US 36 CORRIDOR

Final Environmental Impact Statement/
Final Section 4(f) Evaluation

APPENDIX D

PROGRAMMATIC BIOLOGICAL ASSESSMENT

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ACRONYMS

BA	Biological Assessment
BCZ	Block Clearance Zone
BMP	best management practice
BRT	bus rapid transit
CDOT	Colorado Department of Transportation
CSA	cumulative study area
dBA	decibel (A-weighted scale)
DEIS	Draft Environmental Impact Statement
DRCOG	Denver Regional Council of Governments
ESA	Endangered Species Act of 1973
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
GIS	geographic information system
I-25	Interstate 25
MOA	Memorandum of Agreement
NDIS	Natural Diversity Information Source
NEPA	National Environmental Policy Act of 1969
OSMP	Open Space and Mountain Parks
PAC	Preferred Alternative Committee
PBA	Programmatic Biological Assessment
PBO	Programmatic Biological Opinion
PCA	Potential Conservation Area
RTD	Regional Transportation District
SH #	State Highway #
TIP	*Transportation Improvement Plan*
TDM	Transportation Demand Management
TNC	The Nature Conservancy
USFWS	U.S. Fish and Wildlife Service
URS	URS Corporation
US 36	United States Highway 36

The Federal Highway Administration (FHWA) and Federal Transit Administration, in cooperation with the Colorado Department of Transportation (CDOT) and the Regional Transportation District (RTD), have jointly prepared a Final Environmental Impact Statement (FEIS) to identify and evaluate adverse impacts of multi-modal transportation improvements along United States Highway 36 (US 36), an existing highway alignment between Denver and Boulder (a distance of approximately 18 miles). The U.S. Army Corps of Engineers is a cooperating agency for this project. This Programmatic Biological Assessment (PBA) addresses the geographic area of the Combined Alternative Package (Preferred Alternative) for consultation with the U.S. Fish and Wildlife Service (USFWS). Within 135 days of submittal of the PBA, USFWS will issue a Programmatic Biological Opinion (PBO) that will be used by FHWA and CDOT as a guidance document for avoidance/minimization of adverse effects of project actions on federally-listed species and for implementation of proactive, off-site habitat replacement/conservation.

The highway alignment is along US 36 between Interstate 25 (I-25) in Denver and the Table Mesa Drive/ Foothills Parkway exit in Boulder. The project area encompasses a number of communities in the northwest Denver metropolitan area including: the City and County of Denver, the City of Westminster, the City and County of Broomfield, the City of Louisville, the Town of Superior, the City of Boulder, Boulder County, and portions of unincorporated Adams, Jefferson, and Boulder counties (Attachment A, Figure 1, Project Overview).

The project would have impacts to both riparian and adjacent upland habitat, with the greatest impacts in areas adjacent to the existing US 36 corridor. Impacts from the project would occur to habitat along existing roadways from highway widening, and construction of the US 36 bikepath alignment, and locations proposed for RTD bus stations. A description of the project, biological impacts, and conservation measures are provided in this PBA. The PBA presents how the project would affect threatened and endangered species, the biological consequences of these impacts, and cumulative effects. Because the proposed timeframe for the project is unknown at this time and may occur sometime in the future, mitigation presented is conceptual and based on opportunity and feasibility at the actual time of construction.

The project *may affect, and is likely to adversely affect,* habitat and populations of the Preble's meadow jumping mouse (*Zapus hudsonius preblei*) and the Ute ladies'-tresses orchid (*Spiranthes diluvialis*) in Boulder County, Colorado. Additionally, concurrence is requested from the USFWS that the project *may affect, but is not likely to adversely affect,* populations of the Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*). FHWA and CDOT are requesting consultation under Section 7 of the Endangered Species Act of 1973 (ESA). Opportunities for mitigation sites to replace, enhance, and/or restore habitat will be implemented for the project. The actual locations and extent of compensatory mitigation will be identified at the time the project is funded and a timeframe for construction is developed.

In accordance with Section 7 of the ESA, as amended (16 United States Code 1531 et seq.), this PBA assesses impacts to species listed as threatened or endangered under the ESA that would be affected as a result of the US 36 project. The FHWA and CDOT would like to request formal consultation with the USFWS as the proposed expansion of transportation improvements *may affect, and is likely to adversely affect,* federally-listed threatened and endangered species.

An FEIS has been prepared to analyze impacts from the US 36 Combined Alternative Package (Preferred Alternative) under the National Environmental Policy Act of 1969 (NEPA). This PBA is being prepared to comply with NEPA and ESA requirements to identify the adverse effects to threatened and endangered species caused by construction and operation of the project.

The project *may affect, and is likely to adversely affect,* habitat and populations of the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid in Boulder County, Colorado. Additionally, concurrence is requested from USFWS that the project *may affect, but is not likely to adversely affect,* populations of the Colorado butterfly plant.

The Preble's meadow jumping mouse was listed as threatened under the ESA in 1998 due primarily to loss and degradation of riparian habitat. The areas of habitat known to be occupied by the Preble's meadow jumping mouse were initially identified within the project area based on Natural Diversity Information Source (NDIS) coverage, known locations from previous trapping surveys, and habitat evaluations of specific areas of suitable habitat conducted in 2004 for the preliminary Draft Environmental Impact Statement (DEIS). In July 2006, CDOT, USFWS, and URS Corporation (URS) conducted a field review of current habitat conditions at several locations along US 36 in the vicinity of South Boulder Creek that are classified as occupied habitat by NDIS.

The Ute ladies'-tresses orchid was listed as threatened in 1992, as populations in the Front Range of Colorado were considered highly threatened by loss of riparian habitat to urban development and stream channelization. At the time of listing, fewer than 6,000 individual plants were known to exist throughout the range of the Ute ladies'-tresses orchid. Since 1992, the species' range and known population status has increased to more than 83,000 plants (Fertig et al. 2005). However, in addition to the original reasons for listing, competition from invasive species, vegetation succession, road and infrastructure construction, and recreation are now considered the primary threats to the Ute ladies'-tresses orchid (Fertig et al. 2005).

The Ute ladies'-tresses orchid occurs in several locations on City of Boulder Open Space and Mountain Parks (OSMP) property within the project area. The City of Boulder OSMP property is part of the South Boulder Creek State Natural Area, as well as a Colorado Natural Heritage Program, Colorado Tallgrass Prairie Potential Conservation Area (PCA), which is considered an area of very high biodiversity significance because of a large occurrence of the Ute ladies'-tresses orchid and mesic tallgrass prairie habitat (CNHP 2004). These sensitive areas consist of high quality wetlands, wet meadows, mesic grasslands, and good condition plains cottonwood riparian habitat. Portions of this area are also identified as significant natural communities (wet prairie) in the *Boulder County Comprehensive Plan* (Boulder County 2004). The South Boulder Creek State Natural Area and Colorado Tallgrass Prairie PCA occupy both sides of US 36.

The Colorado butterfly plant was listed as threatened in 2000 due to periodic flooding within the plant's habitat, herbicides, land conversion to agriculture and urban development, and competition by other plant species including noxious weeds (USFWS 2000). The species has declined from competition by dense growths of willows (*Salix* spp.), grasses, and noxious weeds, such as Canada thistle (*Cirsium arvense*) and leafy spurge (*Euphorbia esula*). Census information from 1986 to 1993 indicates that the total global population may be as low as 35,000 plants (USFWS 2000). USFWS designated critical habitat for the Colorado butterfly plant, but no critical habitat occurs within the US 36 project area. The critical habitat is located along 3,538 acres (37 stream miles) in Platte and Larimer counties in Wyoming (USFWS 2005).

The purpose of the proposed action in the US 36 corridor is to improve mobility along the US 36 corridor from I-25 in Adams County to Foothills Parkway/Table Mesa Drive in Boulder, and among intermediate destinations by increasing trip capacity, providing multi-modal opportunities, and upgrading outdated highway facilities. The proposed action is widening US 36 from the existing four lanes by providing additional lanes as well as a bikeway alignment along the corridor. The anticipated construction schedule has not been developed at this time, as funding availability is unknown; however, the project would be completed in a series of phases as funding becomes available. This PBA will provide a determination of effect and outline mitigation based on the Combined Alternative Package (Preferred Alternative) and opportunities identified for conceptual mitigation. This PBA will result in a PBO from the USFWS. FHWA and CDOT anticipate the PBO would be issued within 135 days of submittal of this PBA. The PBO will be required prior to the decision document for the US 36 Corridor FEIS.

The US 36 DEIS was published in 2007 and presented three corridor-level improvement packages:

- **Package 1**: No Action
- **Package 2**: Managed Lanes/Bus Rapid Transit
- **Package 4**: General-Purpose Lanes, High-Occupancy Vehicle, and Bus Rapid Transit

The DEIS comment period identified public and agency interest in minimizing community and environmental impacts and reducing project costs, while providing increased mobility improvements throughout the US 36 corridor.

To respond to public and agency comments, a Preferred Alternative Committee (PAC) comprised of agency representatives, elected officials, and technical staff from local jurisdictions, was convened in January 2008. The PAC process reviewed and addressed DEIS public comments, evaluated corridor elements, identified a Preferred Alternative, and outlined implementation phases.

In July 2008, the PAC recommended a multi-modal transportation solution known as the Combined Alternative Package (Preferred Alternative). The Combined Alternative Package (Preferred Alternative) includes both transit and highway improvements that are responsive to the public and provide long-term transportation benefits.

3.1 COMBINED ALTERNATIVE PACKAGE (PREFERRED ALTERNATIVE): MANAGED LANES, AUXILIARY LANES, AND BUS RAPID TRANSIT

The following provides a detailed description of the Combined Alternative Package (Preferred Alternative), including the specific characteristics of Package 2 and Package 4 that were combined to reduce overall environmental impacts. For a detailed description of Packages 1, 2, and 4; the alternatives evaluation process; and development of the Combined Alternative Package (Preferred Alternative), refer to Chapter 2, Alternatives Considered, of the US 36 Corridor FEIS.

The typical sections associated with Package 2 and Package 4 and the Combined Alternative Package (Preferred Alternative) are shown in Attachment A, Figures 2 through 4.

In general, the Combined Alternative Package (Preferred Alternative) would add one managed lane in each direction on US 36 and auxiliary lanes between most interchanges. The managed lanes would connect to and be an extension of the existing I-25 express lanes that go to and from downtown Denver. The reversible managed lane between Sheridan Boulevard and Pecos Street would remain and traffic would continue to use the existing I-25/US 36 managed lane ramp. The managed lanes from Pecos Street to west of Cherryvale Road in Boulder would be bi-directional, located adjacent to the median of US 36, and separated from the general-purpose lanes by a painted buffer. Buses would exit the highway to pick up and drop off passengers at stations located on ramps and adjacent park-n-Rides. Access to the managed lane would be provided at separate ingress and egress points located between each interchange.

The roadway changes under the Combined Alternative Package (Preferred Alternative) would include improvements to cross-street intersections and interchanges. Those improvements would include upgrading lane transitions of ramp terminals, widening cross-streets at intersections, lengthening turn-lanes, and adding turn-lanes.

The Combined Alternative Package (Preferred Alternative) would include a bikeway facility adjacent to US 36. In general, the bikeway is an off-street, separated, multi-use path adjacent to US 36. Where appropriate, the bikeway connects to and makes use of existing on- and off-street facilities.

The Combined Alternative Package (Preferred Alternative) would also include Transportation Demand Management (TDM) improvements throughout the corridor, such as strategies designed to make the most efficient use of existing transportation facilities by reducing the actual demand placed on these facilities.

Finally, the Combined Alternative Package (Preferred Alternative) would provide bus rapid transit (BRT) improvements, including new and more frequent bus service in the US 36 corridor. See Attachment A, Figure 4, Typical Sections for the Combined Alternative Package (Preferred Alternative).

The following descriptions summarize the highway configuration in the segments of concern.

3.2 DENVER AND ADAMS SEGMENTS

Although the Denver and Adams Segments in the eastern portion of the project area are part of the project area, this PBA does not discuss these segments as they are heavily urbanized and do not support habitat for threatened and endangered species.

3.3 WESTMINSTER AND BROOMFIELD SEGMENTS

In these segments, the managed lanes would remain adjacent to the median of US 36 and would be separated from the general-purpose lanes by a painted buffer. The existing general-purpose lanes would need to be rebuilt, as they would move outward to accommodate the managed lanes in the median. No additional general-purpose lanes would be constructed. The BNSF Railway Company and East Flatiron Circle bridges would be reconstructed as part of the Combined Alternative Package (Preferred Alternative). Additionally, a new bridge at 112th Avenue would be constructed to replace the existing Old Wadsworth bridge. The approaches to the bridge and any associated street improvements would be constructed by other projects. Auxiliary lanes between interchanges would be constructed in both directions between East Flatiron Circle and Sheridan Boulevard.

At the Sheridan Boulevard interchange, the existing configuration would be expanded to a split-diamond between 92nd Avenue and Sheridan Boulevard, with an additional on-ramp to eastbound US 36 from the frontage road. The Church Ranch Boulevard/104th Avenue interchange would be reconstructed, but would maintain its existing configuration.

At Wadsworth Parkway, the proposed partial cloverleaf configuration would incorporate loop-ramps in the northeast and southwest quadrants. These loop-ramps would eliminate the left-turn movements required for traffic to access US 36 from Wadsworth Parkway. This configuration would also provide a grade-separated roadway for the eastbound US 36 off-ramp traffic destined for southbound Wadsworth Parkway to bypass the Wadsworth Parkway/120th Avenue intersection. A braided connection, where one ramp goes over the other, between Wadsworth Parkway and 120th Avenue to the north of US 36, would allow traffic from 120th Avenue to bypass Wadsworth Parkway for access to US 36. In addition, new on- and off-ramps to and from the east would be provided at 120th Avenue.

3.4 SUPERIOR/LOUISVILLE AND BOULDER SEGMENTS

In these segments, the managed lane in each direction would remain adjacent to the median of US 36 and would be separated from the general-purpose lanes by a painted buffer. In the westbound direction, the managed lane would become a general-purpose lane west of Cherryvale Road. In the eastbound direction, traffic would enter the added managed lane just west of Cherryvale Road. A new climbing lane in each direction would be provided from McCaslin Boulevard westbound and from Table Mesa Drive/Foothills Parkway eastbound to the top of Davidson Mesa. From Davidson Mesa westbound to Table Mesa Drive/Foothills Parkway and eastbound to McCaslin Boulevard, the climbing lane would become a bus-only lane.

The McCaslin Boulevard interchange would remain in the existing configuration. However, the bridge over US 36 would need to be replaced to provide additional lanes on McCaslin Boulevard. The existing loop-ramp would need to be reconstructed to accommodate the new McCaslin Boulevard bridge.

The Foothills Parkway/Table Mesa Drive interchange would be reconfigured slightly to improve geometric conditions. In particular, the existing loop-ramp from westbound Table Mesa Drive to eastbound US 36 would be removed. The ramp from Foothills Parkway to eastbound US 36 would be relocated to improve the merging operations among the US 36, Table Mesa Drive, and Foothills Parkway traffic.

The existing general-purpose lanes in these segments would need to be rebuilt, as they would be moved outward to accommodate the managed lanes in the median. No additional general-purpose lanes would be constructed. The Interlocken Loop, West Flatiron Circle, Coal Creek, Cherryvale Road, and South Boulder Creek bridges would be reconstructed.

3.5 BIKEWAY/PEDESTRIAN PATH

In general, the bikeway facility included in the Combined Alternative Package (Preferred Alternative) is an off-street, separated, multi-use path adjacent to US 36. Where appropriate, the bikeway connects to and makes use of existing on- and off-street facilities. The bikeway planned for this package would parallel US 36 from the Cherryvale Road to Foothills Parkway/Table Mesa Drive, where it would access Table Mesa Station. Crossings of major arterials along US 36 would be grade-separated. Grade separation of the bikeway from the major arterials is required due to safety and continuity criteria related to traffic volumes on the major arterials. Maintenance of the US 36 bikeway would be the responsibility of the local jurisdictions through an Intergovernmental Agreement with CDOT.

CDOT requested a list of federally-listed threatened and endangered species for counties in the US 36 project area; USFWS provided a list on April 15, 2004. On June 17, 2004, CDOT and URS met with USFWS to review threatened and endangered species issues, survey requirements, and mitigation. The group reviewed each riparian crossing within the project area and made conclusions on the need for Preble's meadow jumping mouse trapping surveys at some locations where presence of the species is unknown. None of the riparian crossings along US 36 were recommended for trapping.

In July 2006, CDOT, USFWS, and URS conducted a field review of habitat conditions at several locations in the vicinity of South Boulder Creek on US 36 that are classified as *occupied habitat* by NDIS. Based on the field review, areas between riparian corridors that NDIS classified as *unoccupied habitat* were determined to be suitable habitat for the Preble's meadow jumping mouse. Therefore, the impact evaluation in the DEIS included these areas as habitat potentially occupied by the Preble's meadow jumping mouse. However, a University of Colorado property that would be impacted on the western end of the project area that NDIS classifies as *occupied habitat* was later considered in the DEIS to be *likely not habitat* for the Preble's meadow jumping mouse based on the field review, as well as negative Preble's meadow jumping mouse trapping records and evaluations.

CDOT, USFWS, FHWA, URS, City of Boulder OSMP, and Boulder County Open Space met on August 23, 2006 to discuss mitigation goals and opportunities for the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid. CDOT asked City of Boulder OSMP and Boulder County Open Space to identify properties that are in need of enhancement, restoration, creation, or preservation and are located within or adjacent to open space that would provide mitigation by improving linkages within the floodplain (on- and off-site) for populations of the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid.

On October 6, 2006, Mark Gershman, of City of Boulder OSMP, provided a memorandum that identified six sites with potential to meet the mitigation needs of the project (Gershman 2009). City of Boulder OSMP, CDOT, and URS discussed these six sites in more detail in a telephone conference on September 28, 2006. CDOT, USFWS, City of Boulder OSMP, and URS visited the following sites on October 11, 2006:

1. South Boulder Creek floodplain near Baseline Road
2. Lafayette Water Treatment Facility at South Boulder Creek
3. Coal Creek at the Jefferson/Boulder county line
4. Coal Creek crossing at State Highway (SH) 128
5. Boulder Creek, east of North 75th Street
6. Dry Creek, east of Valmont Road

On October 2, 2006, CDOT and URS discussed three additional potential mitigation sites identified on Boulder County Open Space property during a phone conference with Mark Brennan and Claire DeLeo of Boulder County Open Space. On October 23, 2006, CDOT, USFWS, Boulder County Open Space, and URS visited the following three sites:

1. Boulder Creek (east of US 287)
2. Rock Creek (west of McCaslin Boulevard, east of SH 128)
3. Coal Creek (Mayhoffer/Singletree property)

In December 2008, CDOT met with USFWS regarding the Combined Alternative Package (Preferred Alternative), to discuss USFWS comments on the Draft PBA, and to strategize how to move forward to finalize the PBA.

On April 3, 2009, Mark Gersham, at the request of CDOT, provided a memorandum that included comments on the potential mitigation sites previously identified. The memorandum updated the information on these sites, and that information has been incorporated into this PBA.

On July 3, 2009, Mark Gersham, in a telephone conversation with Jon Chesser, Biologist at CDOT, made it clear that the City of Boulder OSMP strongly supports an ecological approach to impact mitigation that includes mitigation sites in the South Boulder Creek floodplain where the impact occurs. This comment prompted the addition of a general mitigation "site" to the mitigation table that includes other sites not yet identified in the South Boulder Creek floodplain as other possible locations to consider for mitigation. These will be worked out with the various Boulder and regulatory agencies during the update to the PBA when site-specific mitigation is detailed. This PBA was formally submitted to USFWS at the end of July 2009 for their review and acceptance.

5.1 SPECIES CONSIDERED

Based on a species list obtained from the USFWS Region 6 Endangered Species website (USFWS 2009), the following threatened and endangered species are listed for Boulder, Broomfield, Jefferson, and Denver counties as shown in Table 1, Threatened and Endangered Species Occurrence in the US 36 Project Area.

Table 1: Threatened and Endangered Species Occurrence in the US 36 Project Area

Common Name	Species	Status	Habitat	Occurrence in Project Area
Interior least tern	*Sterna antillarum*	Endangered	Migrants occur at reservoirs, lakes, and rivers with bare sandy shorelines. Local uncommon summer resident on southeastern plains of Colorado.	Water depletions in the South Platte River may affect this species and/or critical habitat in downstream reaches in other states. Nests along the Platte River in central Nebraska. Will not be evaluated further.
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	Mixed conifer forests and pinyon-juniper woodland with narrow, shady, cool canyons in sandstone slickrock elevations of 4,400 to 6,800 feet.	Not present; no suitable habitat. Will not be evaluated further.
Piping plover	*Charadrius melodus*	Threatened	Wetlands, lakeshores, and marshes. Rare migrant on eastern plains to foothills of Colorado between April and May.	Water depletions in the South Platte River may affect this species and/or critical habitat in downstream reaches in other states. Occurs downstream along the Platte River in central Nebraska. Will not be evaluated further.
Whooping crane	*Grus americana*	Endangered	Rare migrant in Colorado, east of project area. Stopover habitat during migration includes wetlands, irrigated meadows, broad drainage bottoms and reservoir edges. Generally in areas with minimal human disturbance.	Water depletions in the South Platte River may affect this species and/or critical habitat in downstream reaches in other states. Species has not been observed in Colorado since 2002. Occurs downstream along the Platte River in central Nebraska. Will not be evaluated further.
Black-footed ferret	*Mustela nigripes*	Endangered	Found in association with black-tailed prairie dog colonies in grassland habitats.	Unlikely. Considered extirpated from eastern Colorado. Will not be evaluated further.
Canada lynx	*Lynx canadensis*	Threatened	Contiguous old-growth spruce, fir, and lodgepole pine forests with deep snow and available prey of snowshoe hare.	Not present; no suitable habitat. Will not be evaluated further.
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Threatened	Occurs along Front Range of northern Colorado and southern Wyoming along permanent or intermittent streams in areas of good herbaceous cover and adequate cover of shrubs and trees.	Present in project area along South Boulder Creek and adjacent ditches crossed by US 36 in Boulder County. Critical habitat designated in Jefferson County.
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	Threatened	Prefers cold, clear, gravely headwater streams in the Arkansas and South Platte River drainages.	Not present; nearest population is in Rocky Mountain National Park. Will not be evaluated further.
Pallid sturgeon	*Scaphirhynchus albus*	Endangered	Known population in Mississippi River from Missouri to the Gulf of Mexico.	Water depletions in the South Platte River may affect this species and/or critical habitat in downstream reaches in other states. Occurs downstream in lower reaches of the South Platte River. Will not be evaluated further.

Table 1: Threatened and Endangered Species Occurrence in the US 36 Project Area

Common Name	Species	Status	Habitat	Occurrence in Project Area
Pawnee montane skipper	*Hesperia leonardus montana*	Threatened	Found in the South Platte Canyon, southwest of Denver.	Not present; no suitable habitat and no known populations in project area. Will not be evaluated further.
Ute ladies'-tresses orchid	*Spiranthes diluvialis*	Threatened	Sub-irrigated alluvial soils along streams; open meadows on floodplains.	Present, largest population in Colorado occurs in Boulder along US 36.
Colorado butterfly plant	*Gaura neomexicana* ssp. *coloradensis*	Threatened	Sub-irrigated alluvial soils of drainage bottoms within mixed grass prairie.	Present along Walnut Creek west of US 36 in Westminster.
Gunnison's prairie dog	*Cynonyms gunnisoni*	Candidate	Level to gently sloping grasslands and semi-desert and montane shrublands, at elevations from 6,000 to 12,000 feet.	Not present; no suitable habitat. Will not be evaluated further.

Source: US 36 Mobility Partnership, 2009.

5.2 SPECIES EVALUATED

Based on the results of research conducted and coordination efforts described in Section 4, Consultation History, three species are evaluated in this PBA including the Preble's meadow jumping mouse, the Ute ladies'-tresses orchid, and Colorado butterfly plant. Each species and its habitat requirements are discussed below.

5.2.1 Preble's Meadow Jumping Mouse

The Preble's meadow jumping mouse is a small, primarily nocturnal rodent and is one of 12 recognized subspecies of the species *Z. hudsonius*, the meadow jumping mouse. The Preble's meadow jumping mouse inhabits well-developed plains riparian vegetation with adjacent, undisturbed upland grassland communities and with nearby water sources. Suitable habitat is typically a dense combination of grasses, forbs, and shrubs, although a taller shrub and tree canopy may be present. In addition to plant diversity, density and abundance of riparian vegetation is an important indicator of suitable Preble's meadow jumping mouse habitat. The Preble's meadow jumping mouse has been found in uplands as far as 330 feet beyond the 100-year floodplain, and it can move up to 1 mile in 1 night (USFWS 2003a).

Common plant associations of occupied Preble's meadow jumping mouse habitat includes an overstory of willow, with snowberry (*Symphoricarpus* spp.), chokecherry (*Prunus virginiana*), hawthorn (*Crataegus* spp.), Gambel's oak (*Quercus gambelli*), alder (*Alnus incana*), river birch (*Betula fontinalis*), skunkbrush (*Rhus trilobata*), wild plum (*Prunus americana*), leadplant (*Amorpha fruticosa*), and dogwood (*Cornus sericea*) (Bakeman 1997; Shenk and Eussen 1998). The effect of invasive, non-native plants on Preble's meadow jumping mouse habitat use is not well known at this time.

The Preble's meadow jumping mouse constructs day nests usually at the base of shrubs or trees, or in open grassland, from available plant material. Nests are globular shaped or raised mats of litter, and are most commonly above ground but also can be below ground. An individual mouse can have multiple day nests in both riparian and grassland habitats and may abandon a nest after approximately 1 week of use (USFWS 2003a).

This species also hibernates near riparian habitat, usually from September or October to May. Hibernacula are located within and upland of the 100-year floodplain. Because the adults accumulate winter fat stores earlier than young of that year, adults enter hibernation earlier. The Preble's meadow jumping mouse usually has two litters per year, with an average of five young born per litter, although litters range from two to eight young (USFWS 2003a).

Their diet consists of fungi, moss, pollen, invertebrates (primarily beetles), and grass seeds. Plant species found in the Preble's meadow jumping mouse diet include willow, lamb's quarters (*Chenopodium* sp.), Russian thistle (*Salsola* sp.), sunflower (*Helianthus* spp.), sedges (*Carex* spp.), mullein (*Verbascum* sp.), various grasses (*Bromus* sp., *Festuca* sp., *Poa* sp., *Sporobolus* sp., and *Agropyron* spp.), bladderpod (*Lesquerella* sp.), horsetail (*Equisetum* spp.), and assorted seeds (Shenk and Eussen 1998; Shenk and Sivert 1998). The Preble's meadow jumping mouse diet shifts seasonally. It consists primarily of insects and fungus after emerging from hibernation; shifts to fungus, moss, and pollen during mid-summer (July through August); and includes insects again in September (Shenk and Sivert 1998). The shift in diet along with changes in mouse movements suggests that the Preble's meadow jumping mouse may require specific seasonal diets, perhaps related to the physiological constraints imposed by hibernation (Shenk and Sivert 1998).

The Preble's meadow jumping mouse is native only to the Rocky Mountains/Great Plains interface of eastern Colorado and southeastern Wyoming. The western boundary of the Preble's meadow jumping mouse distribution is limited to below 7,600 feet in elevation as identified by the Preble's meadow jumping mouse Technical Working Group (NDIS 2006). Historic records indicate its range included Adams, Arapahoe, Boulder, Denver, Douglas, El Paso, Elbert, Jefferson, Larimer, and Weld counties in Colorado; and Albany, Laramie, Platte, Goshen, and Converse counties in Wyoming.

The Preble's meadow jumping mouse has been extirpated from the Denver metropolitan area, which separates the northern and southern extents of the Preble's meadow jumping mouse range. The subspecies occurs in the North and South Platte River basins, from the eastern side of the Laramie Mountains in southeastern Wyoming, southward along the Front Range of Colorado into the Arkansas River Basin (Fitzgerald et al. 1994). In Colorado, the Preble's meadow jumping mouse occurs in seven counties (Weld, Larimer, Boulder, Jefferson, Douglas, Elbert, and El Paso). The USFWS approved a Block Clearance Zone (BCZ) for the Preble's meadow jumping mouse for the Denver metropolitan area which precludes the need for species-specific surveys or USFWS coordination as it has been documented that the Preble's meadow jumping mouse is unlikely to exist in this area (USFWS 2004a). This area is located on the south side of US 36, where the highway crosses Coal Creek, to Rock Creek where the BCZ includes both sides of US 36 to its eastern terminus.

The loss and degradation of riparian habitat has reduced the Preble's meadow jumping mouse habitat and range. Additionally, alteration and fragmentation of habitat from urban development, highway and bridge construction, flood control, water development, agriculture, and other human land uses have adversely impacted Preble's meadow jumping mouse populations. The Preble's meadow jumping mouse was listed as federally threatened in 1998. In 2003, USFWS designated critical habitat in Colorado and Wyoming. The nearest critical habitat to the project area is located approximately 10 miles to the southwest on Ralston Creek in Jefferson County (USFWS 2003b).

In March 2004, USFWS initiated a 90-day review to delist the Preble's meadow jumping mouse in Colorado and Wyoming, based on evidence that the Preble's meadow jumping mouse is not a separate subspecies from the Bear Lodge jumping mouse (*Z. h. campestris*). USFWS has determined that delisting is warranted in Wyoming but not in Colorado. Therefore, the species must still be protected with regard to impacts under the Combined Alternative Package (Preferred Alternative) (73 Code of Federal Regulations 39783-39838 Final Rule, July 10, 2008).

5.2.2 Ute Ladies'-tresses Orchid

The Ute ladies'-tresses orchid is a perennial, terrestrial orchid that flowers from mid-July through August (Spackman et al. 1997). The plant may remain dormant underground for at least one growing season before leaves emerge aboveground (USFWS 1995). The species usually occurs in small, scattered populations in moist soils in mesic or wet meadows near springs, lakes, or perennial streams in the western United States (Hiedel 1998). The Ute ladies'-tresses orchid is often found in association with

floodplain areas where the water table is near the surface throughout the growing season and into late summer or early fall (USFWS 1995). In Colorado, the Ute ladies'-tresses orchid occurs along the eastern slope of the Front Range between 4,300 and 5,740 feet in elevation (Spackman et al. 1997; Fertig et al. 2005).

Because emergent populations of the Ute ladies'-tresses orchid may fluctuate from year to year, assessing population status and distribution is difficult. Prior to 1992, extant populations of the Ute ladies'-tresses orchid were known only in Jefferson and Boulder counties, within the Clear Creek and St. Vrain River watersheds. Current estimates indicate there are 52 populations of approximately 83,300 individuals within eight states (Colorado, Idaho, Montana, Nebraska, Nevada, Washington, Utah, and Wyoming). The largest populations in the region occur in the South Boulder Creek and St. Vrain River watersheds within the US 36 corridor.

Since 1992, the Ute ladies'-tresses orchid has been found to occur in more vegetation and hydrological settings, including seasonally flooded river terraces, sub-irrigated or spring-fed abandoned stream channels and valleys, and lakeshores. Additionally, populations have been discovered along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside barrow pits, reservoirs, and other human-modified wetlands (Fertig et al. 2005). Approximately one-third of the known populations of the Ute ladies'-tresses orchid are found on alluvial banks, point bars, floodplains, or ox-bows associated with perennial streams (Jennings 1989; Riedel 2002). These habitats are dominated by perennial grasses and forbs such as creeping bentgrass (*Agrostis stolonifera),* quackgrass (*Elymus repens),* mountain rush (*Juncus balticus),* and smooth horsetail (*Equisetum laevigatum*), where the vegetation is short a result of grazing, periodic flooding, or mowing. In areas where the Ute ladies'-tresses orchid becomes encroached upon by riparian shrub or woodland, such as sandbar willow (*Salix exigua*), narrowleaf cottonwood (*Populus angustifolia*), or river birch (*Betula occidentalis*), individual plants may persist for a limited time in the understory of shrubs, but do not thrive under these conditions (Ward and Naumann 1998).

The Ute ladies'-tresses orchid was listed as federally threatened in 1992 primarily due to the fragmentation and conversion of riparian and floodplain habitat to agricultural and urban development, as well as the orchid's small population and low reproductive rate, which makes it vulnerable to other threats (USFWS 1995). Additionally, watershed and stream alternations, such as stream channelization and water diversions that degrade natural stream stability and diversity, have heavily impacted the riparian and wetland habitats that support this species. No critical habitat was designated for the species at the time of listing.

USFWS implemented a recovery plan for delisting the species (USFWS 1995). Recovery objectives include obtaining information on life history, demographics, habitat requirements, and watershed processes that allow specification of management and population goals and monitoring progress; managing watersheds to perpetuate or enhance viable populations; and protecting and managing populations occurring in wet meadows, seep, and spring habitats (USFWS 1995).

In 2004, USFWS initiated a status review to determine if delisting the Ute ladies'-tresses orchid was warranted based on new information on population sizes, distribution, and increased knowledge of its life history and habitat requirements (USFWS 2004d). New occurrences have been documented in Nebraska, Wyoming, Washington, Idaho, Utah, and Colorado, substantially increasing the known range and estimated population size. Current population estimates are 83,300 individuals; original estimates were 20,500 in 1995.

5.2.3 Colorado Butterfly Plant

The Colorado butterfly plant is a short-lived, perennial herb with one to several reddish, hairy stems that are 1 to 3 feet tall. The flowers are 5 to 10 millimeters long with four reddish sepals and four white petals that turn pink or red with age. Flowerless plants consist of a ground-hugging rosette of oblong, hairless leaves that are 1.5 to 8 inches long. The flowers occur from July to September, while the fruits occur from late July to October (Fertig 2000). Individual Colorado butterfly plants may live for 1 to 5 years as stemless, vegetative rosettes before flowering once and dying (Fertig 2000).

Colorado butterfly plant grows in sub-irrigated fields and/or alluvial soils on level or slightly sloped floodplains and drainage bottoms within mixed grass prairie in northeast Colorado. It typically grows at elevations of 5,800 to 6,200 feet (Spackman et al. 1997). Colonies are commonly found growing in low depressions or along bends of wide, meandering stream channels, upslope of the actual channel (Fertig 2000).

The plant usually grows in areas that are intermediate in moisture between wet, streamside habitats dominated by sedges, rushes, and cattails, and adjacent dry, upland shortgrass prairie. Common plant associations include creeping bentgrass (*Agrostis stolonifera*) and Kentucky bluegrass (*Poa pratensis*) on wet sites and American licorice (*Glycyrrhiza lepidota*), thistle (*Cirsium* sp.), curlycup gumweed (*Grindelia squarrosa*), and smooth horsetail (*Equisetum laevigatum*) on dry sites.

Colorado butterfly plants are adapted to periodic disturbance such as periodic flooding, wildfire, and grazing. Sandbar willow and Canada thistle may dominate in undisturbed areas, which prevents new seedlings from establishment (Fertig 2000).

Historically, Colorado butterfly plant occurred in Boulder, Douglas, and Larimer counties in Colorado, and in Wyoming and Nebraska. Currently, the plant is found on approximately 1,700 acres in Laramie County, Wyoming; western Kimball County, Nebraska; and Weld County, Colorado, within the North and South Platte River watershed (Fertig 2000). Additionally, an introduced population is present on Walnut Creek, approximately 0.7-mile west of US 36.

In 2000, Colorado butterfly plant was listed as threatened throughout its range due to population declines from periodic flooding within the plants' riparian habitat, herbicides, and land conversion to agricultural and urban development. Additionally, the species has declined from competition by dense growths of willows, grasses, and noxious weeds, such as Canada thistle and leafy spurge. Census information from 1986 to 1993 indicates that the total global population may be as low as 35,000 plants (USFWS 2000).

USFWS designated critical habitat for the Colorado butterfly plant, but no critical habitat occurs within the US 36 project area. The critical habitat is located along 3,538 acres (37 stream miles in Platte and Larimer counties in Wyoming) (USFWS 2005). At this time, there are no recovery plans for the Colorado butterfly plant. USFWS will continue biological surveys and monitoring to gather more information regarding the habitat and potential recovery of the species.

This section discusses the current known distribution of each species analyzed in this PBA, as well as suitable habitats for these species in the US 36 project area.

6.1 DESCRIPTION OF ACTION AREA AS RELATED TO SPECIES

The project is located on the Front Range of the Denver metropolitan area, which includes the cities of Boulder, Louisville, Broomfield, and Westminster. The affected streams are in the St. Vrain Watershed. The project area contains South Boulder Creek, various associated irrigation ditches, and Coal Creek, Rock Creek, Big Dry Creek, and Walnut Creek. The majority of Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitats are within the South Boulder Creek floodplain. Elevations in the project are from approximately 5,400 to 5,700 feet. The project area is in Universal Transverse Mercator 13, 478068 East 4427552 North at the west end terminus to 489406 East 4420155 North at the US 36 crossing at Rock Creek.

The primary vegetation types include grassland, riparian woodland and shrub, wetlands, and grassland with some irrigated and dryland agriculture. Narrow bands of riparian vegetation are present along a number of streams and some irrigation canals. Adjacent upland areas on City of Boulder OSMP property are irrigated pastures and hayfields or residential. The City of Boulder OSMP property has suitable vegetation, hydrology, and soil character to support both the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid. The portion of the bikepath alignment along Cherryvale Road and South Boulder Road is bounded by City of Boulder OSMP property. A large portion of the area along Cherryvale Road appears to contain wetlands, and Cherryvale Road crosses South Boulder Canyon Ditch; South Boulder Road crosses South Boulder Creek. The following ditch and stream crossings are located along the US 36 corridor within the Preble's meadow jumping mouse range.

6.1.1 South Boulder Ditch/Upper Bear Canyon Ditch (University of Colorado Property)

This ditch is approximately 500 feet long and crosses US 36 on a diagonal. The vegetation along the ditch banks on the north side of US 36 is plains cottonwood (*Populus deltoides*) and Siberian elm (*Ulmus pumila*), with dense sandbar willow wetlands in the drainage. Cottonwoods, crack willow (*Salix fragilis*), and black locust (*Robinia pseudoacacia*) occur near the highway; the vegetation on the south side of the highway is a narrow strip of sandbar willow and young cottonwoods surrounded by mowed lawn. This ditch is located at the edge of City of Boulder OSMP property on the north side of US 36; the vegetation along the ditch on the south side is mowed.

6.1.2 South Boulder Creek

The area along the creek is occupied Preble's meadow jumping mouse habitat, as indicated by trapping records (USFWS 2004b). The vegetation is primarily composed of mesic riparian shrub (sandbar willow) and riparian woodland (plains cottonwood). The east slope of the creek also supports chokecherry (*Prunus virginiana*) and hawthorn (*Crataegus* sp.). Understory species include burdock (*Arctium* sp.), houndstongue (*Cynoglossum officinale*), Canada thistle, common mullein (*Verbascum thapsus*), winter cress (*Barbarea vulgaris*), goldenrod (*Solidago* sp.), avens (*Geum* sp.), smooth horsetail, orchard grass (*Dactylis glomerata*), meadow fescue (*Festuca pratensis*), alfalfa (*Medicago sativa*), black medic (*Medicago lupulina*), and white clover (*Trifolium repens*).

6.1.3 South Boulder Canyon Ditch

This ditch runs parallel to and is immediately east of South Boulder Creek. The habitat on the west side of the ditch is contiguous with South Boulder Creek at US 36. Sandbar willow and chokecherry with a large stand of plains cottonwood are the dominant overstory plants on the north side of US 36. Understory species include snowberry (*Symphoricarpus occidentalis*), wild rose (*Rosa woodsii*), poison ivy (*Toxicodendron rydbergii*), Canada thistle, houndstongue, wild licorice (*Galium lanceolatum*), smooth brome (*Bromus inermis*), toadflax (*Linaria* sp.), and prairie sagewort (*Artemisia frigida*). This ditch flows under US 36 through a large concrete siphon. Positive trapping records in the vicinity indicate the Preble's meadow jumping mouse occupies this ditch corridor (USFWS 2004b).

6.1.4 Shearer Ditch

This ditch, located within City of Boulder OSMP property, crosses under US 36 via a 3-foot-diameter metal culvert. This ditch runs in a north-south direction along Cherryvale Road. Vegetation communities along the ditch include grassland to the east of Cherryvale Road, riparian woodland between Cherryvale Road and US 36, and riparian shrub and grassland south of US 36.

The vegetation on the north side of US 36 is a mixture of riparian woodland (plains cottonwood, chokecherry, and Russian olive [*Elaeagnus angustifolia*]) and grassland, while the south side of US 36 is comprised of sandbar willow and various grasses and forbs. These understory species include smooth brome, Canada thistle, wild rose, Kentucky bluegrass, Baltic rush (*Juncus balticus*), poison ivy (*Carex* sp.), showy milkweed (*Asclepias speciosa*), cutleaf teasel (*Dipsacus fullonum*), redtop (*Agrostis gigantea*), and perennial pepperweed (*Lepidium latifolium*).

6.1.5 Marshallville Ditch

This ditch is also located on City of Boulder OSMP property and crosses under US 36 via an approximately 8-foot-wide box culvert. The vegetation along the ditch on the north side of US 36 is composed of riparian shrub/woodland with cattails (*Typha* sp.) in the ditch. Understory vegetation includes wild rose, showy milkweed, Baltic rush, Canada thistle, Indian hemp (*Apocynum cannabinum*), orchard grass (*Dactylis L*), meadow fescue, showy milkweed, wild licorice, dandelion (*Taraxacum* sp.), smooth brome, clustered field sedge (*Carex praegracilis*), and common teasel. Overstory species include sandbar willow, plains cottonwood, Russian olive, and box elder (*Negundo aceroides*).

6.1.6 Goodhue Ditch

This ditch is located on City of Boulder OSMP property. The current conveyance structure is a 12-foot-wide box culvert. The vegetation at the crossing is riparian shrub primarily composed of sandbar willow and leadplant, with some crack willow, box elder, American plum, Russian olive, and plains cottonwood. Additionally, wild rose grows in the adjacent grasslands north of US 36. Recent trapping confirmed presence of the Preble's meadow jumping mouse at this ditch crossing (USFWS 2004b).

6.1.7 Davidson Ditch

This ditch is located within City of Boulder OSMP property and water is conveyed under US 36 via a 26-foot by 76-foot culvert (from opening-to-opening). Vegetation at this ditch crossing includes riparian shrub (sandbar willow) with scattered plains cottonwood, green ash (*Fraxinus pennsylvanica*), and Siberian elm on the south side of US 36. The vegetation is heavily grazed on the south side of US 36 where the ditch crosses under the highway. Understory species include smooth brome, crested

wheatgrass (*Agropyron cristatum*), and Canada thistle. Recent trapping confirmed presence of the Preble's meadow jumping mouse at this ditch crossing (USFWS 2004b).

6.1.8 Unnamed Ditch

This ditch consists of a 2-foot-wide concrete box culvert. The vegetation along the ditch is plains cottonwood, peachleaf willow (*Salix amygdaloides*), sandbar willow, and leadplant (*Amorpha canescens*) with an understory of smooth brome and cheatgrass (*Bromus tectorum*). The riparian woodland does not continue far from the road crossing. The site is surrounded by vacant land with some rural residences on the south side of US 36.

6.1.9 Coal Creek

This creek flows under a bridge on US 36. The immediate banks of Coal Creek are protected, though the areas surrounding Coal Creek are developed. On the north side of US 36, Coal Creek is bounded on the west by buildings and a golf course, and on the east by a residential development. The north side of US 36 is dense riparian woodland consisting of crack willow, plains cottonwood, Russian olive, green ash, Siberian elm, American elm (*Ulmus americana*), hawthorn, American plum (*Prunus americana*), and chokecherry. Understory vegetation includes sandbar willow, snowberry, bluestem willow (*Salix irrorata*), leadplant, wild grape (*Vitis* sp.), western virgin's bower (*Clematis occidentalis*), meadow fescue, horsetail, Canada thistle, bulrush (*Scirpus* sp.), cutleaf teasel, orchardgrass, creeping spikerush (*Eleocharis palustris*), false tarragon (*Artemisia dracunculus*), and goldenrod.

The portion of Coal Creek on the south side of US 36 is within the Denver metropolitan area Preble's meadow jumping mouse BCZ (USFWS 2004a). Areas of Coal Creek upstream and downstream of US 36 have been previously trapped (USFWS 2004b) with positive records approximately 1-mile upstream (west) of US 36. However, the habitat is disturbed and developed in areas adjacent to the creek at the US 36 crossing.

6.1.10 Rock Creek

This creek crosses US 36 just west of the Interlocken Loop exit. The portion of Rock Creek on the south side of US 36 is within the Denver metropolitan area Preble's meadow jumping mouse BCZ. Vegetation along Rock Creek on the north side of US 36 is mainly riparian woodland with cottonwoods, peachleaf willow, sandbar willow, leadplant, skunkbush, sumac (*Rhus trilobata*), western wheatgrass (*Agropyron smithii*), Kentucky bluegrass, smooth brome, Canada thistle, curly dock (*Rumex crispus*), field bindweed (*Convolvulus arvensis*), wild licorice, and common teasel. Rock Creek flows under US 36 via a two-span concrete box culvert, approximately 8 feet high by 20 feet wide by 360 feet long. Previous trapping surveys have been negative (USFWS 2004b).

6.2 SPECIES OCCURRENCE IN PROJECT AREA

6.2.1 Preble's Meadow Jumping Mouse

The Preble's meadow jumping mouse is known to occur along South Boulder Creek floodplain on both sides of US 36, along Coal Creek approximately 1 mile south of US 36, and the drainages in foothills west of Boulder (Attachment A, Figure 5, Preble's Meadow Jumping Mouse Habitat). In 2004, the riparian crossings in the project area were evaluated using the *Preble's Meadow Jumping Mouse Survey Guidelines* (USFWS 2004c), April 2004 revision. These site evaluations recorded dominant vegetation, site condition, suitability to support the Preble's meadow jumping mouse, and photographs of each crossing. Additionally, USFWS provided a geographic information system (GIS) shapefile and associated data (USFWS 2004b) of all previous trapping and habitat assessment locations within the project area. These data were used to determine areas where the presence or absence of the Preble's meadow jumping mouse is known.

The areas of habitat known to be occupied by the Preble's meadow jumping mouse was initially identified within the project area based on Colorado Division of Wildlife NDIS data, using a mapped layer of the Preble's meadow jumping mouse *occupied range*. This *occupied range* was created by NDIS using the standard 100-year floodplain boundary and 300-foot buffer zones around South Boulder Creek and the associated major ditches. The area from Table Mesa Drive interchange to Davidson Ditch is classified as *occupied habitat*, but with islands of non-habitat in several areas in between the buffered riparian corridors. Based on a June 2006 field review, Preble's meadow jumping mouse habitat boundaries within the South Boulder Creek floodplain were refined. Most of the non-habitat *island* areas depicted in the NDIS data are considered *occupied habitat* for the US 36 EIS because the areas are within the floodplain of South Boulder Creek, are surrounded and bordered by habitat known to be occupied by the Preble's meadow jumping mouse, consist of relatively undisturbed open space, and have vegetative characteristics that make them suitable for at least occasional use by this species.

The University of Colorado property along US 36, south of the Table Mesa Drive interchange, was also reviewed. This property consists of several small borrow pit ponds and connecting ditches (South Boulder and Upper Bear Canyon ditches) in a matrix of upland grassland and weedy areas, separated from the floodplain by a levee. The habitat at this location is considered to be marginal and the site is isolated from the known and presumed *occupied habitat* in the open space within the South Boulder Creek floodplain. In 2002, USFWS concurred with previous Preble's meadow jumping mouse trapping studies conducted on the University of Colorado property by DA TI MBI in 2000 and 2001 concluding the University of Colorado South Campus property is not suitable Preble's meadow jumping mouse habitat. The habitat on the CU property has not changed since the 2002 determination, and therefore, the University of Colorado property was excluded from the South Boulder Creek floodplain Preble's meadow jumping mouse habitat for the FEIS. Additional areas excluded as habitat based on the 2006 field review include the mowed in-field between US 36, the eastbound on-ramp at the Table Mesa Drive interchange, the paved surface of the roadway, and prairie dog colonies.

6.2.2 Ute Ladies'-tresses Orchid

A large population of the Ute ladies'-tresses orchid occurs in the South Boulder Creek floodplain within City of Boulder OSMP lands on both sides of US 36 (Attachment A, Figure 6, Ute Ladies'-tresses Orchid and Colorado Butterfly Plant Locations). Individuals are located primarily in irrigated meadows, but also in more natural habitat along South Boulder Creek and small to large patches in wet meadows adjacent to South Boulder Creek (City of Boulder OSMP 2004).

Based on surveys conducted by City of Boulder OSMP of their properties since 1999, scattered locations of Ute ladies'-tresses orchid occur between Davidson Ditch and Table Mesa Drive. The largest concentration of the Ute ladies'-tresses orchid surveyed by City of Boulder OSMP occurs west of South Boulder Creek along both sides of US 36 on City of Boulder OSMP property up to the fence line of the CDOT right-of-way. During a site reconnaissance conducted for the DEIS in summer 2004, at least 50 plants were observed in or adjacent to the US 36 footprint.

6.2.3 Colorado Butterfly Plant

The Nature Conservancy (TNC) established a population of Colorado butterfly plant in a segment of Walnut Creek at the TNC Chambers Preserve, west of US 36. A new population was identified in 2004, 0.3 to 0.5 mile downstream of the TNC site on a low terrace adjacent to Walnut Creek (Attachment A, Figure 6, Ute Ladies'-tresses Orchid and Colorado Butterfly Plant Locations). Other vegetation growing in the site includes poison hemlock (*Conium maculatum*), showy milkweed, Canada thistle, tall evening primrose (*Oenothera villosa*), cultivated garlic (*Allium sativum*), cutleaf teasel, Kentucky bluegrass, alkali muhly (*Muhlenbergia asperifolia*), and creeping spikerush (Mayo 2004). Other records of Colorado butterfly plant from Boulder County are historic; no plants are currently known to occur in the US 36 project area (Riedel pers. comm. 2004; Mayo 2004).

Impacts to the Preble's meadow jumping mouse, the Ute ladies'-tresses orchid, and Colorado butterfly plant were assessed by comparing the footprint of the Combined Alternative Package (Preferred Alternative), as well as Package 1 (No Action), to the occupied habitats or known ranges of each species. The limits of construction for the US 36 project include the toe slope (the bottom of the slope that falls away from the edge of the highway) plus 15 feet for construction.

Construction staging areas would be needed throughout the alignment to provide adequate space for equipment, construction materials, materials stockpiling, and employee parking. These parcels would be purchased or leased before construction begins. The BRT transit stations may be used for staging, thus offsetting the need to acquire additional staging areas. Haul routes for construction materials would be proposed by the contractor and approved by CDOT and the local jurisdiction.

All water crossings would involve construction in riparian areas of the streams, causing short-term sedimentation. Due to the small width of these streams, direct construction impacts to the riparian areas would be from 0.1 to 0.2 acre on either side of the crossing. Vegetation that is removed would be replaced immediately after construction is complete. Construction of new, replaced, or widened bridges would require 100 feet on either side of US 36 to allow room for cranes and other equipment to place girders. Bridge and grade separation construction (aerial structure) would involve site preparation, excavation, installation and construction of support columns and abutments, placement of girders, and bridge deck construction.

In general, highway construction projects directly affect wildlife and plants through land use change and habitat loss, and the disturbance causes changes in behavior or movement, and possibly mortality. Effects may include direct effects that result from the action and indirect effects. Direct effects include impacts to individual plants or animals from loss of habitat, displacement from disturbance, and loss of habitat connectivity. Indirect effects include degradation of habitat from increased water runoff, loss of connectivity, and competition from noxious weeds and non-native species. Cumulative effects include impacts of the project combined with past, present, and future projects. Effects may be further defined as temporary or permanent and short- or long-term.

7.1 PREBLE'S MEADOW JUMPING MOUSE

The Preble's meadow jumping mouse occupies stream and ditch crossings within the project area under and adjacent to the US 36 alignment in Boulder County. These locations include South Boulder Creek north and south of US 36, and all suitable riparian and adjacent upland habitat east to Davidson Ditch. Destruction of riparian habitat directly and indirectly affects the Preble's meadow jumping mouse by destroying nest sites, food resources, and hibernation sites; by disrupting behavior; and/or by forming a barrier to movement. Direct effects were quantified for the Preble's meadow jumping mouse by measuring acres of occupied habitat loss within the footprint of the project alignments, using GIS. Indirect effects of connectivity losses (or gains) from extension or replacement of bridges and culverts in Preble's meadow jumping mouse habitat were analyzed by comparing the existing dimensions of crossing structures with the proposed changes under each build package and consideration of existing connectivity conditions.

The existing highway was originally constructed in the 1950s; therefore, disturbance of the vegetation and riparian habitat and changes in stream morphology in areas previously and currently occupied by the Preble's meadow jumping mouse has already occurred. Package 1, No Action, would not involve ground disturbance, and therefore would have no measurable direct effect on the Preble's meadow jumping mouse. Indirect impacts under Package 1, No Action, would be minor, as the Preble's meadow jumping mouse has persisted largely due to protection of their habitat as open space. The irrigation ditches that cross under US 36 in Boulder generally carry water between April and November, which overlaps with the Preble's meadow jumping mouse active season. Therefore, during the active season, Preble's meadow jumping mouse movement is limited at some crossings when water is present in ditches. The

existing bridge at South Boulder Creek does not impede Preble's meadow jumping mouse movement under US 36 as evidenced by the positive trapping records on both sides of the highway (USFWS 2004b).

The Combined Alternative Package (Preferred Alternative) would directly affect the Preble's meadow jumping mouse through loss of habitat from widening of the highway and extension of culverts, as well as incidental mortality to individuals from earth moving or crushing during construction. Construction activities that occur during the Preble's meadow jumping mouse active season may affect breeding, feeding, and dispersal activities, and therefore are considered to be a direct impact to the Preble's meadow jumping mouse. Individual mice would be susceptible to mortality from earth moving and excavation that occurs while individuals are in hibernation (October 31 through May 1) or while active. Active individuals are likely to escape construction equipment, though mice may hide in burrows when construction occurs and still could potentially be crushed. However, mortality of individual Preble's meadow jumping mouse from construction activity would be incidental and is an effect that is immeasurable, and therefore is considered insignificant.

Permanent, indirect effects on the Preble's meadow jumping mouse include degradation of habitat caused by increased noxious weeds, habitat alteration caused by changes in hydrology and drainage patterns from development, and increased water runoff. Increased runoff could reduce water quality and result in increased flow in culverts, which would reduce connectivity for the Preble's meadow jumping mouse across the highway. Alteration of habitat from hydrology changes caused by highway construction could eliminate wetlands adjacent to the highway, which would also have a negative effect on the Preble's meadow jumping mouse. Drought conditions and decreased flows may have a short-term positive effect for Preble's meadow jumping mouse movement through culverts, but loss of wetland vegetation caused by decreased hydrology would have a negative effect on the Preble's meadow jumping mouse. The hydrological alterations caused by the US 36 project are unknown at this time.

Table 2, Combined Alternative Package (Preferred Alternative) Direct Habitat Loss to the Preble's Meadow Jumping Mouse, shows the acreages of direct and permanent impact to Preble's meadow jumping mouse occupied habitat under the Preferred Alternative. Table 2 also shows the impact of the Preferred Alternative on the Preble's meadow jumping mouse habitat compared to impacts under Package 2 and Package 4. The results of this comparison in Table 2 are illustrated by a decrease in impacts from Package 2 and Package 4 when considering the impacts of the Combined Alternative Package (Preferred Alternative). For example, the impact to the Preble's meadow jumping mouse for the Preferred Alternative would be 41.72 acres, which represents a decrease impact of 0.54 acre over Package 2, Option A, and a decreased impact of 10.04 acres when compared to Package 2, Option B.

Table 2: Combined Alternative Package (Preferred Alternative) Direct Habitat Loss to the Preble's Meadow Jumping Mouse

Species	Combined Alternative Package (Preferred Alternative)	Package 2		Package 4	
		Option A (acres)	Option B (acres)	Option A (acres)	Option B (acres)
Preble's meadow jumping mouse	41.71	43.31	52.81	50.47	54.63
Impact Difference (in acres) compared to the Combined Alternative Package (Preferred Alternative)	N/A	-1.60	-11.10	-8.76	-12.92

Source: US 36 Mobility Partnership, 2006 and 2009.

Notes:

There would be no impacts under Package 1 (No Action) so these are not outlined in this table.

- = The Combined Alternative Package (Preferred Alternative) impacts are less than the package it is being compared to

N/A = not applicable

Impacts to Preble's meadow jumping mouse habitat under the Combined Alternative Package (Preferred Alternative) would be less than those described for Package 2 and Package 4, and the types of impacts that would occur would be the same. The acreage of impact provided in Table 2, Combined Alternative Package (Preferred Alternative) Direct Habitat Loss to the Preble's Meadow Jumping Mouse, represents a small proportion of available habitat for the Preble's meadow jumping mouse. The areas of impact are located primarily along the existing US 36 road right-of-way, and therefore are not necessarily high quality habitat. However, where the highway crosses the various ditches and creeks along US 36 there is known habitat occupied by the Preble's meadow jumping mouse. Indirect effects to the Preble's meadow jumping mouse from loss of connectivity at riparian corridors may occur in some locations; however, replacement of crossing structures would increase connectivity across the highway at some locations.

Habitat linkages or connectivity is very important in these riparian crossings to maintain Preble's meadow jumping mouse genetic diversity and population demographics. Isolated populations have a greater probability of extinction. Connected subpopulations are larger and have greater rates of genetic exchange. Populations can better survive catastrophic events; if a small part of the population survives the event, survivors remain to recolonize vacant habitat. These factors lead to greater population persistence.

Connectivity is related to landscape features and life history traits. Studies suggest that the Preble's meadow jumping mouse is a good colonizer and is very fragile when confronted with unfavorable habitat conditions. This is exhibited through characteristics such as an adaptation to early successional vegetation (willows), not strongly territorial, omnivorous in its diet allowing for more flexibility in selection of food sources, and excellent at long distance travel (distances of 1 mile) (Ensight 2003). These qualities suggest that the Preble's meadow jumping mouse can take advantage of connections between patches of habitat. Movement patterns from individual animals show that the Preble's meadow jumping mouse can move through the entire drainage corridor, including these lower quality habitat patches.

Preble's meadow jumping mouse habitat connectivity is dependent on hydrologic pathways because the mouse exclusively travels by riparian corridor, as studies show that 90 percent of movements are within 300 feet of a stream (Ensight 2003). However, the Preble's meadow jumping mouse is occasionally captured in upland habitats that are at considerable distances from drainage pathways. These movements appear to be rare, but are potentially significant if a dispersing animal reaches a new population.

Restoration or maintenance of connectivity does not imply that all individuals within a population require constant opportunity for movement and dispersal. One reproductive individual dispersing from one population to another each generation can maintain the population and reduce the potential for inbreeding. However, areas with small populations eliminated by random events may not be able to recolonize through filters.

Residential and commercial developments are barriers to Preble's meadow jumping mouse movement and dispersal that have fragmented populations. The existing US 36 corridor is not an absolute barrier to Preble's meadow jumping mouse movement as individuals access habitats on both sides of the highway through culverts and bridges during low- or no-flow conditions. It is possible that individual mice may cross over the roadway in some situations.

Direct effects to the Preble's meadow jumping mouse from loss or gain of habitat connectivity following construction of the highway under the Combined Alternative Package (Preferred Alternative) and Package 2 and Package 4 are shown in Table 3, US 36 Project Impacts to Preble's Meadow Jumping Mouse Habitat Connectivity. The following section discusses the crossing structures planned at each wildlife corridor along the US 36 alignment. Table 3 includes the width and length of each structure. The width of the structure refers to opening-to-opening, parallel to the channel flow. The structure length is perpendicular to the channel from bridge abutment to abutment or culvert wall-to-wall.

Table 3: US 36 Project Impacts to Preble's Meadow Jumping Mouse Habitat Connectivity

Crossing Location	Structure Dimensions (feet)							
	Existing		Package 2		Package 4		Combined Alternative Package (Preferred Alternative)	
	Length[1]	Width[1]	Length[1]	Width[1]	Length[1]	Width[1]	Length[1]	Width[1]
Rock Creek	32	234	82	+52	82	+6	52	+34
Coal Creek	54	42/49 (WB/EB)	294	+121	294	+105	294	+98
Davidson Ditch	26	110	26	+290	26	+300	26	+330
Unnamed Ditch	5[2]	110[2]	5[2]	+290[2]	5[2]	+300[2]	5[2]	+300[2]
Goodhue Ditch	12[2]	160	12[2]	+110	12[2]	+170	12[2]	+110
Marshallville Ditch	10	150	10[2]	+185	10[2]	+185	10[2]	+550
Shearer Ditch	5[2]	100	5[2]	+400	5[2]	+370	5[2]	+420
South Boulder Creek	115	187	115	+40	115	+40	115	+40
South Boulder Canyon Ditch	15[2]	170[2]	15[2]	+250	15[2]	+220	15[2]	+190

Source: US 36 Mobility Partnership, 2009.

Notes:

[1]Length is the direction along the road centerline, and width is the width of the road for the length of the culvert/bridge.

[2]Approximate measurements.

\+ = additional worse-case width to the existing structure – this is the additional "acquisition" of the ditch needed for the project

EB = eastbound

WB = westbound

Several of the ditches listed in Table 3, US 36 Project Impacts to Preble's Meadow Jumping Mouse Habitat Connectivity, have not been fully designed at the writing of this PBA. It is assumed that the height of some of these bridges could change but are assumed worse-case and assumed that they would not change at this time. The details would be determined during final design and will be included in the assessment during the final mitigation plan preparation.

As mentioned previously, water flows in the irrigation ditches generally between April and November, which limits Preble's meadow jumping mouse movement during the active season. Small mammal ledges should be installed in new or extended culverts to enhance mouse mobility. A research study evaluated the Preble's meadow jumping mouse use of ledges on City of Boulder OSMP property (Meaney et al. 2007). The study found that these ledges are used by the Preble's meadow jumping mouse and are effective to increase movement through crossing structures (Meaney et al. 2007).

During construction, replacement, or extension of bridges and culverts, the connectivity between occupied habitats on the both sides of the highway would be temporarily reduced. Permanent impacts to Preble's meadow jumping mouse habitat connectivity would be affected to some extent by widening of crossings under US 36. Some of these structures will exceed 300 feet, which is close to the maximum known culvert dispersal distance for the Preble's meadow jumping mouse of 305 feet (Ensight 1999). In many cases, habitat connectivity may be increased by structure replacement with a larger, more open structure, especially with the addition of ledges for small mammal passage during periods of flowing water. For structures that are extended rather than replaced, without the addition of ledges, movement would still be restricted to low- or no-flow conditions.

7.1.1 Rock Creek

The Preble's meadow jumping mouse does not currently occupy Rock Creek in the vicinity of where it crosses US 36; the nearest populations on Rock Creek occur upstream of SH 128. The habitat is degraded at this location. The replacement of the structure would likely increase the habitat connectivity at Rock Creek due to the increased length perpendicular to US 36.

7.1.2 Coal Creek

The Preble's meadow jumping mouse does not occur where US 36 crosses Coal Creek; the nearest Preble's meadow jumping mouse trapped was on an irrigation ditch adjacent to Coal Creek, approximately 1 mile west of US 36. Coal Creek does not provide suitable habitat for the Preble's meadow jumping mouse where it crosses US 36; however, the replacement structure would provide adequate connectivity for movement in the event a population was re-established.

7.1.3 Unnamed Ditch

This is a concrete box that currently does not provide connectivity across the highway. However, this ditch is not suitable habitat for the Preble's meadow jumping mouse. The design for this ditch under the Combined Alternative Package (Preferred Alternative) has not been completed.

7.1.4 Davidson Ditch

Under the Combined Alternative Package (Preferred Alternative), widening of the highway would reduce the connectivity through this crossing between habitats in City of Boulder OSMP on the both sides of the highway. Installation of ledges for small mammal movement above water flow would assist in providing connectivity.

7.1.5 Goodhue Ditch

Under the Combined Alternative Package (Preferred Alternative), widening of the highway would require Goodhue Ditch to be extended. The structure at this location probably is not a barrier to Preble's meadow jumping mouse movement across the highway, but connectivity could be improved by installation of small mammal ledges.

7.1.6 Marshallville Ditch

This location is not a barrier to Preble's meadow jumping mouse movement but connectivity is likely limited to seasons of low- or no-flow conditions. Under the Combined Alternative Package (Preferred Alternative), widening of the highway would require Marshallville Ditch to be extended to accommodate the increased road width.

7.1.7 Shearer Ditch

This metal pipe culvert likely limits Preble's meadow jumping mouse movement during periods of water flow. Under the Combined Alternative Package (Preferred Alternative), widening of the highway would require the culvert at Shearer Ditch to be extended to accommodate the increased road width.

7.1.8 South Boulder Creek

This location currently provides connectivity across US 36. However, during high flow conditions, Preble's meadow jumping mouse movement under the bridge may be limited. The South Boulder Creek bridge would be widened by a maximum of 12 feet on the north and 29 feet on the south, for a total of 41 feet; therefore, the action could potentially reduce connectivity for the Preble's meadow jumping mouse in the long-term.

7.1.9 South Boulder Canyon Ditch

This large concrete siphon is likely a barrier to Preble's meadow jumping mouse movement under US 36. Under the Combined Alternative Package (Preferred Alternative), widening of the highway would require this culvert to be replaced and extended. However, the lack of connectivity at South Boulder Canyon Ditch would not be limiting for Preble's meadow jumping mouse movement since the ditch is adjacent to South Boulder Creek, which has good connectivity.

7.1.10 Summary

The increased highway width proposed would not create a barrier to Preble's meadow jumping mouse dispersal to the point where movement under road surfaces would be impossible resulting in isolation of populations. All crossing structures would allow for dispersal rates that should support both genetic mixing and at least maintain current population sizes. However, with the addition of mitigation measures such as ledges, connectivity could be improved by the project.

During construction, permanent and temporary direct impacts to the Preble's meadow jumping mouse would occur in the location of bridge and culvert replacement or extension. Temporary impacts would result from staging and use of construction equipment in the riparian corridor. Areas of temporary habitat loss would be restored following construction through vegetation restoration. Permanent loss of habitat would occur where bridges and culverts are extended. The widening of bridges would require in-stream construction that can damage wetlands and riparian vegetation, and the shading effect from the wider structures would eliminate vegetation.

Temporary, direct effects to the Preble's meadow jumping mouse would occur during construction. Although these effects are difficult to quantify, disturbances to habitat may affect breeding behavior, dispersal ability, and susceptibility to predation. For instance, lights used for night construction may affect the Preble's meadow jumping mouse within 300 feet of construction, causing individuals to hide in burrows and change normal breeding and foraging behaviors for the duration of construction activity. The most common noise source would be from engine-powered heavy earth-moving equipment (scrapers, bulldozers, etc.), materials handling equipment (cranes), and stationary equipment (generators). The loudest and most disruptive construction noise would result from pile driving and demolition work requiring the use of jackhammers and hoe rams. Typical noise levels from construction equipment range from 69 to 85 decibels (A-weighted scale) (dBA) at 50 feet. Peak noise levels from pile driving are as high as 106 dBA at 50 feet.

Implementation of the US 36 project under the Combined Alternative Package (Preferred Alternative) ***may affect, and is likely to adversely affect***, the Preble's meadow jumping mouse.

7.2 UTE LADIES'-TRESSES ORCHID

The Ute ladies'-tresses orchid is known to occur along both sides of US 36 from Davidson Ditch to the western edge of the City of Boulder's Van Fleet Open Space. Small to large patches of the Ute ladies'-tresses orchid occur in scattered locations throughout this area, and populations vary widely from year to year (City of Boulder OSMP 2006). Field studies for preparation of the DEIS included a reconnaissance of the habitat, but more detailed surveys to map individuals would be conducted prior to construction. Approximately 50 orchids were present in the construction footprint in August 2004.

Direct impacts to the Ute ladies'-tresses orchid include habitat loss and removal of individual plants. As shown in Attachment A, Figure 6, Ute Ladies'-tresses Orchid and Colorado Butterfly Plant Locations, areas of *occupied habitat* were identified based on information provided by City of Boulder OSMP (2006). Additional areas classified as *potentially occupied habitat* are based on field reconnaissance conducted for the DEIS; these are areas where the Ute ladies'-tresses orchid has not been found to date, but could occur in the future. Because the Ute ladies'-tresses orchid may not emerge annually, delineating specific areas of occupied range are difficult. Therefore, impacts are defined for *potentially occupied habitat*, as well as *occupied habitat*, because plants may be present currently or could become established by the time construction is initiated.

In occupied habitat, individual plants of the Ute ladies'-tresses orchid that occur within the construction footprint would be destroyed by crushing, uprooting, or burial during ground-clearing and earth-moving activities. Impacts are most likely to occur where the construction footprint would extend outside of the CDOT right-of-way for road widening, on-ramps, and stormwater detention ponds. The number of plants that would be affected is unknown, but is likely to represent only a very small portion of the South Boulder Creek population, which numbers around 8,500 plants (Fertig et al. 2005).

Table 4, Combined Alternative Package (Preferred Alternative) Impacts to the Ute Ladies'-tresses Orchid, shows the acreages of direct and permanent impact to orchid habitat under the Combined Alternative Package (Preferred Alternative). Table 4 also shows the impact of the Combined Alternative Package (Preferred Alternative) on orchid habitat compared to impacts under Package 2 and Package 4. The results of this comparison in Table 4 are illustrated by a decrease or increase in impacts. For example, the impact to the orchid under the Combined Alternative Package (Preferred Alternative) would be 35.94 acres, which represents a decreased impact of 1.98 acres over Package 2, Option A, and a decreased impact of 9.65 acres when compared to Package 2, Option B.

Table 4: Combined Alternative Package (Preferred Alternative) Impacts to the Ute Ladies'-tresses Orchid

Species	Combined Alternative Package (Preferred Alternative)	Package 2		Package 4	
		Option A (acres)	Option B (acres)	Option A (acres)	Option B (acres)
Ute ladies'-tresses orchid	35.94	37.92	45.59	41.04	46.88
Impact Difference (in acres) Compared to the Combined Alternative Package (Preferred Alternative)	N/A	-1.98	-9.65	-5.10	-10.94

Source: US 36 Mobility Partnership, 2006 and 2009.

Notes:

There would be no impacts under Package 1 (No Action) so these are not outlined in this table.

- - = impacts under the Combined Alternative Package (Preferred Alternative) are less than the package being compared to
- - = decrease

N/A = not applicable

Direct impacts to the Ute ladies'-tresses orchid under the Combined Alternative Package (Preferred Alternative) would be less than those described for Package 2 and Package 4, and the types of impacts that would occur would be the same. Indirect impacts to the Ute ladies'-tresses orchid are associated with flooding and de-watering in wetlands and riparian habitat from development, competition from non-native plants, degradation of habitat associated with urban/residential expansion, inappropriately timed agricultural practices (i.e., mowing and grazing), and drought. Indirect effects on Ute ladies'-tresses orchid plants from habitat alteration caused by changes in hydrology and drainage patterns in areas adjacent to US 36 could result from construction and operation of the project. Long-term loss of natural flow in creeks or irrigation ditches would cause long-term declines in the Ute ladies'-tresses orchid (Fertig et al. 2005). Changes in hydrology that eliminate wetlands would adversely affect the Ute ladies'-tresses orchid. After drought conditions in Boulder in 2002, larger irrigation ditches that provided water to occupied Ute ladies'-tresses orchid wet meadow habitat did not flow. Flowering and fruiting were reduced and population counts were low.

Runoff from highway construction may affect habitat conditions for the Ute ladies'-tresses orchid. Information on hydrological alterations as a result of the US 36 project are not known at this time. However, highway widening would increase the area of impervious surface, which would increase the amount of runoff from the highway to riparian areas and wetlands. Highway storm water runoff contains sediments, hydrocarbons (oil, grease, fuel), litter, deicing salts and minerals, and heavy metals. In areas where the Ute ladies'-tresses orchid occupies habitat adjacent to the highway right-of-way, such as the Van Fleet Open Space, it is possible that this increased runoff could enter the riparian habitat, resulting in some amount of degradation and increased flows in streams, leading to long-term, adverse affects to the plants. However, water would be treated in detention ponds adjacent to the highway, which would have no measurable effect on the Ute ladies'-tresses orchid.

Competition with non-native plant species is one of the greatest threats to the Ute ladies'-tresses orchid. This is due to the adaptation of the orchid to early- and mid-seral conditions with low competition for light, space, and water. Non-native weed species compete with the Ute ladies'-tresses orchid as they occur in the same conditions, spread or reproduce more rapidly, and are not favored by grazing.

Studies have found that winter grazing and early season (prior to spring) mowing can reduce competing vegetation cover and favor orchid survival and reproduction, while grazing or haying during early summer before flower and fruit production can be detrimental (Fertig et al. 2005).

Implementation of the US 36 project under the Combined Alternative Package (Preferred Alternative) ***may affect, and is likely to adversely affect***, the Ute ladies'-tresses orchid. Package 1 would have no effect on the Ute ladies'-tresses orchid as no plants would be removed or disturbed and no changes in hydrology would occur.

In the South Boulder Creek floodplain, populations of the Ute ladies'-tresses orchid co-occur with the Preble's meadow jumping mouse; these species have conflicting habitat requirements; orchids prefer early- to mid-seral meadow communities and the Preble's meadow jumping mouse favors later seral mixed willow and meadow stands (Fertig et al. 2005). Managing riparian areas with a mosaic of seral conditions is currently the only viable solution to meeting the needs of both species.

7.3 COLORADO BUTTERFLY PLANT

Factors that adversely affect Colorado butterfly plant are similar to those described for the Ute ladies'-tresses orchid. Haying and mowing, overgrazing, water development and flood control, urban development, some herbicidal uses, and habitat degradation from competition by noxious weeds are the primary impacts to Colorado butterfly plant. Colorado butterfly plant favors conditions created by natural disturbances such as flooding, fire, and native ungulate grazing. Areas dominated by dense willow stands, grasses, and exotic weeds compete out the species. Many populations of Colorado butterfly plant

occur in areas of active haying and grazing, though some populations are adversely affected by these management practices. Similar to the Ute ladies'-tresses orchid, summer season grazing prevents flowering, while mowing prior to hardening of the fruit wall prevents seed dispersal.

Colorado butterfly plant is known to occur about 0.7-mile upstream of US 36 on Walnut Creek, but not within the US 36 construction footprint. The plant could become established along downstream portions of Walnut and/or Dry creeks prior to construction. If present in the construction footprint, construction activities would destroy plants and destroy soil seed banks by exposure or deep burial. Package 1 would have no effect on Colorado butterfly plant. Under the Combined Alternative Package (Preferred Alternative), the US 36 project ***may affect, but is not likely to adversely affect***, Colorado butterfly plant. Potential habitat is present in the project area, but the plant is not known to occur in the project area.

7.4 CUMULATIVE EFFECTS

The cumulative effects analysis includes the areas within 1 mile from either side of the existing US 36 corridor, referred to as the cumulative study area (CSA). Cumulative effects are defined as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.

The present and reasonably foreseeable future projects and associated land use changes were evaluated using Denver Regional Council of Governments (DRCOG) projects most closely associated with the *2008-2010 Transportation Improvement Plan* (*TIP*) (DRCOG 2002), the *2030 Metro Vision Regional Transportation Plan* (DRCOG 2006), and information collected from local jurisdictions. To assess cumulative impacts, baseline habitats were mapped using various sources and data collected during field visits. A GIS analysis compared the habitat mapping to project land use information and acres of habitat potentially affected were estimated.

The DRCOG 2030 population estimates in the CSA are 997,724, an increase of 187,076 persons, representing a 23 percent increase over 2005. This planned population growth, which would require approximately 18,700 acres of new development by 2030 in the CSA, would occur with or without implementation of the Combined Alternative Package (Preferred Alternative). Urbanization that supports DRCOG's 2030 planned population growth would have greater environmental consequences than present or planned infrastructure projects, which includes any of the build packages for the US 36 project area. The cumulative effects to some threatened and endangered species, including the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid, would be minimal as these species primarily occur in areas currently protected as open space by the City of Boulder and Boulder County. However, for more mobile species, the increased development in the region would reduce the overall habitat availability within the CSA. The loss of habitat and degradation of riparian habitats resulting from development would be greater than 2006 conditions under Package 1, No Action.

7.4.1 Effect of Present and Future Projects

The effect of present and future projects, excluding the Combined Alternative Package (Preferred Alternative), on federally-listed threatened and endangered species would be degradation or elimination of potential habitat in areas that are not protected as open space or other preservation policies. The riparian corridors where habitat loss (from land adjoining the corridors) is anticipated to be greatest include Big Dry, Walnut, Coal, and Rock creeks, due to the lack of protected open space within and adjacent to these drainages. Vacant lands along Rock Creek east of US 36 and Coal Creek adjacent and south of US 36 will likely be developed.

Areas along South Boulder Creek and Davidson, Goodhue, and South Boulder ditches that currently support Preble's meadow jumping mouse and the Ute ladies'-tresses orchid habitat are protected as open space and will continue to be protected. The habitat for the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid is generally in good condition on City of Boulder OSMP property. There are places where populations do not occur, however, because of past land uses which degraded or fragmented habitat. The City of Boulder and Boulder County have several land use policies in place that are intended to protect sensitive natural environments and manage growth in the US 36 project area. Other municipalities within the CSA also have preservation policies in place, as well as open space, though the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid are not currently known to occur outside Boulder County within the project study area. Implementation of these policies and regulations would minimize the impact of future development on threatened and endangered species habitats. These land use policies for protection of sensitive environments include:

- Open space purchases
- Transfer of development rights programs
- Conservation easements
- Floodplain permitting and protection
- Wetlands protection requirements
- Zoning
- Riparian protection in Boulder, Broomfield, and Superior

Present and future transportation projects would have a minor impact on threatened and endangered species. The recently completed Northwest Parkway, Cherryvale Bridge, and a City of Boulder Wastewater Treatment Plant represent projects that could cumulatively affect land uses in the CSA. The Northwest Parkway has the potential to indirectly affect potential habitat in Rock Creek and Walnut Creek, though no occupied habitat for the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid is present in these creeks where they cross US 36. However, as discussed above, land use changes along Rock Creek to the north of US 36 are not anticipated due to the large amount of open space adjacent to the Northwest Parkway. However, the parkway has added an additional barrier to wildlife movement in this portion of the CSA. The Cherryvale Bridge and the City of Boulder Wastewater Treatment Plant are in known Preble's meadow jumping mouse habitat and impacts are being mitigated through consultation with USFWS. The US 36 Corridor FEIS actions, when impacting the federally-listed species in this area, will work with on-going mitigation actions to compliment and build upon these mitigations if these are chosen as the course of action during consultation with USFWS.

7.4.2 Preble's Meadow Jumping Mouse

Although the primary threat to the Preble's meadow jumping mouse is the direct loss of habitat area, there are other potential cumulative effects that may adversely affect the structure and function of habitat areas. However, these cumulative effects would be minor since most Preble's meadow jumping mouse-occupied habitat is currently within protected areas. Potential cumulative effects due to increased development include:

- Increases in stream flows due to increases in impervious surfaces. Residential and commercial building footprints, new roadways, and other compacted urban surfaces can contribute to increased runoff. Such increased flows can cause downcutting in stream channels, altering groundwater hydrology in the riparian zone, and negatively affecting riparian vegetation in the Preble's meadow jumping mouse habitat. There may also be increases in stream erosion with subsequent effects on water quality.

- Increases in urban predatory animals that may prey on the Preble's meadow jumping mouse. Such animals may include skunks, raccoons, house cats, coyotes, and foxes.
- Increases in exotic species, both animal and plant. House mice (*Mus musculus*) and Norway rats (*Rattus norvegicus*) are often associated with urban and rural residences and may compete with and prey upon the Preble's meadow jumping mouse in upland and riparian habitats. Bullfrogs (*Rana catesbeiana*) inhabit slower moving waters and are known predators of the Preble's meadow jumping mouse. Construction practices may introduce or help spread weed species such as diffuse knapweed (*Centaurea diffusa*), Canada thistle, and cheatgrass, among others.
- New trails and increased trail use in riparian and upland habitat areas to accommodate an increase in recreational demand.
- Fragmentation of habitat that isolates populations resulting in decreases in genetic viability and susceptibility to catastrophic events.

7.4.3 Ute Ladies'-tresses Orchid and Colorado Butterfly Plant

When listed in 1992, the Ute ladies'-tresses orchid population in the Front Range of the Denver metropolitan area was considered primarily threatened by loss of riparian habitat to urban residential development, stream channelization, and construction projects. Currently, competition from invasive species, vegetation succession, road and other infrastructure construction, and recreation are considered the primary threats. While winter grazing can be beneficial to the orchids, summer grazing can lead to an increase in trampling and reduced flowering production, increasing susceptibility of habitat to noxious weed invasions.

Cumulative effects to Ute ladies'-tresses orchid and Colorado butterfly plant include effects to populations that are unprotected (i.e., located on private land). These populations are likely to be smaller in size and more isolated from protected populations, and therefore are more susceptible to increased recreation, changes in hydrology from flood control projects and road construction, competition from introduced weeds, and loss of native pollinators (Fertig et al. 2005).

Modification of wetland habitats resulting from development, flood control, de-watering, and other changes to hydrology are a threat to the Ute ladies'-tresses orchid. As development continues in the US 36 corridor, water use will increase and water currently used for irrigating crops and hayfields, including areas occupied by the Ute ladies'-tresses orchid, may be converted to other uses. Conversion of irrigation water could reduce the quantity and availability of water (especially during the growing season) and reduce groundwater recharge for seeps and springs, resulting in a net loss in area and quality of wet meadow habitat for the Ute ladies'-tresses orchid (Fertig et al. 2005).

This PBA discusses compensatory mitigation opportunities for loss of habitat for the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid as a result of the US 36 corridor improvements. During design and construction, CDOT and FHWA will continue to avoid or minimize impacts to Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat; however, some habitat impacts are unavoidable. These impacts will be offset by various conservation measures that are provided in this section. The mitigation for this project is still conceptual; specific mitigation will be determined during project phasing as funding is available. However, USFWS stated that compensatory mitigation for adverse effects to populations of the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid must be in an area that is near known occupied habitats. If impacts are determined to directly affect the Colorado butterfly plant during the final design process, then consultation with USFWS would be initiated. Meanwhile, actions to improve or mitigate habitat for the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid will indirectly benefit the Colorado butterfly plant, since all three species are associated with riparian habitats. This would offset any indirect impacts that could occur to the Colorado butterfly plant as a result of the Combined Alternative Package (Preferred Alternative).

8.1 METHODS OF CONSERVATION

Recovery can occur when habitat protection and other measures have been put in place that will guarantee the survival of a species. FHWA/CDOT will work toward the recovery goal and conservation objectives through on- and off-site habitat actions, monitoring, and reporting, as described in this section.

Criteria for delisting the Preble's meadow jumping mouse have been outlined in a draft *Preble's meadow jumping mouse Recovery Plan* (USFWS 2003b), and FHWA and CDOT have used that plan to guide conservation measures for this PBA. The first criterion that must be met for delisting the Preble's meadow jumping mouse in the South Boulder Creek floodplain is the existence of one medium, self-sustaining wild population, consisting of greater than 500 to 2,499 individuals. Other recovery criteria include protecting and managing Preble's meadow jumping mouse habitat, threat abatement, and long-term management plans and cooperative agreements (USFWS 2003b).

The USFWS has developed a draft recovery plan for the Ute ladies'-tresses orchid with three primary objectives for recovery:

1. Obtain information on life history, demographics, habitat requirements, and watershed processes that will allow specification of management and population goals and monitoring progress.
2. Manage watersheds to perpetuate or enhance viable populations of the species.
3. Protect and manage the Ute ladies'-tresses orchid populations in wet meadow, seep, and spring habitats.

Progress has been made on Objective 1 and management techniques, including monitoring and habitat manipulation, have been developed and applied to Ute ladies'-tresses orchid populations in the South Boulder Creek floodplain (Fertig et al. 2005). Management practices that simulate natural disturbance events and maintain adequate soil moisture levels support Ute ladies'-tresses orchid populations.

Objectives for delisting the Ute ladies'-tresses orchid, including management techniques, such as monitoring and habitat manipulation, have been developed and applied to Ute ladies'-tresses orchid populations in the South Boulder Creek floodplain (Fertig et al. 2005). Other objectives such as protective populations in wet meadow, seep, and spring habitats and monitoring watersheds, to enhance viable populations, have not yet been achieved.

The primary methods of conservation that will be used for the US 36 project are avoidance of impacts through design, minimization of impacts by employing mitigation during construction, effective species management, and off-site compensatory mitigation. These methods and FHWA and CDOT commitments for this project are discussed below.

8.2 AVOIDANCE

The US 36 corridor project would intersect several drainages and adjacent uplands that are occupied by the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid, and moving the project to non-habitat areas is not feasible. However, by confining reconstruction and improvements to the existing corridor, impacts to new habitat areas generally would be avoided where possible to the greatest extent practicable.

8.3 MINIMIZATION OF IMPACTS

Although every effort was made to minimize impacts, full minimization cannot be realized at this early stage of design (design is currently at about 5 percent). At the FEIS level of design, CDOT has implemented several impact minimization efforts. To minimize impacts to the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid on City of Boulder OSMP property, retaining walls will be constructed along US 36 in portions of the Boulder Segment. Permanent water quality Best Management Practices (BMPs) will be used to improve water quality and stream flows will not be altered by bridge and culvert replacement. In many cases, culverts will be extended rather than replaced.

CDOT environmental staff will continue to work with design engineers through the final design phase, where additional impact reduction is likely. Design engineers and construction staff will also be briefed thoroughly on the need for further reductions and the use of BMPs. A project workplan will be developed that would outline the construction schedule and activities as related to threatened and endangered species. The workplan will include the location, type, projected time of completion, and projected timing of various construction activities.

USFWS and the U.S. Department of Transportation have developed guidelines on structuring and implementing PBAs (USDOT 2000). These guidelines are used to develop schedules, procedures for correspondence and project approval, and other process related elements. After submittal of the final PBA, USFWS is expected to issue a PBO within 135 days. The PBO serves as the framework for assuring that the project activities it covers proceed in a manner fully compatible with the ESA. The PBO includes a description of project activities, as well as an incidental take statement for all projected impacts identified in this PBA, assuming that proposed conservation measures outlined in this PBA offset the expected impacts. Consultation will include the elements described in the following sections.

8.3.1 Memorandum of Agreement

A Memorandum of Agreement (MOA) will be written during final design of each phase of project construction to express the intent of CDOT, USFWS, and City of Boulder OSMP to implement the objective of conservation and management of the listed species affected by the US 36 project, as well as to outline the comprehensive and cooperative approach to accomplish the conservation measures outlined in this PBA. The MOA will include criteria for each agency's involvement and participation, describe conservation easements, and establish procedures for dispute resolution. The MOA will also provide management procedures for the mitigation property and details on CDOT's commitment of mitigation and monitoring. USFWS often recommends that Preble's meadow jumping mouse population monitoring be conducted for 3 years following project construction.

8.3.2 Site-specific Consultation

During final design for each stage of the US 36 project, and prior to initiation of any construction activities, CDOT will conduct site-specific consultation with USFWS to:

- Provide an update of baseline conditions such as changes in species' ESA-listing status or habitat modifications for separate actions
- Outline new listed species commitments
- Discuss new direct, indirect, or cumulative effects based on the most updated design information
- Document construction impacts and detailed mitigation for the construction phase

8.3.2.1 Site-specific Biological Assessment

Site-specific consultation will include submittal of a Biological Assessment (BA) by FHWA and CDOT for each specific stage of the project constructed on US 36 that are covered in the PBO. The site-specific BA may address multiple sites and will conform to construction schedules, funding mechanisms, and any future unforeseen circumstances. USFWS will review the site-specific BA and if it complies with the terms and conditions of the PBO, a letter amending the PBO will be issued within 30 days. However, if the site-specific BA does not comply the agencies will re-consult on the project. The site-specific BA will include:

1. Detailed project description, including known locations of listed species in the project area.
2. Specific timing of project construction.
3. Habitat affected, project effects, and how they will be addressed. Site-specific impacts will be compared to the incidental take permitted in the PBO.
4. Project database to track the level of impacts, number of individuals of a species taken, and acres of habitat lost. This information will be summarized in an annual report submitted to USFWS.
5. Description of monitoring program that tracks project effects, level of incidental take, exceedance of incidental take allowed in the PBO, and effectiveness of avoidance/minimization measures and conservation actions.

8.3.2.2 Monitoring and Success Criteria

FHWA and CDOT recognize the importance of a monitoring program for both habitat restoration and evaluation of the response of the target species. The monitoring program will track project-related actions (including the implementation of associated conservation actions) and record adverse effects to evaluate the success of restoration, level of incidental take, and effectiveness of avoidance/minimization measures and conservation measures. Effectiveness monitoring determines if the anticipated impacts stated in this PBA and permitted in the PBO are occurring, and if the objectives of this PBA are met. Effectiveness monitoring will include a determination of the disturbed area (tracked in the project database described below) and an accounting of revegetation activities. Revegetation monitoring includes management of the revegetation contract, selecting appropriate plant materials, ensuring proper planting techniques, and implementing appropriate BMPs. Revegetated areas are then surveyed following planting until the success standards stated in the PBO are met. Success standards will likely be similar to standards stated in other PBOs (e.g., 70 percent foliar cover). These monitoring actions will be reported to USFWS in an annual report. Monitoring will be conducted quarterly or annually at minimum.

FHWA and CDOT will deliver an annual report to USFWS that documents the status of all activities covered in the PBA/PBO. CDOT will submit a report to USFWS describing any actions taken, additional impacts (if any), and an updated project database report (described below).

Project Report Database. Reporting will include development of a database to cumulatively track the level of impacts, number of individuals of a species taken, and acres of habitat lost. The database will include the following fields: (a) incidental take statement duration, (b) amount of allowable take, (c) location of permitted action and conservation areas, (d) amount of area in action area, (e) species and habitats in biological opinion, and (f) nature of allowable activities that conform to the incidental take statement. This data will indicate the need to reinitiate consultation due to unforeseen levels of impact, take, or habitat loss, and allow for tracking of the baseline. The information obtained from the database will be summarized in an annual report submitted to USFWS. The report will include progress on re-establishment of linkages; on-site conservation actions including acres of habitat disturbed, acres revegetated, and acres restored; research progress and outcomes; and coordination actions and outcomes.

8.3.3 Conservation Measures during Construction

FHWA and CDOT recommend the following BMPs to avoid and reduce potential impacts to Preble's meadow jumping mouse and Ute ladies'-tresses orchid populations and habitat. BMPs may be superseded by more stringent or general conditions that are established in project-specific BAs.

The following BMPs will be used during construction:

- An erosion control plan will be developed with permanent and temporary measures (BMPs) to minimize adverse effects to water quality.
- Silt fencing and sediment basins will be used around construction areas to prevent erosion and sedimentation into Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat areas.
- Riprap will be covered with soil and revegetated where possible.
- US 36 project design is currently at approximately 5 percent; impact minimization efforts will continue through final design phases. Habitat areas that are subject to disturbance will be identified and prioritized for avoidance prior to construction. For example, large willow patches or prime hibernation areas will be avoided if possible. Design options will be discussed with project designers to reduce or avoid site impacts.
- Chain-link or plastic (orange) fencing will be installed to establish no-work zones around Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat as early in the project as possible to minimize disturbance to during construction.
- On-site construction workers will be informed by CDOT of the importance of avoiding impacts to vegetated habitat outside the area of construction disturbance.
- Equipment entrance/exit areas will be limited to a single location and will utilize existing pathways where possible. Construction access routes will overlap with permanently disturbed areas to the greatest extent possible. CDOT will coordinate with equipment operators to find out specifically where they will drive to make last minute adjustments that can result in a further reduction of site impacts.
- Impacts to vegetation will be minimized by pruning trees rather than removal of the entire tree or cutting shrub stems to the ground and allowing sprout re-growth rather than removal of the entire root system.
- If wetland or shrubby vegetation is removed, it should be salvaged for replanting, or use on-site for other uses, such as brush piles for mouse cover, in consultation with project biologist.

- If areas will be temporarily disturbed by construction, these areas will be promptly revegetated using native vegetation. Native seed mixes will be used in all revegetation efforts, and the site will be promptly revegetated. All revegetation plans will be consistent with revegetation and monitoring guidelines established in the PBO.
- The duration of time soil is left bare will be kept to a minimum. Vegetation cover is not only beneficial for the Preble's meadow jumping mouse, but affords the site better resistance to invasion from non-native weeds and reduces the potential for erosion.
- Soil will be stockpiled from disturbed natural areas to be used as a seed bank to re-establish native plant species.
- Noxious weeds will be controlled as necessary as discussed in the US 36 Corridor FEIS. For successful noxious weed control, noxious weeds must be less than 5 percent of the foliar cover after 3 years.
- Engineers and construction staff will consult with the project biologist if there are any changes in plans or if they have any questions regarding proposed activities within Preble's meadow jumping mouse or Ute ladies'-tresses orchid habitat.

The following additional conservation measures are proposed to reduce the potential for impacts to the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid:

- Highway construction in the identified habitat areas will be scheduled to occur during the Preble's meadow jumping mouse hibernation season (November 1 to April 30), when practicable, to minimize impacts to the Preble's meadow jumping mouse, and prevent disruption to breeding, feeding, and dispersal activities that occur during the active season.
- Disturbances within Preble's meadow jumping mouse hibernation habitat will be mitigated by clearing such areas of shrubs and other woody vegetation by August 15, when practicable, to discourage mice from hibernating in these areas prior to construction.
- Preconstruction surveys to identify the presence or absence of the Ute ladies'-tresses orchid will be conducted in the construction footprint between July and August when inflorescences are visible.
- Temporarily impacted areas within Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat that are revegetated will be monitored for 3 years following completion of construction to determine the success of the revegetation. Areas will be considered successfully reclaimed if 70 percent or greater of plantings have survived and 70 percent or more of the disturbed area is revegetated with favorable species, as determined by foliar cover.
- Herbicide use in Ute ladies'-tresses orchid habitat or potentially occupied habitat will be limited and used only after coordination with USFWS.
- Construction of minor drainage culverts and other roadway features will be done from the roadway itself where practicable to limit disturbance to Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat.
- Maximum slope grades will be used to reduce habitat impact areas on toe slopes, including the use of guardrail when appropriate. Wing walls will be used on bridges and culverts as appropriate to further reduce impacts to toe slopes.
- Placement of bridge girders and related work will take place from existing roadway pavement (from above) to the extent possible.
- Small mammal ledges will be installed in culverts, where practicable, for the Preble's meadow jumping mouse use to maintain connectivity across the highway. Cameras should be used to monitor

the use of selected crossing structures by the Preble's meadow jumping mouse following construction.

- CDOT will establish mowing and grazing management practices that promote species presence along suitable habitats on road right-of-ways (i.e., riparian crossings). Mowing along the highway will be limited to one mower width in most cases, and the remainder of the toe slopes will be left unmowed. Mowing will occur early in the season (between January and March) to be consistent with current management practices that promote Ute ladies'-tresses orchid dispersal. Demarcations will be provided to delineate mowing limits for CDOT maintenance personnel.
- In the event that a Preble's meadow jumping mouse is encountered during construction, including either dead, injured, or hibernating, the USFWS Colorado Field Office will be contacted immediately at (303) 275-2370.
- If a Ute ladies'-tresses orchid or population is identified during construction within the construction area, the USFWS Colorado Field Office will be contacted immediately at (303) 275-2370.
- Ditch and culvert flows in areas of Preble's meadow jumping mouse and Ute ladies'-tresses orchid range will be maintained during construction.
- CDOT will research the possibility of relocating Ute ladies'-tresses orchid plants that would be impacted by the highway widening.

8.3.4 Effective Management of Habitat to Reduce Impacts

Although the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid both occur in the South Boulder Creek floodplain, each species has different habitat requirements. The Preble's meadow jumping mouse prefers late seral mixed willow and meadow stands, while the Ute ladies'-tresses orchid occurs in early- to mid-seral meadow communities (Fertig et al. 2005). Therefore, management of one species can conflict with the management of the other. To provide ideal conditions for both species, riparian areas require a mosaic of seral conditions.

8.3.4.1 Preble's Meadow Jumping Mouse

To effectively manage habitat to promote Preble's meadow jumping mouse use, crossings under the highway at riparian drainages must allow connectivity. Population monitoring, including trapping studies and cameras installed in culverts, will provide further data on population impacts or persistence following re-construction of US 36. Additionally, weed management on CDOT right-of-way will effectively reduce the potential for indirect impact and degradation to Preble's meadow jumping mouse habitat.

8.3.4.2 Ute Ladies'-tresses Orchid

To effectively manage habitat for the Ute ladies'-tresses orchid, a combination of several management practices are best. These practices are described below.

Grazing and Mowing

A combination of winter grazing and mowing is effective for maintaining Ute ladies'-tresses orchid populations by reducing competing vegetation cover. Late season mowing (after fruit ripened) may be one of the best management tools for maintaining Ute ladies'-tresses orchid habitat. Mowing can keep competing vegetation cover low, but can be detrimental if mowing occurs before fruits have ripened, or if the areas are cut too short.

Early summer grazing, prior to blooming, has also been found beneficial in keeping vegetation cover low. Grazing just before or during flowering reduces fruit production. Since the Ute ladies'-tresses orchid is edible to livestock, plants located in areas where grazing occurs exhibit decreased flowering and fruit production due to summer grazing or trampling. However, winter grazing is beneficial to the Ute ladies'-tresses orchid by reducing competing vegetation and escape cover of voles. Other potentially adverse impacts of grazing still need to be determined.

Hydrology

Changes in hydrology that eliminate wetlands would adversely affect the Ute ladies'-tresses orchid. Irrigation should continue during the growing season to maintain wet meadow habitat. Long-term loss of natural flow in creeks or irrigation ditches would cause long-term declines in the Ute ladies'-tresses orchid (Fertig et al. 2005). The project is designed to maintain existing flows to minimize hydrological impacts.

Weed Management

Competition from invasive species has been identified as a primary threat to the Ute ladies'-tresses orchid. Control of weeds in the CDOT right-of-way is of particular importance to City of Boulder OSMP (Riedel pers. comm. 2006). However, the Ute ladies'-tresses orchid can be susceptible to broadleaf herbicides applied in hay meadows to control noxious weeds (Fertig et al 2005). Herbicides should be used only to a limited extent by CDOT to control noxious weeds.

8.4 COMPENSATORY MITIGATION

Conservation measures will be needed to offset impacts to Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat and populations that could not be avoided or prevented through minimization. CDOT is committed to population monitoring in the corridor, following construction, until the success criteria outlined in the PBO are met. Additionally, CDOT will keep the management practices that promote species presence, such as limiting grazing practices. As described in Section 8.3.1, Memorandum of Agreement, an MOA will be developed for mitigation to outline steps needed to carry out successful mitigation, monetary compensation, and maintenance agreements between signatory agencies.

CDOT's approach to compensatory mitigation for the US 36 project is to continue consultation with the USFWS, City of Boulder OSMP, Boulder County, and other applicable federal, state, and local agencies to develop a comprehensive mitigation strategy for the South Boulder Creek floodplain ecological system. The impacts to the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid identified in this PBA are concentrated in the South Boulder Creek floodplain, and CDOT is committed to developing mitigation in this area that will provide a benefit to the system as a whole rather than small isolated improvements. Although the project will be constructed in phases, and mitigation requirements will need to be met for each individual phase, CDOT is confident that the mitigation for each phase can be completed as part of a larger, comprehensive approach.

In anticipation of mitigation requirements, CDOT has coordinated with City of Boulder OSMP to identify potential mitigation sites that may provide opportunity for habitat improvements. Off-site mitigation would include property acquisition, restoration, monitoring, and possible ownership transfer, and would be focused on creation, enhancement, and restoration of habitat to create habitat linkages and provision of continuous movement corridors. Mitigation will compensate for the loss of Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat under the Combined Alternative Package (Preferred Alternative) (see Tables 2 and 4) and increase the quantity and quality of habitat for both species within

their localized range. Mitigation projects aimed to restore, create, or enhance habitat linkages will be given the highest priority. Linkages can provide measurable biological benefits in two ways:

- Linkages generally have poor habitat conditions that not only restrict or prevent the Preble's meadow jumping mouse movement, but also preclude animal residency. Restoration or enhancement of linkages can lead to improved (or restored) mouse mobility, and may also provide the critical habitat elements that will allow establishment of a resident population, if the linkage is large enough. The length and condition of the linkage will determine the eventual benefits of restoration or enhancement actions.
- Restored linkages reconnect isolated populations. This is the primary benefit that would be needed to achieve the recovery goal.

Although other sites in the South Boulder Creek floodplain can be considered during final mitigation planning, nine potential mitigation sites were categorized based on two factors: their need for restoration and their vulnerability to development or other threats (see Attachment A, Figures 7A and 7B, Overview of Mitigation Site Opportunities). Restorable sites have degraded habitat, but are contiguous to known occupied habitat of the Preble's meadow jumping mouse or the Ute ladies'-tresses orchid and could be restored with an investment of resources for at least a season (City of Boulder 2006). Vulnerable sites contain suitable habitat or are occupied by the Preble's meadow jumping mouse or the Ute ladies'-tresses orchid but are not protected through ownership by a public agency or land trust, or are not within a conservation easement. The acquisition of restorable or vulnerable sites for mitigation for the US 36 project would need to result in a balance or gain of *occupied* or *potentially occupied* habitat, not of *potential* habitat. Additionally, acquisition of open space buffers that would enhance the survival and spread of the species in occupied habitat would be allowed (see Section 8.4.1, Description of Mitigation Site Opportunities).

These properties may not be available or may not fit the requirements of the project when CDOT is ready to implement mitigation. If a site is not currently owned by City of Boulder OSMP or Boulder County, CDOT would have to acquire (through purchase or conservation easement), restore, and monitor the property for several seasons to ensure success, and possibly transfer ownership of the site. Funding for property acquisition and mitigation will be determined during the final design process. No contact has been made with the landowners to gather specific information about the current availability of the properties or their cost.

Re-introduction of the Ute ladies'-tresses orchid to suitable habitat may provide another potential mitigation option, although it presents more uncertainties than conservation and/or restoration. Re-establishment of populations would be conducted in cooperation with USFWS, who would need to assist in development and approval of re-introduction protocol. The site with the most potential for the re-establishment/re-introduction of Preble's meadow jumping mouse populations would be the Boulder Creek riparian corridor and floodplain downstream of 75th Street to US 287. Portions of this area are owned and managed by Boulder County and City of Boulder OSMP.

Table 5, Mitigation Opportunities Identified by City of Boulder and Boulder County for US 36 Project, lists the sites identified as examples and current potential opportunities of restorable or vulnerable habitat, listed in order of priority. These sites are shown in Attachment A, Figures 7A and 7B, Overview of Mitigation Site Opportunities. City of Boulder OSMP focused their recommendations on areas that are currently unprotected or vulnerable or are in need of restoration. The City expressed recent support of other potential, but yet undefined, mitigation sites located within the South Boulder Creek floodplain because these sites would support the ecological system where the project impacts would occur. The sites identified by Boulder County are already open space properties that are in need of restoration and are contiguous to known occupied Preble's meadow jumping mouse habitat. At this time, no specific acreages of compensatory mitigation have been identified since a construction schedule for the project has

not yet been determined. Therefore, these mitigation opportunities do not reflect final mitigation, but provide direction and identify the types of situations that are currently possible.

8.5 DESCRIPTION OF MITIGATION SITE OPPORTUNITIES

A more detailed description of each potential mitigation site as well as mitigation needed is listed in Table 5, Mitigation Opportunities Identified by City of Boulder and Boulder County for US 36 Project, and is discussed below. Figures of each site are included in Attachment A, Figures, Figures 8 through 16; photographs of each site are included in Attachment B, Photographs of Mitigation Site Opportunities.

The following definitions are used in the description of mitigation requirements in this section:

- **Habitat protection** involves permanently setting aside known areas of functioning ecosystems where listed species are present or have been present in the past. Without protection of these ecosystems, these areas may be destroyed or fragmented by urban expansion, cattle grazing, or other activities that degrade or alter habitats with associated loss in value. Therefore, protecting functioning ecosystems provides the greatest benefit to species.
- **Habitat restoration** returns a disturbed, degraded, or totally altered site to its original condition or to some approximation of that condition.
- **Habitat enhancement** improves one or more functions of existing habitat to meet a particular goal. For instance, supplemental planting may provide additional foraging, erosion control, and refugia that may improve the site for the Preble's meadow jumping mouse.
- **Habitat creation** converts unsuitable habitat to suitable for a particular species. For instance, a dry upland could be graded down or subirrigated to provide hydrology that would support establishment of habitat for the Ute ladies'-tresses orchid.

Table 5: Mitigation Opportunities Identified by City of Boulder OSMP and Boulder County for the US 36 Project

Name	Location	Ownership	Size	Target Species	Perennial Stream	Mitigation Consideration	Limitations to Acquisition
City of Boulder OSMP Identified Sites							
South Boulder Creek Floodplain	City of Boulder OSMP land in South Boulder Creek floodplain	City of Boulder OSMP	Various	PMJM and ULT	South Boulder Creek (ajacent/in floodplain)	Restorable	N/A
South Boulder Creek Floodplain	South of Baseline Road, west of Cherryvale Road, east of 55th Avenue	Six parcels privately owned	80-90 acres (northern portion is eligible for annexation)	PMJM and ULT	South Boulder Creek (adjacent/in floodplain); 20-30 acres of wetlands	Vulnerable and restorable	Water rights would need to be acquired with property
Lafayette Water Treatment Facility	South Boulder Creek west of Colorado SH 170	City of Lafayette	5 acres	PMJM and ULT	South Boulder Creek	Vulnerable and restorable	Needs to be acquired from City of Lafayette
Hogan Property	West of SH 93 at Jefferson/ Boulder county line	Private (Hogan) including a City of Boulder OSMP Conservation Easement	440 acres	PMJM	Coal Creek	Vulnerable and occupied	Conservation easement expensive
Coal Creek at SH 128	Culvert crossing at SH 128	CDOT	Approx 1 stream mile	PMJM	Coal Creek	Vulnerable and restorable	N/A
Straty-Cline/Colorado Open Lands	East of North 75th Street	City of Boulder OSMP and Transportation	Approx 3 stream miles	PMJM and ULT	Boulder Creek	Restorable	In active reclamation
Dry Creek	South of Valmont Road, north of Arapahoe Road	Several (5-6) private owners (City of Boulder OSMP owns up and downstream)	Approx 0.75-1.0 stream mile	PMJM and ULT	Dry Creek	Vulnerable and restorable	Private ownership; grazing/horse pasture
Boulder County Open Space							
Boulder Creek	East of SH 287 off of Jasper Road	Boulder County	1.25 stream mile	PMJM	Boulder Creek	Restorable	N/A
South Central Grasslands Open Space	West of McCaslin Boulevard, east of SH 128	Boulder County Open Space	Approximately 0.5 mile	PMJM	Rock Creek	Restorable	High priority for Boulder County; may not be available when mitigation initiated
Mayhoffer/Singletree Property	West of McCaslin Boulevard, accessed from 2nd Street in Superior	Boulder County Open Space, City of Boulder, Town of Superior	Approximately 0.5 mile	PMJM	Coal Creek	Restorable	N/A

Source: US 36 Mobility Partnership, 2006 and 2009.

Notes:

CDOT = Colorado Department of Transportation
N/A = not applicable
OSMP = Open Space Mountain Parks
PMJM = Preble's meadow jumping mouse
SH = State Highway
ULT = Ute ladies'-tresses orchid

8.5.1 Sites Identified by City of Boulder OSMP as Mitigation Opportunities

The City of Boulder OSMP supports mitigation sites, as yet undefined, in the South Boulder Creek floodplain. In addition, the City provided a list of sites that they either currently own or manage but that are in need of restoration or privately owned properties in need of preservation that would need to be acquired. These are either areas of currently occupied habitat, or unoccupied but adjacent and connected to occupied habitat. The City of Boulder OSMP recommends conducting a hydrologic assessment as part of mitigation, as well as an integrated weed management plan for the US 36 right-of-way.

Site 1. South Boulder Creek Floodplain near Baseline Road

The habitat on this site is currently weedy grasslands and hay meadows. Howard Ditch transects the site and connects downstream to South Boulder Creek (see Attachment A, Figure 8, South Boulder Creek Floodplain). The ditch carries water for livestock. The site is privately owned; portions are currently available for annexation. Acquisition of the site would create a buffer of open space between the residential developments to the north and west of the occupied Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat on current City of Boulder OSMP property.

This site would require acquisition of 80 to 90 acres of land as well as water rights to Howard Ditch to ensure hydrology to the site is unaffected. Habitat known to be occupied by the Preble's meadow jumping mouse is adjacent to the site on South Boulder Creek, and therefore the Preble's meadow jumping mouse may occur on the site during hibernation or foraging activities. Additionally, the Ute ladies'-tresses orchid has been documented in the adjacent property to the east. Lynn Riedel, botanist for City of Boulder OSMP, stated the Ute ladies'-tresses orchid is not present directly on this site because of the current horse grazing (Riedel pers. comm. 2006). However, she stated this site is the best opportunity for mitigation of the Ute ladies'-tresses orchid, even though wetlands on the site would need restoration. Other portions of the site are active hay meadows, which can support high densities of the Ute ladies'-tresses orchid due to the practice of irrigation, winter grazing, and haying.

This site contains intact floodplain geomorphology in the shallow groundwater and hydrology within the old irrigation ditch channel (Howard Ditch) that is ideal habitat for the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid. Additionally, the hay meadows on the site, with seasonal mowing, would provide ideal conditions for the Ute ladies'-tresses orchid.

The current condition of the site threatens the population of the Ute ladies'-tresses orchid in the adjacent properties due to the presence of invasive plant species, including purple loosestrife (*Lythrum salicaria*), common teasel, and oxeye daisy (*Leucanthemum vulgare*). Additionally, fill placed in the wetlands has degraded them. Management of grazing would allow creation of a willow complex that would connect the site with South Boulder Creek and increase habitat for the Preble's meadow jumping mouse.

Site Requirements for Mitigation

Mitigation at Site 1 would require CDOT to acquire the property as well as water rights in the Howard Ditch. The site conditions are currently degraded, and therefore habitat restoration would require regrading to remove areas of fill from wetlands. Management of weeds, especially in northern portions of the site, would be ongoing due to existing weed problems on adjacent private properties. Restoration would include willow plantings along Howard Ditch to create habitat for the Preble's meadow jumping mouse. Additionally, mowing and grazing management would need to be applied to promote species presence.

Site 2. Lafayette Water Treatment Facility

The Lafayette Water Treatment Facility is a currently unused facility owned by the City of Lafayette, which previously supplied water to the cities of Lafayette and Boulder for irrigation purposes. The site includes two buildings, three sheds, and the water treatment holding pond located adjacent to South Boulder Creek (see Attachment A, Figure 9, Lafayette Water Treatment Facility).

The site is adjacent to the Preble's meadow jumping mouse-occupied habitat along South Boulder Creek. The Ute ladies'-tresses orchid occurs both up and downstream, including at Dry Creek. Acquisition of this site through purchase or a conservation easement would protect the Preble's meadow jumping mouse vulnerable habitat and restore the conditions to support both the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid, as well as provide habitat linkages to known occupied areas. Habitat at the site consists of a good quality wetland and riparian habitat along Dry Creek Ditch and South Boulder Creek. The site is surrounded by protected properties, including City of Boulder OSMP lands designated as a Colorado Natural Area (The Colorado Tallgrass Prairie State Natural Area). An invasive weed, knapweed (*Centaurea sp.*), was observed at the site.

Site Requirements for Mitigation

Site 2 would require acquisition or a conservation easement from the City of Lafayette. The facilities associated with the water treatment plant would need to be removed, which would allow for regrading and revegetation in order to create wetlands and a willow complex.

Site 3. Hogan Property

The site includes a portion of upper Coal Creek, as well as adjacent wetlands of good quality (see Attachment A, Figure 10, Hogan Property). A shale quarry is located on the east side of Coal Creek in the northern portion of the site. Site 3 is privately owned, but the City of Boulder OSMP has a conservation easement on the site. The City of Boulder OSMP real estate staff has confirmed that they would be interested in active restoration and grazing management of the portion of Coal Creek in the easement. The Preble's meadow jumping mouse occurs upstream and downstream, as well as on the Hogan property. The Ute ladies'-tresses orchid is not known to occur within the Coal Creek corridor due to insufficient hydrology, although some patches of suitable habitat exist.

Site Requirements for Mitigation

The City of Boulder OSMP real estate staff and the private owners (the Hogans) would need to be contacted to determine the level of interest in participating in mitigation opportunities for the US 36 project. Because the Preble's meadow jumping mouse already occurs upstream and downstream, and the site contains suitable habitat along Coal Creek, the use of the site would be a good opportunity for preservation. Mitigation would require some restoration, including installation of riparian fencing to limit trespassing of grazing cattle from adjacent properties.

Site 4. Coal Creek at SH 128

The site includes approximately 1 mile of Coal Creek with associated willow/cottonwood riparian woodland and adjacent grasslands, as well as the culvert under SH 128 (see Attachment A, Figure 11, Coal Creek at State Highway 128). The Preble's meadow jumping mouse occupies habitat approximately 1.5 miles downstream on Coal Creek and also occurs upstream; the Preble's meadow jumping mouse was trapped on the west side of SH 128 along Coal Creek in the early 1990s. The site is important to the City of Boulder OSMP for the Preble's meadow jumping mouse seasonal movement. The City of Boulder OSMP considers this portion of Coal Creek in need of restoration; the current crossing of SH 128 is a flat bottom box culvert. The site is considered vulnerable due to the current grazing practices.

Site Requirements for Mitigation

Mitigation of Site 4 would include riparian fencing to exclude cattle grazing from the creek corridor, and modification of the crossing structure at SH 128. The crossing location could be enhanced by installation of a dry shelf for Preble's meadow jumping mouse passage or removal of the existing culvert and installation of a bridge.

Site 5. Straty-Cline/Colorado Open Lands

This site is being considered for Preble's meadow jumping mouse and Ute ladies'-tresses orchid potential restoration habitat. The property was extensively mined for gravel, is currently under reclamation, and is owned by the City of Boulder OSMP and Transportation. Adjacent areas are Walden Ponds (Boulder County Open Space) and Sawhill Ponds (managed by the City of Boulder OSMP). Adjacent properties include the Cline Trout Farms, which is a fish hatchery in a conservation easement. The portion of Boulder Creek downstream of North 75th Street was part of an ecological restoration project in 2006. The City of Boulder is currently considering options for managing this area, including some options that could result in the creation of additional habitat for the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid. The City anticipates taking action within the next 1 to 5 years at this location. The City of Boulder has approved construction of a bikepath along Boulder Creek.

The site includes an approximately 3-mile segment of Boulder Creek with associated gravel pit ponds just downstream of the confluence of Boulder and South Boulder creeks, and two irrigation ditches on the slope to the north of the site (see Attachment A, Figure 12, Straty-Cline/Colorado Open Lands). The Ute ladies'-tresses orchid occurs across 61st Street, to the east, and possibly upstream on Boulder Creek at 47th Street. Potential habitat for the Ute ladies'-tresses orchid occurs on Boulder Creek, South Boulder Creek, and the wetland habitat around the ponds. City of Boulder OSMP owns most of the area around the confluence of Boulder Creek and South Boulder Creek. Known problems at the site include invasive species including common teasel, Russian olive, and New Zealand mudsnail.

The Preble's meadow jumping mouse has not occurred in the vicinity of the site since the 1980s. The nearest occupied habitat is 2 miles upstream on South Boulder Creek. South Boulder Creek above the confluence has been heavily degraded, and since this site is not adjacent to occupied habitat, it would be a possible re-introduction site for the Preble's meadow jumping mouse. The City of Boulder OSMP sees a long-term opportunity to re-establish the Preble's meadow jumping mouse on Boulder Creek either through re-introduction or passive re-establishment through restoration of Boulder Creek and South Boulder Creek. The current and potential habitat for the Preble's meadow jumping mouse at the site is the irrigated ditches lined with willows north of the gravel pit pond.

Site Requirements for Mitigation

The City of Boulder currently owns this site. Mitigation opportunities include restoration of habitat through wetland creation, as well as restoration of Boulder Creek. This would involve removing fill, regrading, and potentially renaturalizing the channel of Boulder Creek. Fill material previously placed on the site from the uncompleted construction of Pearl Parkway would require removal or regrading to incorporate it into the landscape. Additionally, invasive species would require management to provide suitable habitat conditions for the Preble's meadow jumping mouse or the Ute ladies'-tresses orchid.

To re-establish the Preble's meadow jumping mouse at this site, individual mice would need to be translocated to the area following restoration. This site may also provide approximately 40 to 50 acres of potential wetland mitigation opportunities.

Site 6. Dry Creek

Approximately five to six private landowners own this site; therefore, the site is considered vulnerable without protection (see Attachment A, Figure 13, Dry Creek). Acquisition of the site would create habitat connectivity for the Preble's meadow jumping mouse between South Boulder Creek and Boulder Creek (if habitat was restored as described for Site 5). The focus of mitigation at this site is the Preble's meadow jumping mouse, which occurs upstream on South Boulder Creek. Additionally, as previously stated, City of Boulder OSMP sees long-term opportunity to re-establish the Preble's meadow jumping mouse on Boulder Creek either through re-introduction or passive re-establishment through restoration of Dry Creek (which confluences to Boulder Creek downstream, and confluences with South Boulder Creek to the south). The nearest Ute ladies'-tresses orchid occurrences are upstream west and north of Baseline Reservoir.

Site Requirements for Mitigation

The property would need to be acquired through a purchase or conservation easements from each of the property owners. Mitigation at Site 6 would require riparian fencing to exclude horse grazing, and removal of weedy species such as Russian olive. Additionally, planting of willow complexes along Dry Creek would create suitable habitat conditions for Preble's meadow jumping mouse.

8.5.2 Sites Identified by Boulder County as Potential Mitigation Opportunities

Site 7. Boulder Creek

This portion of Boulder Creek is located east of SH 287 at Jasper Road (see Attachment A, Figure 14, Boulder Creek). This site, owned by Boulder County and managed as open space, is situated on an approximately 1.25-mile length of Boulder Creek that was previously gravel-mined. The Preble's meadow jumping mouse occurs upstream on South Boulder Creek. No habitat for the Preble's meadow jumping mouse is currently present at this site currently and CDOT would likely consider this site for wetland mitigation rather than threatened species mitigation. Known problems are invasive species including common teasel and Eurasian mudfoil, gas wells, and channelization of Boulder Creek. Boulder County needs funding to complete restoration.

Site Requirements for Mitigation

Due to the distance of Site 7 from known occupied Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat, this site is primarily being considered by CDOT for wetland mitigation opportunities rather than mitigation for threatened species.

Site 8. South Central Grasslands Open Space on Rock Creek

Boulder County owns and manages the southern portion of this property (from McCaslin Boulevard to SH 128) as open space; the northern portion is jointly owned with the City of Boulder. Site 8 is located on the northern edge of Rocky Flats National Wildlife Refuge The site includes Rock Creek, which is ephemeral through the site, flowing mostly in the spring season and the crossing at SH 128 (see Attachment A, Figure 15, South Central Grasslands Open Space).

The focus species for mitigation at this location is the Preble's meadow jumping mouse, which occurs in the Rock Creek drainage upstream of the site on the Rocky Flats National Wildlife Refuge. The current conditions of the site are variable from north to south. At McCaslin Boulevard, the habitat is in good condition but is degraded upstream. The northern portion of Rock Creek on the site has been improved in the last 5 years and has good willow growth.

Current problems associated with the site include cattle grazing, as well as extreme erosion, and headcutting in one section of Rock Creek. The headcutting is historic as the previous owner of the property likely channelized the creek. The culvert at SH 128 may be a barrier for Preble's meadow jumping mouse movements across the highway; however, mice may cross at grade, although the slope is 3:1.

Site Requirements for Mitigation

The site is high priority for Boulder County; therefore, due to the estimated time frame of the US 36 project, this site may not be available for mitigation for this project. Additionally, trapping surveys need to be completed at the SH 128 crossing of Rock Creek to determine the extent of habitat use by the Preble's meadow jumping mouse, since Rock Creek is not perennial in this stretch. Habitat connectivity would require replacement of the box culvert at SH 128 on Rock Creek, which does not currently allow movement. The east side of the SH 128 crossing is degraded and a large area of ponded water is present.

Mitigation would create a habitat linkage to upstream Preble's meadow jumping mouse populations through restoration of Rock Creek. Rock Creek would require rechannelization to restore natural meandering, as well as revegetation of the riparian habitat, fencing, and improved grazing management on adjacent properties.

Site 9. Mayhoffer/Singletree Property

This site is currently open space jointly owned between Boulder County, the City of Boulder, and the Town of Superior. The Preble's meadow jumping mouse was trapped a few hundred feet above the trail on Hake Ditch, several hundred feet from Coal Creek; the Preble's meadow jumping mouse has not been trapped specifically on this portion of Coal Creek. Conceptual mitigation would create Preble's meadow jumping mouse habitat within the Coal Creek corridor, which is currently considered occupied range (NDIS 2006). The area of potential habitat creation is riparian woodland on Coal Creek and adjacent grasslands (see Attachment A, Figure 16, Mayhoffer/Singletree Property). Wetlands were present due to a leaky headgate on Hake Ditch; however, since the leak was repaired the wetlands have mostly dried up.

Site Requirements for Mitigation

Since the Preble's meadow jumping mouse occupies habitat in the ditch adjacent to this site, mitigation would require creation and enhancement of Preble's meadow jumping mouse habitat within this open space property. The hydrology of the site would need to be enhanced in order to support a population of the Preble's meadow jumping mouse. This would include providing water to Coal Creek and the adjacent wetland areas. The riparian woodland would need to be enhanced to support a willow complex understory with areas of grasses and forbs in the understory.

9.1 PREBLE'S MEADOW JUMPING MOUSE

The US 36 project ***may affect, and is likely to adversely affect,*** the Preble's meadow jumping mouse, but the proposed conservation measures will offset these impacts and improve the viability of Preble's meadow jumping mouse populations in the watershed.

9.2 UTE-LADIES'-TRESSES ORCHID

The US 36 project ***may affect, and is likely to adversely affect,*** the Ute ladies'-tresses orchid, but the proposed conservation measures will offset adverse impacts and possibly expand the known range of the Ute ladies'-tresses orchid.

9.3 COLORADO BUTTERFLY PLANT

The US 36 project ***may affect, but is not likely to adversely affect,*** Colorado butterfly plant.

The US 36 project ***may affect, and is likely to adversely affect,*** habitat and populations of the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid, and ***may affect, but is not likely to adversely affect,*** habitat and populations of the Colorado butterfly plant. Currently no populations or individual Colorado butterfly plants are known to occur in the construction footprint; however, populations could become established prior to construction.

Minimization efforts during the development of preliminary design reduced project impacts, and further reductions during final project design and construction are expected. Project descriptions, effects of the project, and conservation measures are described in this PBA. Conservation measures presented in this PBA were guided by recommendations from USFWS regarding the use of off-site mitigation projects that will preserve and restore Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat, while providing habitat linkages to known occupied habitats. On-site measures would restore disturbed habitat following construction. The off-site conservation measures focus on creating, restoring, or enhancing habitat linkages and acquiring additional habitat areas within the range of the Preble's meadow jumping mouse and the Ute ladies'-tresses orchid in Boulder County.

Although the project would result in alteration and loss of Preble's meadow jumping mouse and Ute ladies'-tresses orchid habitat, the project would not cause habitat fragmentation and loss of connectivity within and between populations in the project area once construction and restoration is complete. Habitat connectivity and mouse mobility would improve at project sites by improved culvert and bridge designs. The nature of the impacts and subsequent restoration actions would allow populations in the project impact area to recover.

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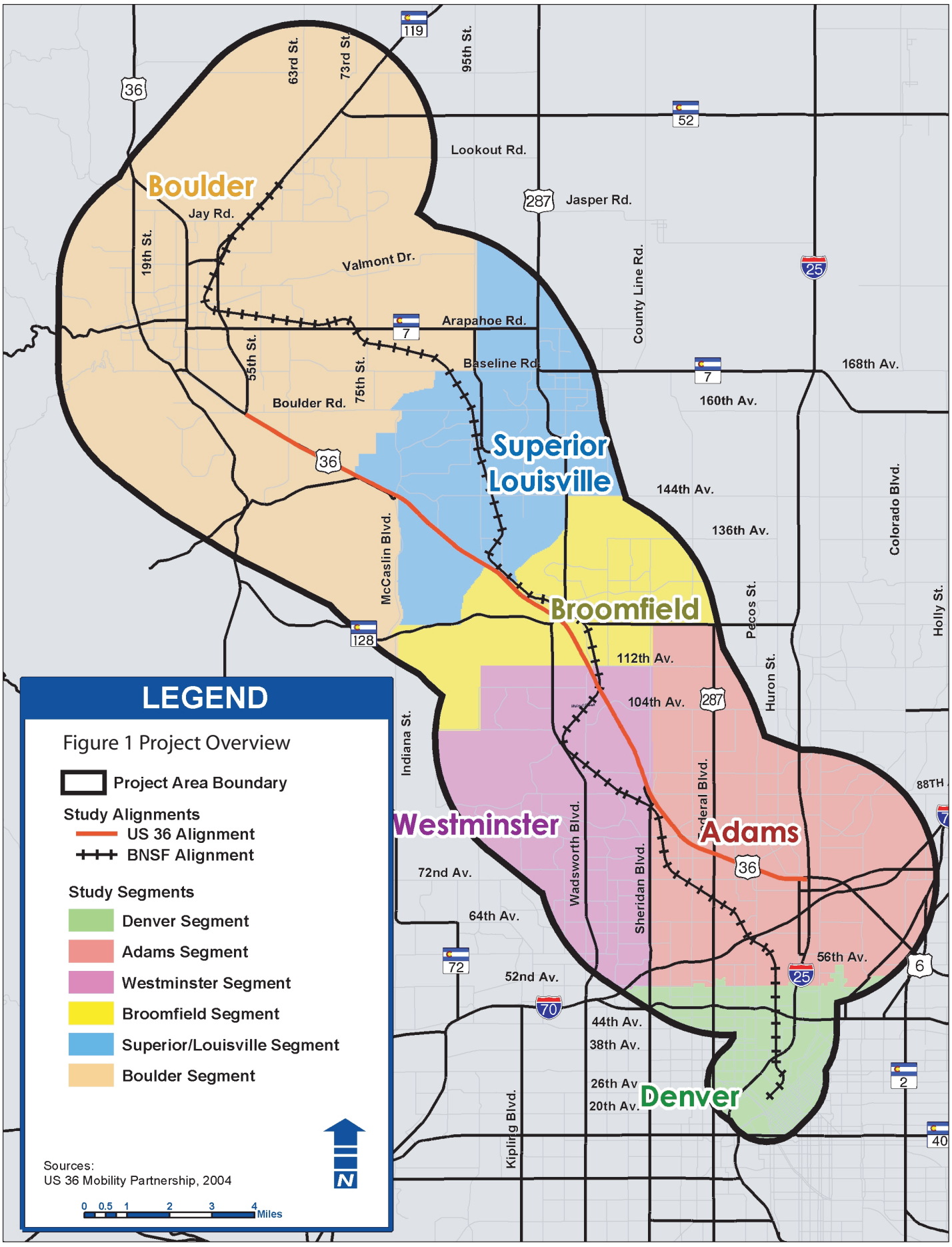
Attachment A
Figures

LIST OF FIGURES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Superior
Louisville
Broomfield
Westminster
Adams
Denver
63rd St.
73rd St.
95th St.
Lookout Rd.
Jasper Rd.
Jay Rd.
19th St.
Valmont Dr.
Arapahoe Rd.
55th St.
75th St.
Baseline Rd.
Boulder Rd.
County Line Rd.
168th Av.
160th Av.
144th Av.
136th Av.
Colorado Blvd.
McCaslin Blvd.
Pecos St.
Holly St.
112th Av.
104th Av.
Huron St.
Indiana St.
Federal Blvd.
88TH
Wadsworth Blvd.
Sheridan Blvd.
72nd Av.
64th Av.
56th Av.
52nd Av.
44th Av.
38th Av.
26th Av
20th Av.
Kipling Blvd.
LEGEND
Figure 1 Project Overview
Project Area Boundary
Study Alignments
US 36 Alignment
BNSF Alignment
Study Segments
Denver Segment
Adams Segment
Westminster Segment
Broomfield Segment
Superior/Louisville Segment
Boulder Segment
Sources:
US 36 Mobility Partnership, 2004
0 0.5 1 2 3 4 Miles
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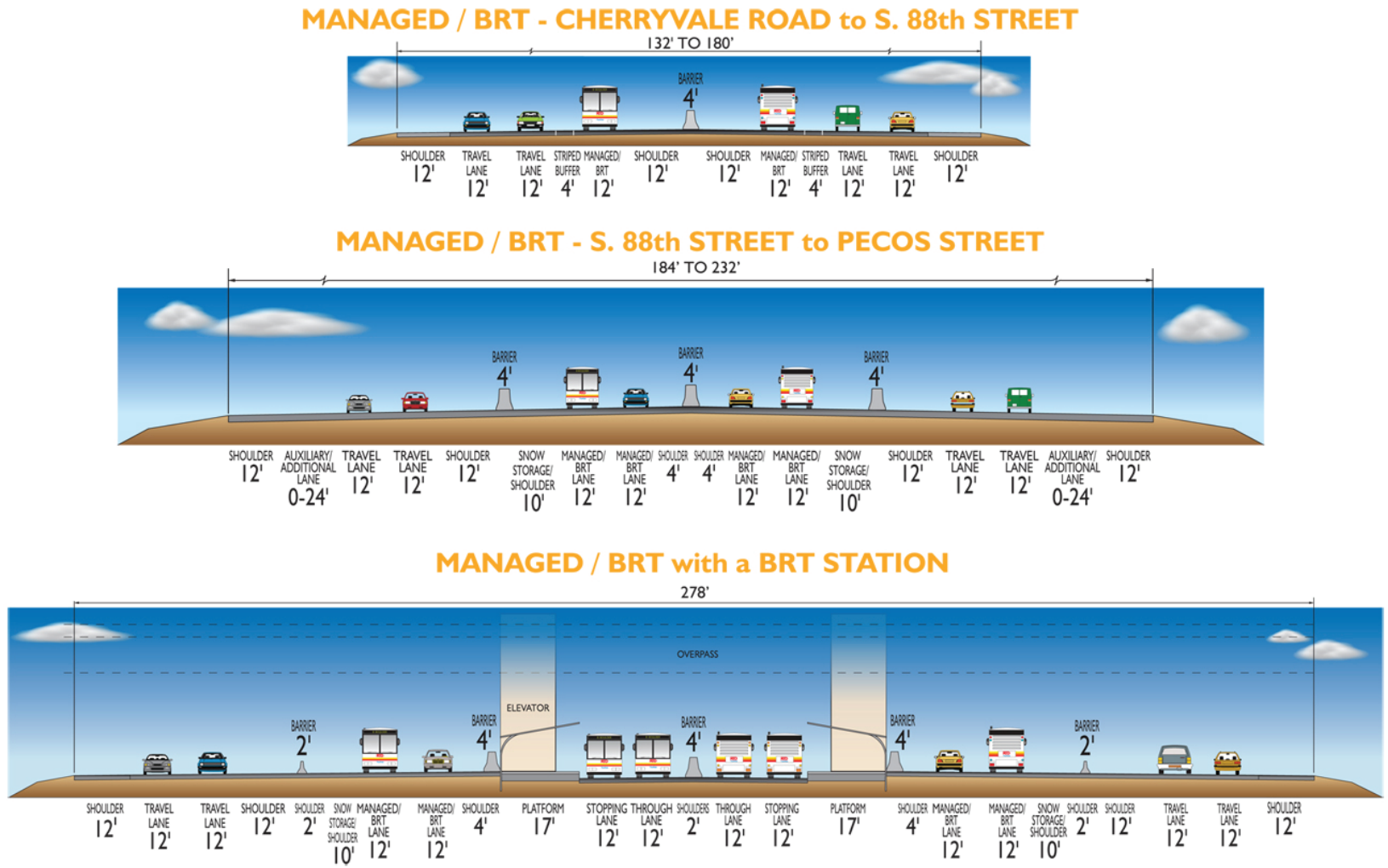
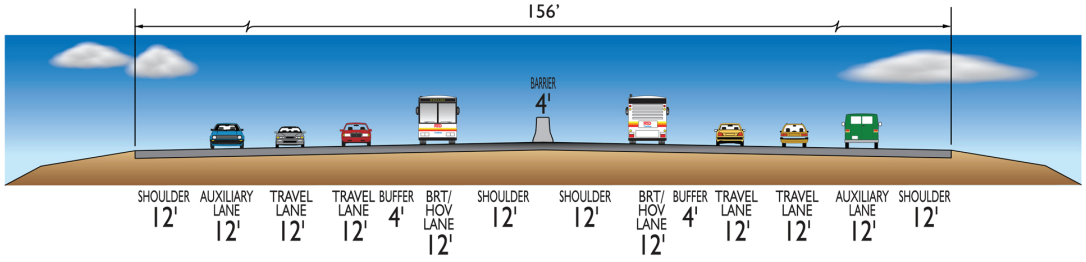


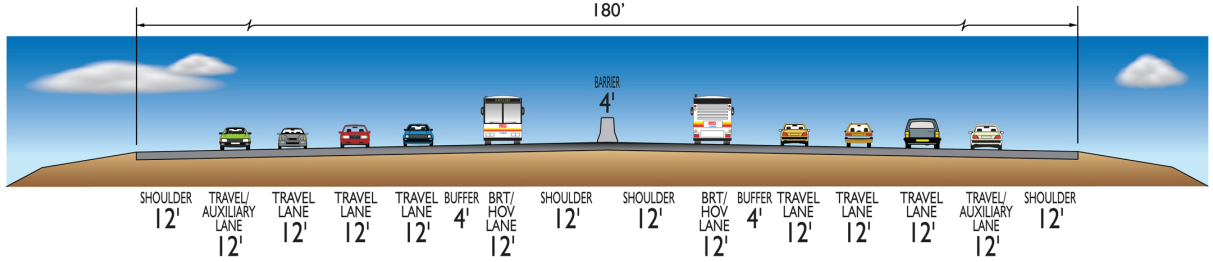
Figure 2 – Typical Sections for Package 2
US 36 Programmatic Biological Assessment

Source: US 36 Mobility Partnership, 2009

GENERAL PURPOSE LANES, HOV and BRT - FOOTHILLS PARKWAY to EAST FLATIRON CIRCLE



GENERAL PURPOSE LANES, HOV and BRT - EAST FLATIRON CIRCLE to I-25



GENERAL PURPOSE LANES, HOV and BRT with a BRT STATION

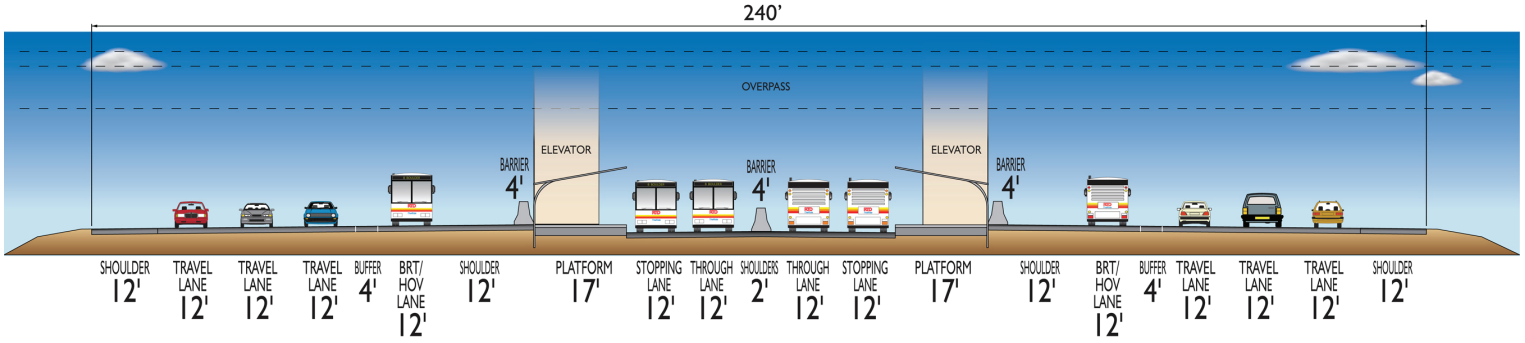
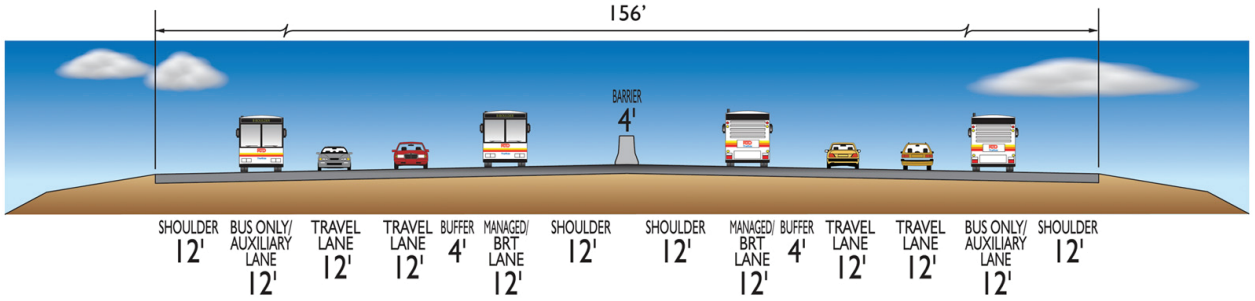


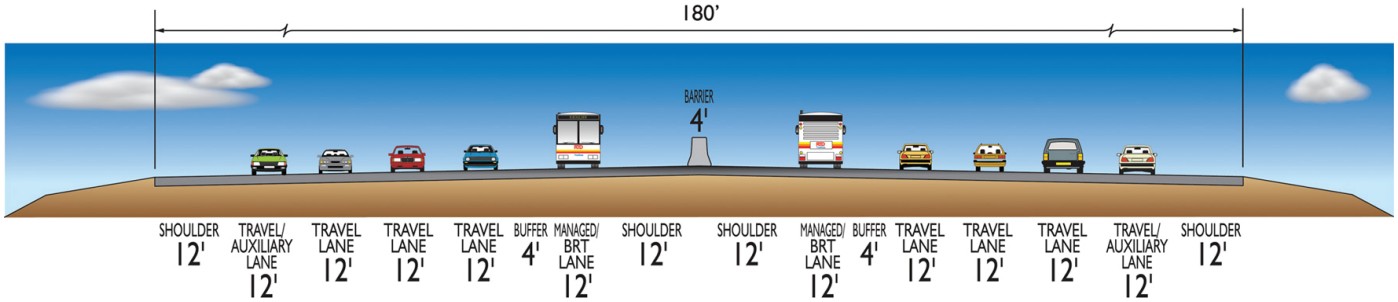
Figure 3 – Typical Sections for Package 4
US 36 Programmatic Biological Assessment

Source: US 36 Mobility Partnership, 2009

GENERAL PURPOSE LANES and MANAGED/BRT - FOOTHILLS PARKWAY to SHERIDAN



GENERAL PURPOSE LANES and MANAGED/BRT - SHERIDAN to PECOS



GENERAL PURPOSE LANES and MANAGED/BRT - PECOS to I-25

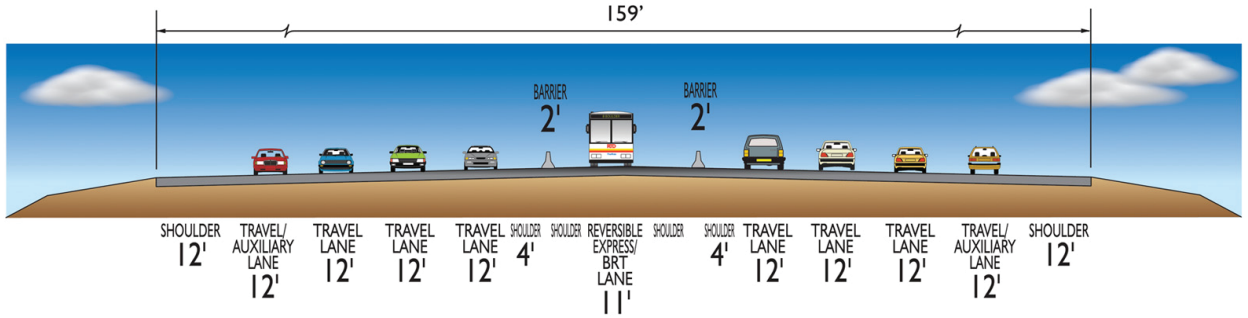
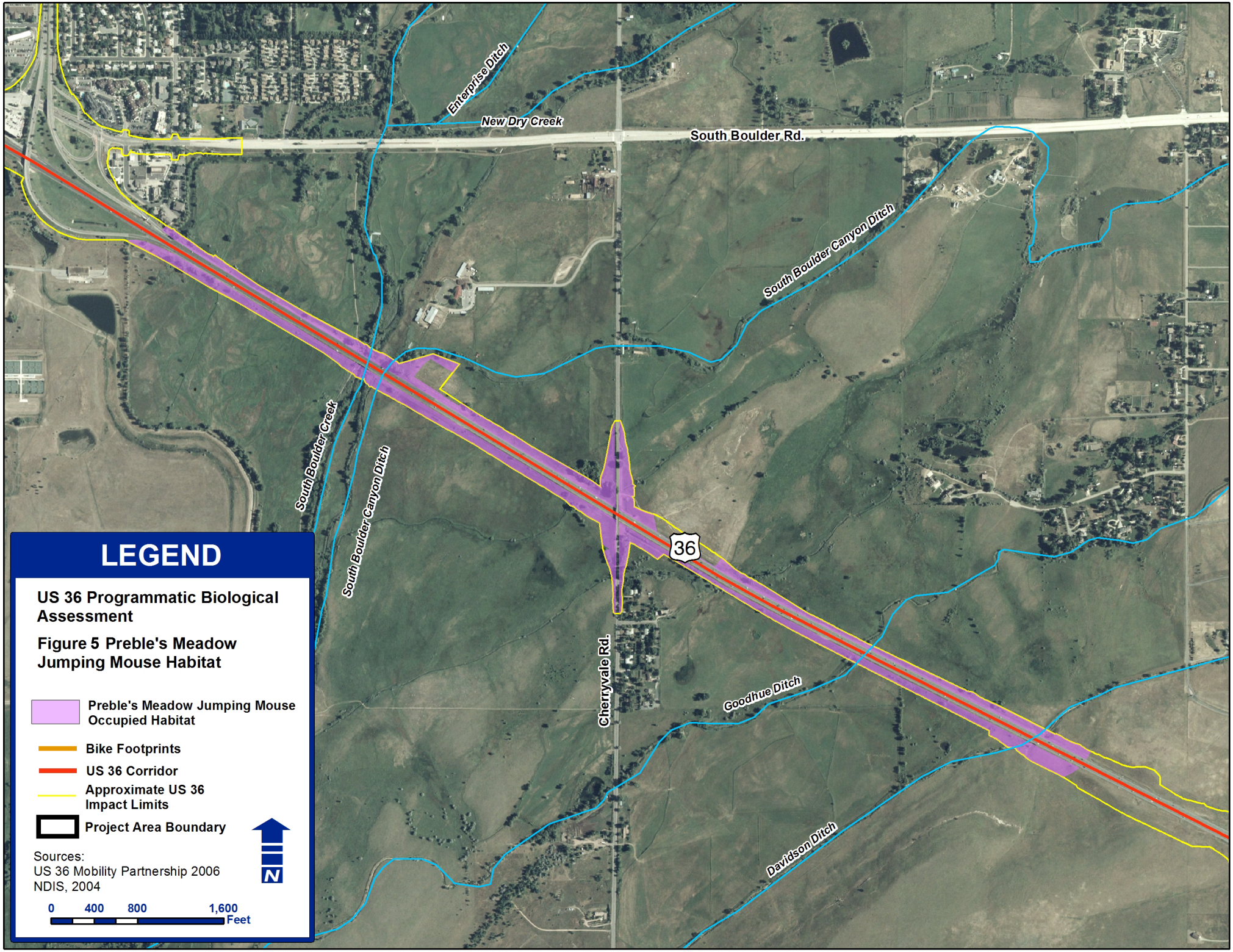
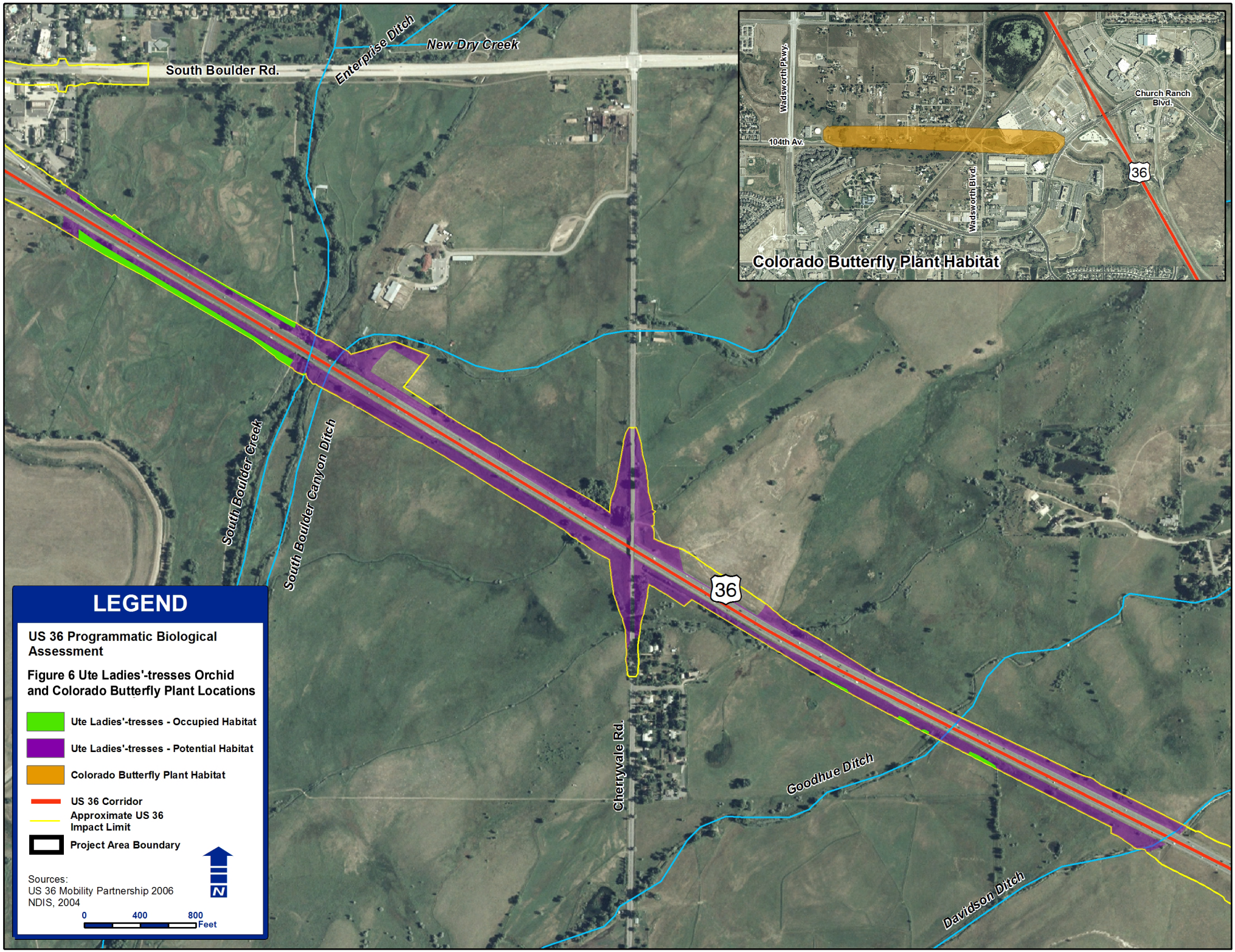


Figure 4 – Typical Sections for the Combined Alternative Package

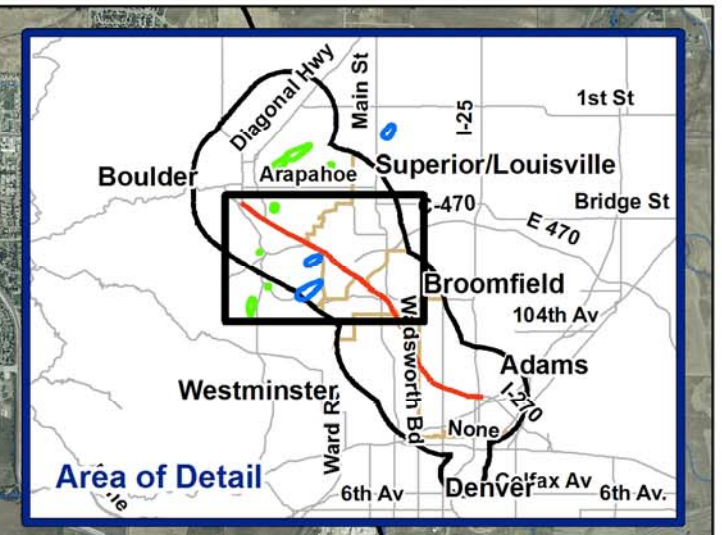
US 36 Programmatic Biological Assessment

Source: US 36 Mobility Partnership, 2009


Enterprise Ditch
New Dry Creek
South Boulder Rd.
South Boulder Canyon Ditch
South Boulder Creek
South Boulder Canyon Ditch
36
Cherryvale Rd.
Goodhue Ditch
Davidson Ditch
LEGEND
US 36 Programmatic Biological Assessment
Figure 5 Preble's Meadow Jumping Mouse Habitat
Preble's Meadow Jumping Mouse Occupied Habitat
Bike Footprints
US 36 Corridor
Approximate US 36 Impact Limits
Project Area Boundary
Sources:
US 36 Mobility Partnership 2006
NDIS, 2004
N
0 400 800 1,600
Feet


South Boulder Rd.
Enterprise Ditch
New Dry Creek
South Boulder Creek
South Boulder Canyon Ditch
Cherryvale Rd.
Goodhue Ditch
Davidson Ditch
36
Wadsworth Pkwy.
104th Av.
Wadsworth Blvd.
Church Ranch Blvd.
Colorado Butterfly Plant Habitat
LEGEND
US 36 Programmatic Biological Assessment
Figure 6 Ute Ladies'-tresses Orchid and Colorado Butterfly Plant Locations
Ute Ladies'-tresses - Occupied Habitat
Ute Ladies'-tresses - Potential Habitat
Colorado Butterfly Plant Habitat
US 36 Corridor
Approximate US 36 Impact Limit
Project Area Boundary
Sources:
US 36 Mobility Partnership 2006
NDIS, 2004
N
0
400
800
Feet

Baseline Rd
Foothills Py
South Boulder Creek Floodplain
Baseline Reservoir
New Dry Creek Ditch
McGinn Ditch
Enterprise Ditch
95th St.
Highline Lateral
N 10th St
Louisville Lake
Goodhue Ditch
96th St.
Broadway
Bear Canyon Creek
South Boulder Creek
Shearer Ditch
Marshallville Ditch
Davidson Ditch
Upper Bear Creek Ditch
Denver/Boulder Turnpike
Lafayette Water Treament Facility
Lafayette ByPass
C-470
Mayhoffer/Singletree
Marshall Lake
Stearns Lake
Coal Creek
Coal Creek Ditch
Spring Brook
Autrey Reservoir
Coal Creek at Highway 128
South Central Grasslands Open Space
Commerce St
120TH Av
Hogan Property
Rock Creek
Upper Church Lake
Wadsworth Bd
Great Western Reservoir
Walnut Creek
Walnut Creek



LEGEND

US 36 Programmatic Biological Assessment

Figure 7A - Map 1 of 2
Overview of Mitigation Site Opportunities

Mitigation Opportunities Identified by:

- City of Boulder Open Space and Mountain Parks
- Boulder County Open Space

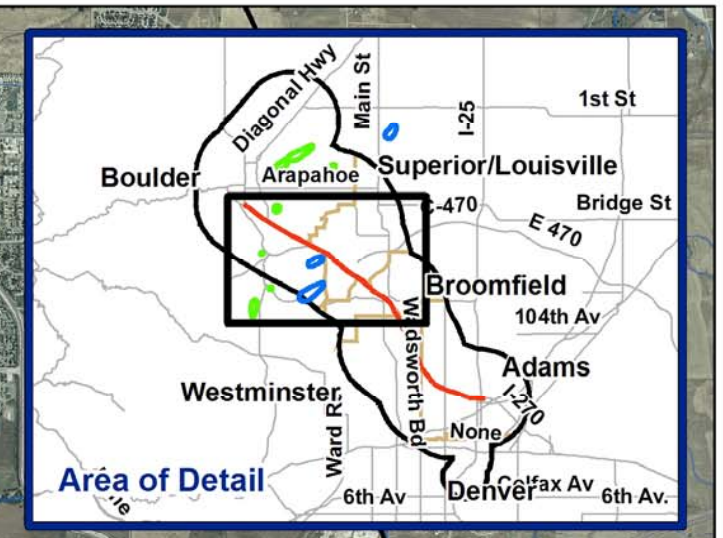
- US 36 Alignment
- Approximate US 36 Impact Limits
- Project Area Boundary

Source:
US 36 Mobility Partnership 2009

N

0 2,000 4,000 8,000 Feet

Baseline Rd
Foothills Py
South Boulder Creek Floodplain
Baseline Reservoir
New Dry Creek Ditch
McGinn Ditch
Enterprise Ditch
Louisville Lake
Goodhue Ditch
95th St.
96th St.
Highline Lateral
N 10th St
Broadway
Bear Canyon Creek
South Boulder Creek
Shearer Ditch
Marshallville Ditch
Davidson Ditch
Upper Bear Creek Ditch
Denver/Boulder Turnpike
Lafayette Water Treament Facility
Lafayette ByPass
C-470
Mayhoffer/Singletree
Marshall Lake
Stearns Lake
Coal Creek
Coal Creek Ditch
Autrey Reservoir
Commerce St
Spring Brook
Coal Creek at Highway 128
South Central Grasslands Open Space
120TH Av
Hogan Property
Rock Creek
Upper Church Lake
Wadsworth Bd
Great Western Reservoir
Walnut Creek
Walnut Creek



LEGEND

US 36 Programmatic Biological Assessment

Figure 7B - Map 2 of 2
Overview of Mitigation Site Opportunities

Mitigation Opportunities Identified by:

- City of Boulder Open Space and Mountain Parks
- Boulder County Open Space

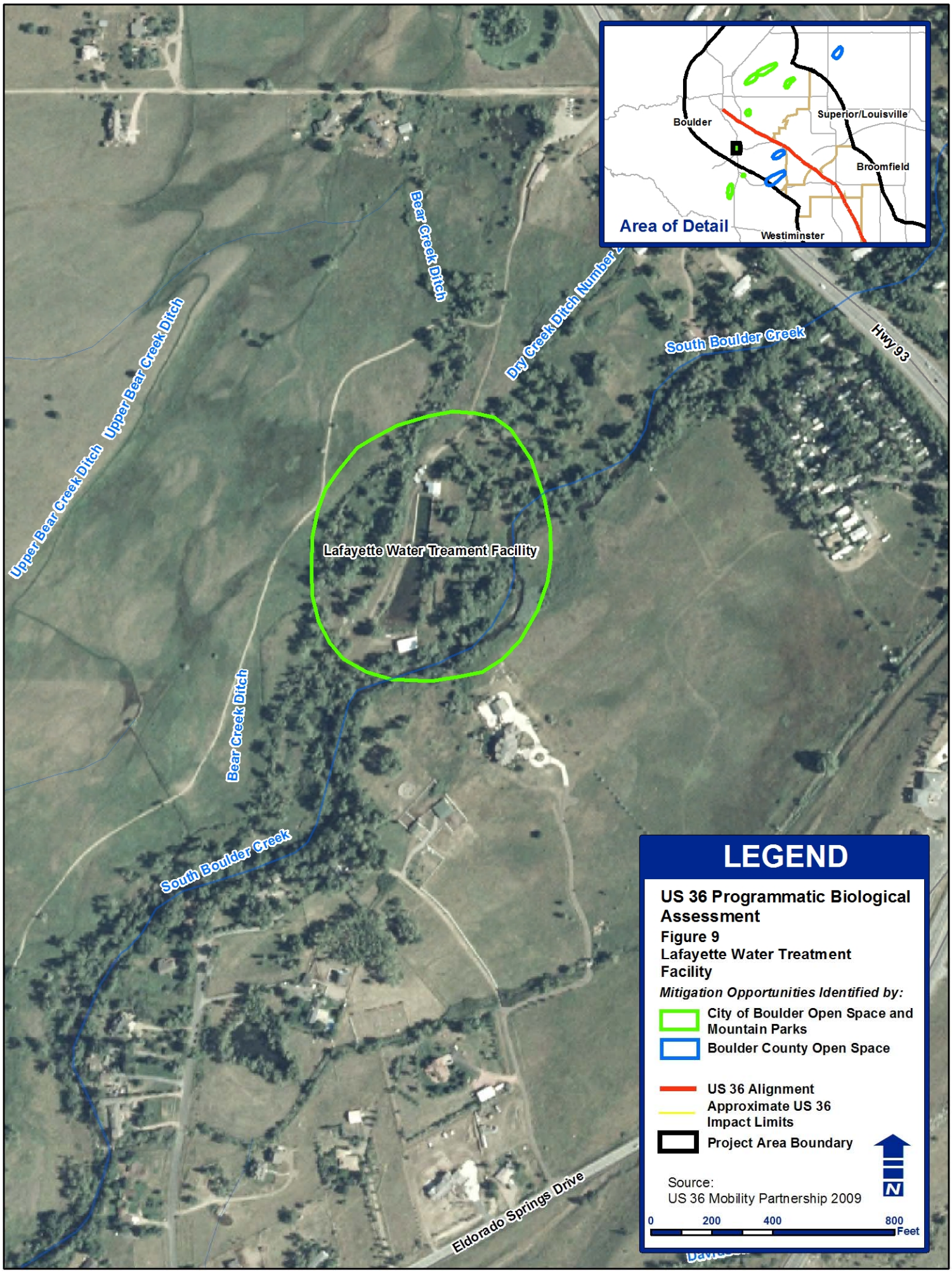
- US 36 Alignment
- Approximate US 36 Impact Limits
- Project Area Boundary

Source:
US 36 Mobility Partnership 2009

N

0 2,000 4,000 8,000 Feet


Boulder
Superior/Louisville
Broomfield
Westminster
Area of Detail
Baseline Road
South Boulder Creek Floodplain
South Boulder Creek
East Boulder Ditch
Enterprise Ditch
Cherryvale Road
South Boulder Road
LEGEND
US 36 Programmatic Biological Assessment
Figure 8
South Boulder Creek Floodplain
Mitigation Opportunities Identified by:
City of Boulder Open Space and Mountain Parks
Boulder County Open Space
US 36 Alignment
Approximate US 36 Impact Limits
Project Area Boundary
Source:
US 36 Mobility Partnership 2009
N
0
350
700
1,400
Feet


Area of Detail
Boulder
Superior/Louisville
Broomfield
Westminster
Bear Creek Ditch
Upper Bear Creek Ditch
Upper Bear Creek Ditch
Dry Creek Ditch Number 2
South Boulder Creek
Hwy 93
Lafayette Water Treament Facility
Bear Creek Ditch
South Boulder Creek
Eldorado Springs Drive
LEGEND
US 36 Programmatic Biological Assessment
Figure 9
Lafayette Water Treatment Facility
Mitigation Opportunities Identified by:
City of Boulder Open Space and Mountain Parks
Boulder County Open Space
US 36 Alignment
Approximate US 36 Impact Limits
Project Area Boundary
Source:
US 36 Mobility Partnership 2009
N
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200
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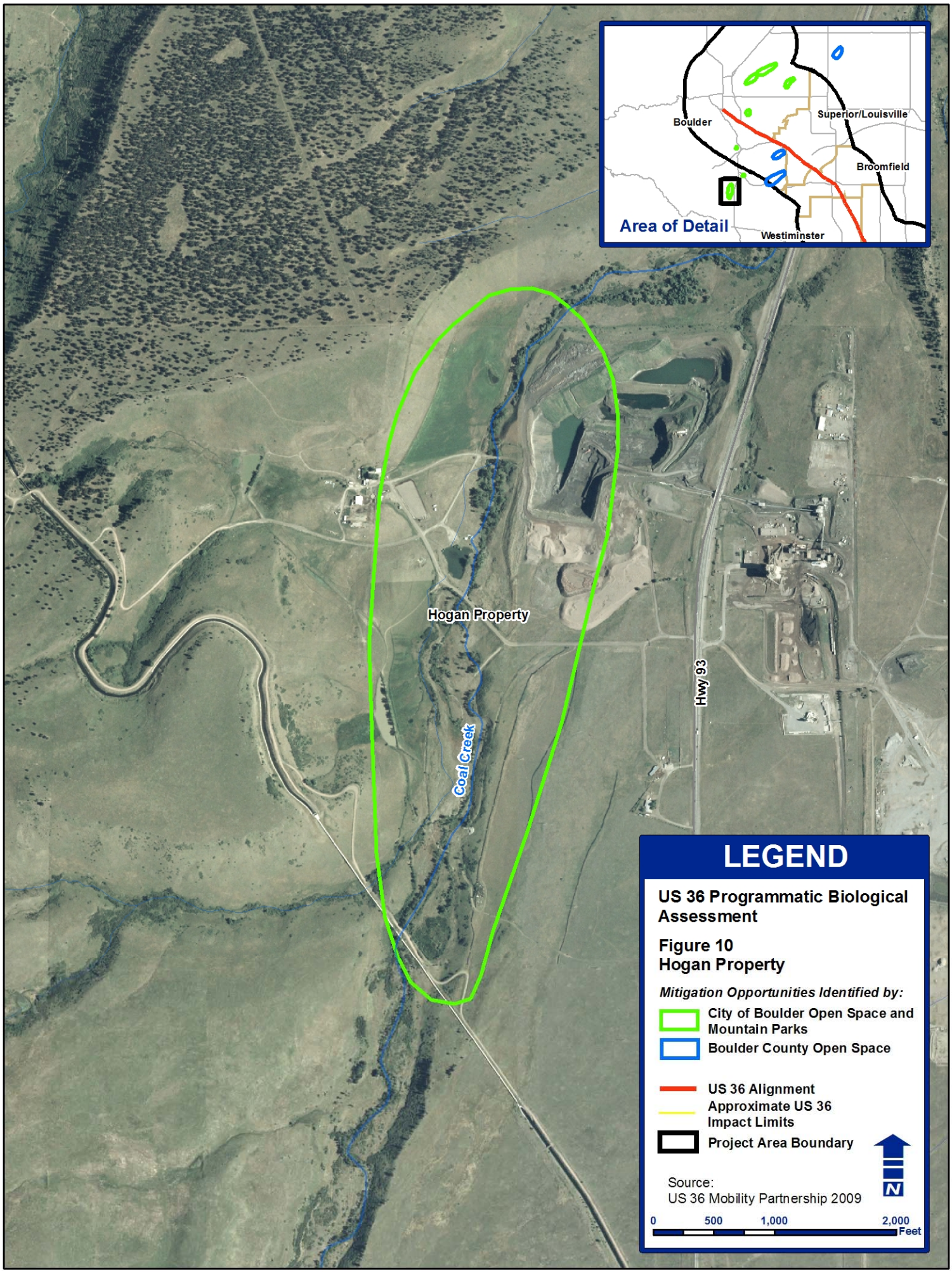
Feet


Boulder
Superior/Louisville
Broomfield
Area of Detail
Westminster
Hogan Property
Coal Creek
Hwy 93
LEGEND
US 36 Programmatic Biological Assessment
Figure 10
Hogan Property
Mitigation Opportunities Identified by:
City of Boulder Open Space and Mountain Parks
Boulder County Open Space
US 36 Alignment
Approximate US 36 Impact Limits
Project Area Boundary
Source:
US 36 Mobility Partnership 2009
N
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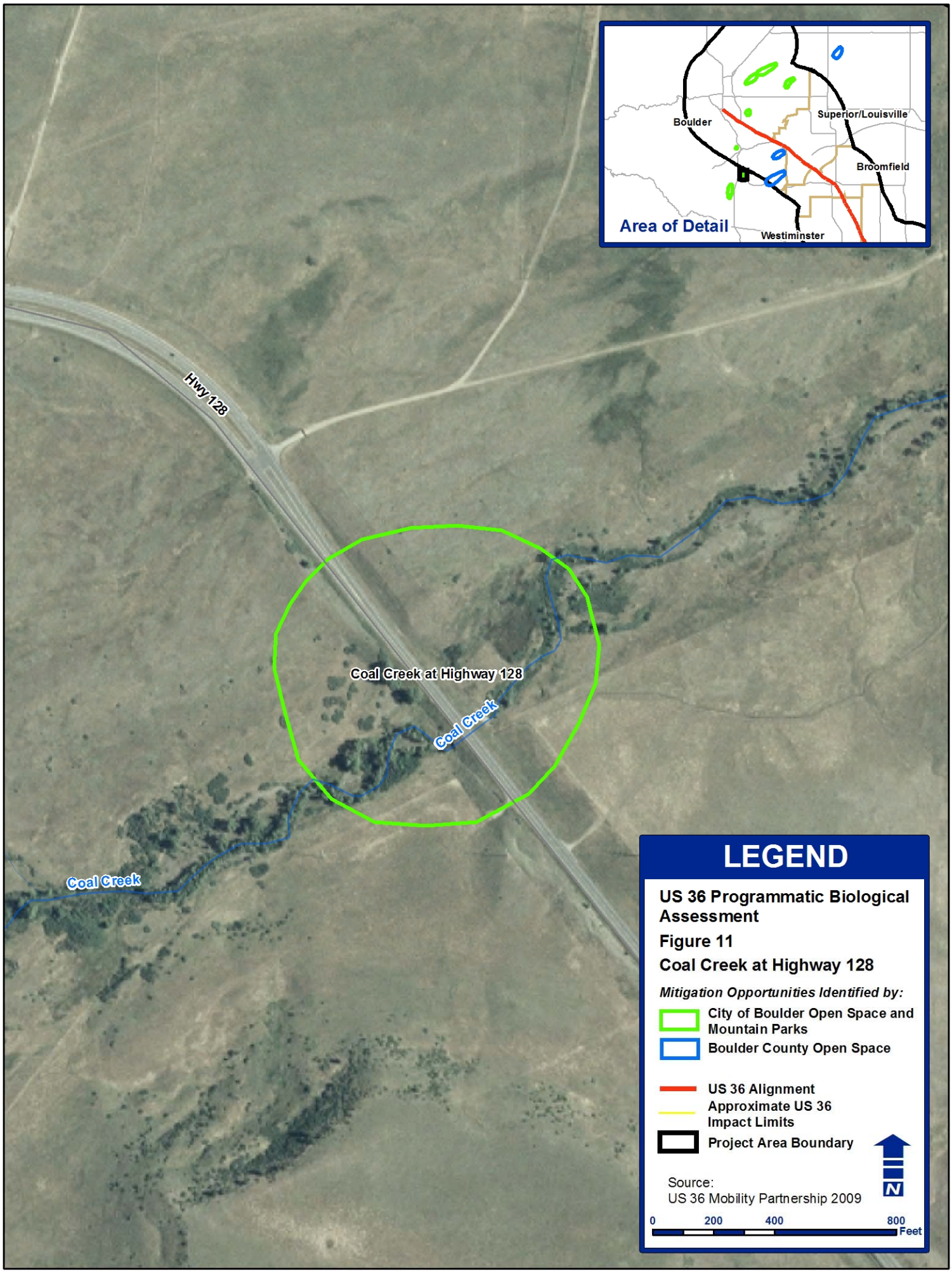
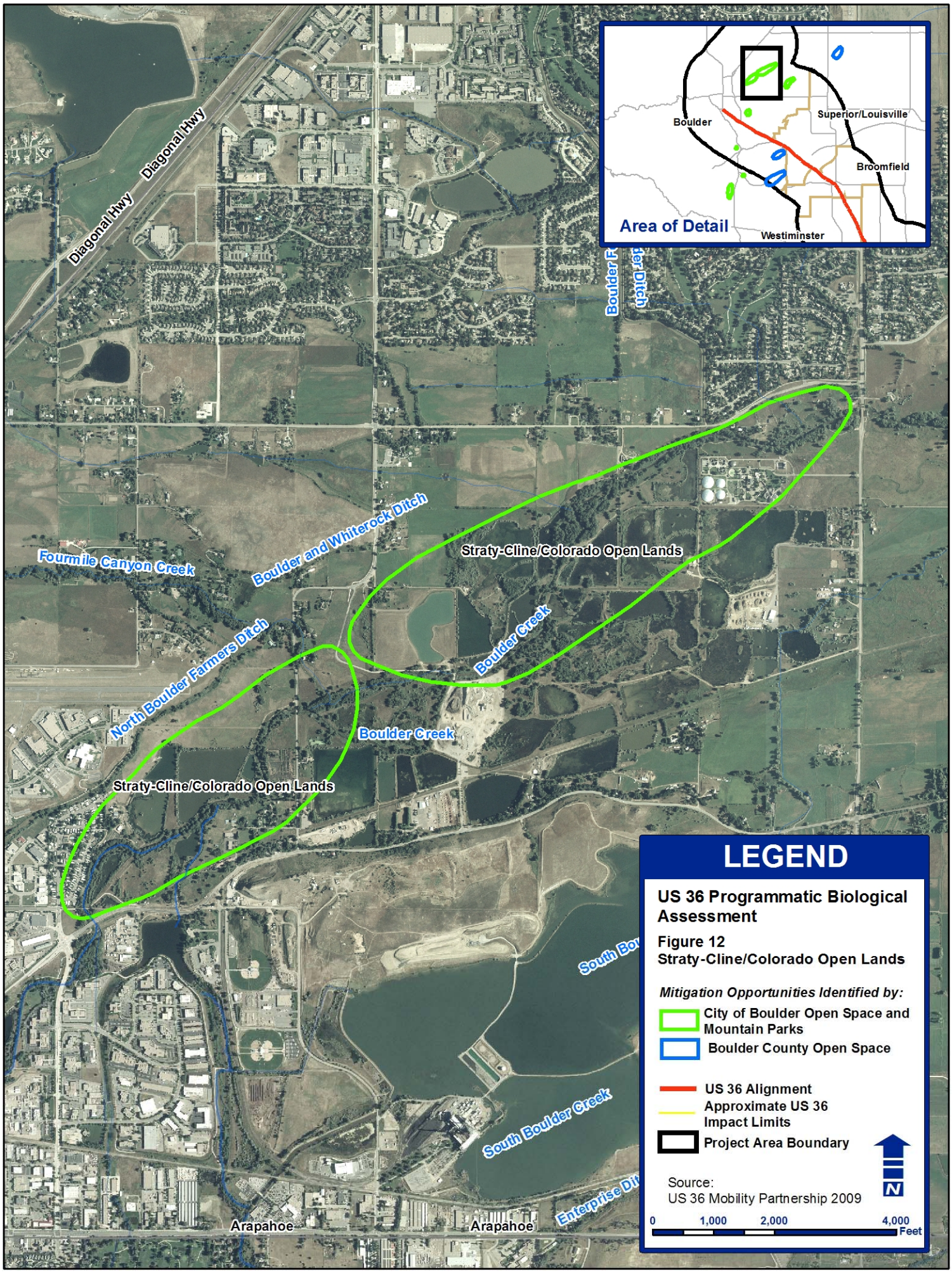
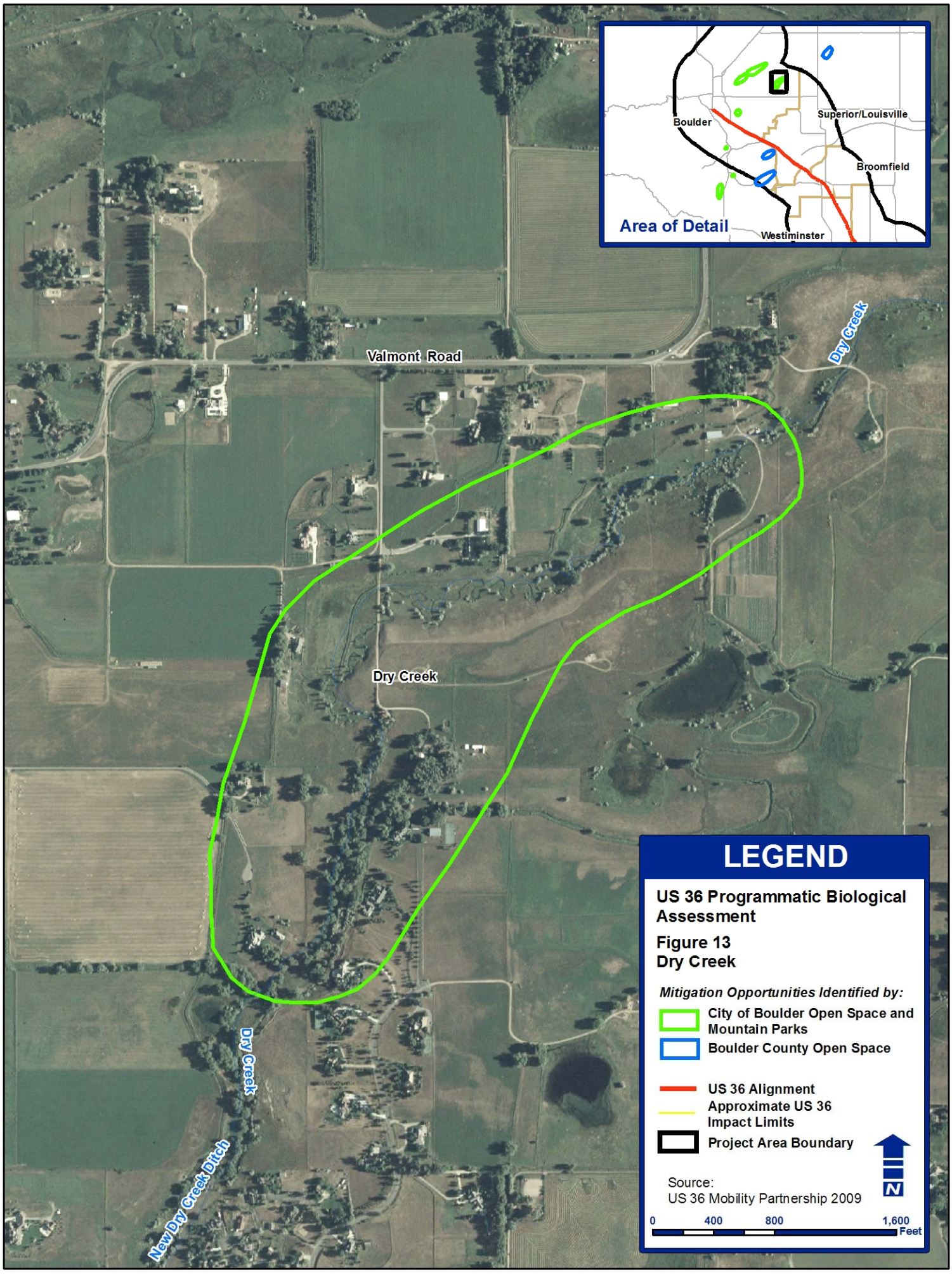
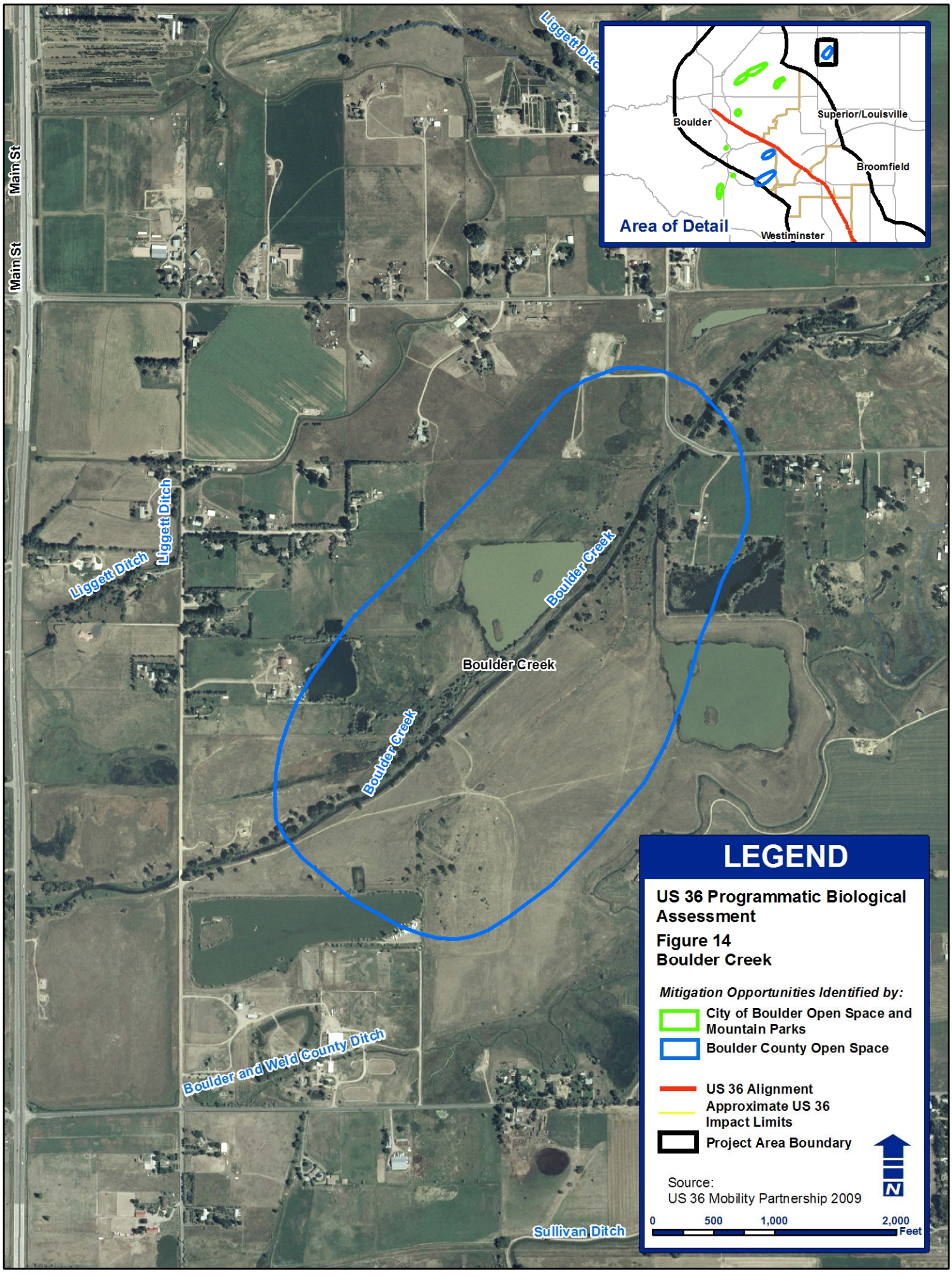
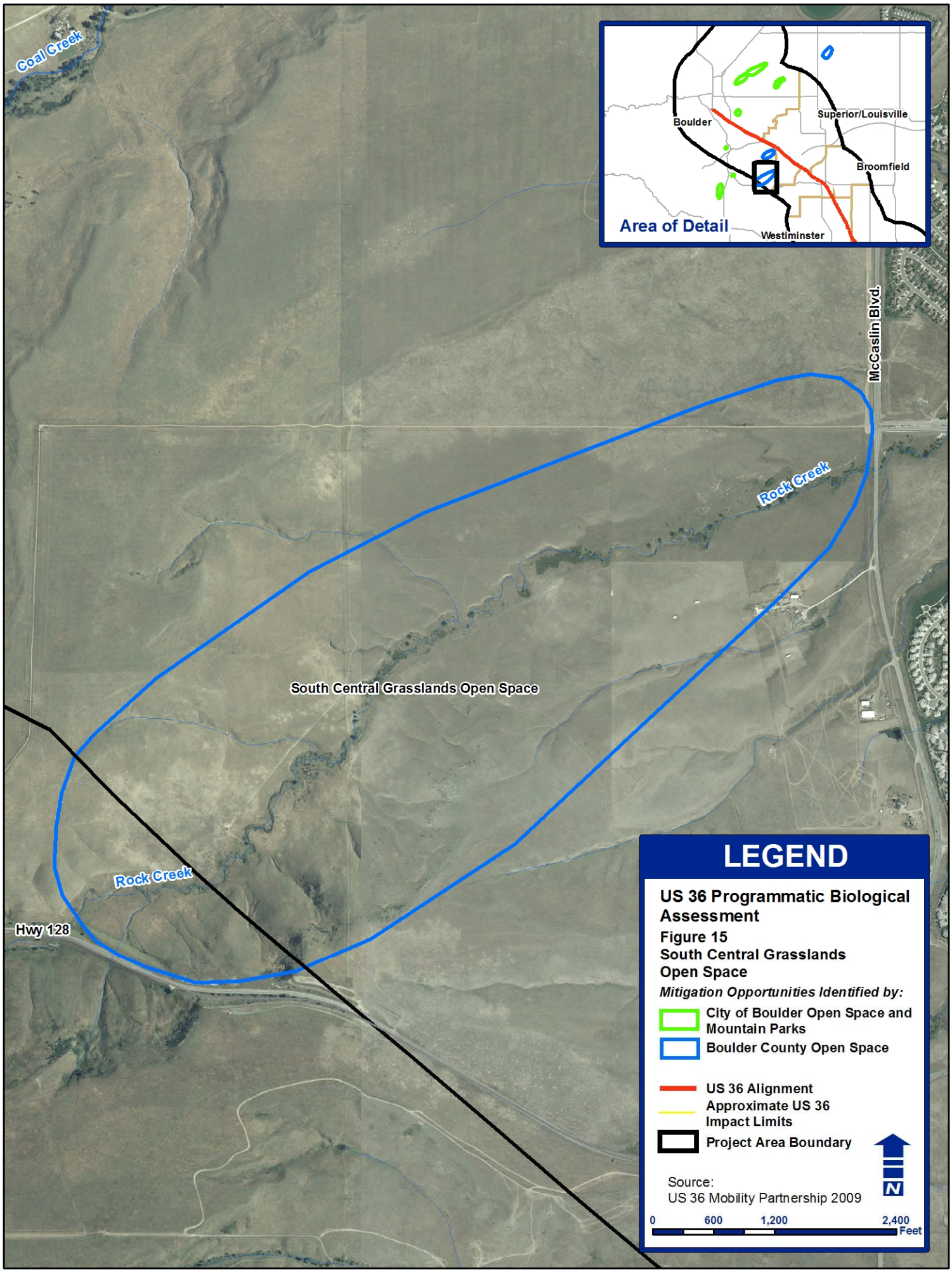
500
1,000
2,000
Feet


Boulder
Superior/Louisville
Broomfield
Westminster
Area of Detail
Hwy 128
Coal Creek at Highway 128
Coal Creek
Coal Creek
LEGEND
US 36 Programmatic Biological Assessment
Figure 11
Coal Creek at Highway 128
Mitigation Opportunities Identified by:
City of Boulder Open Space and Mountain Parks
Boulder County Open Space
US 36 Alignment
Approximate US 36 Impact Limits
Project Area Boundary
Source:
US 36 Mobility Partnership 2009
N
0
200
400
800
Feet


Diagonal Hwy
Diagonal Hwy
Boulder
Superior/Louisville
Broomfield
Westminster
Area of Detail
Boulder and Whiterock Ditch
Fourmile Canyon Creek
Straty-Cline/Colorado Open Lands
Boulder Creek
North Boulder Farmers Ditch
Boulder Creek
Straty-Cline/Colorado Open Lands
South Boulder Creek
Arapahoe
Arapahoe
LEGEND
US 36 Programmatic Biological Assessment
Figure 12
Straty-Cline/Colorado Open Lands
Mitigation Opportunities Identified by:
City of Boulder Open Space and Mountain Parks
Boulder County Open Space
US 36 Alignment
Approximate US 36 Impact Limits
Project Area Boundary
Source:
US 36 Mobility Partnership 2009
N
0
1,000
2,000
4,000
Feet


Boulder
Superior/Louisville
Broomfield
Westminster
Area of Detail
Valmont Road
Dry Creek
Dry Creek
Dry Creek
New Dry Creek Ditch
LEGEND
US 36 Programmatic Biological Assessment
Figure 13
Dry Creek
Mitigation Opportunities Identified by:
City of Boulder Open Space and Mountain Parks
Boulder County Open Space
US 36 Alignment
Approximate US 36 Impact Limits
Project Area Boundary
Source:
US 36 Mobility Partnership 2009
N
0
400
800
1,600
Feet


Liggett Ditch
Main St
Main St
Liggett Ditch
Liggett Ditch
Boulder Creek
Boulder Creek
Boulder Creek
Boulder and Weld County Ditch
Sullivan Ditch
Boulder
Superior/Louisville
Broomfield
Westminster
Area of Detail
LEGEND
US 36 Programmatic Biological Assessment
Figure 14
Boulder Creek
Mitigation Opportunities Identified by:
City of Boulder Open Space and Mountain Parks
Boulder County Open Space
US 36 Alignment
Approximate US 36 Impact Limits
Project Area Boundary
Source:
US 36 Mobility Partnership 2009
N
0
500
1,000
2,000
Feet


Coal Creek
Boulder
Superior/Louisville
Broomfield
Westminster
Area of Detail
McCaslin Blvd.
Rock Creek
South Central Grasslands Open Space
Rock Creek
Hwy 128
LEGEND
US 36 Programmatic Biological Assessment
Figure 15
South Central Grasslands Open Space
Mitigation Opportunities Identified by:
City of Boulder Open Space and Mountain Parks
Boulder County Open Space
US 36 Alignment
Approximate US 36 Impact Limits
Project Area Boundary
Source:
US 36 Mobility Partnership 2009
N
0
600
1,200
2,400
Feet


Denver/Boulder Turnpike
Boulder
Superior/Louisville
Broomfield
Westminster
Area of Detail
Coal Creek Ditch
McCaslin Blvd.
Coal Creek
Mayhoffer/Singletree
Coal Creek Ditch
Coal Creek
Coal Creek Ditch
Coal Creek Ditch
LEGEND
US 36 Programmatic Biological Assessment
Figure 16
Mayhoffer/Singletree
Mitigation Opportunities Identified by:
City of Boulder Open Space and Mountain Parks
Boulder County Open Space
US 36 Alignment
Approximate US 36 Impact Limits
Project Area Boundary
Source:
US 36 Mobility Partnership 2009
N
0
500
1,000
2,000
Feet

Attachment B
Photographs of Mitigation Site Opportunities

Photo 1. View north of Site 1, South Boulder Creek Floodplain

Photo 2. View southeast of Site 1, South Boulder Creek Floodplain

Photo 3. View southwest of Site 2, Lafayette Water Treatment Facility, at holding pond

Photo 4. View northwest at Site 2, Lafayette Water Treatment Facility, at treatment pond

Photo 5. View west at Site 2, Lafayette Water Treatment Facility, at South Boulder Creek

Photo 6. View west at Site 3, Hogan Property; Coal Creek is visible

Photo 7. View west at Site 4, Coal Creek at State Highway 128; photo taken from west side of State Highway 128

Photo 8. View southwest at Site 4, Coal Creek at State Highway 128; photo taken of culvert from west side of State Highway 128

Photo 9. View west at Site 5, Straty-Cline/Colorado Open Lands, at Boulder Creek

Photo 10. View west at Site 5, Straty-Cline/Colorado Open Lands, at fill adjacent to Boulder Creek in the northern portion of the site

Photo 11. View northwest at Site 5, Straty-Cline/Colorado Open Lands, gravel pit pond north of Boulder Creek

Photo 12. View southwest at Site 5, Straty-Cline/Colorado Open Lands, gravel pit pond north of Boulder Creek

Photo 13. View southwest at Site 6, Dry Creek

Photo 14. View southeast at Site 6, Dry Creek

Photo 15. View northwest at Site 7, Boulder Creek

Photo 16. View east at Site 7, Boulder Creek

Photo 17. View east at Site 8, South Central Grasslands Open Space, at Rock Creek

Photo 18. View southwest at Site 8, South Central Grasslands Open Space, at the eastern culvert opening under State Highway 128 at Rock Creek

Photo 19. View west at Site 9, Mayhoffer/Singletree Property, at Coal Creek

Photo 20. View southeast at Site 9, Mayhoffer/Singletree Property; Coal Creek corridor is visible in background and to the right of trail