

**Hildebrand Ranch Historic District (5JF188)**

After the post-Civil War influx of people into the Chatfield Basin area, the Hildebrand Ranch, located at 8500 Deer Creek Road, was established in what is now known as Jefferson County. Frank and Elizabeth Hildebrand settled at the head of Deer Creek Canyon when they purchased the property in 1866 and built a log cabin, slowly developing their ranch. Little is known about the family’s antecedents. This property is historically significant as one of the earliest agricultural operations in South Jefferson County. The site is currently interpreted with the assistance of the Denver Botanic Garden, and the site is located within the boundaries of the Denver Botanic Garden at Chatfield. The Hildebrand Ranch was listed on the National Register of Historic Places in 1975 under Criterion A and C for its historic association with domestic agriculture in the Rocky Mountain region prior to the advent of Colorado’s railroad era, its continuous operation for over a century by a single family, and its nineteenth-century historical integrity. Today the ranch is part of the Denver Botanic Gardens at Chatfield.

**Selzell Ditch (5JF2613)**

Selzell Ditch is located near the Denver Botanic Gardens at Chatfield, a nature preserve in southern Jefferson County. Ranchers Peter Selzell and Frank Hildebrand constructed the ditch in 1868 by drawing water from nearby Deer Creek to irrigate their farm and grazing lands. During the period of establishing legal water priorities, Peter Selzell appeared as a witness at an 1883 adjudication hearing for water rights on the Selzell Ditch. Today it is associated with the Hildebrand Ranch National Register District. Selzell Ditch was determined eligible for listing on the NRHP under Criterion A for its association with water rights and irrigation and its contribution to early agricultural and ranching development in Jefferson County, Colorado.

**City Ditch (5AH254.7 and 5DA987.1)**

The entire City Ditch was determined officially eligible to the NRHP under Criterion A for its historical significance in engineering and

irrigation on the Plains and its association with Early High Plains Irrigation and Farming to 1900. The two segments within the APE lack historical integrity, meaning that these segments have been altered from their original form to the point that they no longer meet the criteria for which the entire resource was determined eligible for listing on the NRHP. These segments are considered non-contributing due to the realignment and routing of the ditch into pipes during the construction of C-470 between 1985 and 1990.

**Littleton Large Animal Clinic and Canary Ranch Barn (5AH732)**

The Littleton Large Animal Clinic and Canary Ranch Barn, located at 8025 South Santa Fe Drive, Littleton, was determined eligible for listing on the NRHP under Criterion C for the Canary Ranch Barn. The barn has a distinctive type of architectural construction – a Bank Barn with dual-level access. The Canary Ranch Barn is located on property that was once associated with the Littleton Large Animal Clinic, but eventually was separated from the property when the land it is situated on was sold to Green Valley Turf Farm. Barns of this age, and especially this design, are growing increasingly rare in urban settings; this may be one of the last of its style in Littleton.

**Atchison, Topeka and Santa Fe Railroad (5AH256.4 and 5DA922.1 and 5DA922.2)**

The Atchison, Topeka and Santa Fe Railroad (AT&SF RR) in Arapahoe and Douglas Counties was determined eligible for listing on the NRHP eligible under Criterion A for its significant contribution to the expansion of the West and Colorado during the railroad-building era and its role in settlement and community building. All three segments within the APE have historical integrity. The AT&SF Railroad was one of the largest in the United States. It was chartered in Kansas, but did not reach solid footing until after its reorganization in 1863. During Colorado’s railroad-building era, the AT&SF managed to stay afloat as others failed. The railroad played an important role in the state’s history and devel-

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opment connecting the state and its cities to the region.

### Denver and Rio Grande Railroad (5AH255.2 and 5AH255.5 and 5DA921.1)

The Denver and Rio Grande Railroad (D&RG RR) in Arapahoe and Douglas Counties was determined eligible for listing on the NRHP under Criterion A for its significant contribution to the expansion of the West and Colorado during the railroad-building era and its role in settlement and community building. It is also eligible under National Register Criterion C for engineering. All three segments within the APE have historical integrity. Following the construction of the First Territorial Road between Denver and Colorado City, a similar north-south route along the foothills was surveyed for the site of the first narrow-gauge railroad in the United States. General William Jackson Palmer and the National Land and Improvement Company provided the funds to construct the railroad between Denver and Colorado Springs.

### High Line Canal (5AH388 and 5DA600.3)

The High Line Canal was determined officially eligible for listing on the NRHP under Criterion A for its association with Colorado's early agricultural development. The segments evaluated within the APE have historical integrity. In 1880 plans were completed for the canal, and construction crews began work on the High Line Canal. It would reportedly extend for 70 miles with several laterals. At its head was an intake dam in the South Platte River Canyon in the foothills. The dam was not to store water, but actually to divert water. It was reportedly completed in 1883. The canal was used extensively by farmers and ranchers in northern Douglas County. By 1887 a series of droughts initiated local water rights battles, which later were carried to the Colorado state courts.

Eventually in 1924, it became the property of Denver. Today the water flow through the canal is erratic, depending upon water levels of the South Platte River and the needs of water rights owners.

### 3.3.7.2 Environmental Consequences

Effects to historic resources, as described in this section, were documented in *Historic Resource Effects and Mitigation: C-470 Kipling Parkway to I-25* (March 2005) and concurred upon by the SHPO in April 2005. Douglas County also concurred on the report findings in correspondence from May 2005. Records of this correspondence can be found in **Appendix B**. A summary of the effects determination is provided in **Table 3-38**. Although there are no adverse effects to both City Ditch and the High Line Canal, a finding of de minimis impact under Section 4(f) has been completed. **Section 3.3.8** discusses Section 4(f) resources and the finding of *de minimis* for these historic resources. Correspondence with the SHPO to satisfy the new Section 4(f) requirements for historic resources under SAFETEA-LU can also be found in **Appendix B**.

#### No-Action Alternative

The No-Action Alternative would not impact historic resources.

#### General Purpose Lanes Alternative

The GPL Alternative would not cause the highway to encroach on property associated with the Denver Botanic Gardens at Chatfield and the Hildebrand Ranch National Register District or Selzell Ditch, as improvements in this area would be constructed within the existing center median, and would not extend beyond the existing CDOT ROW. At its closest point, the limits of construction would be approximately 1,950 feet from the National Register District and 1,640 feet from Selzell Ditch. No visual or noise effects are expected. This alternative would result in no historic properties affected with regard to the Hildebrand Ranch National Register District or Selzell Ditch.

The portion of City Ditch located under C-470 in the vicinity of the Santa Fe Drive interchange would be re-aligned and re-constructed as the highway is reconstructed as part of the GPL Alternative. During the initial construction of this section of C-470 between 1982 and 1985,

these sections of City Ditch were significantly altered when they were re-aligned and put into pipes south of C-470, under the highway, and north of the highway along Santa Fe Drive. As a result, the City Ditch in this area lacks historical integrity. Therefore, reconstruction of the ditch's pipeline would result in no adverse effect with regard to the City Ditch.

The GPL Alternative would include the addition of a deceleration lane from Santa Fe Drive for access to the southbound flyover ramp to eastbound C-470 in conjunction with the Santa Fe Drive interchange reconstruction. The deceleration lane would be added to the west of the existing edge of pavement and would not require property acquisition from the Littleton Large Animal Clinic. The limits of construction extend to within 12 feet of the Littleton Large Animal Clinic property boundary and 781 feet of the Canary Ranch Barn. Design modifications were implemented specifically to avoid direct effects to this property. Temporary effects such as higher noise levels could occur during construction. However, there are no long term effects. Therefore, there would be no historic properties affected with regard to the Littleton Large Animal Clinic.

Both the D&RG (5AH255.2, 5AH255.5, and 5DA921.1) and AT&SF (5AH256.4, 5DA922.1, and 5DA922.2) Railroads run parallel to Santa Fe Drive within the APE. The widening of Santa Fe Drive as part of the interchange improvements would result in no historic properties affected with regard to any of the referenced segments of these railroads.

During the initial construction of C-470, the section of the High Line Canal within the APE (5AH388 and 5DA600.3) was put in a low, concrete-box culvert to allow the highway to cross over the ditch and not interrupt the flow of water. Despite the widening of the highway, there would be no need to extend the existing box culvert. As part of the GPL Alternative, a concrete retaining wall would be extended from the edge of the pavement down the slope to within 15 feet of the box culvert on both the north and south sides. The concrete wall would stabilize the earthen slope protecting the High Line Canal from erosion associated with the highway. An earthen slope would continue from the edge of the wall down to the head wall of the box culvert. There would be no adverse effect to this historic resource.

**Table 3-38**  
**Effects Determination**

Site Number	Site Name	No-Action Alternative	GPL Alternative	EL Alternative
5JF188	Hildebrand Ranch	No historic properties affected	No historic properties affected	No historic properties affected
5JF2613	Selzell Ditch	No historic properties affected	No historic properties affected	No historic properties affected
5AH254.7 and 5DA987.1	City Ditch	No historic properties affected	No adverse effect	No adverse effect
5AH732	Littleton Large Animal Clinic and Canary Ranch Barn	No historic properties affected	No historic properties affected	No historic properties affected
5AH255.5, 5AH255.2, and 5DA921.1	D&RG Railroad	No historic properties affected	No historic properties affected	No historic properties affected
5AH256.4, 5DA922.1, and 5DA922.2	AT&SF Railroad	No historic properties affected	No historic properties affected	No historic properties affected
5AH388 and 5DA600.3	High Line Canal	No historic properties affected	No adverse effect	No adverse effect

Source: *Historic Resource Effects and Mitigation: C-470 Kipling Parkway to I-25 (March 2005)*

### Express Lanes Alternative (Preferred Alternative)

The EL Alternative would not cause the highway to encroach on property associated with the Denver Botanic Gardens at Chatfield and the Hildebrand Ranch National Register District or Selzell Ditch, as the improvements in this area would be constructed within the existing center median, and would not extend beyond the existing CDOT ROW. At its closest point, the limits of construction would be approximately 1,950 feet from the National Register District and 1,640 feet from Selzell Ditch. No visual or noise effects are expected. As a result, there would be no historic properties affected with regard to the Hildebrand Ranch National Register District or Selzell Ditch.

The portion of City Ditch located under C-470 in the vicinity of the Santa Fe Drive interchange would be re-aligned and re-constructed as the highway is reconstructed as part of the EL Alternative. During the initial construction of this section of C-470 between 1982 and 1985, these sections of City Ditch were significantly altered when they were re-aligned and put into pipes south of C-470, under the highway, and north of the highway along Santa Fe Drive. As a result, the City Ditch in this area lacks historical integrity. Therefore, the reconstruction of the ditch's pipeline as a result of implementing the EL Alternative would result in no adverse effect to this historic property.

The EL Alternative would include the addition of a deceleration lane from Santa Fe Drive for access to the southbound flyover ramp to eastbound C-470 in conjunction with the Santa Fe Drive interchange reconstruction. The deceleration lane would be added to the west of the existing edge of pavement and would not require property acquisition from the Littleton Large Animal Clinic. The limits of construction extend to within 12 feet of the Littleton Large Animal Clinic property boundary and 781 feet of the Canary Ranch Barn. Design modifications were implemented specifically to avoid direct effects to this property. Temporary effects such as

higher noise levels could occur during construction. However, there are no identified long-term effects. Therefore, there would be no historic properties affected with regard to this linear resource.

Both the D&RG and AT&SF railroads run parallel to Santa Fe Drive within the APE. The widening of C-470 or Santa Fe Drive as part of the interchange improvements would not directly or indirectly impact either of these railroads. The bridges were built between 1982 and 1985 and do not meet the minimum 50-year age requirement for eligibility to the NRHP. The C-470 road surface under the railroad overpasses would be reduced to a buffer separation between the general purpose lanes and the express lanes at this location, instead of a barrier separation due to the restricted distance between the bridge piers. Flared, poured-concrete barriers would abut and protect the current bridge piers. These barriers would remain permanently in place as part of the EL Alternative only. The wing walls under the overpasses on either side of the highway would be expanded, but expansion would result in no historic properties affected with regard to either of these two linear resources.

During the initial construction of C-470, the section of the High Line Canal within the APE was put in a low, concrete-box culvert to allow the highway to cross over the ditch and not interrupt the flow of water. Despite the widening of the highway, there would be no need to extend the existing box culvert. As part of the EL Alternative, a concrete retaining wall would be extended from the edge of the pavement down the slope to within 15 feet of the box culvert on both the north and south sides. The concrete wall would stabilize the earthen slope protecting the High Line Canal from erosion associated with the highway. An earthen slope would continue from the edge of the wall down to the head wall of the box culvert. There would be no adverse effect to this historic resource.



### 3.3.7.3 Mitigation

No mitigation measures for historic resources are anticipated.

### 3.3.8 Section 4(f) Properties

Section 4(f) was created when the United States Department of Transportation (USDOT) was formed in 1966. It was initially codified at Title 49 United States Code (USC) Section 1653(f) (Section 4(f) of the USDOT Act of 1966). Later that year, Title 23 USC Section 138 was added. Section 138 states: "The Secretary shall not approve any program or project (other than any project for a park road or parkway under Section 204 of this title) which requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance as determined by the Federal, State, or local officials having jurisdiction thereof, or any land from an historic site of national, State, or local significance as so determined by such officials unless (1) there is no feasible and prudent alternative to the use of such land, and (2) such program includes all possible planning to minimize harm to such park, recreational area, wildlife and waterfowl refuge, or historic site resulting from such use." In 1983, Section 1653(f) was reworded and recodified at Title 49 USC Section 303. These two statutes have no real practical distinction and are still commonly referred to as "Section 4(f)".

There would be no publicly-owned lands from parks, recreation areas, or wildlife and waterfowl refuges that would be converted to a transportation use by the GPL Alternative or the tolled EL Alternative. However, as discussed in **Section 3.3.7**, there are seven historic properties eligible for the NRHP in the area of potential effect. One property, the City Ditch (5AH254.7 and 5DA987.1), would require that land from the property be converted to a transportation use for the GPL and EL Alternatives. The entire City Ditch was determined officially eligible to the NRHP under Criterion A for association with irrigation on the Plains and Early High Plains Irrigation and Farming to 1900. Two segments of the ditch were evaluated for this project and

were found to lack sufficient integrity to support the overall eligibility of the entire ditch.

#### 3.3.8.1 The Preferred Alternative

The tolled EL Alternative would add up to four express lanes to the existing four general purpose lanes, from Kipling Parkway to I-25, improve ramps for the general purpose lanes, and reconstruct the Santa Fe Drive interchange. This alternative also includes the addition of slip ramps to access the express lanes; the addition of direct access ramps to the express lanes at Colorado Boulevard, Quebec Street, and I-25; and widening or new construction of existing bridges to accommodate an increased number of lanes, which includes but is not limited to the South Platte River, Broadway, University Boulevard, Acres Green Drive, and Yosemite Street bridges.

The existing Santa Fe Drive interchange is currently a substandard diamond interchange with one-lane ramps and two through-lanes in each direction on Santa Fe Drive over C-470. The EL Alternative at the Santa Fe Drive interchange would improve geometric conditions of the standard diamond and add an unsignalized movement with a flyover from south-bound Santa Fe Drive to eastbound C-470 within the limits of the existing interchange.

#### City Ditch

The portion of City Ditch located under C-470 in the vicinity of Santa Fe Drive interchange would be re-aligned and re-constructed as the highway is reconstructed as part of the EL Alternative. During the initial construction of the section of C-470 between 1982 and 1985, these segments of City Ditch were significantly altered when they were realigned and put into pipes south of C-470. As a result, these two segments lack sufficient integrity to support the overall eligibility of the entire ditch. Although the work will directly affect the City Ditch, the work will only affect segments of ditch that have already been altered and lack integrity.

### 3.3.8.2 Finding of De Minimis

Congress amended Section 4(f) when it enacted the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (Public Law 109-59, enacted August 10, 2005) (SAFETEA-LU). Section 6009 of SAFETEA-LU added a new subsection to Section 4(f), which authorizes the FHWA to approve a project that results in a de minimis impact to a Section 4(f) resource without the evaluation of avoidance alternatives typically required in a Section 4(f) Evaluation. Under the “FHWA Guidance for Determining De Minimis Impacts to Section 4(f) Resources” dated December 13, 2005, the SHPO must concur in writing with the Section 106 “no adverse effect” determination and must be informed that the FHWA intends to make a de minimis finding based on the Section 106 effect determination. Consulting parties under Section 106 must also be informed of the de minimis finding.

Because “no adverse effect” determinations under Section 106 have been made by the FHWA for the historic sites impacted by the C-470 Corridor Environmental Assessment project under the preferred EL Alternative, the FHWA, with the concurrence of the Colorado SHPO, has made a finding that the proposed EL Alternative will result in only a de minimis impact to historic sites. This determination, and SHPO’s concurrence are documented in **Appendix B** and satisfy the requirements of section 4(f).

### 3.3.8.3 Coordination and Consultation

In correspondence dated April 8, 2005, the FHWA and CDOT determined that there would be no adverse effect to the City Ditch as a result of the EL Alternative. The SHPO concurred with this finding in correspondence dated April 14, 2005. The Douglas County Historic Preservation Board, the Arapahoe County Board of Commissioners, and the Jefferson County Historic Preservation Committee were also contacted regarding the determinations of effect for this project in correspondence dated April 8, 2005. The Douglas County Historic Preservation Board responded in correspondence dated May

5, 2005 and agreed with the determinations of effect for the project. The other parties listed above did not comment on the project.

The Colorado SHPO concurred with the finding of de minimis on December 5, 2005. The Douglas County Historic Preservation Board was afforded an opportunity to comment on the de minimis finding in correspondence dated December 12, 2005, and responded that they did not object to the de minimis finding, in a email dated December 28, 2005. Copies of the Section 106 and de minimis correspondence are included in **Appendix B**.

### 3.3.9 Archaeological Resources

In July and August 2004, CDOT archaeologists completed archival research for the project area. This research involved investigating the site and study files housed at the Colorado Office of Archaeology and Historic Preservation and reviewing CDOT records. The entire length of C-470 between I-25 and I-70 was initially inventoried for archaeological resources by the Colorado Department of Highways in 1976, as part of the Section 106 compliance process that preceded highway construction (*The Archaeological Survey of I-470 – Southwest Circumferential. Highway Salvage Report No. 14, 1976*). The parcel within the current project area located east of I-25, along the E-470 alignment, was surveyed under the auspices of the E-470 Authority in 1987 (*Final Report of Cultural Resource Inventory for the Proposed E-470 Corridor, Douglas, Arapahoe and Adams Counties, Colorado, 1988*). From the late 1970s to early 2000s, a number of additional cultural resource studies included portions of C-470, some of which were transportation-related, while others were undertaken as a result of ancillary developments. No additional field survey to identify archaeological sites was necessary for the current study.

#### 3.3.9.1 Affected Environment

The file search identified eight prehistoric sites located completely or partially within the 1000-foot wide APE established for the archaeological resources assessment (500-feet on either side of

the highway centerline). All eight sites were documented during the mid- to late 1970s, well before C-470 was constructed. However, official determinations of National Register eligibility were never completed for many of these resources, a task ultimately undertaken by CDOT for this study. The eight sites have been entirely or partially destroyed by transportation, residential, or commercial construction activities such that they no longer retain physical integrity and/or exhibit the potential to contain significant buried cultural deposits. In September 2004, the SHPO concurred with the FHWA and CDOT evaluations of not eligible for listing on the NRHP for all archaeological sites within the project area. Records of agency correspondence are located in **Appendix B**.

### 3.3.9.2 Environmental Consequences

No archaeological sites listed on or eligible for the NRHP are located within the project area. As such, the No-Action, GPL, or EL Alternatives would have no effect on this type of historic properties. In the event archaeological remains are exposed during any phase of construction associated with the study, the CDOT Senior Staff Archaeologist will be contacted to evaluate the discovery and coordinate appropriate Section 106 compliance actions with the SHPO and other agencies or entities, as necessary.

### 3.3.9.3 Mitigation

In the event archaeological remains are exposed during any phase of construction associated with the study, the CDOT Senior Staff Archaeologist will be contacted to evaluate the discovery and coordinate appropriate Section 106 compliance actions with the SHPO and other agencies or entities, as necessary.

### 3.3.10 Native American Consultation

Section 106 of the National Historic Preservation Act (as amended) and the Advisory Council on Historic Preservation regulations (36 CFR 800.2[c][2][ii]) mandate that federal agencies coordinate with interested Native American tribes in the planning and environmental process for federal undertakings. Consultation with

Native American tribes recognizes the government-to-government relationship between the United States government and sovereign tribal groups, and federal agencies must be sensitive to the fact that historic properties of religious and cultural significance to one or more tribes may be located on ancestral, aboriginal, or ceded lands beyond modern reservation boundaries.

Consulting tribes are offered the opportunity to identify concerns about cultural resources and comment on how the project might affect them. If it is found that the project would impact cultural resources that are eligible for inclusion on the NRHP and are of religious or cultural significance to one or more consulting tribes, their role in the consultation process could also include participation in resolving how best to avoid, minimize, or mitigate those effects. By describing the proposed undertaking and the nature of known cultural sites, and consulting with the interested Native American community, the FHWA and CDOT strive to effectively protect areas important to American Indian people. The USACE administers properties within the project area, and as such, that agency has an interest in, and responsibility for, Section 106 compliance and the tribal consultation process. The USACE delegated all tribal consultation responsibilities for the study to the FHWA, the lead agency, but in so doing did not relinquish its obligations, as mandated by federal statute. The USACE maintained an active role and was involved in all facets of the consultation process.

In March 2004, the FHWA contacted 15 federally recognized tribes with an established interest in Arapahoe, Douglas and Jefferson Counties, and invited them to participate as consulting parties. These parties are: Ute Mountain Ute Tribe (Colorado), Southern Ute Indian Tribe (Colorado), Ute Tribe of the Uintah and Ouray Agency (“Northern” Ute) (Utah), White Mesa Ute Tribe (Utah), Cheyenne River Sioux Tribe (South Dakota), Crow Creek Sioux Tribe (South Dakota), Oglala Sioux Tribe (South Dakota),

Rosebud Sioux Tribe (South Dakota), Standing Rock Sioux Tribe (North Dakota), Cheyenne and Arapaho Tribes of Oklahoma (two tribes administered by a unified tribal government), Pawnee Nation of Oklahoma, Comanche Nation of Oklahoma, Kiowa Tribe of Oklahoma, Northern Arapaho Tribe (Wyoming), and Northern Cheyenne Tribe (Montana).

Four tribes responded to the invitation in writing (Northern Arapaho, Southern Ute, Pawnee Nation, and Standing Rock Sioux), of which two (Northern Arapaho and Southern Ute) expressed the desire to be consulting parties for the study. The record of this correspondence is located in **Appendix B**. Neither of the two consulting tribes raised specific issues of concern regarding the proposed undertaking in the context of places of religious or cultural significance.

Each consulting tribe will continue to receive information about the study as it becomes available, and every opportunity will be taken to involve them in the planning and environmental process. In so doing, the FHWA and CDOT have fulfilled their legal obligations for tribal consultation under federal law.

### 3.3.11 Paleontological Resources

Paleontological resource compliance is mandated by the Colorado Historical, Prehistorical, and Archaeological Resources Act of 1973. In September 2004, the CDOT paleontologist completed archival research for the study area. A literature survey was conducted to evaluate the potential for scientifically substantial paleontological resources within the geologic units of the study area.

#### 3.3.11.1 Affected Environment

The geologic units mapped within the EA study area limits, from youngest to oldest, are shown in **Table 3-39**.

Because of heavy residential and commercial development along C-470 in recent years, there are no potentially fossiliferous bedrock exposures within the study area that merit on-the-ground reconnaissance for paleontological resources. Therefore, no additional field survey to identify paleontological sites was necessary for this EA.

**Table 3-39**  
**Geologic Units**

Geological Unit	Age
Post-Piney Creek alluvium	Holocene
Piney Creek Alluvium	Holocene
Unnamed colluvium	Holocene and Pleistocene
Unnamed eolian sand	Holocene and Pleistocene
Unnamed loess	Late Pleistocene
Broadway Alluvium	Late Pleistocene
Louviers Alluvium	Late Pleistocene
Slocum Alluvium	Late Pleistocene
Verdos Alluvium	Middle Pleistocene
Dawson Arkose	Late Paleocene to early middle Eocene
Denver Formation	Late Cretaceous to early Paleocene
Laramie Formation	Late Cretaceous
Fox Hills Sandstone	Late Cretaceous
Pierre Shale	Late Cretaceous



### 3.3.11.2 Environmental Consequences

#### No-Action Alternative

The No-Action Alternative would have no affect on paleontological resources.

#### General Purpose Lanes and Express Lanes Alternative (Preferred Alternative)

Construction activity at or above the present ground surface will have no affect on scientifically important paleontological resources. However, potentially fossiliferous units found in pre-Holocene and Pleistocene, Late Cretaceous and Paleocene formations mapped within the EA study area have produced scientifically important fossils within a few miles of the EA study area. These units are not, for the most part, well-exposed naturally, but could be encountered during excavation associated with roadway depression or highway widening within the existing ROW. Subsurface excavation associated with either of the two action alternatives could have an affect on scientifically important paleontological resources, but it is impossible at this time to determine which potentially fossiliferous deposits, if any, would be affected. Most of the known fossil localities within a few miles of the EA study area were uncovered during earth-moving activities associated with sand and gravel mining, housing and commercial development, and highway and railroad construction.

#### 3.3.11.3 Mitigation

CDOT is committed to having a qualified paleontologist on site during major construction excavation to monitor for buried paleontological resources where known fossiliferous deposits are mapped, but not currently exposed at the ground surface.

### 3.3.12 Geology and Soils

Geologic conditions present within the C-470 project area were identified using information from geologic maps, topographic maps, USGS reports, Colorado Geological Survey publications, United States Department of Agriculture soil survey reports, and geotechnical reports. This information was supplemented with field

reconnaissance and communications with local engineering and planning personnel. Evaluation of existing geologic conditions was based on proximity to the corridor, history of occurrence, and effect of occurrence on transportation and mobility. Additional details regarding geotechnical analysis can be found in the *Geology Technical Report* (March 2005). Anticipated effects of the three alternatives as a result of existing geology and soils are described in **Section 3.3.12.2**. Mitigation of geological conditions to the constructed roadway alternatives is then described in **Section 3.3.12.3**.

#### 3.3.12.1 Affected Environment Regional Geology

The geologic units along the C-470 corridor range from recent unconsolidated river deposits to sedimentary bedrock between 55 and 70 million years old and are directly related to the formation of the Rocky Mountains located west of the highway. Much of the mountainous terrain associated with the Rocky Mountains began during a mountain building event known as the Laramide Orogeny, which began near the end of the Cretaceous Period about 72 million years ago. The mountain building process in Colorado occurred from this time to 65 million years ago, with the last of the major uplifts occurring as recently as the Eocene Epoch, around 50 million years ago. Bedrock found at the northwestern portion of the highway were folded and faulted during these tectonic episodes as the Rocky Mountains formed.

Bedrock along the C-470 Corridor typically consists of hard sedimentary rock, exposed at or near the surface at the western end of the corridor. These rock formations are the oldest at the western end of the corridor, with the younger formations exposed progressively to the east. These sedimentary rocks represent former environments and conditions that existed along the Front Range during the Cretaceous and early Tertiary geologic time periods. These environments include shallow inland seaways, near shore and terrestrial streambed conditions. Closer to the mountain front, the sedimentary

units are tilted up on end, creating a zone of steeply dipping bedrock. The clays and claystones of the bedrock formations underlying the corridor and surficial soils derived from the bedrock typically exhibit erratic swell potential.

Overlying the bedrock formations are deposits of surficial material. These surficial deposits are the result of geomorphic activity that has shaped the present landforms and vary considerably in depth. This activity is primarily related to processes involving wind and water including former and modern streams and rivers. The surficial deposits are younger than the bedrock and are unconsolidated and loose by comparison.

Artificial fill is also found at various locations along the corridor ranging from zero to 15 feet above ground and is used for highway and other road fills, flood control, canal embankments, trash dumps, and sanitary landfills. This material is composed of various amounts of clay, silt, sand, gravel, concrete, brick, and trash. For construction purposes, it is assumed that this material is not suitable unless it can be removed and re-compacted to specified CDOT standards.

A chronological list of geologic units found within the C-470 project area are listed previously in **Table 3-39**, and summarized in the following sections.

**POST-PINEY CREEK ALLUVIUM.** This geologic formation can be found 1.2 miles west of the Santa Fe Drive interchange and stretches for about 2000 feet. It is light brown to tan silty sand and fine gravel that occurs in modern stream channels, floodplains, and alluvial fills. Generally it is five to ten feet thick. Possible unstable slopes could occur in some cut areas within this geologic unit.

**PINEY CREEK ALLUVIUM.** Alluvium in this geologic formation can be up to 20 feet thick and consists of dark-gray clayey silt and sand with particles up to cobble size. Due to its formation of terraces just above existing streams, this unit may be subject to seasonal

flooding. The highway corridor lies within this formation, approximately 200 feet east of Kipling Parkway for 2000 feet and for 800 feet at a point 1600 feet west of Santa Fe Drive. Possible unstable slopes could occur in some cut areas within this geologic unit.

**UNNAMED COLLUVIUM.** This geologic unit can be found at many sporadic locations along the corridor. It is composed of brown to light brown sand, sandy silt, and clay. In places it may contain pebbles and cobbles. Generally, colluvium is less than five feet thick. Geologic hazards and constraints associated with this geologic unit include expansive and corrosive soils.

**UNNAMED EOLIAN SAND AND SILT.** Windblown sand and silt deposits cross C-470 approximately 1000 feet west of Wadsworth Boulevard for one half mile, and again approximately one mile east of the Santa Fe Drive interchange. This wind-deposited, fine to medium sand and silt is grayish-orange to light-brown and five to 25 feet thick. It may contain some loose, unconsolidated zones that are prone to settlement and hydro-compaction when saturated. The density can be determined from blow counts from future subsurface drilling, which will assist in determining the potential effect of construction along this section of C-470.

**UNNAMED LOESS.** This geologic unit can be found throughout the corridor and is generally 10 feet thick. It is composed of light brown to tan sandy silt deposited by wind. Loess occurs on upland surfaces and is hard when dry, but slightly sticky when wet. Geologic hazards and constraints associated with this geologic unit include expansive and collapsible soils.

**BROADWAY ALLUVIUM.** This geologic unit is found approximately 800 feet west of the Santa Fe Drive interchange and 1000 feet west of Holly Street, and is generally 10-25 feet thick. It consists of yellowish-orange to

reddish-brown clayey silt and sand, with sections of cobbles, pebbles, and gravel, and serves as an excellent source of gravel for concrete aggregate.

**LOUVIERS ALLUVIUM.** This geologic unit is found west of the Santa Fe Drive interchange, continuing approximately one mile east, and can be up to 25 feet thick. It consists of reddish-brown pebbly to bouldery material, with manganese and iron staining as well as calcium carbonate coatings. It is often used as a source of gravel for concrete aggregate.

**SLOCUM ALLUVIUM.** Grayish brown to yellowish brown stratified pebbly clay, silt, sand, and gravel compose this 15-20 feet thick unit. A strongly developed calcium carbonate enriched zone occurs in the upper part of the deposit. This unit can be found for 1000 feet either side of the Wadsworth Boulevard interchange and one mile west of Santa Fe Drive for approximately 1500 feet.

**DAWSON/DENVER FORMATION.** The Dawson/Denver Formation typically consists of a blend of bluish-gray to olive gray claystones and siltstones and lighter colored sandstones and conglomerates that are variably cemented. The varying degree of cementation affects the hardness and stability of the rock. This formation is exposed for approximately 500 feet at a point 3000 feet west of the Wadsworth Boulevard interchange and can be up to 1000 feet thick. Geologic hazards and constraints associated with this geologic unit include expansive bedrock and corrosive soils.

**LARAMIE FORMATION.** The Laramie Formation can be found approximately 4500 feet west of the Wadsworth Boulevard interchange, extending for about 1000 feet. The material is composed of freshwater deposits of olive-gray siltstone and claystone, and yellowish-gray sandstone with local deposits of coal and can be up to 600 feet thick. Geologic hazards and constraints associated

with this geologic unit include expansive bedrock and corrosive soils.

**FOX HILLS SANDSTONE.** The Fox Hills Sandstone consists of greenish-tan to yellow fine or medium sized grains of quartz and mica. It contains hard limy sandstone concretions as large as four feet in diameter and can serve as a local aquifer. This geologic unit can be up to 300 feet thick and is exposed for approximately 500 feet, approximately one mile west of the Wadsworth Boulevard interchange.

**PIERRE SHALE.** A small section of C-470 lies on Pierre Shale, beginning at the Kipling Parkway interchange, extending east for about 300 feet, and again, one half mile east of this intersection for 1500 feet. The Pierre Shale can be up to 8000 feet thick and is a marine shale consisting of olive-gray to tan clayey shale with some siltstone, silty sandstone and limestone. In areas where Pierre Shale is exposed, swell potential could be high. Further evaluation of the site would be necessary to determine the swell potential in the field area and then determine the appropriate mitigation measure.

Chemical treatment may be a feasible option for dealing with the potential swell problems in this area. Either lime treatment or fly ash may be used as treatment. In some cases, over-excavation of this material is recommended in areas underlain by the Pierre Shale. The depth of over excavation is based on swell potential and the proposed development (retaining walls, pavement, etc.). In addition to high swell potential clays, the Pierre Shale is steeply dipping in this area. This indicates additional mitigation measures may be necessary for differential movement within the geologic units in this area.

**3.3.12.2 Environmental Consequences  
No-Action Alternative**

The No-Action Alternative would not disturb existing soils and geological conditions.

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Therefore, no effects to the existing roadway from geologic and soil conditions are anticipated.

### General Purpose Lanes and Express Lanes Alternative (Preferred Alternative)

Both action alternatives were evaluated. The existing geological conditions and soils would have the same effects to each of the action alternatives. Geologic conditions and soils generate risks to project design and construction and include: expansive soils and bedrock, corrosive soils, steeply dipping bedrock, collapsible soils, and unstable slopes. None of these geologic conditions would result in effects that would alter the location of either of the alternatives. Effects to geology and soils from construction of the alternatives would be in the form of excavation, construction disturbance, and exposure of previously buried and stable geological and soil units to precipitation, air, and weathering.

Expansive soils and bedrock and corrosive soils may cause increasing damage to transportation system components over a period of years. Differential movement in steeply dipping bedrock has damaged local pavement and transportation structures. Collapsible soils could also damage the highway infrastructure by either large settlement areas or differential settlement. Unstable slopes could also cause failure at cut and fill areas.

#### 3.3.12.3 Mitigation

Mitigation of geological and soil conditions for the constructed roadway alternatives is described in terms of engineering design solutions. Expansive soils and bedrock as well as collapsible soils would be mitigated at structure locations by designing deep foundation systems, such as driven H-piles or drilled piers. Foundation pads would also be designed to form a raft across any swelling or collapsing materials. Floating floor slabs would be designed instead of slab-on-grade construction. Structural retaining walls, such as soil nail walls, ground anchors, mechanically stabilized earth walls, cantilever walls, or reinforced soil slopes would be built to stabilize slopes when cut or fill slopes require steep

gradients greater than 3:1, or where potential slope failures may occur due to the presence of water and loose material.

Expansive subgrade soils under pavement sections would be stabilized with chemicals (lime or fly ash), removed and recompacted, or removed and replaced with imported structural fill of better quality. For planning purposes, preliminary evaluations indicate the corridor would require up to four feet of over-excavation, moisture treatment and recompaction with up to 12-inch lime stabilization.

Collapsible subgrade materials under pavement sections would be mitigated by over-excavation prior to embankment placement or additional loading with a thicker section of embankment material.

Steeply dipping bedrock areas require alternative practices such as over-excavation with refill and compaction to remove the conditions that perpetuate heaving. A barrier between the subgrade material and the pavement section would be constructed out of imported structural fill materials that range in thickness of three to five feet. Under structures, this depth of sub-excavation and replacement could be as much as 10 feet under the base of the shallow foundation footer.

The collection and diversion of surface drainage away from paved areas is critical to pavement performance. Proper design of drainage would prevent water from ponding immediately adjacent to pavement. All landscape sprinkler heads and lines adjacent to pavement areas would be frequently checked for leaks and maintained in good working order. It is also imperative that surface and subsurface water conditions be addressed in the design of any retaining wall systems. Any design would consider diverting and controlling surface water around or away from the wall areas and the wall designs should incorporate an internal drainage system. Horizontal drains may increase slope stability by reducing the seepage and freezing pressure acting



within fractures in rock and within zones of weakness in the soil. Slopes and other stripped areas would be protected against erosion by re-vegetation or other methods.

A Stormwater Management Plan that prescribes best management practices to minimize potential soil erosion, and includes prescriptions for monitoring of conditions before and after the completion of work (and for immediate post-restoration site stabilization) would be prepared and implemented. Measures that would be required are typical of erosion control procedures used in highway construction projects. The methods for controlling erosion are described in the CDOT's *Standard Specifications for Road and Bridge Construction*.

In addition to designing the appropriate mitigation measures, proper maintenance of the new roadway sections is critical. Surface and underground drainages would be properly maintained to keep water flowing away from the roadway.

### 3.3.13 Hazardous Materials

Hazardous materials are any product that is flammable, corrosive, or toxic. Hazardous material sites are found in association with a variety of industrial, mining, and municipal land uses. Hazardous material sites located adjacent to the highway ROW could result in project delays and increased cost if contaminated soils or groundwater are exposed during construction activity, particularly if they have not been identified prior to construction.

Two federal acts that can potentially affect transportation projects are the Resource Conservation Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), or Superfund. RCRA regulates substances that can be defined as hazardous materials and focuses on preventing future contamination. CERCLA addresses sites that are contaminated from a past release of hazardous contamination that was uncontrolled at the time of release.

The following concerns would apply for proposed construction areas with soil and/or groundwater contamination:

- Health and safety of workers encountering contaminated material
- Special handling and disposal requirements for contaminated material and a corresponding cost increase
- Inability to reuse contaminated soil as fill in other areas of the construction
- Requirements for special permits

#### 3.3.13.1 Affected Environment

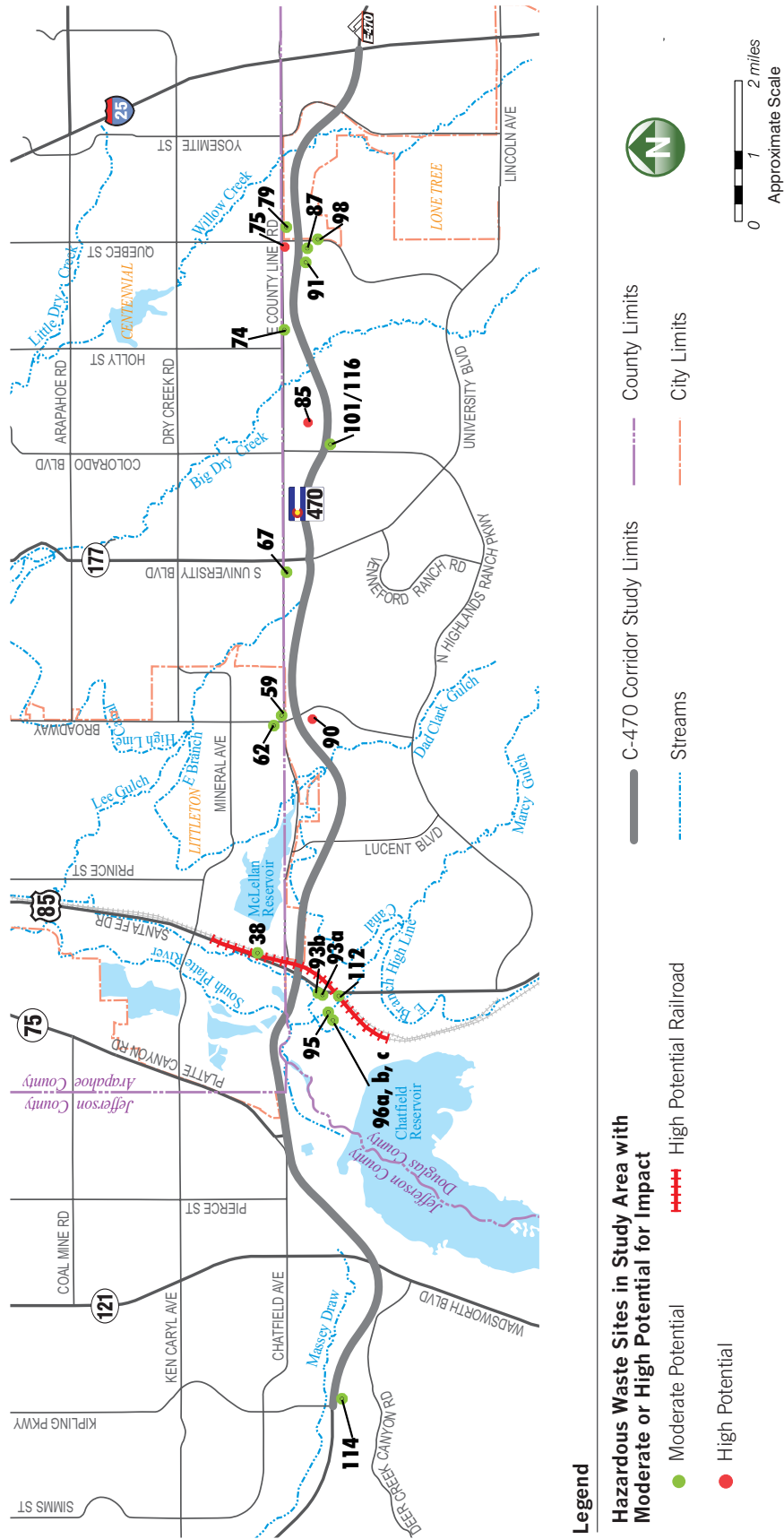
In accordance with the FHWA and CDOT guidance, the potential for highway projects to impact hazardous material sites must be evaluated. A database search was conducted in August 2003 to identify potential hazardous waste sites in the project area. Findings from the database search and information obtained from EPA, Colorado Department of Public Health and Environment, Tri-County Health Department, and the Colorado Department of Labor and Employment Division of Oil and Public Safety (OPS) are summarized in the *Hazardous Waste Technical Report* (March 2005).

Potential ROW acquisition was evaluated to determine the likelihood for encroachment on known hazardous material sites in the project area.

Of the 138 sites initially identified in the project area, 21 sites were considered to have a moderate or high level of concern, based on their distance from the highway, type of release, and direction of groundwater flow. These sites are shown in **Figure 3-21**. Of these, ten sites are active underground storage tank (UST) sites. No tank or line leaks from any of the USTs registered at these sites have ever been reported to the OPS. However, leaks can occur that are often not discovered until tank or line replacement upgrades are made. Because of this uncertainty,

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**Figure 3-21  
Hazardous Material Sites**



Source: Hazardous Waste Technical Report, March 2005

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the potential for undetected contamination is present. Three of the sites are leaking underground storage tanks (LUST) sites with associated soil and groundwater contamination. One RCRA site was also included in the 21 sites identified for further investigation.

**3.3.13.2 Environmental Consequences**

The hazardous material sites identified as having a high or moderate level of concern were mapped relative to the proposed construction footprint for both the GPL and EL Alternatives. This limit eliminated most of the 21 sites identified in the database search, as it was determined that they would not be affected by potential construction activities or represent a portion of a parcel purchased for ROW. However, since the potential for undetected contamination is still present, it is still possible that hazardous material may be encountered during construction.

**No-Action Alternative**

The No-Action Alternative would not affect any hazardous material sites identified along C-470.

**General Purpose Lanes Alternative**

Four hazardous material sites were ranked with a high potential for concern within the C-470 project area. Potential impacts from these sites resulting from the GPL Alternative are shown in **Table 3-40**.

**Express Lanes Alternative (Preferred Alternative)**

The effects identified for the EL Alternative would be the same as those identified for the GPL Alternative.

**3.3.13.3 Mitigation**

The hazardous material mitigation measures would be the same for the GPL and EL Alternatives. Currently no sites have been identified that would require long-term soil or

**Table 3-40  
Hazardous Material Sites**

Site ID	Site Name	Location	Ranking	Potential Effects
85	County Line Landfill	Northeast corner of C-470/Colorado Blvd Douglas County	High	Potential for exposure to soil, groundwater contamination from BETX and chlorinated solvents, and presence of methane with lane widening and bridge improvements. Potential for impact from property acquisition adjacent to ROW and landfill
75	Conoco Station	7130 County Line Rd Highlands Ranch 80125	High	Potential for exposure to soil and groundwater contaminated by large fuel release near County Line Road and Quebec Street, approximately 650 feet north of entrance ramp
90	Diamond Shamrock	34 Centennial Blvd Highlands Ranch 80126	High	Potential for exposure to soil and groundwater contaminated by fuel release. Site is located approximately 500 feet from off ramp and hydraulically up gradient of C-470
NA	UP/BNSF Rail Lines	Crosses C-470 near Santa Fe Dr Douglas County	High	Potential for exposure to heavy metals, volatile and semi-volatile organic compounds, and polyaromatic hydrocarbons in soils and groundwater near the UP/BNSF rail lines



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groundwater remediation. If site conditions change, long-term effects such as treatment of contaminated soil or groundwater would be identified. Effective environmental planning and engineering controls would be employed at the time of construction to remove contaminated materials from the site and to contain materials from having an impact at other locations.

During final design, soil and groundwater testing would be conducted, if necessary, for all of the hazardous material sites that would be directly impacted by construction. Once the testing results are complete, other mitigation measures would need to be identified to avoid hazardous sites. In cases where total avoidance is not possible, measures would be developed to protect workers during construction, in compliance with environmental regulations.

If bridge, building, guardrails, or sign alteration or demolition is required, an asbestos hazardous materials survey and a lead paint survey would be conducted per CDOT's *Standard Specifications for Road and Bridge Construction* and other relevant Occupational Safety and Health Administration, state, and federal regulatory requirements. Because contaminated soil and groundwater may be encountered along C-470, mitigation measures would include development of a site-specific Materials Handling Plan, in accordance with CDOT's *Standard Specifications for Road and Bridge Construction*.

### 3.3.14 Visual and Aesthetic Character

During the process of assessing potential changes to the environment, it is important to consider how the proposed C-470 improvements would change the look or visual character of an area. This is done by defining view sheds away from the highway, as a driver would see the views, and towards the highway as a resident would see the highway.

View sheds are defined as being either natural or man-made vistas which are viewed within a given setting or location. Usually outer boundaries for view sheds are apparent, such as the

edges of a city's downtown, or the bound limits of a specific park. Outer boundaries can also be expansive, such as the extents to which one can physically see. Within the C-470 project area, five such viewsheds were identified as important for the southwest region of Metropolitan Denver. These viewsheds captured the visual essence of the quality of life people choosing to live in this area value. People are attracted to the natural setting this region offers, with the convenience of being close to the economic vitality of both the Denver Technological Center and Denver's Downtown central business district.

Another important consideration in assessing visual changes is the aesthetic treatment of the highway features. It is CDOT's desire to create a unifying identity for the entire length of C-470 by incorporating consistent themes for structural elements such as bridges and retaining walls and other features including guard rail and landscaping throughout the corridor.

#### 3.3.14.1 Affected Environment

More than 80,000 people drive C-470 every day, taking in the views from the roadway, as well as the character of the highway. Two dominant views from the highway include the Dakota Hogback and Chatfield State Park. Westbound travelers on C-470 view the Dakota Hogback on the western horizon. This view provides visual identity for the Denver metro area, different from other Front Range cities in Colorado.

The views of Chatfield State Park from the roadway, including both the reservoir and the dam, can be seen driving from either direction on C-470 in the southwest section of the project area. Chatfield State Park is a 300-acre recreational facility. Chatfield Reservoir is owned by the USACE and provides flood control for the region. The view of this area provides an attractive expanse of undeveloped land and water, in contrast to the surrounding residential and industrial uses surrounding the Park.

As part of the visual analysis for this EA, five view sheds were defined in the project area by