



Paleontology Technical Report - I-270 Corridor Improvements Environmental Impact Statement

Federal Project No.: STU 2706-043

CDOT Project Code: 25611

Identification Number: FHWA-CO-EIS-24-001

July 2025



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Acronyms and Abbreviations

Acronym	Definition
BNSF	BNSF Railway
CDOT	Colorado Department of Transportation
CRS	Colorado Revised Statute
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
I-25	Interstate 25
I-270	Interstate 270
I-70	Interstate 70
I-76	Interstate 76
ITS	Intelligent Transportation Systems
mph	miles per hour
NEPA	National Environmental Policy Act
UPRR	Union Pacific Railroad

1.0 Introduction

The Federal Highway Administration (FHWA) and Colorado Department of Transportation (CDOT) are preparing an Environmental Impact Statement (EIS) to evaluate potential improvements to the Interstate 270 (I-270) corridor. FHWA and CDOT are the lead agencies for this National Environmental Policy Act (NEPA) process, which was initiated in 2020, initially anticipating an Environmental Assessment. Moving into 2023, CDOT determined a more detailed environmental review was needed and requested that an EIS be prepared.

This technical report evaluates and documents potential impacts to and recommended mitigation measures for paleontological resources. It supports the analysis and conclusions in the EIS.

1.1 Project Description

I-270 in Colorado is a controlled-access interstate highway with two through lanes in each direction between Interstate 25 (I-25) and Interstate 70 (I-70) in central Denver and Commerce City (Figure 1). It has a posted speed limit of 55 miles per hour (mph). The project limits include the I-270 interchanges with Interstate 76 (I-76), York Street, Vasquez Boulevard, and Quebec Street. The project will tie into the I-25 and I-70 system interchanges but improvements to these interchanges are part of projects on I-25 and I-70 and will be designed and approved separately.

The purpose of the I-270 Corridor Improvements Project is to implement transportation solutions that modernize the I-270 Corridor to accommodate existing and forecasted transportation demands. The project needs are:

- Traveler safety on the corridor,
- Travel time and reliability on the corridor,
- Transit on the corridor,
- Bicycle and pedestrian connectivity across I-270, and
- Freight operations on the corridor.

In addition to addressing project needs, CDOT, FHWA, and Cooperating and Participating Agencies have established a key project goal: to minimize environmental and community impacts resulting from the project.

Figure 1. I-270 Corridor Improvements Project Limits


2.0 Alternatives

CDOT developed a range of potential alternatives for I-270 improvements. The alternatives ranged from no improvements to minimal infrastructure improvements without added highway capacity to alternatives that added one or two travel lanes in each direction, which could be operated as transit, general-purpose, or Express Lanes.

A two-level alternatives evaluation process was used to screen the alternatives based on the project's purpose and need and goal, and two build alternatives were carried forward for detailed analysis in the EIS:

- Three General-Purpose Lanes Alternative
- Two General-Purpose Lanes and One Express Lane that Accommodates Transit Alternative

The No Action Alternative is also fully evaluated as a baseline for comparison.

Additional information on the alternatives development and evaluation process is included in the Alternatives Development Technical Report.

2.1 No Action Alternative

The No Action Alternative evaluates operations of I-270 if a build alternative would not occur along the corridor. It does not address the project Purpose and Need but is carried forward as a baseline for comparison. This alternative would maintain the existing highway configuration of two general-purpose travel lanes in each direction. Bridges and pavement would be maintained and repaired continuously, but underlying infrastructure deficiencies would remain.

The No Action Alternative would include substantial ongoing maintenance and the rehabilitation of 19 existing structures, including seven locations that have structures that are or will be reaching the end of their useful life. The age of the structure, recent bridge inspections, and current ongoing maintenance costs, both planned and emergency maintenance, determine if a structure is or will be reaching the end of its useful life. The seven structure locations along the I-270 corridor that are or will be reaching the end of their useful life are as follows:

- Vasquez Bridge over Sand Creek (E-17-AT)
- York Street Bridge over I-270 (E-17-IC)
- I-270 over South Platte River Eastbound and Westbound Bridges (E-17-IE & E-17-ID)
- I-270 over Burlington Ditch Eastbound and Westbound Bridges (E-17-IG & I-17-IF)
- I-270 over Brighton Boulevard, Union Pacific Railroad (UPRR) and BNSF Railway (BNSF) Eastbound and Westbound Bridges (E-17-II & E-17-IH)
- I-270 over 60th Avenue & BNSF Eastbound and Westbound Bridges (E-17-IK & E-17-IJ)
- I-270 over East 56th Avenue Eastbound and Westbound (E-17-IO & E-17-IN)

The cross section would remain unchanged along I-270 under the No Action Alternative. The No Action Alternative cross sections are shown on Figure 2 and Figure 3.

Figure 2. No Action Alternative (west of Vasquez Boulevard)

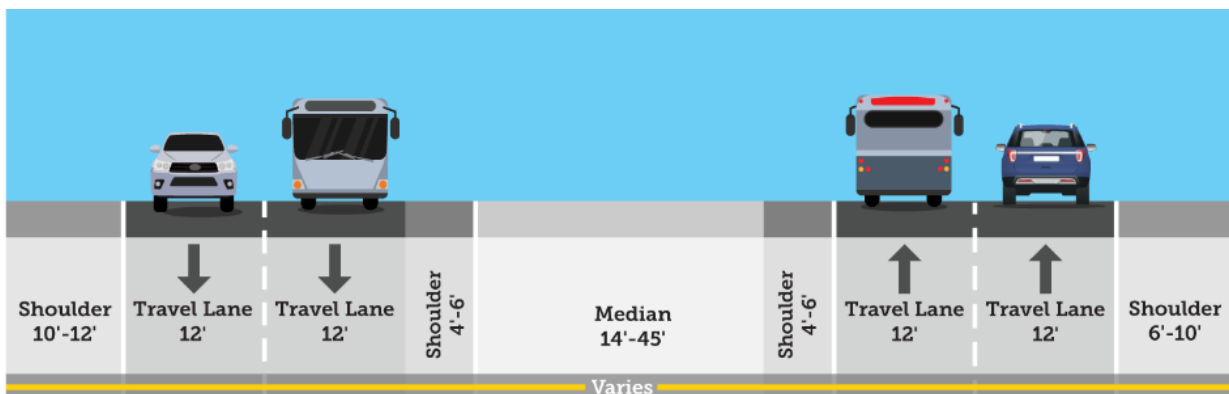
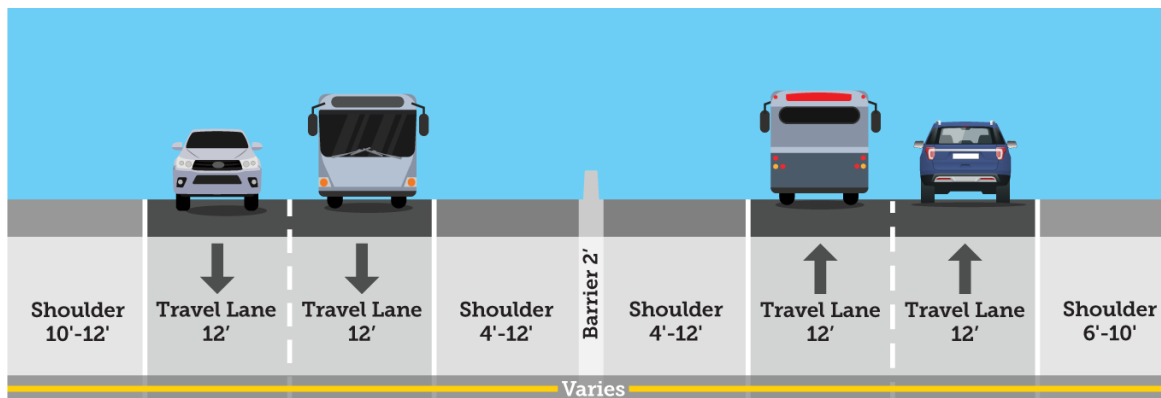


Figure 3. No Action Alternative (east of Vasquez Boulevard)



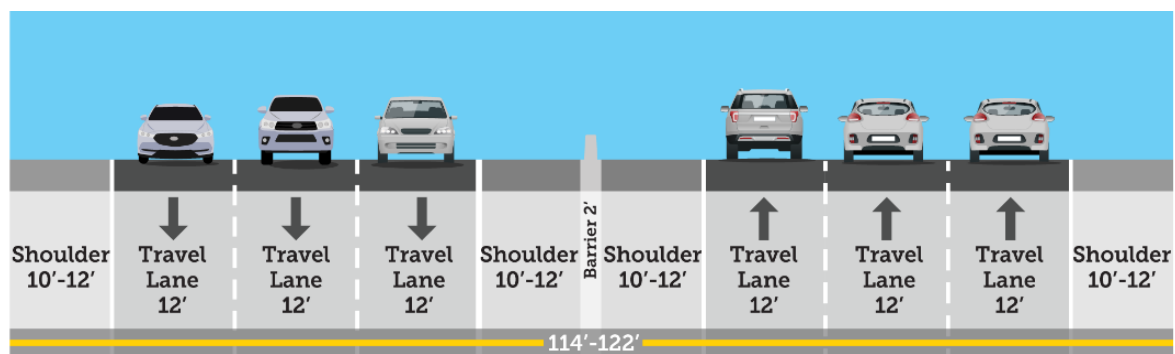
2.2 Build Alternatives

The build alternatives include improving the operational and physical conditions of the I-270 highway; reconfiguring interchanges and ramps; enhancing transit on the corridor; improving bicycle and pedestrian access across I-270; replacing deficient bridges and other infrastructure; and providing modern drainage, water quality, intelligent transportation systems (ITS), and other supporting infrastructure. Both add one new travel lane in each direction and have similar footprints, varying primarily by how the additional travel operates.

2.3 Three General Purpose Lanes Alternative

This alternative would reconstruct I-270 to provide three general-purpose lanes in each direction, as shown in Figure 4.

Figure 4. Three General-Purpose Lanes Alternative



This alternative includes:

Mainline Improvements

- Providing three general-purpose lanes in each direction
- Widening shoulders to meet current standards
- Restriping of the westbound I-270 to northbound I-25 off-ramp to provide dual-exit lane capacity
- Adding emergency turnouts and turnaround.
- Adding one continuous auxiliary lane in each direction between the I-76 and Vasquez Boulevard on-ramps and off-ramps

Interchange Improvements

- Adding an eastbound collector ramp to consolidate incoming movements from the I-76 on-ramps
- Separating the westbound I-270 York Street and I-76 off-ramps
- Improving the Vasquez Boulevard interchange design with improved westbound on-ramp acceleration lanes and the eastbound off-ramp deceleration lanes
- Improving the Quebec Street interchange ramp acceleration and deceleration lengths

Bridge Improvements

- Reconstructing bridges that are at, or will be reaching, the end of their useful life. Bridges carrying travel lanes on I-270 include widening to accommodate additional lanes
 - Replacing the existing York Street bridge over I-270 to meet current bridge standards, accommodate an additional travel lane in each direction on York Street, include a 10-foot multi-use path and a 5-foot sidewalk, and enhance lighting
 - Replacing the existing I-270 bridges over the South Platte River Trail to meet current bridge standards, accommodate this project's bicycle and pedestrian improvements on the South Platte River Trail, and enhance lighting
 - Replacing the existing I-270 bridges over the Burlington Ditch to meet current bridge standards, accommodate future bicycle and pedestrian improvements, and enhance lighting
 - Replacing the existing I-270 bridges over Brighton Boulevard to meet current bridge standards, accommodate this project's bicycle and pedestrian improvements on Brighton Boulevard and future bicycle and pedestrian improvements by others, and enhance lighting
 - Replacing the existing I-270 bridges over East 60th Avenue and the BNSF crossing to meet current bridge standards, accommodate future bicycle and pedestrian improvements, and enhance lighting
 - Replacing the existing I-270 bridges over East 56th Avenue to meet current bridge standards, accommodate this project's bicycle and pedestrian improvements, and enhance lighting
 - Replacing the existing Vasquez Boulevard bridge over Sand Creek to meet current bridge standards and accommodate this project's bicycle and pedestrian improvements

Bicycle and Pedestrian Improvements

- Improving the York Street I-270 ramp terminal intersections with crosswalks, curb ramps, and pedestrian indicators at the ramp terminal traffic signals
- Adding a new 5-foot sidewalk on the west side and reconstructing a 6-foot sidewalk on the east side of Brighton Boulevard under I-270
- Reconstructing East 56th Avenue under I-270 and adding an on-street bicycle lane, a 10-foot multi-use path, and 6-foot sidewalk connecting to existing sidewalks
- Improving the intersection at East 56th Avenue and South Sandcreek Drive to include curb ramps, crosswalks, and lighting that meet current standards
- Improving the intersection at East 56th Avenue and Eudora Street to include curb ramps, crosswalks, and lighting that meet current standards
- Adding attached sidewalks on the west side of South Sandcreek Drive. The new sidewalks would be 8 feet wide from Quebec Street to East 47th Avenue Drive and 6 feet wide from East 47th Avenue Drive to East 49th Avenue, with a pedestrian crosswalk across East 47th Avenue Drive connecting the two segments
- Improving wayfinding at key locations, guiding bicyclists and pedestrians to the nearest RTD bus stops, major road connections, or distances to the next trailhead to avoid out-of-direction travel

Trail Improvements

- Reconfiguring the South Platte River Trail crossing under I-270 to improve bicycle and pedestrian visibility around tight curves and increase vertical clearance from the I-270 overpass
- Improving bicycle and pedestrian visibility on the Sand Creek Trail by straightening out tight curves, adding a center stripe, and enhancing lighting at the Vasquez Boulevard bridge over the Sand Creek Trail
- Adding a multi-use path with bicycle and pedestrian underpasses crossing under two free-flow interchange ramps on the east side of Vasquez Boulevard through the interchange with enhanced lighting
- Adding a multi-use path on the east and west sides of the Vasquez Boulevard bridge over Sand Creek, connecting users from the East 56th Avenue and Vasquez Boulevard intersection to a new connection to the Sand Creek Trail
- Adding a multi-use trail spur, connecting the proposed north-south Vasquez Boulevard multi-use trail to the East 56th Avenue and South Sandcreek Drive intersection
- Adding a multi-use path in the southeast corner of East 56th Avenue and South Sandcreek Drive
- Adding a 10-foot-wide bicycle and pedestrian overpass over I-270 and South Sandcreek Drive approximately halfway between East 56th Avenue and Quebec Street

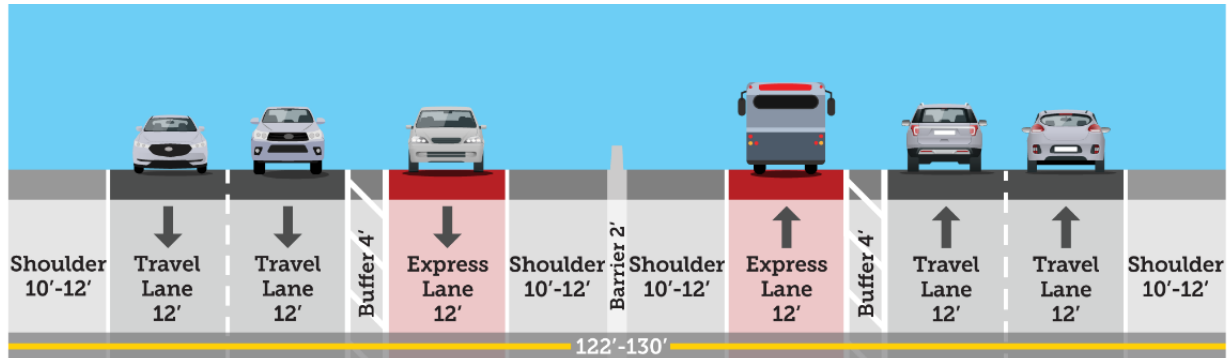
Transit Improvements

- Adding four new bus stops with connecting sidewalks and curb ramps on Quebec Street and South Sandcreek Drive near the I-270/Quebec Street interchange to improve access to RTD routes 88 and 37

2.4 Two General-Purpose Lanes and One Express Lane that Accommodates Transit Alternative

This alternative would reconstruct I-270 with two general-purpose lanes and one Express Lane in each direction, as shown in Figure 5. Transit vehicles and high-occupancy vehicles (three or more people) could travel in the Express Lane, free of charge. Other travelers, including freight trucks, who choose to pay a fee could also use the new Express Lane.

Figure 5. Two General-Purpose Lanes and One Express Lane that Accommodates Transit Alternative



This alternative includes:

Mainline Improvements

- Providing two general-purpose lanes and one Express Lane in each direction that accommodates transit
- Remainder of mainline improvements identified in the Three General-Purpose Lanes Alternative

Interchange Improvements

This alternative includes the same interchange improvements identified in the Three General-Purpose Lanes Alternative.

Bridge Improvements

This alternative includes the same bridge improvements identified in the Three General-Purpose Lanes Alternative.

Bicycle, Pedestrian, Trail, and Transit Improvements

This alternative includes the same bicycle, pedestrian, trail, and transit enhancements identified in the Three General-Purpose Lanes Alternative.

3.0 Regulatory Context

3.1 Federal Regulations

While not specifically called out in the NEPA, fossils, which are formed from the remains or traces of extinct organisms, are considered a non-renewable resource and are therefore, broadly protected under general federal environmental protection rules. In addition, the Paleontological Resource Preservation Act of 2009 (Paleontological Resource Preservation Act, 2009) protects fossils, particularly of vertebrate animals, on federally owned and administered lands. Stricter rules may apply in the National Park System and some other federally administered lands.

3.2 State and Local Regulations

Colorado protects fossils on land owned by the state or by subdivisions of state government. The Historical, Prehistorical, and Archaeological Resources Act (Colorado Revised Statute [CRS] 24-80-401 [State Antiquities Act]) (Historical, Prehistorical, and Archaeological Resources Act, 1973) reserves ownership of fossils on state land as well as land administered by counties, cities, and other subdivisions to the State of Colorado. Permits issued by the State Historical Preservation Office are required to collect, destroy, or otherwise remove fossil localities covered by this law, and a requirement to avoid damage to fossil localities without such a permit is implied.

4.0 Methods

Standard pre-project paleontological evaluation methods used in this review are as follows:

- Review geologic maps of the project area to determine paleontological sensitivity of underlying rock units. High-sensitivity units may require additional mitigation, even if no fossils are known from the immediate project area.
- Review scientific literature and museum records for known fossil localities in the project area. Historical fossil localities may require additional mitigation efforts, if the project will damage or destroy the location.
- Perform remote or on-the-ground surveys to identify exposures of bedrock. If exposures exist, additional survey(s) to search for previously unidentified fossil localities will be conducted.

5.0 Existing Conditions

5.1 Underlying Geology

The entire project lies within the U.S. Geological Survey Commerce City map quadrangle, and the corresponding 7.5-minute geologic map was used to review the geological context of the project. The project is underlain by the following units (Sections 5.1.1 through 5.1.7) and see Figure 6 and Figure 7.

5.1.1 Artificial Fill Underlying Geology

Artificial fill is a human-made unit consisting of displaced sediment and is considered to be non-sensitive for paleontological resources.

5.1.2 Holocene Piney Creek and Post-Piney Creek Alluvium

Holocene units, including the Piney Creek and Post-Piney Creek alluviums, can produce prehistoric bone, shell, or plant material. However, these units are less than about 11,000 years old, placing any such finds in an archaeological rather than a paleontological context. Entirely Holocene units are not typically considered sensitive for paleontological resources but should be evaluated by a qualified archaeologist.

5.1.3 Holocene and Pleistocene Unnamed Eolian Sand Unit

The unnamed eolian sand unit in the Denver Basin has produced camel, pronghorn antelope, black-tailed prairie dog, Richardson's ground squirrel, and extinct peccary remains in Denver and Aurora (Hunt 1954; Lewis 1970).

5.1.4 Pleistocene Broadway Alluvium

The Pleistocene Broadway Alluvium has produced mammoth, bison, horse, camel, jackrabbit, and white-tailed prairie dog specimens in the Denver and Greeley areas (Hunt 1954; unpublished University of Colorado Museum and CDOT fossil locality data).

5.1.5 Pleistocene Louviers Alluvium

The Pleistocene Louviers Alluvium has produced mammoth, horse, camel, llama, deer, bison, bighorn sheep, ground squirrel, black-tailed prairie dog, and pocket gopher remains in the Denver area (Scott 1962; Wang and Neas 1987; unpublished University of Colorado Museum and CDOT fossil locality data).

5.1.6 Pleistocene Slocum Alluvium

The Pleistocene Slocum Alluvium has produced mammoth, camel, horse, bison, prairie dog, Richardson's ground squirrel, pocket gopher, field mouse, and rabbit specimens, especially south of Littleton and east of Byers (Scott 1963; unpublished University of Colorado Museum and CDOT fossil locality data).

5.1.7 Paleocene and Upper Cretaceous Denver and Arapahoe Formations

The Upper Cretaceous Denver and Arapahoe formations are part of the larger Denver/Dawson complex that occurs throughout the Denver area as well as further up and down the Front Range. The Denver Formation, in particular, has produced Late Cretaceous leaves, dinosaur, and other vertebrate remains, including very rare mammal teeth, as well as early Paleocene leaves, and mammal, reptile, and amphibian bones and teeth in the Denver Basin (Cannon 1906; Brown 1962; Middleton 1983; Carpenter and Young 2002; Johnson et al. 2003; Hutchison and Holroyd 2003; Eberle 2003; Middleton and Dewar 2004; Wilf et al. 2006; Raynolds et al. 2007). Published information on invertebrate fossil occurrences in the Denver Formation is limited, with only two occurrences widely known (Cross 1889; Cannon 1893; Brown 1943), but

a third occurrence has been recorded adjacent to State Highway 86 east of Kiowa, at University of Colorado Museum fossil locality 91278.

The Denver Formation is a paleontologically-sensitive geologic unit whose regular production of scientifically important leaf fossils and more sporadic production of scientifically important vertebrate fossils has resulted in establishing a general policy of construction monitoring, wherever substantial construction impacts to the unit are proposed. Note that it can be difficult to predict the exact depth at which the Denver Formation occurs below the surface, because its contact with the overlying more recent units tends to be extremely variable. Depth can be estimated from geotechnical surveys or existing well data, but an exact depth often cannot be given until excavation reaches the unit.

Figure 6. Local Geology (West Section of I-270 Corridor)

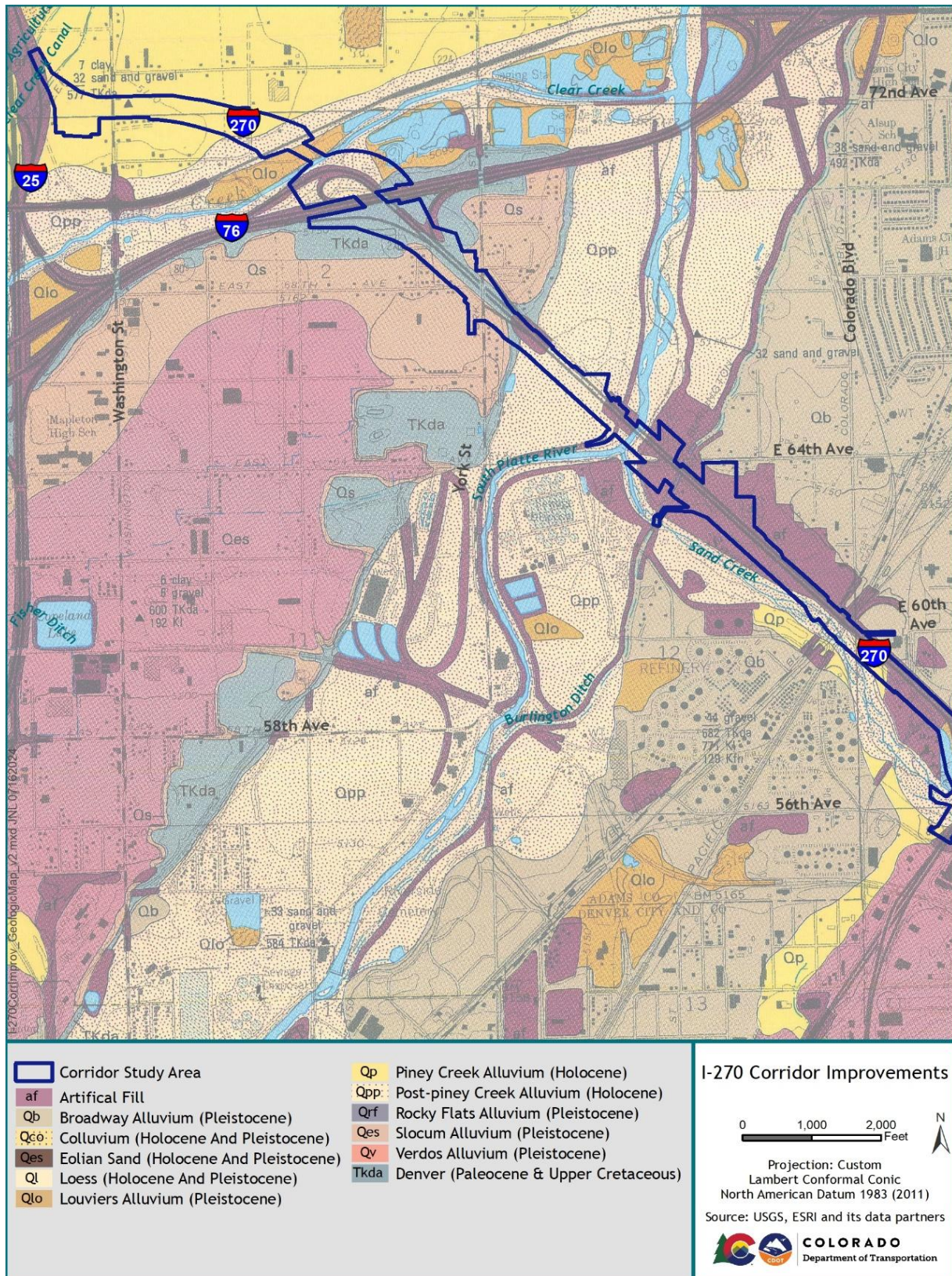
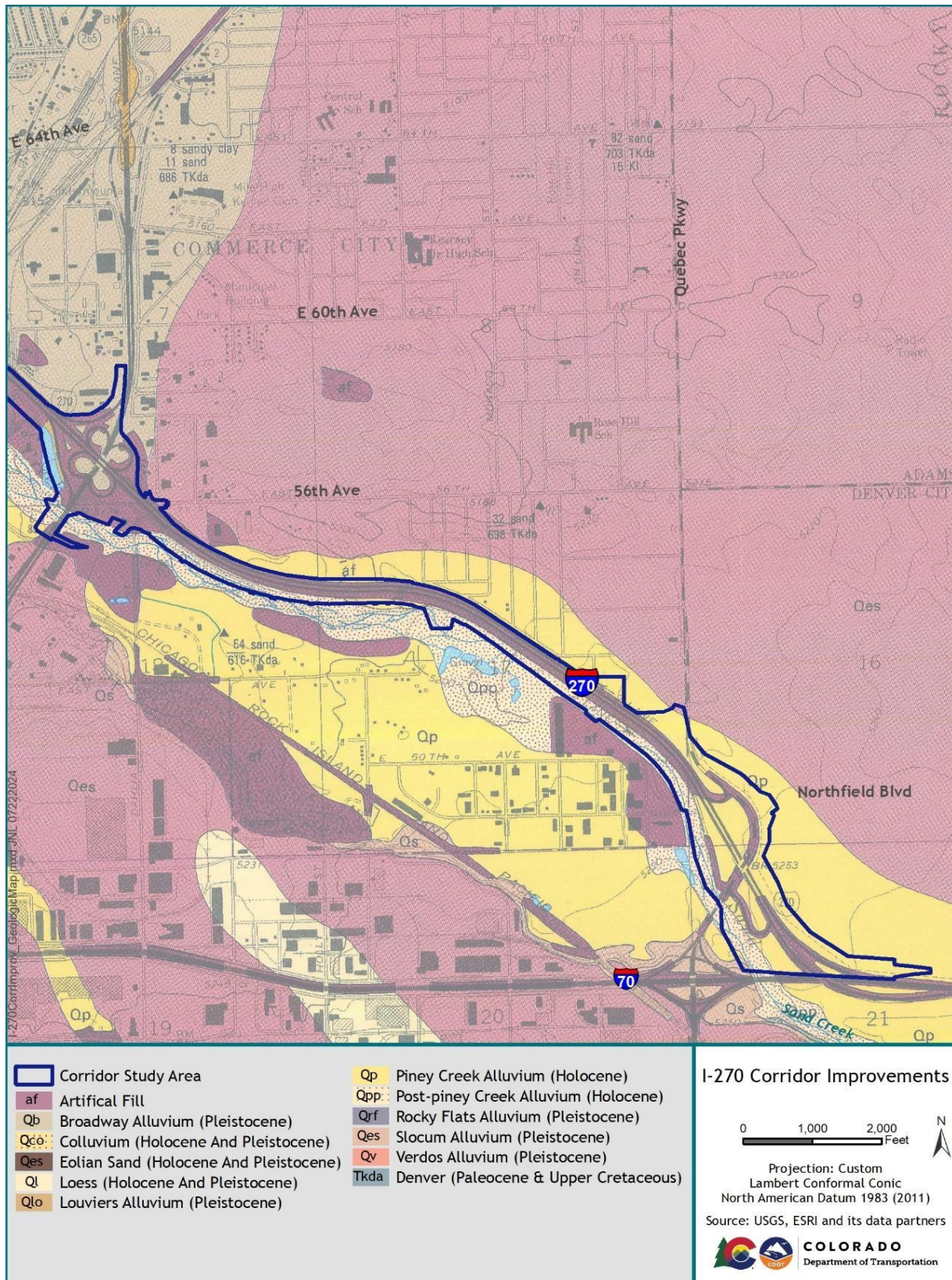


Figure 7. Local Geology (East Section of I-270 Corridor)



5.2 Previously Recorded Localities

Two previously recorded localities are known from the immediate project area. One locality is known from the Paleocene Louviers Alluvium and a second from the Cretaceous portion of the Denver Formation. At least seven additional localities are known from nearby portions of Adams County, including Cretaceous dinosaur fossils and Pleistocene mammal fossils.

5.3 Survey Results

The project area is heavily urban and previously disturbed from prior construction efforts, with appropriate landscaping on slopes. Therefore, no exposed bedrock currently exists that would warrant a detailed on-the-ground survey prior to project construction.

6.0 Impacts Assessment

6.1 No Action Alternative

If no action is taken, no impacts are likely to occur to any known or unknown fossil localities. In addition, any currently buried localities are unlikely to be discovered.

6.2 Three General-Purpose Lanes Alternative

Ground disturbance extending below the current disturbed ground level is highly likely to impact potentially fossil-bearing units, including Pleistocene units and Cretaceous bedrock. Two known localities are likely to be impacted, and an unknown number of additional localities may be uncovered during construction. With appropriate mitigation, potential impacts to paleontological resources can be minimized. It is also possible that fossil resources may be destroyed if not recognized in time.

6.3 Two General-Purpose Lanes and One Express Lane that Accommodates Transit Alternative

Ground disturbance extending below the current disturbed ground level is highly likely to impact potentially fossil-bearing units, including Pleistocene units and Cretaceous bedrock. Two known localities are likely to be impacted, and an unknown number of additional localities may be uncovered during construction. With appropriate mitigation, potential impacts to paleontological resources can be minimized. It is also possible that fossil resources may be destroyed if not recognized in time.

7.0 Mitigation Measures

Table 1 shows a summary of impacts and mitigations for the build alternatives.

Table 1. Summary of Impacts and Mitigation - Build Alternatives

Activity Triggering Mitigation	Location of Activity	Impact	Mitigation	Responsible Branch	Timing/Phase that Mitigation will be Implemented
Excavation into Pleistocene alluvial units	Intermittent; primarily north of the Vasquez Boulevard intersection	Potential damage to Pleistocene mammal fossils	Paleontological monitoring at spot-check frequency, with timing determined by the staff paleontologist in consultation with the active monitor.	CDOT Engineering and Environmental, and Contractor	Construction
Excavation or drilling into the Denver or Arapahoe Formations	Primarily north of the Vasquez Boulevard intersection, but potentially anywhere in the project at various depths ranging from 0 feet near I-76 to about 40 feet near Brighton Boulevard	Potential damage to Cretaceous or Paleocene fossils	Paleontological monitoring at spot-check frequency until bedrock is identified, after which continuous monitoring will be required. Monitoring is not required when landfill material is being excavated.	CDOT Engineering and Environmental, and Contractor	Construction
Discovery of fossils	Study Area	Removal of fossils	Paleontological testing and excavation permit for any paleontological monitoring or removal of fossils (must be held by a qualified paleontologist).	CDOT Engineering and Environmental, and Contractor	Construction

8.0 Required Permits and Coordination

The following permits and coordination will be required for paleontology (Table 2). These permits are also referenced in the mitigation summary table.

Table 2. Required Permits and Coordination by Agency and Project Phase

Agency	Permit/Coordination	Phase
Office of the State Archaeologist	Paleontological testing and excavation permit for any paleontological monitoring or removal of fossils (must be held by a qualified paleontologist)	Construction

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