I-270 Corridor Improvements

Floodplains Technical Report – I-270 Corridor Improvements Environmental Impact Statement

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Contents

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Acronyms and Abbreviations

Acronym	Definition
SRH-2D	Sedimentation and River Hydraulics – Two Dimension
BFE	Base Flood Elevation
BNSF	BNSF Railway
CCR	Code of Colorado Regulations
CDOT	Colorado Department of Transportation
CFR	Code of Federal Regulations
CLOMR	Conditional Letter of Map Revision
DOT	Department of Transportation
EIS	Environmental Impact Statement
EO	Executive Order
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Maps
FIS	Flood Insurance Study
GIS	Geographic Information Systems
I-25	Interstate 25
I-270	Interstate 270
I-70	Interstate 70
I-76	Interstate 76
ITS	Intelligent Transportation Systems
LOMR	Letter of Map Revision
MHFD	Mile High Flood District
MP	Milepost
mph	miles per hour
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
PDF	Portable Document Format
UPRR	Union Pacific Railroad
U.S.	United States
U.S.C.	United States Code

1.0 Introduction

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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 floodplains. 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)

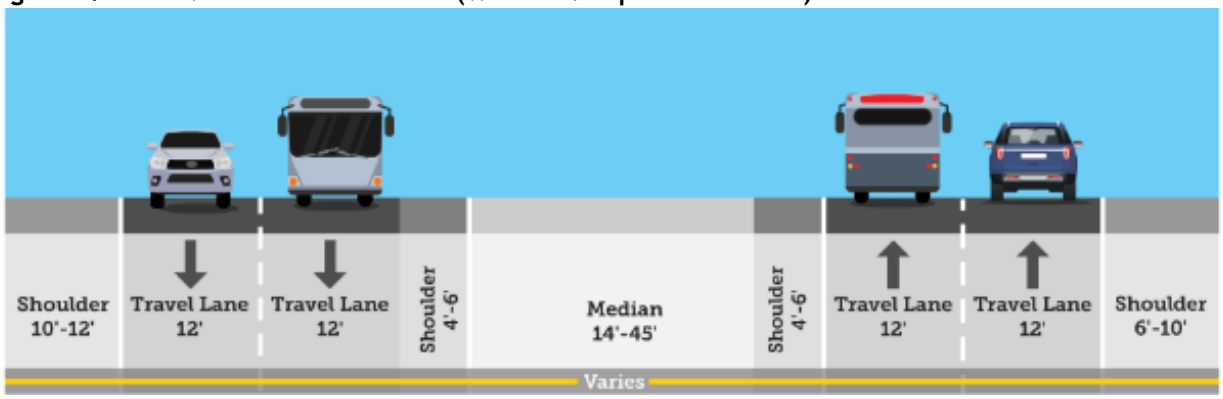
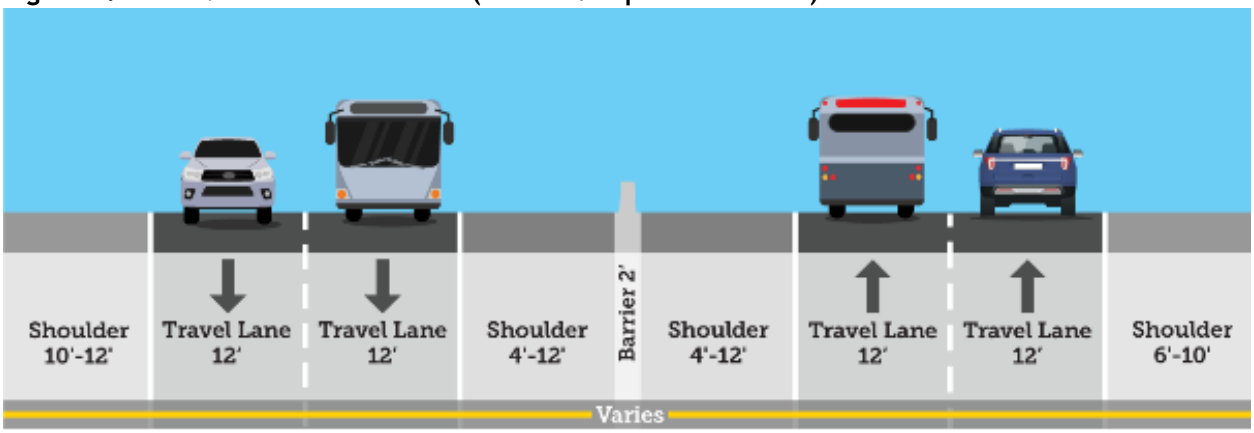


Figure 3. No Action Alternative (East of Vasquez Boulevard)



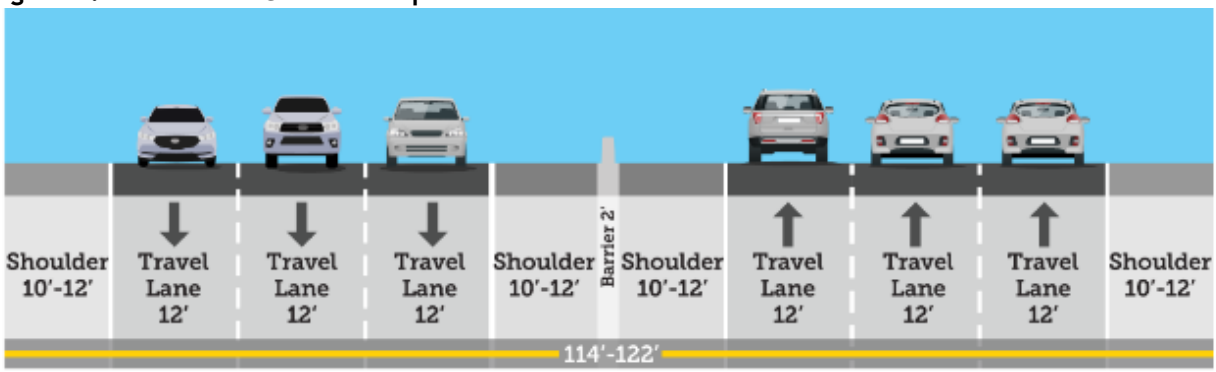
2.2 Build Alternatives

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.

2.2.1 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

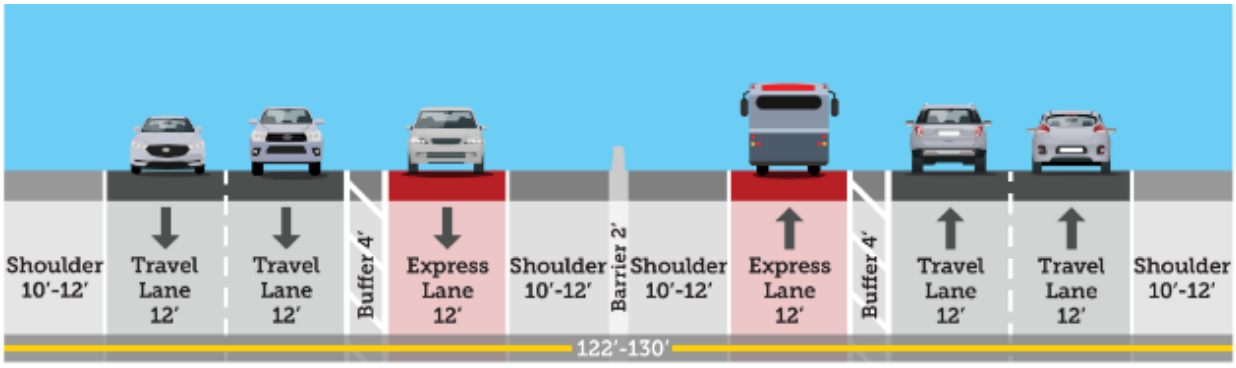
Transit Improvements

- 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

2.2.2 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

CDOT and FHWA are working with local partners Adams County and Commerce City to develop the regulatory framework for the I-270 Corridor Improvements. This technical report presents the technical analysis, findings, and any applicable mitigation measures related to floodplain resources.

The Federal Emergency Management Agency (FEMA) maps floodplains and regulates them through the National Flood Insurance Program (NFIP). NFIP regulations (44 Code of Federal Regulations [CFR] Sections 59, 60, 65, and 70) include limitations on project activities within floodplains and floodways and define processes to re-map flood hazard areas, if a project does result in a change in base flood elevations (BFE) that exceeds the pertinent flood hazard area thresholds. Relevant thresholds to the project are discussed in depth in Section 5.0, Existing Conditions, of this report. Communities that participate in the NFIP must follow federal regulations but also have authority to enact local floodplain ordinances that may be more stringent than NFIP regulations. Applicable legislation and regulations pertaining to flood hazards and floodplain management within the study area include the following:

- National Flood Insurance Act (1968)
- Flood Disaster Protection Act (1973)
- 23 CFR 650 Subpart A, Location and Hydraulic Design of Encroachments on Floodplains
- 44 CFR Chapter I Subchapter B, Insurance and Hazard Mitigation
- United States (U.S.) Department of Transportation (DOT) Order 5650.2, Floodplain Management Protection (1979)
- Rules and Regulations for Regulatory Floodplains in Colorado, Colorado Water Conservation Board: 2 Colorado Code of Regulations (CCR) 408-1

FEMA identifies floodplain boundaries on Flood Insurance Rate Maps (FIRM) and provides the supporting narratives and hydraulic analysis in Flood Insurance Studies. The local jurisdiction(s) adopt FIRMs and any subsequent FIRM revisions. Because effective FIRMs are adopted through local jurisdiction processes, they are considered the best available data for the purposes of evaluating a project's potential impacts to the floodplain. Where discrepancies exist between the effective FIRM floodplain and updated hydraulic analysis, the Letter of Map Revision (LOMR) process occurs to update the effective FIRMs for the relevant area.

3.1 Federal Regulations

The USDOT defines floodplains as the lowland areas adjoining inland and coastal waters which are periodically inundated by flood waters, including flood-prone areas of offshore islands (DOT 5650.2). The NFIP was established following the passage of the National Flood Insurance Act (1968) and the Flood Disaster Protection Act (1973) to encourage sound floodplain management programs at state and local levels. To provide a national standard without regional discrimination, FEMA has adopted the 100-year flood as the "flood having a one percent chance of being equaled or exceeded in any given year" (44 CFR 59.1).

Federal regulations (23 CFR Part 650 Subpart A) prescribe the policy and procedure for the location and hydraulic design of highway encroachments on floodplains. In addition, the U.S. DOT Order 5650.2 describes policies and procedures for "ensuring that proper consideration is given to avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs, and budget requests." FEMA regulations contain basic policies and procedures of FEMA in regulating floodplain management and analyzing, identifying, and mapping floodplains.

3.2 State and Local Regulations

In Colorado, the Colorado Water Conservation Board coordinates the NFIP in cooperation with county and municipal agencies. Statewide floodplain regulations are identified in 2 CCR 408-1, Rules and Regulations for Regulatory Floodplains in Colorado. The project intersects three jurisdictions: unincorporated Adams County, the City of Commerce City, and the City and County of Denver. All three of these jurisdictions participate in the NFIP. Each NFIP-participating community has a designated floodplain administrator who is responsible for overseeing the management of and development within the community's floodplains. The Mile High Flood District (MHFD) and these local floodplain administrators oversee floodplain regulations. As detailed in Section 8.0 of this report, coordination with MHFD occurred during the scoping and will remain ongoing through the design and permitting phases of the project.

4.0 Methods

4.1 Data Gathering

The following information was gathered from FEMA's Map Service Center:

- FIRM panel numbers and portable document formats (PDF) of the applicable FIRM maps;
- The Flood Insurance Study (FIS) for the study area, which contains the narrative that accompanies FIRMs;
- Geographic information systems (GIS) data (shapefiles) of the regulatory floodplain, floodway, and LOMR boundaries within the project vicinity; and
- U.S. Geological Survey 12-minute triangle maps to identify any levees that cross the study area.

Maps based on GIS data have been developed to help visually synthesize floodplain boundaries that may intersect the proposed project facilities (Figure 6). Topographic data required for

the hydraulic analysis was obtained to develop the 2D hydraulic modeling process conducted by Jacobs Engineering.

4.2 Analysis Approach

A floodplain comprises two major parts: the regulatory floodway and the area between the floodway and the limit of the floodplain. The floodway is the main channel of a watercourse that must be kept free of encroachment to discharge flood waters. FEMA prohibits any development within the floodway, unless it can be shown that the development does not increase the height of flooding BFE during a 100-year equivalent event. Development outside the floodway—but still within the floodplain—is permitted, provided the development meets NFIP and local floodplain regulations.

Therefore, the analysis of potential floodplain impacts focuses on how the alternatives:

- Impact the base flood elevation. This analysis requires hydraulic modeling and coordination with hydraulic design staff;
- Ensure consistency with local floodplain ordinances, which may be more restrictive than FEMA floodplain regulations; and
- Require additional coordination with FEMA to revise the floodplain, if the project is not able to meet NFIP and local floodplain requirements.

4.3 Floodplains Study Area

The study area for floodplains is the project footprint and consists of temporary and permanent disturbance areas, resulting from construction and operation of the build alternatives (Figure 6). This area includes temporary impacts from potential equipment and raw material staging areas and necessary work areas to construct the build alternatives.

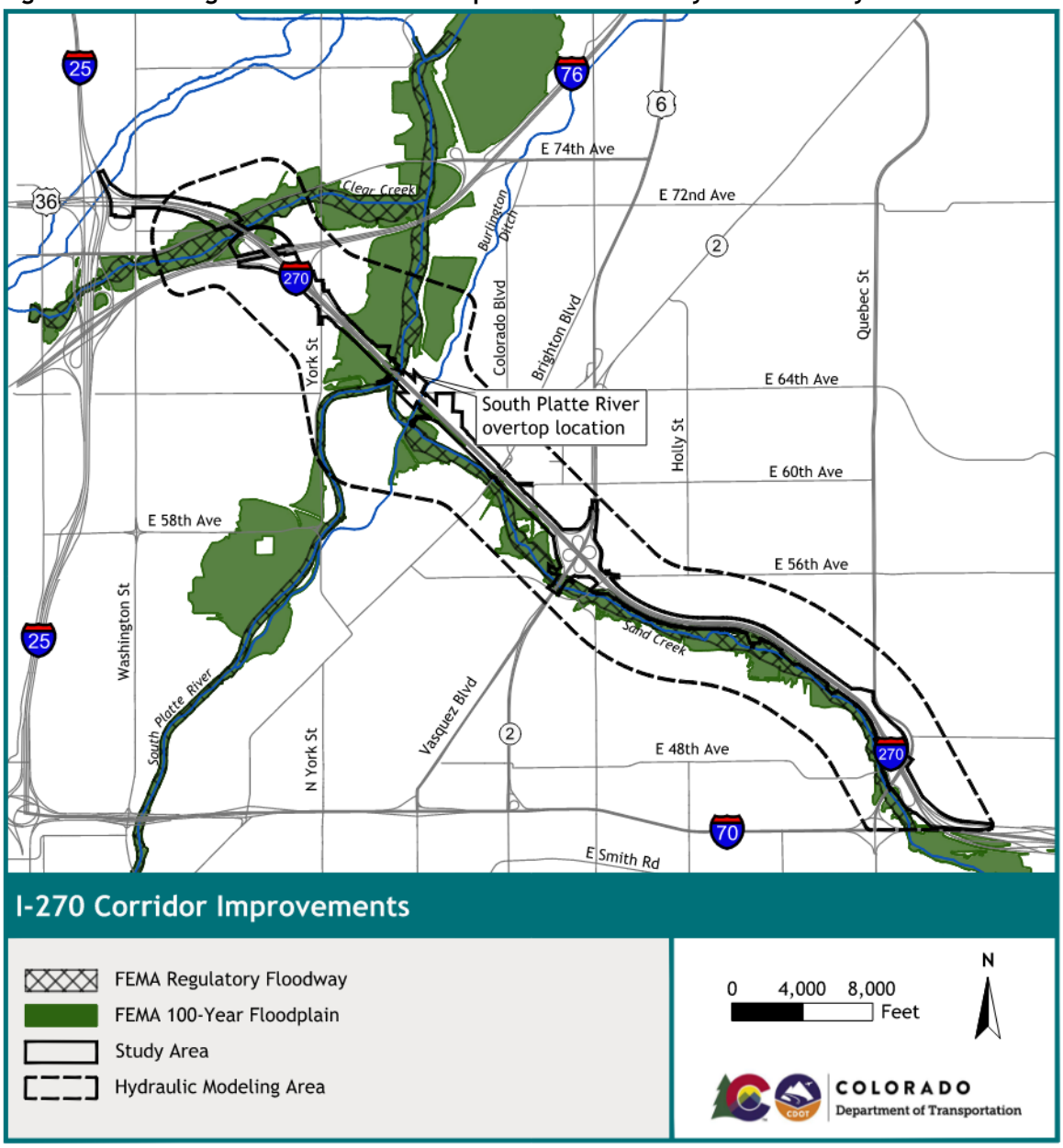
5.0 Existing Conditions

A flood zone is a geographic area that FEMA defines according to varying levels of flood risk. Several different flood zone types exist within the study area. An area designated as floodplain Zone AE, which is defined as an area with a 1 percent annual chance of flooding (referred to as the 100-year floodplain), FEMA considers it at high risk of flooding. Zone AO designations represent areas of sheet flow and shallow flooding with depths ranging from 1 foot to 3 feet. A Zone A floodplain is an area likely to be inundated by a 100-year flooding event, but for which a detailed analysis has not been performed to identify the depth of flooding. A floodway is the channel of a river or other watercourse and adjacent land areas that must be reserved to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height (FEMA 2018). For the purposes of this study, the 100-year floodplain, or “base floodplain”, and floodway are being studied and shown on Figure 6.

There are three major water features in the study area, including the South Platte River, Sand Creek, and Clear Creek. Two flooding characteristics of the South Platte River and its tributaries, including Sand Creek and Clear Creek, are snow melt and strong summer weather

fronts producing intense precipitation events. Major recorded floods have occurred on the South Platte River and its tributaries since 1844 in the Adams County area. During that period, more than 10 of these major flood events have occurred on the South Platte River and three on Clear Creek (FEMA 2018). The South Platte River, Sand Creek, and Clear Creek all have mapped floodways and floodplains that parallel or intersect the study area (Figure 6).

Figure 6. Regulated 100-Year Floodplains and Floodways within Study Area



5.1 Effective Floodplain Data

The project is within the FEMA NFIP areas of the City and County of Denver, Commerce City, and Adams County. The effective Flood Insurance Rate Maps (FIRMs) encompassing the project

study area are listed below (Table 1). An effective FIRM is one that has been through public review and has been adopted as a regulatory FIRM. The study area is covered in the Flood Insurance Study (FIS) for Adams County, with an effective revision date of December 2, 2021. This includes Clear Creek, South Platte River, and Sand Creek.

Table 1. Effective FIRMs Encompassing Study Area

Jurisdiction	FIS Number	FIRM Panel(s)	Panel Effective Date
Unincorporated Adams County	80881CV001D	08001C0604H	3/5/2007
City of Commerce City	80881CV001D	08001C0604H 08001C0612H 08001C0616H	3/5/2007
City and County of Denver	080046V001E	0800460092H	11/20/2013

Source: FEMA Map Service Center

Two LOMRs have been completed for Sand Creek and the South Platte River that removed most of the Suncor Oil Refinery from the floodplain (LOMR Case Numbers 10-08-1048P and 12-08-0512P). The LOMRs are reflected in the FEMA data shown on Figure 6. Early in the project's scoping phase, during preliminary examination of effective FIRMs, concerns with the extents of the floodways and floodplains of Sand Creek, Clear Creek, and the South Platte River were identified. Effective FIRMs show the 100-year flood inundated I-270 at the I-76 interchange and where the South Platte River crosses I-270. In addition, the regulatory floodway is shown to inundate South Sandcreek Drive for nearly its entire length and an approximate 300-foot stretch of the eastbound I-270 lanes west of Quebec Street in the eastern project limits. Despite these FIRM boundaries and designations, CDOT's current maintenance staff anecdotally have not observed overtopping of I-270 or South Sandcreek Drive during heavy precipitation events (Smith, pers. comm. 2021). Furthermore, no overtopping of I-270 is noted in descriptions of major flood events along Sand Creek in the FIS's produced by FEMA.

Because of suspected inaccuracies of the effective FIRM and in accordance with CDOT's Drainage Design Manual (CDOT 2019), CDOT remodeled the existing floodplains for Sand Creek and the South Platte River in the study area by using the U.S. Bureau of Reclamation's more accurate Sedimentation and River Hydraulics – Two Dimension (SRH-2D) modeling process, with supplemental topographic channel surveys. This model generally reproduces the floodplain provided by FEMA in their FIS. The 2D model has more resolution in the depiction of local ground elevations, and thus some differences are expected when comparing results to the FEMA study that was done with a 1D model. The hydraulic modeling completed for this project indicates that the 100-year event would not inundate I-270 nor South Sandcreek Drive because the existing retaining wall on the northern side of the floodway contains flood flows. Hydraulic modeling of existing conditions completed for the South Platte River shows one overtopping location on I-270, west of the South Platte River, during the 100-year flood event; however, this condition is based on the conservative assumption of simultaneous 100-year flows on both the South Platte River and Sand Creek. The peak flow analysis and low overtopping probability (less than 1 in 10,000) indicate a combined 100-year event is not likely. Floodplain levels are below the I-270 pavement elevation for scenarios where the 100-

year-flow is assigned to one river, and the 50-year-flow is assigned to the other. Complete hydraulic analysis performed for the project is included in the Hydraulic Analysis Addendum to the Floodplains Technical Report, provided as Attachment A.

Although hydraulic modeling performed for this project indicates the Sand Creek floodplain and floodway shown on the effective FIRM panels is inaccurate, FHWA procedures dictate "Where NFIP maps are available, their use is mandatory in determining whether a highway location alternative will include an encroachment on the base floodplain" (23 CFR 650, Subpart A). As a result, effective FEMA floodplain data was used in the analysis for the purposes of determining potential floodplain impacts, resulting from the No Action and build alternatives. As detailed in Section 6.0 of this technical report, CDOT will obtain all necessary floodplain development permits and provide engineer-certified "no-rise" letters, as required, prior to construction to advance design and construction of the bridges at the South Platte River, Burlington Ditch, Brighton Boulevard, and East 60th Avenue/BNSF Railway. CDOT will also complete a LOMR for the remainder of the I-270 corridor prior to finalizing design. During stakeholder outreach conducted in January 2021, the project team met with MHFD and verified preliminary hydraulic analysis findings that the 100-year event does not inundate I-270. These findings will be finalized through the LOMR process.

The effective floodplain relates to the project in the following areas.

Clear Creek: A Zone AE floodplain and floodway crosses I-270 just north of the I-76/I-270 interchange at milepost (MP) 0.9 of I-270. At this crossing, the floodway measures 500 feet wide and occupies the entire open space corridor that contains Clear Creek and the Clear Creek Trail. The floodplain boundary fails to consider the existing detention pond in the infield area of the I-76 eastbound to I-270 eastbound ramp, which would likely eliminate the overtopping of I-270 in this area. The floodplain extends an additional 120 feet to the north beyond the floodway. To the south, the floodway encroaches onto the westbound I-270 to westbound I-76 ramp. The floodplain extends an additional 400 feet beyond the floodway, encroaching on the westbound I-76 to eastbound I-270 ramp and portions of the westbound I-270 to westbound
I-76 ramp.

Given the known inaccuracies in adjacent Sand Creek and South Platte River FEMA floodplains and floodways and the lack of consideration of flood detention features, there is a low risk for the 100-year flow to overtop existing I-270, as shown in the effective FIRM.

South Platte River: Crossing the study area perpendicularly at MP 0.9 of I-270, the South Platte River exhibits a well-defined floodway contained by a levee on the west side of the river. Although it is shown to contain the floodway, a Zone AO (that is, sheet flow area) is identified behind levees immediately adjacent to both travel directions of I-270. Floods along this portion of the South Platte River in 1965 and 1973 showed these levees to be ineffective against 1-percent-annual-chance floods (FEMA 2018). Because the stability of levees is unknown, they are not certified U.S. Army Corps of Engineers levees. The Zone AE floodplain beneath I-270 where it crosses the South Platte River is shown to encroach on all four existing travel lanes, on the western side of bridges. Subsequent hydraulic modeling (see Attachment A) shows an inundation of the pavement has a rare chance of occurrence.

Sand Creek: Flowing parallel to eastbound I-270 lanes from the eastern limit of the project study area until it converges with the South Platte River and crosses I-270 at MP 0.9 of I-270, the mapped FEMA Sand Creek Zone AE floodway and floodplain encroaches on the study area nearly continuously from the I-270/Quebec Street interchange at MP 4.5 to its confluence with the South Platte River and subsequent crossing beneath I-270. Before it converges with the South Platte River, Sand Creek crosses over the Burlington Ditch. Like the South Platte River discussed in this section, a levee borders the western edge of the Burlington Ditch. The flood mapping in this area clearly shows that during the 100-year flood event, Sand Creek flows impact the Burlington Ditch (also referred to as the O'Brian Canal), and the levee creates a backwater flooding effect, extending approximately 1,700 feet that encroaches into the CDOT right-of-way but does not encroach onto the lanes of I-270.

Immediately south of the I-270 and Vasquez Boulevard interchange, South Sandcreek Drive serves as a frontage road from East 56th Avenue until it ends at Quebec Street. The mapped FEMA Sand Creek floodplain is shown as overtopping South Sandcreek Drive from its origin near the I-270 and Vasquez Boulevard interchange extending approximately 1.4 miles to the southeast. The mapped FEMA Sand Creek floodway is shown to overtop the frontage road and extend into the I-270 eastbound travel lanes at MP 3.1.

Subsequent hydraulic modeling (see Attachment A) shows no floodplain impacts on I-270 eastbound travel lanes. Impacts Assessment

CDOT's NEPA Manual (CDOT 2023) identifies the levels of significance for floodplain encroachments when determining impacts as part of the NEPA process. The following levels of significance are used when describing the impacts and related mitigation of the alternatives considered.

Significant Encroachment – May result in a high probability of loss of human life, will likely cause future damage that could be substantial in cost or extent (including interruption of service or loss of vital transportation facilities), or will cause a notable adverse impact on natural and beneficial floodplain services.

Minimal Encroachment – There is floodplain involvement, but the impacts on human life, transportation facilities, and natural and beneficial floodplain services are not significant and can be resolved with minimal efforts.

No Encroachment – There are floodplains in the study area, but there is no floodplain encroachment.

No Involvement – There are no floodplains in the study area.

5.2 No Action Alternative

No measurable changes to floodplain resources in the study area are anticipated to occur under the No Action Alternative. I-270 would continue to be at risk of inundation (overtopping the roadway) at the I-76 interchange, where the South Platte River crosses I-270, and along the majority of South Sandcreek Drive. Discrepancies in outdated FIRMs would need to be updated through formal LOMR processes. Without updating effective FIRM panels and the FIS, effective FIRM data will continue to reflect inaccurate floodway and floodplain boundaries.

5.3 Three General-Purpose Lanes Alternative

According to effective FEMA floodplain data, the build alternatives would encroach on existing floodways and 100-year floodplains in the areas, as noted in Table 2 and Figure 7, Figure 8, and Figure 9.

Table 2. Three General-Purpose Lanes Alternative Impacts to Floodways and 100-Year Floodplains

Flood Source	Flood Zone	Floodway (Y/N)	Area (acre)
Clear Creek	100-Year	N	3.9
Clear Creek	Floodway	Y	0.0
South Platte River	100-Year	N	5.5
South Platte River	Floodway	Y	1.4
Sand Creek	100-Year	N	8.6
Sand Creek	Floodway	Y	19.0

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Figure 7. Impacts to Floodplains (West Section)

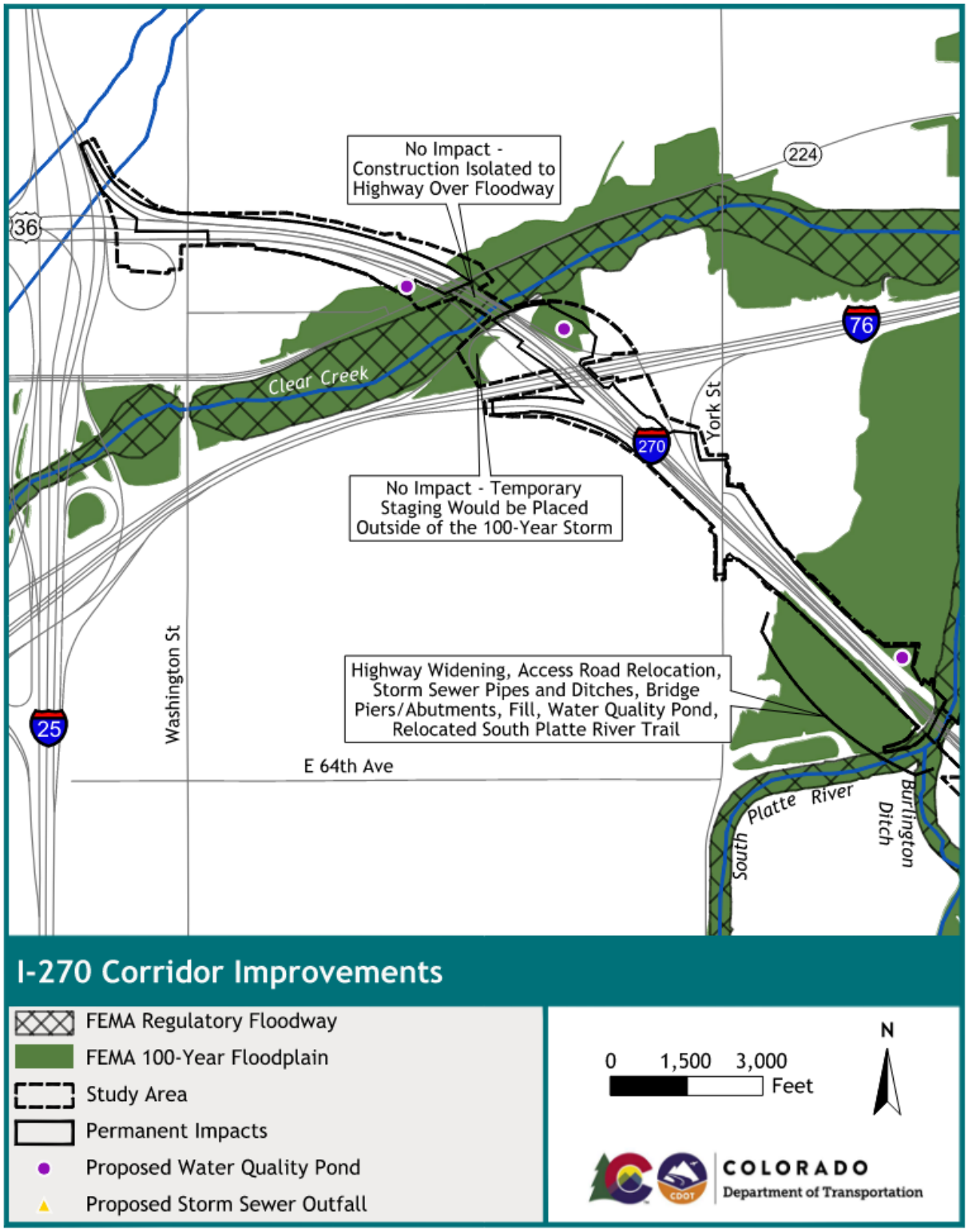


Figure 8. Impacts to Floodplains (Central Section)

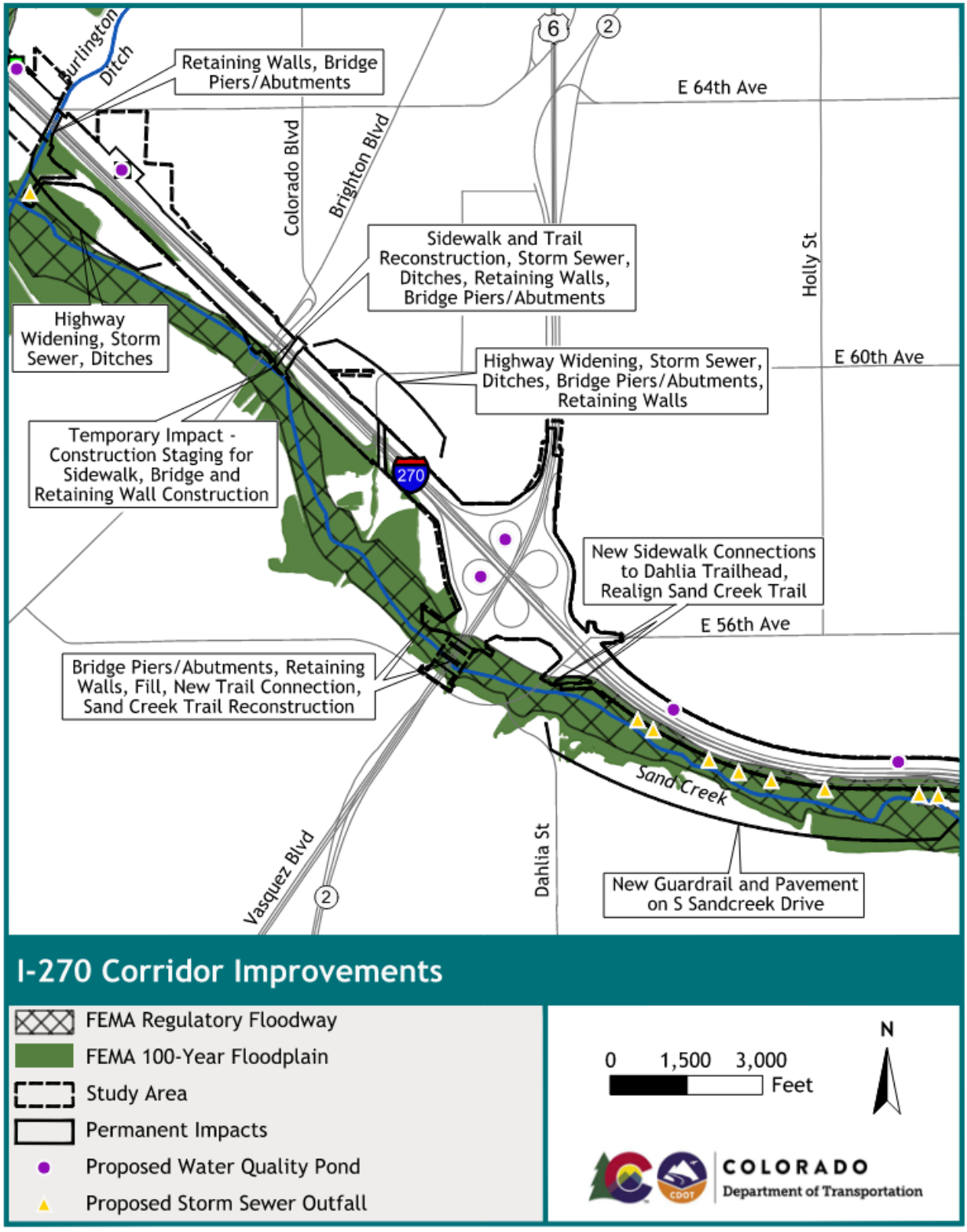
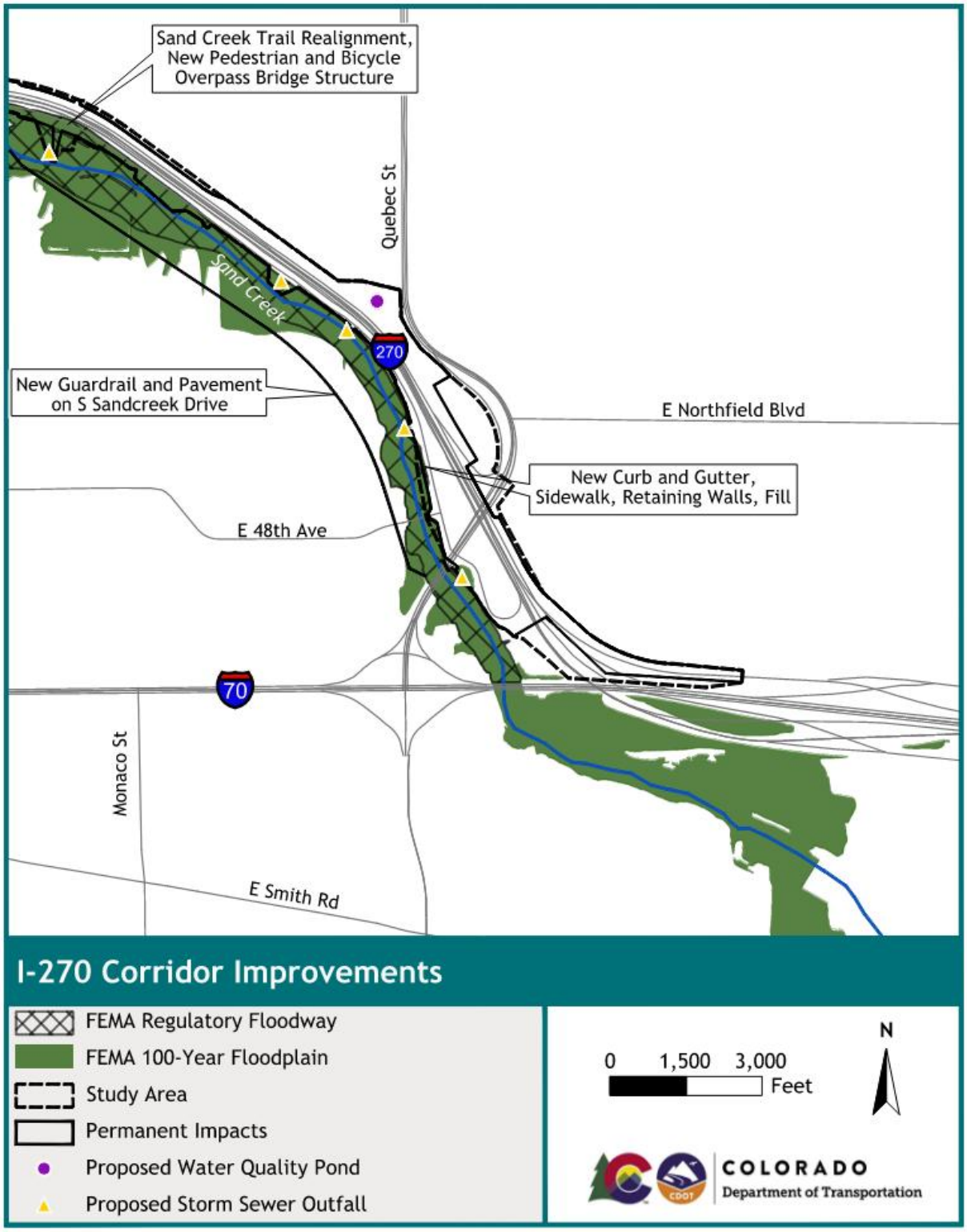


Figure 9. Impacts to Floodplains (East Section)



Twelve of the nineteen bridges within the I-270 corridor are reaching the end of their useful life and will be replaced as part of this project in both Build Alternatives. These bridges,

specifically the bridge over the South Platte River, will require new piers within the floodway and a widened bridge crossing the river. Other bridges will be replaced similarly.

Per the FEMA FIRMs, most of the encroachment into the floodway and floodplain would occur from the widening of I-270, where it runs parallel to Sand Creek and along the west bank of the South Platte River where I-270 is widened before spanning across the river.

5.3.1 Clear Creek

Both eastbound and westbound bridges that carry I-270 over Clear Creek are wide enough to accommodate the proposed roadway template and would remain in place. Similarly, I-76 ramps where the floodway and floodplain encroach onto the roadway would not be impacted by the project. Because Clear Creek would not be impacted by the project, it was not modeled as part of this analysis.

Only minimal encroachments to the Clear Creek floodplain are proposed with the project. Two water quality ponds are being proposed, one on the northeast side of I-270, and one on the southwest side, along with associated storm sewer pipes located within the base floodplain for Clear Creek. Additionally, upgrades to guardrail are proposed within the base floodplain; however, no modifications to the existing pavement or ground surface elevations are anticipated in those locations.

5.3.2 South Platte River

Only minor encroachments to the South Platte River base floodplain are anticipated. The eastbound and westbound on- and off-ramps for York Street west of the river will have small areas of encroachment, as well as the toes of slope, storm pipes, roadside ditches, a water quality pond, and a relocated access road northwest of the South Platte River and I-270 crossing. Because I-270 is an evacuation route the new I-270 bridges over the South Platte River will have a significant encroachment. The new bridge piers will impact the floodway, and the new abutments, realigned trail under the bridge, and new revetment for the riverbanks and scour protection will have impacts to the floodway of the South Platte River. The existing and proposed bridge deck is significantly higher than the effective base flood elevations of the river, providing adequate freeboard.

5.3.3 Sand Creek

Significant encroachments to the effective floodplain and floodway have been identified along Sand Creek due to the widened section of both Build Alternatives. At the Burlington Ditch crossing of Sand Creek, the banks of the ditch act as a levee for larger storm events within Sand Creek. Because of this, the floodplain extends to the toe of slope of the existing eastbound I-270 as well as reaching the existing abutment of the I-270 eastbound bridge over the Burlington Ditch. The eastern abutment and retaining wall of the proposed new bridge over Burlington Ditch will encroach into the floodplain. The proposed roadside ditch, toe of slope, and a portion of the eastbound shoulder will also fill in the floodplain east of the bridge. These encroachments will be minimal as they won't affect the base flood elevations of Sand Creek.

Although the effective floodplain extends beneath a portion of the new bridge at the Brighton Boulevard and East 60th Avenue/BNSF Railway crossing of I-270, minimal encroachments are anticipated. These encroachments include the piers and retaining walls for the new I-270 bridges over Brighton Boulevard, sidewalk improvements along Brighton Boulevard, a storm sewer outfall, as well as a connection to the Sand Creek Trail. All of these improvements will not change the base flood elevations of Sand Creek.

Improvements at the Vasquez interchange will affect the Sand Creek floodplain. The Vasquez Boulevard bridge over Sand Creek will be widened to include shared-use paths and span the floodplain with new piers, revetment for the creek, and scour protection at the piers and abutments, as well as a new Sand Creek Trail alignment located within the base floodplain and floodway. Additional minor encroachments will result from improvements to the Sand Creek Trail and construction of approximately 200 feet of retaining wall along the eastbound off-ramp to Vasquez.

East of the Vasquez Boulevard interchange include new sidewalks connecting to the Dahlia Trailhead, reconstruction of portions of the Sand Creek Trail, and several storm sewer outfalls from the trailhead to East 49th Avenue.

The widened section of I-270 east of Vasquez will also result in a significant longitudinal encroachment as the effective mapping shows the current floodplain limits extending into the eastbound lanes of I-270 for about 300 feet. The proposed improvements push the edge of the roadway to the south, in turn encroaching further into the floodplain.

South Sandcreek Drive and associated retaining walls, pavement, guardrail, and storm sewer improvements will be reconstructed as a part of the project. This will constitute a significant longitudinal encroachment to the floodplain and floodway of Sand Creek per the FEMA FIRMs.

A bicycle and pedestrian overpass is also planned between Vasquez Boulevard and Quebec Street to connect the Sand Creek Trail to northeast of I-270. The new bridge structure, retaining walls, and associated trail improvements will constitute a significant encroachment of the Sand Creek floodplain.

At Quebec Street, the toe of slope for the widened roadway of South Sandcreek Drive from East 49th Avenue to East 47th Avenue Drive will have minimal encroachment into the edges of the Sand Creek floodplain. Two storm sewer outfalls will also be constructed in this location within the floodplain limits. Additional minimal encroachments to Sand Creek floodplain will result from intersection improvements at South Sandcreek Drive with East 49th Avenue and East 47th Avenue Drive, along with new sidewalks and retaining walls east of the intersections.

5.4 Risks Associated with Implementation

The main risk associated with the project is the reduced available volume within the floodplain and a change to the base floodplain elevations and boundaries. However, as noted above, the best available FIRM maps are not accurate.

CDOT anticipates the first phase of construction will replace eight of the twelve bridges located at the South Platte River, Burlington Ditch, Brighton Boulevard, and East 60th

Avenue/BNSF Railway. CDOT plans to obtain floodplain development permits through Commerce City, Adams County, and City and County of Denver to complete this work. Letters of no rise, certified by a licensed engineer, will be completed to obtain these permits prior to construction. This process will be separate from the Letter of Map Revision (LOMR) process CDOT will complete for the existing conditions of Sand Creek for the remainder of the I-270 corridor prior to finalizing preliminary and final design. A LOMR will officially change the FIRM and FIS for Sand Creek, and the changes to the floodplain will be documented through FEMA with this process. After revising the floodplain through this process, floodway and floodplain boundaries are anticipated to be contained within channel banks during the 100-year event. Therefore, after the LOMR process, the Build Alternatives would have a reduced encroachment into the floodplain and no new encroachment into the floodway associated with Clear Creek, the South Platte River, and Sand Creek. Where there are still encroachments, CDOT will follow local, state and federal requirements to ensure base flood elevations are maintained.

5.5 Impacts on Natural and Beneficial Floodplain Values

At the I-270 bridge crossing of the South Platte River and the Vasquez Boulevard bridge over Sand Creek, natural and beneficial values will be temporarily impacted during construction. Anticipated impacts include disturbances to the stream, aquatic habitat and short-term alterations to flow patterns in the streams during construction. No long-term impacts to the natural and beneficial floodplain values or floodplain storage are anticipated.

At the Clear Creek bridge, only minimal encroachments will occur outside the main channel of the stream. Therefore, there will be no impacts on the floodplain values and minimal impacts to floodplain storage.

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

The Two General-Purpose Lanes and One Express Lane that Accommodates Transit Alternative would have a similar footprint to the Three General-Purpose Lanes Alternative; therefore, the impacts would be the same (see Section 6.2).

6.0 Mitigation Measures

During construction, construction materials will not be stored in the floodplain, and construction activities (including trail detours) will be limited within the floodplain, as feasible, to reduce the potential temporary or permanent impacts to the floodplain. A floodplain development permit will be obtained from Denver, Adams County, and Commerce City, if determined necessary.

As noted in the above sections, the two Build Alternatives will have significant longitudinal encroachment on the floodplain due to a widened section of I-270, per the FEMA FIRMS. Improvements that support the widened section, such as fill, storm sewer and retaining walls, will result in impacts within the current floodplain footprints. There are no practicable alternatives to reduce these significant impacts because widening I-270 is necessary to meet

the project purpose and need by improving operations for vehicles, transit, and freight, enhance bicycle and pedestrian connectivity, and increase safety for all users. The Build Alternatives rely on the existing longitudinal alignment to maintain this designated evacuation route and minimize overall environmental and community impacts. Relocating I-270 outside of mapped floodplains would require new right-of-way, substantial additional impacts to developed property, utilities, and other resources.

CDOT will coordinate with the MHFD and the local floodplain administrators for Commerce City, Adams County, and City and County of Denver to ensure the project conforms to applicable State and local floodplain protection standards.

Initially, CDOT will obtain all necessary floodplain development permits and provide engineer-certified "no-rise" letters, as required, prior to construction to advance design and construction of the bridges at the South Platte River, Burlington Ditch, Brighton Boulevard, and East 60th Avenue/BNSF Railway. CDOT will also complete a LOMR for the remainder of the I-270 corridor prior to finalizing design. Based on this project's analysis, the LOMR process is anticipated to demonstrate that the Build Alternatives would reduce encroachment into the floodplain and no new encroachment into the floodway associated with the South Platte River and Sand Creek. The LOMR will document the revised limits and once the LOMR is approved and made effective, it is anticipated that only simple floodplain development permits and no-rise certifications will be required to complete the project.

Table 3 shows a summary of impacts and mitigations of the build alternatives.

Table 3. Summary of Impacts and Mitigation – Build Alternatives

Activity Triggering Mitigation	Location of Activity	Impact	Mitigation	Responsible Branch	Timing/Phase that Mitigation will be Implemented
Construction within the regulatory floodplain and floodway	Along Sand Creek and at the South Platte River Crossing of I-270	Significant encroachment	Obtain and implement any requirements from Adams County's Floodplain Development Permit, if applicable.	CDOT Engineering and Floodplains, and Contractor	Pre-Construction and Construction
Construction within the regulatory floodplain and floodway	Along Sand Creek and at the South Platte River Crossing of I-270	Significant encroachment	Obtain and implement any requirements from Denver's Floodplain Development Permit, if applicable.	CDOT Engineering and Floodplains, and Contractor	Pre-Construction and Construction
Construction within the regulatory floodplain and floodway	Along Sand Creek and at the South Platte River Crossing of I-270	Significant encroachment	Obtain and implement any requirements from Commerce City's Floodplain Development Permit, if applicable.	CDOT Engineering and Floodplains, and Contractor	Pre-Construction and Construction
Construction within the regulatory floodplain and floodway	Along Sand Creek and at the South Platte River Crossing of I-270	Temporary reduction in flood conveyance Significant encroachment	Construction materials will not be stored in the floodplain, and construction activities (including trail detours) will be limited within the floodplain, as feasible, to reduce the potential impacts to the floodplain.	CDOT Engineering and Contractor	Construction

Activity Triggering Mitigation	Location of Activity	Impact	Mitigation	Responsible Branch	Timing/Phase that Mitigation will be Implemented
Placement of fills within the regulatory floodplain and floodway	Along Sand Creek and at the South Platte River Crossing of I-270	Changes to the 100-year base flood elevation Significant encroachment	CDOT will initiate with the Federal Emergency Management Agency a Letter of Map Revision (LOMR) along Sand Creek and the South Platte River to formalize the changes to the Flood Insurance Rate Map panel data. If required by the local agency, CDOT will also prepare a Conditional Letter of Map Revision to conditionally update the effective Flood Insurance Study and Rate Map panel data prior to the LOMR submittal.	CDOT Engineering and Floodplains, and Contractor	Pre-Construction and Post-Construction

7.0 Required Permits and Coordination

Table 4 shows the required permits and coordination related to floodplains that may be required as part of the proposed project.

Table 4. Required Permits and coordination by Agency and Project Phase (from Agency Coordination Plan)

Agency	Permit/Coordination	Phase
Adams County	Floodplain development permit	Construction
City and County of Denver	Floodplain development permit	Construction
Commerce City	Floodplain Development Permit	Construction
Adams County	Engineer-certified "No-Rise" Letter	Final design
City and County of Denver	Engineer-certified "No-Rise" Letter	Final design
Commerce City	Engineer-certified "No-Rise" Letter	Final design
Federal Emergency Management Agency	Letter of Map Revision	Final design

CDOT will submit engineer-certified "no-rise" letters and the LOMR and coordinate with Adams County, the City of Commerce City, the City and County of Denver to acquire any needed floodplain development permits.

Coordination with Adams County, the City of Commerce City, the City and County of Denver, MHFD, and FEMA began occurring early in the project's development during the scoping and stakeholder engagement beginning in summer 2020. In January 2021, CDOT met with MHFD to communicate preliminary hydraulic modeling findings and the project's approach to the LOMR process. MHFD, FEMA, and floodplain administrators will continue engaging through the complete project lifecycle, including close coordination throughout the LOMR process as it continues in parallel with the NEPA process and final design.

8.0 References

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Federal Emergency Management Agency (FEMA). 2024. 44 CFR- Emergency Management and Assistance. https://www.ecfr.gov/current/title-44.

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USDOT Order No. 5650.2, 44 Fed. Reg. 12345 (1979).

Attachment A. Hydraulic Analysis Addendum, March 2022

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