with basements	Limitations for small commercial buildings	Limitations for local roads and streets	Limitations for shallow excavations	Limitations for lawns and landscaping
Forada sandy loam	Very limited (depth to saturated zone)	Very limited (depth to saturated zone)	Very limited (depth to saturated zone)	Very limited	Very limited (depth to saturated zone, cutbanks cave)	Very limited (depth to saturated zone)
Urban land – Hubbard, bedrock stratum complex	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
Dorset, bedrock stratum complex	Very limited (slope)	Very limited (slope)	Very limited (slope)	Very limited (slope, frost action)	Very limited (slope, cutbanks, cave)	Very limited (slopes, droughty)
Sandberg, loamy coarse sand	Very limited (slope)	Very limited (slope)	Very limited (slope)	Very limited (slope)	Very limited (slope, cutbanks cave)	Very limited (slope, drought, too sandy)
Urban land – udipsamments	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

[1]Hennepin County, Minnesota Soil Survey, NRCS 2005

Dorset Series

The Dorset series consists of very deep, somewhat excessively drained soils formed in a thin loamy mantle and in underlying sandy and gravelly outwash sediments. They can be encountered on outwash plains, valley trains, stream terraces, and moraines. They have moderately rapid permeability in the upper mantle and rapid permeability in the lower sediments. Slopes range from 0% to 35%. Native vegetation is prairie grasses, later succeeded by mixed deciduous and coniferous forest (NRCS 2005).

Forada Series

The Forada series consists of very deep, poorly drained, and very poorly drained soils formed in 20 to 40 inches of loamy sediments over sandy and gravelly material on plane or concave surfaces on outwash plains, stream terraces, and valley trains. These soils have moderate or moderately rapid permeability in the upper loamy sediments and rapid permeability in the underlying material. Slopes range from 0% to 2%. Native vegetation includes tallgrass prairie and sedges (USDA/NRCS 2005, USDA/NRCS 2005a). The Forada soil mapping unit is a state-listed hydric soil (USDA/NRCS 2005b).

Sandberg Series

The Sandberg series consists of very deep, excessively drained soils that formed in coarse or moderately coarse glacial outwash sediments or glacial beach deposits with or without a thin loamy mantle. These soils are on outwash plains, glacial lake beaches, stream terraces, valley trains, and glacial moraines. Permeability is moderately rapid or rapid in the upper part and very rapid in the lower part. Slopes range from 0% to 45%. Native vegetation is mixed prairie grasses with scattered oak hardwoods (USDA/NRCS 2005, USDA/NRCS 2005a).

Urban Land – Udipsamments

The Udipsamments (cut and fill) soil consists of nearly level areas that have undergone minimal grading. The cut and fill material is dominantly sandy. Because of the variability of this component, interpretations for specific uses are not available (USDA/NRCS 2004, USDA/NRCS 2005a). Onsite investigation is needed to ascertain the character of the soil and use limitations.

Urban Land – Hubbard

The Urban Land soil mapping unit mainly consists of residential areas covered by impervious surfaces (USDA/NRCS 2004, USDA/NRCS 2005a). Most areas have been disturbed to some degree by construction activity. Because of the variability of this component, interpretations for specific uses are not available. Onsite investigation is needed to determine the properties of the soil mapping unit (USDA/NRCS 2005, USDA/NRCS 2005a). The Hubbard series consists of very deep, excessively drained soils that formed in sandy glacial outwash on outwash plains, valley trains, and stream terraces. Permeability is rapid. Slopes range from 0% to 35%. Native vegetation is principally tallgrass prairie with scattered bur oak and hazel (USDA/NRCS 2005, USDA/NRCS 2005a).

Vegetation

The Mississippi River reach containing the bluff top occupied by the Center and the associated slope that adjoins the Mississippi River floodplain lie within the Hot Continental Division, Eastern Broadleaf Forest Province, as described by Bailey (1995). This vegetation province occupies the transition zone between tallgrass prairie provinces to the west and true forest provinces to the east, with dominant species from both provinces typically present in natural vegetation stands (MN DNR 2005a). Average annual temperatures are 40°F and precipitation averages between 25 to 30 inches per year.

Rolling topography and past glaciation characterizes the northern portion of the Eastern Broadleaf Forest Province, including the Center. Most of the regional geology and landforms, including the Mississippi River valley and its sand plain outwash, are derived from glacial activity. The Minneapolis/St. Paul metropolitan area is cupped in a gently sloped basin formed of Paleozoic sedimentary rocks (MN DNR 2005b). Channels of pre-glacial rivers cut through these sedimentary formations. These channels were then filled over time by glacial till, forming

the chains of lakes located within the cities. Soils onsite are predominantly Alfisols, which are moderately leached forest soils with relatively high native fertility (McDaniel 2005). Alfisols are productive soils due to the combination of favorable climate and high fertility. Most are farmed unless they have become developed as urban areas expand.

Local Plant Communities

The environs adjacent to the Center are a combination of developed lands, highways, roadways, facilities, and parks to the west and south, and natural vegetation of the Mississippi River floodplain to the east and north. The natural vegetation exists on the bluff slope, toeslope, and on the floodplain terrace.

The bluff slope located on the eastern boundary of the project site supports a maple – basswood forest community. This is a mesic forest community of mixed hardwoods, with sugar maple (*Acer saccharum*), American basswood (*Tilia americana*), species of elm (*Ulmus* spp.), green ash *(Fraxinus pennsylvanica*), and northern red and white oak (*Quercus rubra* and *Q. alba*) (MN DNR 2005b). The closed maple – basswood canopy intercepts most of the sunlight, resulting in a patchy distribution of understory plant species. The subcanopy consists of saplings of the canopy tree, plus hophornbeam or ironwood (*Ostrya virginiana*), leatherwood (*Dirca palustris*), bitternut hickory (*Carya cordiformis*), and/or pagoda dogwood (*Cornus alternifolia*) (MN DNR 2005b). A variety of forbs are common in the herbaceous layer of this community, including trout lilies (*Erythronium* spp.), Dutchmen's breeches (*Dicentra* spp.), spring beauty (*Claytonia* spp.), toothwort (*Dentaria* spp.), false rue anemone (*Isopyrum biternatum*), mayapples (*Podophyllum* spp.), and trilliums (*Trillium* spp.) (MN DNR 2005b).

The toeslope, maintained in a saturated condition by natural groundwater seepage, supports a black ash (*Fraxinus nigra*) swamp community. Located between the slope and the Mississippi River floodplain and at the boundary of the Center site, a wet ash swamp hardwood forest stand characterized by black ash and other hardwood trees, including American elm, American basswood, and sugar maple, has become established (MN DNR 2005b). The understory shrub layer is typically sparse and often includes sapling black ash, chokecherry (*Prunus virginiana*), wild black currant (*Ribes americanum*), nannyberry (*Viburnum lentago*), and the liana Virginia creeper (*Parthenocissus quinquefolia*). Common species comprising the herbaceous layer include fowl mannagrass (*Glyceria striata*), common marsh marigold (*Caltha palustris*), touch-me-not (*Impatiens* spp.), and wild geranium (*Geranium maculatum*). The ground surface of swamp stands can be covered by pooled water or have hummocks of peat (MN DNR 2005b).

Occupying the Mississippi River floodplain adjacent to the toeslope and to the river's edge is a relatively unaltered forest community characterized by silver maple, American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), black willow (*Salix nigra*), and eastern cottonwood (*Populus deltoides*). Seasonal flooding occurs when flows in the river overtop the banks and spread across the floodplain terrace. Runoff and seepage from the Center site is delivered to the floodplain terrace, which supports the Central Wet – Mesic Hardwood Forest community (MN DNR 2005b). Common canopy trees include American basswood, black ash, silver maple (*Acer saccharinum*), black willow (*Salix nigra*), eastern cottonwood, northern red oak, and green ash (MN DNR 2005b). The subcanopy is characterized by sapling sugar maple and American basswood trees and hophornbeam or ironwood tall shrubs. The shrub layer is

usually sparse to moderately dense in terms of cover and includes beaked hazelnut (*Corylus cornuta*), chokecherry, and nannyberry, along with seedlings of the dominant tree species and the lianas Virginia creeper and wild grape (*Vitis riparia*). The herbaceous layer is dense with lady fern (*Athyrium filix-femina*), the most abundant forb, and several species of sedge (*Carex* spp.) are commonly present (MN DNR 2005b).

The Minnesota Natural Heritage database identified five native plant communities within a 1-mile radius of the Center. The black ash swamp seepage subtype 10 is dominated by black ash (*Fraxinus nigra*) and has an herb layer that includes sympocarpus, caltha, and impatiens (all common) (MN DNR 2005c).

Black ash swamp seepage subtype 9 is dominated by black ash (*Fraxinus nigra*) that is 2 inches to 10 inches diameter-at-breast-height. Fifty percent of the area is covered by trees other than black ash including (*Frax pensylvanica*), American basswood (*Tilia americana*), slippery elm (*Ulmus rubra*), and sugar maple (*Acer saccharum*). Scattered shrubs include dogwood (*Cornus stol*), elder (*Sambucus can*), black current (*Ribes americanus*), and buckthorn (*Rhamnus cath*). In addition to containing the same common herbs as black ash swamp seepage subtype 10, this area also contains *Saxifraga pens uncommon* (MN DNR 2005c).

The moist cliff is an area where the cliffs vary from dry to moist, portions have some seepage, the tallest cliffs are about 15 meters tall with layers that include limestone, shale, and sandstone, with a large amount of erosion. The driest areas are populated with harebell (*Campanula rotundifolia*), wild columbine (*Aquilegia canadensis*), northern bedstraw (*Galium boreale*), and shadowy goldenrod (*Solidago CF sciaphila*). The wettest areas are populated with bulblet fern (*Cystopteris bulbifera*), clearweed (*Pilea pumila*), mosses, and liverworts (MN DNR 2005c).

Mesic oak savanna (central) 1 is a gentle east-facing slope on sandy loam, and has a 5% canopy cover of bur oak (*Quercus macrocarpa*) and northern pin oak (*Quercus ellipsoidalis*). Common herbs include big bluestem (*Andropogen gerardii*), Kentucky bluegrass (*Poa pratensis*), stiff goldenrod (*Solaigo rigida*), goldenrod (*S. canadensis*), wild bergamot (*Monarda fistulosa*), Canada tick trefoil (*Desmodium canadense*), coneflower (*Ratibida pinnata*), and false boneset (*Kuhnia eupatorioides*) (MN DNR 2005c).

Mesic prairie (central) 5 is a dry mesic prairie cover class, but very weedy. It is dominated by big bluestem (*Andropogon gerardii*), bluegrass (*Poa pratensis*), little bluestem (*Schizacyrhium scoparium*), and slippery elm (MN DNR 2005c).

Center Plant Communities

Plant communities in the project area and onsite are influenced by the climate, topography, soils, and fire (MN DNR 2005b). Pre-settlement, this bluff top likely supported an oak savanna characterized by bur oak (*Quercus macrocarpa*) and tallgrass species including big bluestem (*Andropogon gerardii*) and Indian grass (*Sorghastrum nutans*) that would correspond to the Bur Oak Northern Tallgrass Wooded Herbaceous vegetation association of NatureServe (2005). Currently, the Center is occupied by business infrastructure including access roads, parking areas, buildings, and open areas that were constructed or planted following land-

leveling activities. In addition, wetlands and successional deciduous woodlands remain from the natural, pre-settlement condition or have become established on sites disturbed by development (figure23). These vegetation types found on the Center property have been divided among upland and wetlands plant communities in the following discussion.

FIGURE 23. REPRESENTATIVE WETLANDS ON THE CENTER SITE

Upland Plant Communities

Open Area Vegetation

The open areas of the Center consist of introduced and maintained landscape plant species and some individual native trees, possibly remaining from the pre-settlement woodland/ savanna stand. They are located upslope adjacent to the Camp Coldwater Spring area and Center buildings, extending to the edge of deciduous woodland/forest stands occupying the undeveloped bluff edges and steep slope. Grassy lawns and parks are maintained by regular mowing, and have been planted primarily to species of fescue (*Festuca* spp.), although some wet areas have become invaded by the aggressive nonnative reed canarygrass (*Phalaris arundinacea*). A few nonnative forbs have also become established in the lawns and parks, including common dandelion (*Taraxacum officianale*), black medic (*Medicago lupulina*), and goldenrod (*Solidago* sp.). Occasional large bur and northern red oak trees remain within the maintained Center landscape, along with introduced plantings of pine (*Pinus* sp.), spruce (*Picea* sp.), and weeping willow (*Salix babylonica*).

Bluff Top Woodland and Forest Stands

Undeveloped areas of the bluff top, mostly near the edge, support mixed deciduous woodland and forest stands that are successional and characterized by mature trees, including northern red oak, box-elder (*Acer negundo*), eastern cottonwood, and American sycamore (*Platanus occidentalis*). These trees form an open canopy. Canopy trees range in size from 8 to 18 inches diameter-at-breast-height, with larger trees scattered across stands or occupying the edge of stands and smaller trees occupying the stand interior. The understory canopy is dense and comprised of sapling box-elder, sugar maple, and green ash trees, buckthorn (*Rhamnus* sp.), and red elderberry (*Sambucus racemosa*) shrubs. The liana Virginia creeper is common in the tree canopy. The common herbaceous understory species is garlic mustard (*Alliaria petiolata*), a nonnative forb.

Wetlands Plant Communities

Wetlands of three types (aquatic, emergent, and forested) are present within the Center property boundary, where they occupy drainages, ditches, ponds, swales, seeps, and springs. Seven distinct wetland systems were identified and delineated as part of this project, and occupy approximately 9% of the site area (e²M 2005). Their regulation, delineation, and functional values, including wildlife habitat, are described under the wetlands section of this document and within a separate wetlands delineation report (e²M 2005), incorporated into this draft EIS by reference. This section describes the wetlands vegetation.

Aquatic Wetlands

Formally classified as a palustrine unconsolidated bottom, semi-permanently flooded (PUBF) wetlands, two small aquatic systems were delineated on the Center (figure 24). Located at Camp Coldwater Spring and its associated reservoir, and within an unnamed wetlands in the southeast section of the site fed by Camp Coldwater Spring seepage. These systems encompass only small areas included within the approximately 0.9-acre area of palustrine emergent wetlands habitat, but provide flood storage functions, valuable water supplies, and habitat to resident wildlife. Floating vascular plants characterize the open water, including species such as duckweeds (*Lemna* spp. and *Spirodela* spp.) and bladderwort (*Utricularia* spp.), in addition to algae species. Floating and rooted aquatic plants provide substrate for the aquatic macro-invertebrates, which provide food for vertebrate wildlife including waterfowl, mammals, fish, and amphibians. Wetlands plant species that have become established in shallow water and saturated soils at the pond margins include cattails (*Typha* spp.), sedges (*Carex* spp.), reed canarygrass, orchardgrass (*Dactylis glomerata*), and touch-me-not (impatiens).

Emergent Wetlands

Palustrine emergent (PEM) wetlands located on the Center generally function as headwater wetlands that seasonally discharge water downslope via runoff and/or seepage. Less than 1.0 acre (approximately 0.9 acre) of emergent wetlands habitat was delineated, and most was considered disturbed by past human activity (e²M 2005). These wetlands occupy shallow

FIGURE 24. REPRESENTATIVE AQUATIC WETLANDS AT THE CENTER

standing water and saturated soils around pond margins and in drainages, supporting mixed stands of broad- and narrow-leaved cattail (*Typha latifolia* and *T. angustifolia*), green bulrush (*Scirpus atrovirens*), woolgrass (*S. cyperinus*), soft stem bulrush (*S. validus*), spike-rush (*Eleocharis* sp.), broom sedge (*Carex scoparia*), reed canarygrass, touch-me-not or impatiens, Jack-in-the-pulpit (*Arisaema triphyllum*), common dandelion, black medic, dogbane or Indian-hemp (*Apocynum androsaemifolium*), and goldenrod (*Solidago* sp.) (figure 25). Associated short to tall shrubs scattered along emergent wetlands margins include black willow, box-elder, and green ash saplings and red elderberry and staghorn sumac (*Rhus typhina*) shrubs. The lianas, wild grape, and Virginia creeper were occasionally observed in these communities. Emergent wetlands onsite deposit thick layers of thatch, which provides good habitat for microorganisms, invertebrates, and small vertebrate species.

Forested Wetlands

The forested wetlands on the Center predominantly occupy drainages and seeps and are classified as palustrine forested, broad-leaved deciduous (PFO) stands. These stands have become established on approximately 1.6 acres, and can be characterized as mid-succession woodlands possessing a dense shrub layer (figure 26). Trees common to forested wetlands include eastern cottonwood, box-elder, green ash, American elm, hawthorn (*Crataegus* sp.),

FIGURE 25. REPRESENTATIVE EMERGENT WETLANDS AT THE CENTER

FIGURE 26. REPRESENTATIVE FORESTED WETLANDS AT THE CENTER

and sycamore. The majority of trees are saplings to young in age with estimated diameters-at-breast-height ranging from 2 to 10 inches. A few mature trees measured approximately 15 to 18 inches diameter-at-breast-height and the overall stand structure was considered to be complex (e²M 2005). Stand subcanopy and shrub layers were characterized by sapling box-elder and green ash trees and buckthorn and red elderberry tall shrubs. The liana, Virginia creeper, was notable in some stands. The herbaceous layer was sparse to moderately dense and included reed canarygrass and the forbs touch-me-not or impatiens, garlic mustard, bittersweet nightshade (*Solanum dulcamera*), and Jack-in-the-pulpit. Some forested wetlands were disturbed historically and contained excavated depressions and piles of rubble and abandoned construction debris (e²M 2005).

Tree Management

Removal of trees from the project site, particularly buckthorn and species of elm, has occurred in recent years. Buckthorn is an aggressive nonnative shrub first imported from Europe during the 1800s, principally as a hedge-forming shrub or small tree (MN DNR 2005d). It aggressively invades disturbed sites and the deciduous forest understory where it: (1) forms an impenetrable layer and out-competes native plants for light, moisture, and nutrients; (2) shades and eliminates native ground cover and smaller shrubs, contributing to soil erosion; (3) generally degrades wildlife habitat; and (4) serves as host to pest species including the soybean aphid (*Aphis glycines matsumura*) and crown rust fungus (*Puccinia coronata*) (MN DNR 2005d). Because the fruit is eaten by several wildlife species, including birds, buckthorn seeds are rapidly spread and can remain viable in the soil for up to five years (MN DNR 2005d).

Buckthorn can be controlled by many methods, including hand-pulling seedlings, weed-wrenching saplings, herbicide application to foliage, and/or cutting the stem at the soil surface then treating the stump with herbicide to prevent re-sprouting. Late summer and fall is the optimal time to cut and chemically treat buckthorn stumps (MN DNR 2005). Buckthorn control, in the form of cutting shrubs and trees, was undertaken within the Center during the fall of 2004.

Elm trees on the Center site are succumbing to Dutch elm disease, a fungus (*Ophiostoma ulmi*) transmitted by native and European bark beetles (*Hylurgopinus rufipes* and *Scolutus multistriatus*) (KSU 2006). Beetles of both species are attracted to elm trees that were recently killed by Dutch elm disease for egg laying—spore production by the fungus is typically enhanced in the egg galleries. Elm bark beetles emerging from infected wood are contaminated with spores and introduce them to healthy elm trees as they feed. Both beetle species may travel up to 1,000 feet or more from brood trees (KSU 2006).

Elm trees of the Center range from healthy with no sign of infection to some discolored and wilted leaves on branches to completely dead trees. Elm trees were removed from around the Camp Coldwater Spring area in 2005, as well as other portions of the Center (figure 27).

FIGURE 27. ELM TREE STUMPS ADJACENT TO COLDWATER RESERVOIR

Rare Plant Species

There are 33 known occurrences of rare species or native plant communities in an area within a 1-mile radius of the Center. Endangered plant species listed by the Minnesota Natural Heritage database as being found in the 1-mile radius area include handsome sedge (*Carex formosa*) and plaintain-leaved sedge (*Carex plantagina*). The threatened plant species is rock clubmoss (*Huperzia porophila*). According to the Natural Heritage Program, disposition of the Center alone should not affect any known occurrences of rare plant species (MN DNR 2005c).

Wildlife

The Mississippi River valley and its tributaries in east-central Minnesota attract an array of wildlife that use diverse habitats. Over 260 birds species are common to this area, and of these, 120 are known to nest in this part of Minnesota. Common waterfowl of this area include Canada geese, mallard duck, wood duck, green-winged teal, gadwall, and American wigeon. Marsh and water birds frequently observed along the Mississippi River corridor include great egrets, great blue heron, green-backed heron, and black-crowned night heron. Common birds of prey include red-tailed hawk, Coopers hawk, and American kestrel. Exposed sandbars and

mudflats of the Mississippi River attract shorebirds including greater and lesser yellowlegs, solitary sandpipers, and spotted sandpipers.

Due to its location within one of America's most important migration corridors, the Center undoubtedly provides important stopover habit. Its forested habitats adjacent to the Mississippi River attract nighthawks, wood thrushes, vireos, and warblers. Over 70 other species of birds depend on the forests and wetlands of the area for either nesting or migration habitat, and many of these species winter in the tropical forests of Latin and South America. Camp Coldwater Spring and its associated reservoir also attract hundreds of waterfowl, especially mallards, to its open-water habitat every winter.

The peregrine falcon (*Falco peregrinus*) is the rarest bird of prey in Minnesota (MN DNR 2005e). After the peregrine falcon population in Minnesota was decimated in the 1950s and 1960s by pesticides, they are slowly being restored (MN DNR 2005f). Peregrine falcons are now found in Minnesota in cities, along the north shore of Lake Superior, and along the Mississippi River in southeastern Minnesota (Minnesota DNR 2005e). In Minnesota last year, 38 pairs of peregrine falcons successfully raised 84 young at traditional cliff areas along Lake Superior's north shore, new human-made habitats, power plant stacks, skyscraper balconies and rooftops, and on bridges over the Mississippi River in downtown Minneapolis and St. Paul (Minnesota DNR 2005f). In recent years, a pair of peregrine falcons was spotted nesting in the Mendota Bridge, just southeast of the Center. The female of the pair was killed within the last year and the male has brought in a new female. However, the new pair has not been observed nesting (Fort Snelling SP 2005).

A bald eagle nest is located in Fort Snelling State Park, approximately 1.25 miles southeast of the Center. The narrow band of forest in the eastern portion of the Center is considered to have the potential to be used as a diurnal perch site for bald eagles (Fort Snelling SP 2005). No bald eagles have been observed within the Center and the USFWS indicated by letter that the Center does not contain any threatened or endangered species or designated critical habitat (USFWS 2005a).

At least 50 mammals occur within the Mississippi River corridor and some are likely visitors on Center property. The most visible of these mammals is the whitetail deer. Other year-round residents attracted to river habitats include mink, muskrat, raccoon, and beaver. River otter, nearly eliminated in the past, are now occasionally seen in this area. Small mammals typical of this area include shorttail shrews, white-footed mouse, thirteen-lined ground squirrel, and plains pocket gopher. Eastern chipmunks, eastern gray fox, red fox, and red squirrels are commonly found in forested habitats. Both big and little brown bats are found in this area. Red fox are the most common carnivores of the area, followed by coyote and gray fox.

Hydrology

Surface Water Resources

The 27.32-acre Center is located on the eastern boundary of the Minnehaha Creek watershed, south of the intersection of the east-flowing Minnehaha Creek with the Mississippi River, on

the west bank of the river. Two distinct hydrologic basins exist within the Minnehaha Creek watershed. The first or "Upper Basin," which covers a 123-square-mile area, consists of that part of the watershed from Gray's Bay Dam on Lake Minnetonka to the western boundary of the district. The second or "Lower Basin," which covers approximately 50 square miles, includes the area east of Gray's Bay Dam that is drained by Minnehaha Creek to the Mississippi (Wenck Associates, Inc. 1997). The Center lies within the Lower Basin.

From its origin at Gray's Bay, Minnehaha Creek flows easterly through Minnetonka, Hopkins, St. Louis Park, Edina, and Minneapolis to its mouth at the Mississippi River. Although water released at Gray's Bay produces most stream flows, other sources, including overflow from Lake Nokomis and drainage from the Minneapolis Chain of Lakes (Brownie, Cedar, Lake of the Isles, Calhoun, and Harriet), contribute water to the creek. Several small intermittent streams, ditches, and numerous storm sewers also periodically supply water to Minnehaha Creek (Wenck Associates, Inc. 1997).

Rain water that falls on the Center does not flow into Minnehaha Creek, but rather flows by sheet flow or is collected in a series of gullies and unnamed drainages and drains eastward to the Mississippi River. There are several small depressions or holding basins present within the Center boundary that collect surface water runoff and eventually discharge toward the Mississippi River or allow the runoff to seep into the ground.

The main drainage from the site is the drainage that carries the discharge from Camp Coldwater Spring and the associated reservoir. The spring discharges on the hillside above the reservoir and from there flows into the reservoir. The reservoir then discharges through a culvert. If the culvert becomes plugged or the flow is too great, the discharge is overland across an existing roadway and down the hill east of the road. Inflows to the reservoir are not routinely measured; however, outflows are measured at an established station with an automatic measuring device. Concerns related to potential impacts to the spring flows as a result of the SH 55 and SH 62 intersection improvements project resulted in a requirement that the MnDOT monitor these flows and post monthly reports on their Web site through May 2006. A review of these reports over the period from September 2004 through October 2005, indicates that flows from Camp Coldwater Reservoir have varied from approximately 27 gallons per minute to approximately 161 gallons per minute (MnDOT 2005). (Lower flows were measured; however, the data is listed as suspect due to culvert clogging or instrument problems.) A previous evaluation completed in 2000 with a more limited data set indicated less flow variance, with flows that vary between 77 and 115 gallons per minute (Short Elliot Hendrickson, Inc. 2000). Based on the most recent data, flows can vary a great deal during a day or month and there does not appear to be any seasonally related pattern to the flows.

Groundwater Resources

Groundwater can be found within about 20 feet of the land surface in most places within the Minnehaha Creek watershed, including the Center property. No known measurements of the groundwater table exist within the Center area, although the discharge of the Camp Coldwater Spring reflects a surface discharge of groundwater. Groundwater for drinking water purposes usually comes from much greater depths, sometimes hundreds of feet below ground surface.

Almost every formation in the area will yield some water, but only the glacial drift. The St. Peter sandstone, the Shakopee and Oneota dolomites (also known as the Prairie du Chien aquifer), Jordan sandstone, the Franconia and Galesville sandstones, and the Mount Simon and Hinckley sandstones yield large amounts (Maderak 1965).

TABLE 3. GENERALIZED GEOLOGIC SECTION OF THE MINNEAPOLIS –ST. PAUL AREA
(modified from Maderak 1965)

System	Formation	Thickness (feet)
Quaternary	Alluvium	0 – 150
	Glacial Drift	0 – 400
Ordovician	Decorah Shale	0 – 95
	Platteville Limestone	30 – 50
	St. Peter Sandstone	140 – 160
	Shakopee Dolomite	35 – 60
	New Richmond Sandstone	0 – 10
	Oneota Dolomite	70 – 90
Cambrian	Jordan Sandstone	80 – 105
	St. Lawrence Formation	35 – 70
	Franconia Sandstone	100 – 200
	Galesville Sandstone	250 – 400
	Eau Claire Sandstone	
	Mount Simon Sandstone	
Precambrian	Hinckley Sandstone	75 – 175
	Fond du Loc Sandstone	1,000 +

Several bedrock aquifers underlie the glacial deposits. The most important are the Prairie du Chien aquifer, consisting of limestone and dolomite, and the Jordan sandstone aquifer. These aquifers can be more than 100-feet thick and yield large quantities of water. They are generally confined and therefore protected from contamination. The Platteville limestone and St. Peter sandstone occur closer to the land surface than the Prairie du Chien and Jordan aquifers, but they are less reliable sources of water and may be vulnerable to contamination. Below the

Jordan sandstone lies the Franconia aquifer, which yields large quantities of water. The natural water quality of the Franconia aquifer, however, is not as good as that of the Prairie du Chien and Jordan aquifers, and water wells installed in that aquifer are more expensive due to the depth. The Mt. Simon aquifer lies below the Franconia. The Mt. Simon is potentially an important source of water. In order to maintain the quality of water in this aquifer, drilling has been limited.

Camp Coldwater Spring is fed by groundwater originating upgradient of the Center property. The exact source of the spring water is subject to some debate; however, it is not expected that any of the alternatives proposed in this document would affect the source of the spring.

Water Quality

Surface Water Quality

A combination of natural and cultural factors determines the water quality of lakes and streams. Among the most important natural factors affecting lake water quality are depth and watershed size. Usually, deeper lakes are better quality. Also, lakes with smaller watersheds or smaller ratios of watershed area to lake area, tend to have better water quality. A watershed-to-lake ratio of 10 to 1 is typical in this region. While cultural factors include physical changes brought about by dredging, filling, or altering the natural drainage pattern, the cultural pattern most critical to water quality is the introduction of pollutants into lakes and streams (Wenck Associates, Inc. 1997).

Accelerated nutrient enrichment, or cultural eutrophication, is the district's highest priority water quality issue. Phosphorous is the nutrient of primary concern. An especially rich source of phosphorous is sewage. In the past, seven municipalities discharged treated sewage into the watershed; all seven discharged in the upper watershed, either directly to Lake Minnetonka, or to waters tributary to the lake. The mode of treatment then in use removed little of the phosphorous, and the result was a tremendous phosphorous loading—more than 50,000 pounds yearly as of 1970—to the receiving waters. Between 1971 and 1986, the wastewater from these municipalities was diverted to a regional facility on the Minnesota River. There are no longer any so-called point sources in the watershed, but the alteration of land caused by urbanization and agriculture results in substantial nonpoint pollutant loadings. A watershed comprising natural forest or grassland typically exports 0.1 pound of phosphorous per acre yearly; this is the result of runoff carrying dead vegetation and small quantities of eroded soil particles, along with nutrients leached from such materials. Urban and agricultural lands export phosphorus at typically 5 to 10 times the above rate. However, runoff from urban and agricultural areas carries into lakes and streams a variety of pollutants in addition to phosphorous (Wenck Associates, Inc. 1997).

The outflow from the Camp Coldwater Reservoir is measured for limited water quality along with the flow rate. The water quality measurements include temperature and specific conductivity. Temperature measurements varied for the period of September 2004 through October 2005 from 33°F in January 2005 to 63°F in August 2005 (MnDOT 2005). Specific conductivity also showed great variance from -4.5 units of microSiemens/centimeter (S/cm)

to 2014 S/cm (MnDOT 2005) with most of the readings ranging between 1,600 and 1,900 S/cm. Specific conductivity is a measure of a water's ability to conduct electricity (and therefore the water's ionic activity and content) standardized to a given temperature. Specific conductivity is generally thought to be a good measure of the concentration of total dissolved solids and, potentially, salinity. Elements with ionic forms that contribute the most to the measured specific conductivity include calcium, magnesium, sodium, potassium, bicarbonate, sulfate, and chloride. Values can vary greatly due to the geologic content of the groundwater system as well as from human-caused sources such as road salt, nonpoint source pollution (i.e., agricultural or urban runoff) and industrial inputs.

On August 31, 2005, representatives from the Minnesota Department of Health (MDH) undertook a water quality assessment of Camp Coldwater Spring. Based on observations during testing, the MDH determined that Camp Coldwater Spring has an open and unprotected reservoir, which subjects the water supply to environmental contamination from the immediate surroundings, compromising the integrity of the water (MDH 2005). MDH analytical results of Camp Coldwater Spring water indicate positive for bacteriological contamination of total coliform organisms, but absent for *E.Coli*. Based on water quality testing, MDH recommended to USFWS that:

- Warning signs be placed at Camp Coldwater Spring identifying the bacterial contamination.
- Commercially bottled water should be made available at any public events in the area of Camp Coldwater Spring.
- Water from the spring should not be used for cooking or culinary purposes (MDH 2005).

Groundwater Quality

Water quality in most aquifers of the Minnehaha Creek watershed is good. Drinking water standards have not been exceeded in samples collected from water supply wells. Iron concentrations are above the recommended limit in the Jordan and Franconia aquifers.

The quality of groundwater in the shallow aquifers is poor. It is clear that humans have dramatically impacted shallow groundwater quality. Chloride concentrations average about 245 parts per million (ppm), close to the drinking water standard of 250 ppm. Nitrate concentrations occasionally exceed the drinking water standard of 10 ppm. Shallow groundwater has also been impacted by organic pollutants. There have been more than 750 sites in the watershed identified with leaking underground storage tanks, many which have impacted the underlying groundwater. There are another approximately 150 sites where soil or groundwater cleanup has occurred. Most of these approximate 900 sites occur east of Lake Minnetonka where a shallow sand aquifer exists.

Groundwater quality is not measured anywhere on the Center property. Camp Coldwater Spring discharges from a groundwater source. Limited water quality measurements for the discharge from the reservoir are discussed in the "Surface Water Quality" section.

Wetlands

Wetlands are important natural systems because they perform diverse biologic and hydrologic functions. These functions include water quality improvement, groundwater recharge, pollution abatement, nutrient cycling, the provision of wildlife habitat, unique flora and fauna niche creation, stormwater storage, and erosion protection.

Regulatory Background

Agencies representing federal, state, and local governments in Minnesota regulate certain activities that affect the course, current, and cross-section of lakes, wetlands, rivers, and streams. Work affecting the course, current, or cross-section of a lake, wetlands, river, or stream may require a permit from one or all of these agencies.

On the federal level, regulation is by the U.S. Army Corps of Engineers (USACE) under section 404 of the Clean Water Act (33 U.S.C. § 1344) ("section 404"). Section 404 prohibits the discharge of dredge or fill material into navigable waters, defined as including special aquatic sites such as wetlands, without a permit from the USACE. This agency defines wetlands as "areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas," (33 C.F.R. Part 328.3[b]). The USACE generally covers all water and wetland areas, including those that are regulated by the Minnesota Department of Natural Resources (DNR) or subject to the Wetland Conservation Act (Wetlands Conservation Act of 1991, Laws 1991, chapter 354, as amended by Laws 1993, chapter 175, Laws 1994, chapter 627, Laws 1996, chapter 462, Laws 2000, chapter 382, and Laws 2001, chapter 146).

At the state level, regulation is by the Minnesota Department of Natural Resources Public Waters Work Permit Program. The permit program applies to those lakes, wetlands, rivers, and streams identified on Minnesota Department of Natural Resources Public Water Inventory maps.

At the local level, regulation is by local units of government under the Wetland Conservation Act (Laws 1991, chapter 354, as amended by Laws 1993, chapter 175, Laws 1994, chapter 627, Laws 1996, chapter 462, Laws 2000, chapter 382, and Laws 2001, chapter 146). This law was originally enacted by the State of Minnesota in 1991, and applies to nearly all wetlands not shown on the Minnesota Department of Natural Resources Public Water Inventory maps. The Wetland Conservation Act's purpose is to maintain and protect Minnesota's wetlands and the benefits they provide. The act requires anyone proposing to drain, fill, or excavate a wetlands to first try to avoid disturbing the wetlands; second, to try to minimize any impact on the wetlands; and finally, to replace any lost wetlands acres, functions, and values. Certain wetlands activities are exempt from the act, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation. Local government units (cities, counties, watershed management organizations, soil and water conservation districts, and townships) implement the act locally. The Minnesota Board of Water and Soil Resources administers the act statewide, and the Minnesota

Department of Natural Resources enforces it (BWSR 2005). At the Center site, the local government unit that implements that act is the Minnehaha Creek Watershed District.

Wetlands Classification and Inventory

The USFWS and National Park Service recognize and use the Cowardin system to classify wetlands and deepwater habitats. The Cowardin system uses a hierarchical classification scheme to categorize wetlands habitats based on similar hydrologic, geomorphic, chemical, or biological characteristics (Cowardin et al. 1979). There are five main wetlands types or "systems" in the Cowardin classification: marine, estuarine, riverine, lacustrine, and palustrine. These five systems are further refined hierarchically into subsytems, classes, subclasses, and dominance types. The palustrine system type is the one of interest for discussions related to wetlands at the Center site.

The USFWS *National Wetlands Inventory* is responsible for mapping and inventory of wetlands throughout the United States. The *National Wetlands Inventory* map that includes the Center site (St. Paul SE MN, Quadrangle) shows a single wetland within the Center boundaries. This wetland is classified on the map as PUBF. An onsite wetlands delineation, described below, confirmed the presence of this wetland, which was later determined to be Camp Coldwater Reservoir. The onsite delineation also revealed the presence of additional wetlands that are not shown on the *National Wetlands Inventory* map.

Wetlands on the Center Site

In June 2005, wetlands on the Center site were delineated using the routine methodology described in the USACE *Wetlands Delineation Manual* (USACE 1987). Within the same month, a technical evaluation panel conducted onsite field review of the delineation. The technical panel consisted of regulatory representatives from the USACE, the Minnesota Board of Water and Soil Resources, the Minnehaha Creek Watershed District, the Hennepin Conservation District, and the National Park Service. The panel determined that the wetlands delineation was accurate in all but one case. That one case required that an area of approximately 20 square feet be added to one of the areas identified as an emergent wetlands. The USACE and Minnesota Board of Water and Soil Resources have provided jurisdictional confirmation of the wetlands delineation performed at the Center site in June 2005.

In all, seven wetlands areas were identified on the Center site (table 4). Three can be characterized as palustrine emergent wetlands and four as palustrine forested wetlands. One of the emergent wetlands and one of the forested wetlands contain smaller areas that are shallow eutrophic (containing a high concentration of dissolved nutrients, with periods of oxygen deficiency) ponds. The boundaries of each wetlands area were marked in the field, and each wetland was assigned an alphanumeric identification label. The geographic coordinates of the wetlands boundaries were recorded with a Global Positioning System (GPS) and exported into a Geographic Information System (GIS) mapping program. A map showing the location of the seven wetlands is provided as figure 28.

TABLE 4. WETLANDS OF THE CENTER SITE

Wetlands ID	Palustrine Wetlands Type	Size (acres)	Notes
A	Emergent (PEM)	0.56	Includes a smaller shallow pond area (unconsolidated bottom—PUBF)
B	Emergent (PEM)	0.12	
C	Forested (PFO)	0.61	
D	Forested (PFO)	0.88	Includes a smaller shallow pond area (unconsolidated bottom—PUBF)
E	Forested (PFO)	0.08	
F	Emergent (PEM)	0.18	
G	Forested (PFO)	0.03	

Note: Under the Cowardin system, abbreviations (PEM, PFO, and PUBF) are used to denote these particular wetlands types.

Each of the wetlands on the Center site has been classified as belonging to the palustrine system. The palustrine system refers to vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen, and prairie. It also includes the small, shallow, permanent or intermittent water bodies often called ponds (Cowardin et al. 1979). The wetlands of the Center site have been further classified under the Cowardin system into emergent, forested, and unconsolidated bottom wetlands. The wetlands are discussed further below by type.

Palustrine Emergent Wetlands

Wetlands A, B, and F are palustrine emergent wetlands that have been disturbed. Emergent wetlands are characterized by erect, rooted, herbaceous water-loving plants, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. These wetlands are located in the eastern half of the site, either adjacent to abandoned buildings or on the fringe of drainage ditches.

Vegetation in these wetlands generally consists of broad-leaved cattail (*Typha latifolia*), narrow-leaved cattail (*Typha angustifolia*), soft stem bulrush (*Scirpus validus*), green bulrush (*Scirpus atrovirens*), broom sedge (Carex *scoparia*), and impatiens (*Impatiens* sp.).

Emergent wetland A is associated with Camp Coldwater Spring and Reservoir, and functions as the headwaters of a stream. It discharges water into wetlands D and E from two locations. It discharges water eastward beneath a paved road into wetland D. The southern portion of wetland A has a seasonal surface connection to wetland E, as well as a subsurface connection. The surface connection is a shallow eastward-draining swale (about 1-foot wide) that runs across a road and into wetland E. The subsurface connection is an underground PVC pipe that seasonally conveys water eastward and into the drainage swale of wetland E. Building 4 of the Center is located entirely within wetland A. Wetland F consists of a vegetated drainage swale adjacent to Building 8 of the Center. In June 2005 there was standing water within the wetland, with the depth varying from 0–2 inches. The headwater of the drainage swale is an early seral scrub-shrub wetlands bordered by an emergent wetlands component (includes the invasive

reed canarygrass—*Phalaris arundinacea*). At its southernmost point, wetland F drains into a buried culvert that conveys water seasonally south and away from the site.

Palustrine Forested Wetlands

Wetlands C, D, E, and G are palustrine forested wetlands. This wetlands type most commonly occurs in the eastern United States and in the West where moisture is relatively abundant, particularly along rivers and in the mountains. It occurs only in the palustrine and estuarine systems and normally possesses an overstory of trees, an understory of young trees or shrubs, and a herbaceous layer. It is characterized by woody vegetation that is 20 feet tall or taller (Cowardin et al. 1979).

Cottonwood and box-elder dominate in the forest canopy of wetlands C, D, E, and G. The trees have an estimated diameter-at-breast-height of four to 14 inches, suggesting that the woody vegetation became established within the past 40 to 50 years. The understory consists of dense stands of the nonnative, invasive buckthorn (*rhamnus cathartica*), plus box-elder and green ash. Some portions of the forested wetlands were disturbed historically and some contain excavated depressions and piles of rubble and abandoned construction debris. For example, abandoned construction debris is present along the southwest boundary of wetland D. A bike trail, located on an abandoned railway bed, borders the eastern boundary of wetlands C and D.

Palustrine Unconsolidated Bottom Wetlands

Wetland areas A and D contain smaller subareas within them that can be classified under the Cowardin system as PUBF. These subareas are essentially shallow ponds. Palustrine unconsolidated bottoms wetlands are characterized by the lack of large stable surfaces for plant and animal attachment.

The first PUBF wetlands, a subarea of wetland A, is located near the middle of the Center site and is identified as Camp Coldwater Spring and Reservoir. It is a nutrient-rich wetlands vegetated by floating vascular emergent plants. Groundwater from hillside seeps bordering wetland A drains downslope into this PUBF wetlands. Surface water from Camp Coldwater Reservoir is then conveyed eastward beneath a paved road via an underground pipe and discharged into wetland D.

The second PUBF is located in the southeastern portion of wetland D. Its immediate surroundings include forested wetlands to the north and south, emergent wetlands to the west, and the Center property boundary to the east. Water is provided by overland flow from Camp Coldwater Spring, seasonal precipitation, and possibly, groundwater. The portion of the wetlands immediately upstream from the PUBF subarea is vegetated in reed canarygrass (*Phalaris arundinacea*), a nonnative invasive species, and impatiens.

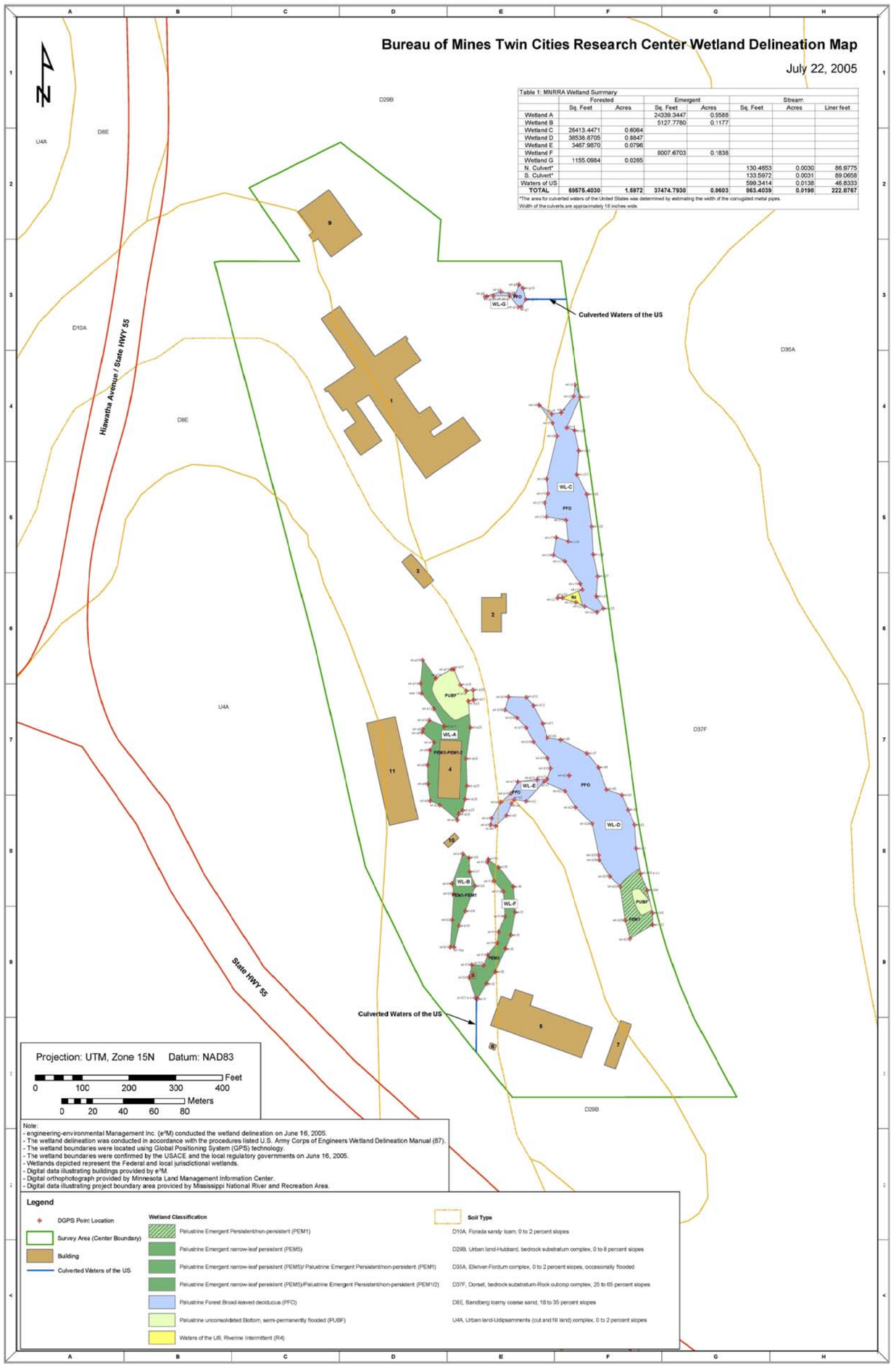

FIGURE 28. WETLANDS DELINEATION MAP

SOCIOECONOMICS

The Center is an integral part of the socioeconomic composition of the surrounding community. When operational, it employed as many as 200 workers. Today, it functions as an informal adjunct to adjoining properties and, when open to the public, a destination for visitors to the Camp Coldwater Spring area.

The 27.32-acre Center lies within unincorporated Hennepin County, Minnesota. It is part of a federal enclave lying south of the city of Minneapolis, which was once Fort Snelling, but has since been parceled out and developed over the years into a number of state and federal facilities. Among the latter are the Veterans Administration Medical Center, Fort Snelling State Park, Historic Fort Snelling, several military reserve units, federal office buildings, a golf course, and ball fields.

Area Demographics

The closest neighborhoods that could be affected by the disposition and reuse of the Center are four neighborhoods in the southeasternmost corner of Minneapolis: Minnehaha, Morris Park, Keewayden, and Wenonah. These are a portion of the larger Nokomis Community and are represented collectively in civic affairs by the Nokomis East Neighborhood Association. These stable neighborhoods saw little change in population or the number of households between the 1990 and 2000 censuses (table 5).

While minority race and ethnic population in the neighborhoods doubled over the decade, the area was still over 90% Caucasian in 2000.

The area is predominately single-family homes with over 80% of the households living in owner-occupied units in 2000. There was an increase in the number of owner-occupied units and a decrease in the number of renter occupied units over the decade from 1990 to 2000.

TABLE 5. NEIGHBORHOOD CHARACTERISTICS 1990–2000

Neighborhood	Population		Housing Units	
	1990	2000	1990	2000
Minnehaha	4,334	4,058	1,978	1,940
Morris Park	3,213	2,984	1,372	1,365
Keewayden	3,369	3,178	1,453	1,490
Wenonah	4,159	4,422	1,955	1,915
Nokomis East Total	15,075	14,642	6,758	6,710

Source: Census data compiled by Minneapolis Community Planning and Economic Development Department

Median household income in the four neighborhoods ranged from $42,400 (Wenonah) to $52,400 (Keewayden) in the 2000 census (1999 incomes), with virtually identical growth over the previous decade. The overall median household income of the Nokomis East neighborhoods was above that of Minneapolis, but below that of Hennepin County and the seven-county metropolitan area (table 6).

TABLE 6. MEDIAN HOUSEHOLD INCOME 1999

Nokomis East	$45,836
Minneapolis	$37,974
Hennepin Co	$51,711
Metropolitan Area	$54,304

Source: Data derived from Minneapolis Community Planning and Economic Development Department statistics and U.S. Census 2000

Whatever the means of disposition or the eventual use of the site, it would take place within the context of the larger regional economy. The Twin Cities metropolitan area grew from 2.29 million people in 1990 to 2.64 million in 2000. According to forecasts prepared by the Metropolitan Council in 2004, the area is expected to reach a population of 3.33 million by 2020. In doing so, the region would produce a net gain of more than 340,500 households and 426,750 jobs between 2000 and 2020 (table 7).

Other than the Veterans Administration Medical Center and the other government employment in the former Fort Snelling, there is little employment or commercial activity nearby. There are a few small businesses along Minnehaha Avenue north of East 54th Street. The closest commercial area of any size is a community-serving strip center at SH 55 and East 43rd Street at the north end of Minnehaha Park.

TABLE 7. METROPOLITAN GROWTH AND PROJECTIONS 1990–2020

	1990	2000	2020
Population			
Minneapolis	368,383	382,747	423,000
Hennepin Co	1,032,431	1,116,206	1,310,030
Metropolitan Area	2,288,729	2,642,062	3,430,100
Households			
Minneapolis	160,682	162,352	181,000
Hennepin Co	419,060	456,133	550,480

TABLE 7. METROPOLITAN GROWTH AND PROJECTIONS 1990–2020

	1990	2000	2020
Metropolitan Area	875,504	1,021,459	1,386,200
Employment			
Minneapolis	278,438	301,826	332,500
Hennepin Co	723,105	856,838	1,045,610
Metropolitan Area	1,272,773	1,563,245	2,002,100

Source: Metropolitan Council 2006

HEALTH AND SAFETY

Section 120 of CERCLA requires that "all remedial action necessary to protect human health and the environment be taken with respect to hazardous substances before real property may be transferred outside the federal government." In anticipation of divestiture of the Center property, the TCRC Closure Team conducted an extensive environmental cleanup of the property in the late 1990s. Although many potentially hazardous materials, such as chemicals and wastes associated with laboratories, were removed, others (e.g., asbestos, mold) remain in some buildings.

Several reports detail what remediation actions were taken and what potential hazards remain at the Center. These include the "Phase I Environmental Site Assessment" conducted by Loucks and Associates (1996), "Phase II Environmental Site Assessment" conducted by Rani Engineering (1997), "Environmental Actions Taken at TCRC: A Report to the Minnesota Pollution Control Agency Voluntary Investigation and Cleanup Program" (1997), and an "Environmental Disclosure Statement" prepared by the TCRC Closure Team (2000). In addition, the Minnesota Pollution Control Agency sent a letter report to the TCRC Closure Team on May 5, 1998, indicating that the Center had satisfied the Minnesota Pollution Control Agency Voluntary Identification Cleanup requirements. More recently, a safety evaluation of the Center was conducted under the direction of the USFWS. This evaluation included inspections of the Center's buildings, roads and grounds, and parts of the perimeter fence (USFWS 2005b).

Demolition or reuse of the buildings at the Center would require safe cleanup or removal of remaining hazardous substances and elimination of other safety hazards. The following sections summarize the status of health and safety issues at the Center.

Asbestos

Asbestos is a naturally occurring mineral with a chain-like crystal structure. It is usually found mixed into other minerals. Asbestos was used in many ways over the years. Pipe insulation, shingles, wallboard, and blown-in insulation are just a few of the products that once contained asbestos. Although the federal government suspended production of most asbestos products in the early 1970s, installation of these products continued through the late 1970s and even into the early 1980s. Asbestos is dangerous only if its broken crystal fibers float in the air after being disturbed. Asbestos fibers can be released during renovation or demolition of older buildings. Chronic exposure to asbestos may increase the risk of lung cancer, mesothelioma, and nonmalignant lung and pleural disorders (USDHHS, Agency for Toxic Substances and Disease Registry 2005).

At the time the environmental disclosure statement was prepared in 2000, asbestos was present in the Center in various structures in the form of pipe insulation, floor and ceiling tiles, building panel, and possibly refractory brick. Asbestos-containing material in Buildings 1, 2, and 9 was found to be in good condition and not friable. The roof and siding of Building 4 were found to contain asbestos, and these were repaired and repainted to reduce the risk of asbestos fibers being released into the air. Known asbestos locations were labeled in each building for future use and information in case of building repair or demolition. However, asbestos labeling was limited to easily accessible locations and the potential for asbestos to be present behind sealed walls is unknown (i.e., asbestos pipe insulation for pipes behind walls). There is no known asbestos in Buildings 3, 5, 6, 7, 8, 10, and 11 (TCRC Closure Team 2000).

Mold

Building 9 has an extensive mold infestation on walls, ceilings, and curtains. Mold is also evident on ceiling tiles and walls in some areas of Building 1 (USFWS 2005b). The mold is a result of past wet conditions caused by natural flooding and sewer system back up after power to sump pumps was disconnected.

Molds can grow on virtually any organic substance (including wood, paper, carpet, foods, and insulation), so long as moisture and oxygen are present. When excessive moisture accumulates in buildings or on building materials, mold growth often occurs, particularly if the moisture problem remains undiscovered or unaddressed. Molds reproduce by making spores that usually cannot be seen without magnification. These spores continually waft through the air and are easily inhaled by humans.

Molds produce allergens (substances that can cause allergic reactions), irritants, and in some cases, potentially toxic substances (mycotoxins). Inhaling or touching mold or mold spores may cause allergic reactions in sensitive individuals. Allergic responses include hay fever-type symptoms such as sneezing, runny nose, red eyes, and skin rash (dermatitis). Allergic reactions to mold are common. They can be immediate or delayed. Molds can also cause asthma attacks in people with asthma who are allergic to mold. In addition, mold exposure can irritate the eyes, skin, nose, throat, and lungs of both mold-allergic and non-allergic people (EPA 2005a). Health effects of mold can vary widely from person to person. However, long-term exposure to high levels from indoor mold growth can eventually be unhealthy for anyone (MDH 2005).

Mold problems can be difficult to resolve. Mold can remain hidden even when all visible signs of mold have been removed. It may be growing on hidden surfaces, such as the back side of drywall, wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads, etc. (EPA 2005a).

Radon

Radon is a naturally occurring gas that comes from various rocks, soils, and underground water sources. Radon gives off radiation that can cause lung cancer. In fact, radon is second only to smoking as a cause of lung cancer; as many as 12% of lung cancers annually in the United States may be attributable to radon (EPA 2005b). Radon is odorless, tasteless, and colorless. It forms from the breakdown of the natural elements uranium and radium. Radon comes from the ground and can enter a building from the soil. One way radon can get into buildings is by cracks in basements, and if there is not good ventilation, radon concentrations can be high enough to be hazardous. The EPA publishes a map of radon risk levels, and Hennepin County, where the Center is located, is in the highest risk zone.

Radon levels at several Center buildings were measured by the USBM between December 1989 and September 1991, when the Center was still in operation. The basement of Building 9 was determined to be the only area of concern, based on radon levels greater than the EPA action limit of 4 pico curies per liter of air (pCi/L) for continuous occupation (8 hours per day). The Building 9 basement was vented and the floor cracks sealed in an effort to reduce radon levels. A warning sign was also posted warning employees and visitors of the radon risk associated with remaining in the basement for extended time periods (USBM 2000).

Radon levels were measured in the basement again as a part of the Center closure process and again found to be above recommended levels. However, because the space was not occupied continuously, the warning signs were left in place, but no additional action was taken.

Polychlorinated Biphenyls

PCBs are a group of chemicals that contain 209 individual compounds with varying harmful effects. There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in the air. PCBs have no known smell or taste. The EPA considers all PCB mixtures to be toxic. PCBs are probable human carcinogens and can also cause non-cancer health effects such as hormone disruption, effects to the nervous and reproductive system, immune system depression, respiratory tract systems, learning problems, etc. One source of PCB exposure is from contaminated indoor air in buildings that contain devices made with PCBs.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the United States in 1977 because evidence showed that they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

PCBs may be present in most Center buildings in the form of capacitors, ballasts (electrical devices for starting and regulating fluorescent and discharge lamps), and other electrical components. Ballasts in light fixtures installed prior to 1977 contained PCBs. As ballasts became defective over the years, they were replaced with nonPCB ballasts. Many ballasts were replaced in Building 1 in 1997 by the Federal Emergency Management Administration, which was using the building space to coordinate flood relief for the state of Minnesota. The TCRC Closure Team continued the practice of collecting the PCB ballasts as they became non-functional, but some may still remain.

Buildings that may contain PCB-containing devices include 1, 2, 3, 4, 5, 6, 7, 8, and 9. Buildings 10 and 11 are not likely to contain PCBs because they were constructed well after 1977. A list of PCB capacitors used in the Center electrical distribution system at the time the environmental disclosure statement was prepared is available as an attachment to the statement (TCRC Closure Team 2000).

Safe disposal of materials containing PCBs (e.g., old lighting ballasts) is critical. They should be handled as hazardous wastes. The Toxic Substances Control Act regulates how materials containing PCBs should be disposed (15 U.S.C. section 2601 *et seq.*, 1976).

Lead-based Paint

Lead-based paint is known to have been used, primarily on door frames and window sills, in Buildings 1, 2 , 4, and 9. As of the late 1990s, all lead-based paint was in good condition with no apparent peeling or deterioration (Rani Engineering 1997, TCRC Closure Team 2000).

Other Hazards

Break-ins and unauthorized entry of some buildings have occurred since closure of the Center. The chain-link boundary fence has been cut periodically by unauthorized persons to gain entry to the grounds. A recent safety evaluation (USFWS 2005b) determined that "break-ins" into the Center grounds and buildings continue to occur, and they could expose individuals to hazards with serious injury potential. Hazards documented by the 2005 safety evaluation include the following:

- electrical hazards (e.g., exposure to energized wires and equipment)
- fall hazards (there are numerous storage bins, floor openings, unlit stairways and passageways, and other hazards that may cause injuries from trips and falls)
- physical hazards (e.g., from broken windows and door planes, broken glass on floors, old ladders, dangerous tree limbs, etc.)
- health issues (mold, exposure to bird droppings, etc.)

The evaluation concluded that: (1) greater site security is necessary to prevent individuals from accessing buildings and restricted areas; and (2) corrective safety and action plans are needed to protect workers, visitors, and potential intruders using the Center site (USFWS 2005b).

As a result, the USFWS has installed additional fencing to limit public access when the Center is open to the public. The fencing directs the public to the Camp Coldwater Spring area and prohibits entrance to site buildings.

LAND USE

The land use of the Center from the first construction in 1949 through closure in 1995 was for governmental light industrial purposes, researching mining techniques, and safety.

The lands surrounding the Center are primarily government owned and used for recreation or for government offices or a medical center. The property is bounded on the north by a service road and a 23-acre parcel of undeveloped property, which was the Veterans Administration power plant, now used informally by visitors to Minnehaha Park, just to the north. The property is still owned by the U.S. Department of Veterans Affairs. The eastern boundary is the Minnehaha Trail, a paved bike and hiking trail maintained by the Minnesota Department of Natural Resources as a part of Fort Snelling State Park. The land east of the trail to the Mississippi River (21 acres) is owned by the Minnesota Historical Society and is designated as Camp Coldwater State Historic Site, although there are no developed facilities or interpretation. At the base of the Minnesota Historical Society property is Island 108-01, a 10-acre island owned and managed by the National Park Service. To the south, the Center abuts Fort Snelling State Park. Its western boundary is the right-of-way of SH 55, which separates the Center from the Veterans Administration Medical Center property to the west. The lands to the east, directly across the Mississippi River from the Center, contain Hidden Falls / Crosby Farm Regional Park.

The other prominent land use in the area is the Minneapolis-St. Paul International Airport, which lies southwest of the Center. Although the airport is not contiguous with the Center, airport zoning regulations and Federal Aviation Administration airspace obstruction rules play an important role in governing land uses on the Center.

Local governments, the Metropolitan Council, the Minnesota Department of Natural Resources, and the National Park Service are partners in managing land uses along the Mississippi River corridor through the Critical Areas legislation and the MNRRA CMP. Critical Area plans are required for communities that manage land within the Critical Area.

Existing Easements, Licenses, Rights-of Way, and Leases

During the Center closure in 1998, the Bureau of Land Management contracted with Lake State Realty Services, Inc. to complete a fair market value appraisal for the Center property. The appraisal was completed by Julie Jeffrey-Schwartz, a certified general appraiser, and is detailed in a report entitled “Fair Market Appraisal of the Bureau of Mines, Twin Cities Research Center Main Campus, 27.32 Acres & Buildings at the NE Quadrant of Hiawatha Avenue at SH 55 −And − The 201 Building at 201 Federal Drive, Fort Snelling, Minnesota, Contract Number: 1422-N660-P98-2008.” The final report is dated March 1998.

The appraisal identified existing easements, licenses, rights-of-way, and leases on the Center. The following text is taken directly from that report and contains the most recent listing of existing easements, licenses, rights-of-way, and leases. The National Park Service has not conducted additional research. Any recipient of the Center property should further investigate any easements, licenses, rights-of-way, and leases that may continue to exist. The appraisal report states:

Easements / Licenses / Rights-of-Way / Leases

An attorney's title opinion and title commitment have never been complete. A list of the outstanding rights-of-way, licenses, and leases exists on the USBM property, Main Campus, which was gleaned from the records, which exist under the custody of Jim Olson. These were transmitted on December 16, 1997, from Mr. William A. Swanson, Chief, Division of Realty, USFWS, Fort Snelling. Additionally, we have viewed the "Analysis of (Todd Crawford) Deeds." Other than the information from the Todd Crawford Deeds, none of the rights-of-way or licenses (or easements) are recorded at the Hennepin County courthouse. The utilities that service the Center (water/sewer, electric, and telephone), are reported as being owned by the USBM (according to William A. Swanson); therefore, we are not making any standard assumptions about utility easements. There is an easement for the natural gas mains, in favor of Minneapolis Gas Co. (07/18/58) at the land area surrounding Building 9.

A list of applicable rights-of-way, licenses, and leases for the Center follows:

1. Easement (58-67), dated July 18, 1958, in favor of Minneapolis Gas Co. (now Minnegasco) for natural gas mains. Please note that the information from Mr. Swanson indicates that the USBM and Minnegasco do not have any signed copies of this easement. The area of the easement is that area westerly of Building 9, following the irregular-shaped property line at the subject's westernmost edge.

2. Easement dated December 21, 1990, in favor of the Williams Telecommunications Co. for installation of underground fiber optic cable. This is located along the existing bike trail, and is on a portion of the Center. This easement has no affect on the subject property since it is not located on the current USBM 27.32-acre parcel.

3. A special-use permit dated July 1, 1952, in favor of the Department of the Air Force to construct and maintain a power transmission line, water supply line and sanitary sewerline. The information from William A. Swanson indicates that they are unsure if this is located on the USBM property.

4. A letter dated April 1, 1952, from the USACE requesting a utility easement. No easement was found in the files, and William A. Swanson's notes indicate that they were unable to locate a legal description for the easement.

5. There is a MOA dated August 19, 1949, whereby the Veterans Administration grants a right of entry to the USDI, USBM on 43.24 acres of land. The 43.24 acres of land represents the original land holding of the Center, which was reduced to approximately 27 acres after conveying a portion of the original property to the State of Minnesota.

This MOA was subsequently terminated via a letter of unknown date, indicated and stamped October 30, 1950, for "ready to file," whereby the Veterans Administration grants the entire 43.24 acres to the USDI, USBM. It is not clear from this letter whether the transfer included the existing roadway for access; however, today, this roadway is maintained by the Veterans Administration. This letter of unknown date is included in the addenda of this report, entitled *Main Campus Transfer, Legal Description and MOA.*

6. A lease in favor of the University of Minnesota (U of M), Board of Regents, extended and amended March 31, 1997. The U of M leases a portion of Building 1 and all of Building 2 for research purposes.

7. A right-of-way legal description dated October 2, 1963, and a letter from the U.S. Attorney, relating to a dispute over 3 acres of land claimed by the railroad. The U.S. District Court decided in favor of the Veterans Administration on April 21 ([sic] should be 1966, with the railway being shortly later abandoned.

8. According to the Todd Crawford Deeds, on September 24, 1958, 11.82 acres of the USBM property was transferred to the General Services Administration for disposal to the Minnesota Department of Transportation via a Quit Claim Deed. On June 19, 1959, a correction of the Quit Claim Deed was registered. Although the Todd Crawford Deed analysis does not indicate what portion of land, it would seem that it would be that portion of land along existing SH 62 and/or SH 55. We assume that this is not an easement for the highways, rather the acquisition was in fee title, hence the use of a Quit Claim Deed (Lake State Realty Services, Inc. 1998).

Additional research on existing easements, licenses, rights-of-way, and leases may be necessary prior to conveyance of the Center.

PUBLIC USE AND EXPERIENCE

The disposition of the Center may affect public use, opportunities for experiences at the site, or certain public values, depending on the alternative to be implemented and the actual use of the Center property by any future owner. There is considerable public concern that the values and resources that people cherish at the Center not be lost. The following information provides a sense for the current public uses, experiences, and values related to the site.

Public Use and Access

The Center has a park-like setting, with grassy lawn areas and occasional shade trees surrounding vacant buildings and the Camp Coldwater Spring area. The easternmost portion of the site is wooded. Up until 1995, during the time that the Center was operating in its official capacity, the property was not open for general public use. After closure, it was open for public use from 9:00 a.m. to 3:00 p.m., Monday through Friday, until August 2005. On August 8, 2005, the USFWS instituted a new public access policy, citing increasing safety and vandalism concerns. The public could enter the site grounds only by submitting a special-use permit

application and entering the site during the hours specified on the approved permit. In November 2005, the USFWS reopened the Center from 9:00 a.m. to 3:00 p.m., Monday through Friday, excluding federal holidays. Additional fencing was installed to prevent the public from entering buildings and directing visitors to the Camp Coldwater Spring area. The Center is surrounded by a chain-link fence with a gated entry, and is patrolled by the U.S. Department of Homeland Security, Federal Protective Service. However, the fence has been cut in the past by those seeking unauthorized entry during times when the Center is closed. In addition, the original gated entry was damaged, is no longer functional, and has been replaced with a chain-link fence and gate.

Public Experience and Values

Groups of people have special fondness for the Center site. During public scoping meetings held by the National Park Service for this draft EIS, some members of the public reported coming to the Center to walk, picnic, enjoy the setting near the spring, watch wildlife, and recreate with their children. Special events at Camp Coldwater Spring, such as group activities and invited speakers, are organized by a local group, Friends of Coldwater (Friends of Coldwater 2005). One example is the monthly "Full Moon Tours" that usually include a guided walk and often a guest lecture on some aspect of the area's history or geology. The tours are available to the general public and are conducted on the Center site (if permission for such use is given in advance by the USFWS), or in the surrounding area.

The site of the Center is viewed by some as being spiritually important to American Indians. Some members of the public have fashioned a labyrinth on the grounds from rocks and tree limbs on a grassy area near Camp Coldwater Spring. The labyrinth is designed to be meditative; users say it is for spiritual rejuvenation and connecting with the spiritual importance of the area (Friends of Coldwater 2005). The labyrinth was constructed recently and is not part of the historic setting for either the Fort Snelling National Historic Landmark, National Historic District, State Historic District, or USBM Twin Cities Research Center Historic District.

Although some long-time residents of the area recall using the Center site for informal recreation and "playing in the woods" before facilities were constructed in the late 1940s, there was little general public awareness of the site until the rerouting of SH 55 prompted protests in the late 1990s. The protests centered around the proposed demolition of four oak trees, believed by some to be sacred to American Indians, located along the new road corridor, but outside the Center boundaries. The protests and related media coverage brought increased public awareness of the presence and history of the Camp Coldwater Spring area. The concerns resulted in the passage of S.F. 2049, state legislation for the protection of the flow of water to and from Camp Coldwater Spring.

Some groups organized to advocate for the protection and preservation of the spring and its underlying groundwater source. In the process, the site became an attraction in its own right, as well as a place for personal meditation and inspiration, and a setting for informal ceremonies and rituals. The site receives visitors for such purposes. The labyrinth is a curiosity that has drawn some people to the site. The spring, springhouse, and reservoir are the primary focus of attention and concern. However, there is no general agreement regarding whether

these elements should be preserved as they are, restored, or returned to a natural state. The labyrinth, while important to some, is less universally revered, and is even offensive to some.

Broad-based neighborhood organizations in the vicinity of the Center have special interest in Minnehaha Park, the Mississippi Gorge, and adjacent woodlands as "neighborhood parks," and they are interested in the preservation and accessibility of these areas. In that sense, the Center is viewed as a potential recreation resource. Several trails run through the area near the confluence of the Mississippi and Minnesota rivers, where the Center is located. A hiking/bicycling trail administered by Fort Snelling State Park runs along the bluff, outside the northeast fenced boundary of the Center. This trail runs between the boundaries of the Center and adjacent Minnesota Historical Society tract just to the east of the Center. The trail connects Minnehaha Regional Park, located north of the Center, with Fort Snelling State Park, located southeast of the Center (NPS 2005).

Some members of the public are interested in celebrating the history of Camp Coldwater and the early settlement of Minnesota—both American Indian and European American. However, there is recognition that the Center represents only one small piece of regional history. Public scoping for this draft EIS also indicated that some members of the public recognize that development of the site for economically viable purposes could occur, and they find this idea acceptable, provided development is done sensitively and complies with appropriate laws and regulations. Regardless of the final use of the Center, the general consensus of the public is for continued access to the Camp Coldwater Spring area.

Parks, Open Space, and Trails

As previously noted, the Center is within the MNRRA, a designated unit of the National Park Service. The Center is in close proximity to several popular recreation facilities and open space, including a small island, Island 108-01, that is to the east of the Center and owned by the National Park Service. Under some alternatives the Center could complement those areas and their activities, or potentially be incorporated into their operations. Some of these more popular facilities and their characteristics are summarized in the following paragraphs.

Minnehaha Park

Minnehaha Park is a 193-acre site operated by the Minneapolis Park and Recreation Board. The main feature of the park is the 53-foot Minnehaha Falls, but there are gardens, manicured lawns and picnic areas, trails through forests and along the creek down to the Mississippi, and a recently added off-leash pet area. According to the Metropolitan Council, Minnehaha Park generates about of 700,500 visits annually, of which 10,200 are for special events such as charity "walks" and ethnic festivals. Although no detailed records of specific activities are kept for the park, the Metropolitan Council has surveyed users and tabulated the most popular activities in its regional park system (of which Minnehaha Park is a part). Over the entire system, walking/hiking and biking were the most popular activities, followed by swimming/wading, picnicking and a general category, "relaxing." Of course not all categories could be offered at the Center even if recreation were to be a component of the site's reuse; neverthe-

less, the survey gives an indication of the demand for various activities in the vicinity of the site (table 8).

TABLE 8. TOP ACTIVITIES IN THE REGIONAL PARK SYSTEM, 2004

Activity	Total Activity Occasions[1]
Walking/hiking	10,705,000
Biking	5,983,000
Swimming/wading	5,111,000
Picnicking	3,869,000
Relaxing	3,606,000
Jogging/running	3,085,000
Playground use	2,388,000
Sunbathing	1,958,000
Zoo visits	1,785,000
In-line skating	1,630,000
Fishing	1,385,000
Dog walking	682,000

[1] An activity occasion is one activity in a day. Visitors may participate in more than one activity during a single visit

Source: Metropolitan Council 2005

Fort Snelling State Park

Fort Snelling State Park, with a total of 2,931 acres, contains several components. The area in the lowlands below the bluffs and along the Mississippi and Minnesota rivers hosts picnic areas, a swimming beach, a boat ramp, bike and hiking trails, cross-country skiing in the winter, and a visitor center. The Upper Bluffs include the parade grounds of the "modern" Fort Snelling, which now hosts a golf course and ball fields operated by the Minneapolis Park and Recreation Board. The Upper Bluff also includes many vacant buildings that were a part of the former military occupancy that are awaiting restoration and reuse. The park reported a total attendance in 2004 of 512,700, of which 242,700 were in the lower area, 21,400 were rounds of golf, an estimated 65,000 were on the Minnehaha Trail (along the east boundary of the Center), and about 183,600 were in other uses, most of which were users of the athletic fields.

Historic Fort Snelling

Although historic Fort Snelling is located within Fort Snelling State Park, it is a separate operation and is administered by the Minnesota Historical Society. The historic fort is a replica

of the fort as it existed in the period 1820–1846. It features costumed guides and demonstrations of period activities such as musket loading, military drills and life on the frontier. It draws about 90,000 paying customers over its seven-month operating season, about one-third of whom are school children on field trips. The Minnesota Historical Society also owns a portion of the 21-acre Camp Coldwater Historic Site between the Center and the Mississippi River. That area is rich in archeological significance from the early settlers, but the Minnesota Historical Society does not currently have the resources to research or police the area. The area has been allowed to become overgrown to discourage informal use and to protect the resources.

TRANSPORTATION

Vehicular access to the Center is via Minnehaha Avenue South that parallels SH 55. Minnehaha Avenue is accessed from East 54th Street just east of the intersection of SH 55 and East 54th Street. The southern entrance to Minnehaha Park lies just east of Minnehaha Avenue South. There is metered parking along Minnehaha Avenue South that is used by visitors to Minnehaha Park and informal users of the old Veterans Administration property; these users are largely dog walkers accessing the off-leash area and bike riders accessing the Minnehaha Trail. Minnehaha Avenue South ends in a cul de sac with the Center main entrance gate driveway off the cul de sac.

State Highway 55 was rerouted from Minnehaha Avenue to a new right-of way in 2002. The Minnesota Department of Transportation reports traffic counts of 29,500 vehicles per day as the average annual daily traffic on SH 55 south of East 54th Street in 2004. Average annual daily traffic on East 54th Street west of SH 55 was 10,000 in 2004. Counts are not available for the entrance to Minnehaha Park and the Center east of SH 55. The traffic volume on SH 55 was less in 2004 than the count on the old alignment of 30,500 average annual daily traffic in 2000. The park board staff indicates that since the southern entrance to Minnehaha Park was opened at 54th Street, there has been a problem with people using the internal park road to avoid some of the congestion and traffic lights along the realigned SH 55.

The site is in close proximity to light rail and transit routes. The Metro Transit Hiawatha line (SH 55) opened in June 2004; it connects downtown Minneapolis to a park-and-ride facility at Fort Snelling (950 spaces), and generally follows the old alignment of SH 55 near the Center. In December 2004, the line was extended through the airport to the Mall of America in Bloomington, Minnesota. The closest station to the Center is at the entrance to the Veterans Administration Medical Center on Hiawatha Avenue. Transit planners consider a radius of 0.25 to 0.5 mile to be the influence area of light rail stop, and indeed those standards are reflected in the city of Minneapolis's guidance for the development of transit station areas in the city's comprehensive plan. Although the Center lies within that distance, it is separated from the light rail station by SH 55. The actual walking distance is over two-thirds of a mile to the entry point of the property at the end of the cul-de-sac. Fully integrating the Center into a transit oriented development as envisioned by the transit station areas principles would require a pedestrian bridge over SH 55. Transit bus routes 436 and 446 also serve the local area. Transportation impacts are treated in this draft EIS under the impact topic of socioeconomics in chapter 4.

VISUAL RESOURCES

Visual resources are the stimuli upon which actual visual experience is based or the appearance of the features that make up the visible landscape. Visual resources are described in terms of character, quality, and viewshed. Visual character includes landform, water features, vegetation types, and cultural modifications. The visual quality is the excellence of visual experience determined by vividness, intactness, and unity. The visual quality of an area ranges between areas that are entirely natural to those that are strongly influenced or modified by human action. A park or natural area is generally considered to have high scenic value whereas an industrial area would have low scenic quality. The viewshed comprises the limits of the visual environment associated with the proposed action, including view within and from the Center, and views of the Center.

The MNRRA CMP identifies that "a priority has been placed on preservation of visual character. Archeological resources, historic structures and sites, and key natural resources (the bluffs, shoreline, floodplain, vegetation, wetlands, and the water), and the views to and from the river provide this character (NPS 1995)."

Views from within the Center looking outward are limited (usually less than 1,000 feet and not panoramic). The character of the views consists of dense woods and vegetation on the east side. The Mississippi River is approximately 1,000 feet to the east and is not visible from the Center. Views to the north consist of the access road into the Center, the vacant Veterans Administration property, and Minnehaha Regional Park. Views to the west and south are urban, consisting of SH 55 and SH 62 and government/commercial development. The overall quality of the views is medium. The more natural views are unified and intact, but approximately half of the views from the site are commercial or industrial in nature. Most viewers are visitors to the Center.

Views from within the Center include dense wooded bluffs along the east side. Views within the Center are limited due to woods and buildings, and include natural and introduced vegetation, driveways and parking lots, Center buildings, and the Camp Coldwater Spring and Reservoir. The overall quality of the views is medium to low. The buildings have an industrial quality and are not harmonious or coordinated in design. The buildings are deteriorating and the grounds are not adequately maintained to create a vivid and distinctive quality visual experience. Many of the structures are low cost construction. There are components of visual interest within the Center, such as the Camp Coldwater Spring and Reservoir.