Water Quality Technical Memorandum

Southeast Extension Project
Lincoln Station to RidgeGate Parkway

Prepared for:
Federal Transit Administration

Prepared by:
Denver Regional Transportation District

May 2014
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Chapter 1.0 Introduction

This Technical Memorandum was prepared in support of the Southeast Extension Environmental Assessment initiated by Regional Transportation District (RTD) in 2012. This Technical Memorandum focuses on information regarding potential effects to water quality that would occur as a result of the Southeast Extension project.

1.1 Background

In November 2004, RTD voters approved the FasTracks initiative to expand and improve public transit service within the Denver Metropolitan Region (Metro Region). The comprehensive FasTracks Plan, which formed the basis of the FasTracks ballot initiative, includes the construction and operation of new fixed-guideway transit lines, improved bus service, and park-n-rides throughout the Metro Region. The Southeast Extension was included in the RTD FasTracks program and is in the currently adopted Regional Transportation Plan (RTP). The fixed-guideway transit elements (rail and bus rapid transit) of the FasTracks Plan are shown in Figure 1-1.

The proposed action is to extend transit service south into the City of Lone Tree to serve the increased population and employment generated by planned development in the City of Lone Tree. The Southeast Extension study area is located in northern Douglas County, and includes the City of Lone Tree and portions of Highlands Ranch and the Town of Parker. It begins at the existing end-of-line Lincoln Avenue LRT station and extends south along I-25 to the I-25/RidgeGate Parkway interchange. It includes areas of planned development south of Lincoln Avenue on the east and west side of I-25 (see Figure 1-2).

The Southeast Extension water quality study area differs from the larger project study area. The water quality study area consists of the proposed track alignment with a 300-foot buffer on either side of the light rail right-of-way or light rail station property lines, and is shown on Figure 3-1 in Chapter 3.0.

1.2 Regulatory Environment

The primary federal regulatory drivers for the current stormwater quality program are the Phase I and Phase II Stormwater Regulations under the Clean Water Act (CWA), which among other requirements, mandate regulated entities to acquire a National Pollutant Discharge Elimination System (NPDES) permit for their stormwater discharges. The Environmental Protection Agency (EPA) stormwater NPDES regulations specify that entities required to have municipal permits must comply with the requirement to control the discharge of pollutants to the maximum extent practicable. The Colorado Department of Public Health and Environment (CDPHE) has jurisdiction over the NPDES permit program in Colorado.
Figure 1-1
FasTracks Plan
Figure 1-2
Project Study Area
Surface water features provide important habitat for wildlife and are used for both domestic water supplies and recreational activities. The groundwater aquifer is also an important feature because of its potential use for agricultural water supply. Nationwide, water quality has progressively been reduced with increased urbanization, as impervious surfaces (e.g., asphalt and concrete) have been added to the landscape, and non-point sources of contamination have been introduced to the surface drainage system through increased storm runoff. Historically, water quality protection from storm runoff was not provided for new development projects, including highway and street projects. During rain events, pollutants and sediments that accumulated on impervious surfaces were flushed into the receiving stream, causing a detrimental effect on stream water quality. As a result, current federal and state regulations require stormwater detention and treatment for most transportation improvements.

The Colorado Water Quality Control Commission (WQCC) has classified streams for various beneficial uses, as described in Colorado Regulation 38, Classifications and Numeric Standards for South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin, dated January 1, 2012. The numeric water quality standards that are suitable in maintaining the water quality to preserve the beneficial uses or improve the water quality of the stream are referred to in subsequent watershed sections of the regulation. According to the water quality regulations established by the WQCC, classifications are established for all state surface waters, except water in ditches or other man-made conveyance structures. Although ditches are considered waters of the state, they are not classified, and numeric water quality standards do not apply.

The CWA requires states to publish an annual list of water bodies that are not meeting their beneficial uses because of excess pollutants; these pollutants can be naturally occurring or a result of human activity. The list, known as the Section 303(d) list, is based on violations of water quality standards and is organized by watersheds, which are further divided into stream segments.

Cherry Creek and the South Platte River, as well as all other state waters, are protected by the EPA’s anti-degradation policy. The anti-degradation regulations are in place to prevent the deterioration of state waters and protect the current uses and purposes they serve. The South Platte and all state waters, including the waterways that pass through the water quality study area, are protected under the tier 1 and tier 2 anti-degradation requirements of the EPA. The State of Colorado does not distinguish between tier 1 and tier 2 state waters; however, all state waters in Colorado are protected under these requirements (BLM, 2008). The purpose of these requirements is to protect the existing uses and water quality conditions to support current river uses. Uses are defined as water supply, fishing, swimming or any other type of recreational use. The qualities of all the state waters in the study area may be altered so long as applicable use-based water quality classifications and standards are met (EPA, 2008).

The state requirements for stormwater discharge falls under the Colorado Discharge Permit System (CDPS) Municipal Separate Storm Sewer System (MS4) Phase II permit requirements. Currently, RTD operations are covered under a general Phase II permit.
Chapter 2.0 Alternatives Evaluated

This technical memorandum evaluates the effects of two alternatives – a No Action Alternative and the Preferred Alternative. These alternatives are described below.

The No Action Alternative assumes no new improvements would be constructed other than currently committed projects identified in the 2035 RTP. This alternative includes the existing bus routes in the area and a new bus route (Route 411) connecting Parker and the Lincoln Station along RidgeGate Parkway. The CDOT project that includes I-25 widening from RidgeGate Parkway to C-470 is also included as part of this alternative. Figure 2-1 shows the No Action Alternative.
The Preferred Alternative includes a 2.3-mile, double-track light rail extension that runs south from the existing Lincoln Station along the west side of I-25, crosses to the east side of I-25 just north of the Sky Ridge Medical Center, and continues south to the RidgeGate Parkway interchange. This alternative provides three new stations. The Sky Ridge Avenue Station across from the Sky Ridge Medical Center and the Lone Tree City Center Station situated in the core of the RidgeGate planned development are both planned as kiss-n-ride stations without parking. A new end-of-line station at RidgeGate Parkway would provide a park-n-ride. Access to the RidgeGate Station would be provided from Havana Street via two access roads. All three stations would accommodate feeder bus service. The light rail tracks would be grade separated via an overpass where they cross Lincoln Avenue, I-25, and RidgeGate Parkway. One at-grade crossing is proposed on a minor roadway near the Sky Ridge Station.

Two parking design options are being considered at the RidgeGate Station, as described below:

- **Option 1**: This option would provide a 1,300-space surface parking lot on opening day (2019). In 2035, the surface parking lot would be replaced with two parking structures that would accommodate a total of 2,100 parking spaces. The southern parking structure would consist of four levels and the northern parking structure would consist of three levels.

- **Option 2**: This option would provide one 4-level, 1,300-space parking structure on opening day (2019). In 2035, an additional 3-level parking structure would be built north of the first structure that would provide 800 parking spaces, for a total of 2,100 spaces.

The two parking structures in 2035 would be the same design and configuration under both parking options.

The Preferred Alternative is shown on Figure 2-2.
Figure 2-2
Preferred Alternative

Legend
- City Boundary
- Preferred Alternative
- Existing Southeast Light Rail Line
- Station including Park-n-Ride
- Station without Parking
- 403 Bus Route
- 411 Bus Route
- 410 Bus Route
- Grade Separated Crossing
- At-Grade Crossing
Chapter 3.0 Affected Environment

The Southeast Extension water quality study area (study area) is located in the Upper South Platte River Basin, which encompasses more than 4,000 square miles. Drainage from this basin general flows in an east or northeast direction towards Cherry Creek, a major tributary to the South Platte River. The study area consists of the proposed track alignment with a 300-foot buffer on either side of the light rail right-of-way or light rail station property lines (Figure 3-1).

Denver and the surrounding areas are classified as a semi-arid climate with an average annual precipitation of 15.81 inches and an average yearly temperature of 50.1 degrees Fahrenheit (NOAA, 2005). The existing topography in the study area is generally flat or rolling with slopes ranging from 0 to 25 percent grade.

There are two perennial streams located within and/or adjacent to the study area; Cottonwood Creek and Happy Canyon Creek (Figure 3-1). The closest major waterway and ultimate outfall of Cottonwood Creek and Happy Canyon Creek is Cherry Creek, which is approximately 4.5 miles to the east of the study area. The designated beneficial uses of Cottonwood Creek and Happy Canyon Creek, noted as tributaries to Cherry Creek, are summarized in Table 3-1.

<table>
<thead>
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<tbody>
<tr>
<td>Watercourse</td>
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<tr>
<td>All tributaries to Cherry Creek, including all lakes and reservoirs and wetlands, from the source East and West Cherry Creeks to the confluence with the South Platte River, except for specific listings in segment 2.</td>
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</tbody>
</table>

Source: CDPHE, 2012

<sup>1</sup>Warm Water Aquatic Life, Class 1—These are waters that 1) currently are capable of sustaining a wide variety of warm water biota, including sensitive species, or 2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of species.

<sup>2</sup>Recreation, Class E—These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.

<sup>3</sup>Water Supply—These surface waters are suitable or intended to become suitable as a drinking water supply.

<sup>4</sup>Agriculture—These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado, and which are not hazardous as drinking water for livestock.

<sup>5</sup>Warm Water Aquatic Life, Class 2—These are waters that are not capable of sustaining a wide variety of warm water biota, including sensitive species, due to physical habitat, water flows or levels, or uncorrectable water quality conditions that result in substantial impairment of the abundance of diverse species.
In the Upper South Platte River Basin, the water quality of the South Platte River is poor due to industrial wastewater, municipal waste water, and non-point source and point source pollution. The WQCC has developed a list of stream segments included in the CWA Section 303(d) list of impaired waters for various physical, biological, inorganic, and metal parameters. Cottonwood Creek has been included in the WQCC CWA Section 303(d) list of impaired waters for elevated selenium levels, meaning Cottonwood Creek may require additional water quality protections.

### 3.1 Stream Characteristics

**Cottonwood Creek**
The Preferred Alternative would cross Cottonwood Creek in one location, where the proposed LRT alignment is on the east side of I-25. The ultimate outfall of Cottonwood Creek is Cherry Creek, upstream of the Cherry Creek Reservoir. The total drainage area of Cottonwood Creek where it outfalls into Cherry Creek is approximately 8.7 square miles. The alignment would cross over Cottonwood Creek where the drainage area up to that point is approximately 1.0 square mile. With such a small drainage area, this indicates that the alignment crosses the creek in the upper reaches of the watershed (Gingery, 1975). In the past, Cottonwood Creek delivered substantial amounts of phosphorus downstream to the Cherry Creek Reservoir due to erosion. Cottonwood Creek is a deep, narrow creek bed that over time has eroded into the existing natural landscape due to urban development. Other than several cottonwood trees and some sporadic willow growth, the corridor is largely devoid of riparian vegetation. The deep eroding channel prevents plant establishment on the flood banks. In 1997, a feasibility study was completed for a Cottonwood Creek Stabilization project, but visual observations over the past few years indicate that the active channel is continuing to incise. Phosphorus associated with eroding sediments and urban land uses has been shown to impair the water quality of Cherry Creek Reservoir by hastening lake eutrophication (CCBWQA, 2008). To protect the water quality of the Cherry Creek Reservoir, the Cherry Creek Control Regulation was established in 2004 and requires the implementation of Best Management Practices (BMPs) for all new development and pollutant reduction facilities (PRFs) throughout the watershed. PRFs are typically larger-scale BMPs constructed by the Cherry Creek Basin Water Quality Authority (CCBWQA) that reduce phosphorus loads to the reservoir.

**Happy Canyon Creek**
Happy Canyon Creek ultimately outfalls to Cherry Creek. At the outfall, the total drainage area to Happy Canyon Creek is approximately 17.2 square miles. However, the portion adjacent to the alignment study area has a total drainage area of approximately 6.6 square miles. The 10-year calculated flow in the channel at the intersection with the light rail lines is approximately 2,000 cfs. The 10-year flow is caused by the calculated storm with a frequency of occurring once every 10 years (HNTB, 1977).

### 3.2 Groundwater

Three municipal wells are located in the water quality study area (Figure 3-1). The well records do not indicate whether the wells are currently in use (Colorado Division of Water Resources, 2012).
Pollutant concentrations in groundwater will not be known until project final design, when soil borings are performed as part of geotechnical activities or Phase II hazardous materials site assessments are conducted.
Chapter 4.0 Impact Evaluation and Mitigation

4.1 Methodology

Water quality impacts can occur as a result of storm runoff from impervious surfaces that convey pollutants from vehicle and rail operations to surface or groundwater systems. Impacts to these systems will be evaluated in coordination with CDPHE and other agencies, as necessary.

Annual pollutant mass loading from light rail station runoff was evaluated using the Driscoll Model for existing and project conditions. This model was prepared for FHWA in 1990 to help predict the effect of highway runoff on the water quality of a receiving water body through an estimation of the pollutant loading in the highway runoff. The model is based on a Probabilistic Dilution Model under the EPA National Urban Runoff Program (NURP) that specifically addresses pollutant runoff. Rainfall statistics, statistics for runoff water quality concentrations, and stream flow data are used to develop probabilities of stream concentrations. From these probabilities, stream concentrations that would likely exceed standards once every three years are identified.

The analysis contained herein and the results reported are from a partial Driscoll analysis applied to the station areas. This partial analysis only predicts the increase in annual pollutant loading over the existing conditions and does not predict the impacts of the runoff to the receiving water bodies. Although the analysis was developed to evaluate highways, it is used in this study to analyze the potential impacts of the proposed RidgeGate Station park-n-ride.

4.2 No Action Alternative

The No Action Alternative would likely result in direct, indirect, and construction-related impacts to water resources or water quality as a result of construction and operation of planned transportation projects contained in the 2035 RTP, including I-25 widening, which would result in increased impervious surface.

Because development is occurring at a rapid rate within the study area, growth is expected to occur regardless of construction of the Preferred Alternative. The No Action Alternative is likely to result in lower density development and conversion of undeveloped land with increases in direct and indirect impacts to water quality (RTD, 2007). This could result in cumulative impacts to the natural hydrology and water quality of the streams in the study area.

4.3 Preferred Alternative

The direct, indirect, construction-related, and cumulative impacts of the Preferred Alternative are described below.

4.3.1 Direct Impacts

The Preferred Alternative crosses one stream: Cottonwood Creek. Cottonwood Creek would be spanned by a new bridge carrying the light rail line. No permanent stream alterations to accommodate the light rail alignment (e.g., channelizing, relocating, piping, tree removal along
the banks) are anticipated at Cottonwood Creek. Piers would be placed to avoid the creek bottom, its banks, and its floodplain.

Potential impacts to water quality are, in large part, related to stations and the impervious surfaces created for drop-off areas, bus bays, kiss-n-rides, park-n-rides, and platforms. Impacts to water quality may also occur at bridge crossings over the drainages where capture and treatment of runoff is difficult. The impervious surfaces concentrate pollutants brought in by the cars and buses using these facilities, which are eventually transported in stormwater runoff. Park-n-rides, bus bays, and drop-off areas create the greatest amount of impervious surface and have the greatest potential to concentrate pollutants.

To quantify the impacts of the light rail station runoff on local surface waters, Driscoll modeling impervious surface areas were calculated from the conceptual engineering plans and are subject to change as the engineering design proceeds. The Preferred Alternative would add approximately 666,045 square feet of impervious surface for the RidgeGate park-n-ride facility. (This square footage is based on a worst-case scenario of a 1,300-space surface parking lot provided at the RidgeGate park-n-ride facility as proposed under Option 1 on opening day in 2019. The square footage of impervious surface would be lower under Option 2 in 2019 and Options 1 and 2 in 2035.).

As shown in Table 4-1, the model predicted that increases in copper and zinc in runoff to the receiving stream would occur at the RidgeGate Station. However, these increases are relatively small and less than the threshold effect level as defined by the EPA (EPA’s threshold effect is defined as the mortality of the most sensitive individual of the most sensitive species).

<table>
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<tr>
<th>Station</th>
<th>Receiving Stream</th>
<th>Copper (pounds per year)</th>
<th>Zinc (pounds per year)</th>
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<tr>
<td>RidgeGate Station</td>
<td>Happy Canyon Creek</td>
<td>0.3</td>
<td>4.1</td>
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<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>25.2</td>
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Source: Southeast Corridor Extension Project Team, 2009
1 Rounded to the nearest tenth.

Natural drainage patterns indicate that the runoff from the rail structures and other station areas along the alignment would be collected and brought to the stormwater system through underdrains, and discharged into the appropriate detention facilities before being released to natural waterways. The increased copper and zinc loads reported by the Driscoll analysis are low and not likely to cause water quality problems. Required permanent water quality BMPs would effectively mitigate these impacts, as discussed further in Section 4.4.

Groundwater is not expected to be encountered during the construction process within the alignment study area. Further, it is not anticipated that the supply wells located in the study area would be impacted by the Preferred Alternative.
4.3.2 Indirect Impacts

Indirect impacts to water quality may occur in proximity to station area transit-oriented development; however, all new development would adhere to state and local laws regarding stormwater control and water quality.

4.3.3 Construction Impacts

Potential water quality effects during construction would include sedimentation in receiving streams and drainage facilities, erosion of on-site and off-site soils, and petroleum spills from heavy equipment fueling. These risks are higher for Cottonwood Creek because it is crossed by the proposed LRT alignment. RTD and associated contractors would adhere to all state, Douglas County, and City of Lone Tree regulations regarding the state-issued Stormwater Construction Permit. Construction-related impacts would be minimal due to the proper implementation of BMPs and erosion control techniques and devices as discussed in Section 4.4. All construction activity impacts would be temporary.

4.3.4 Cumulative Impacts

Urbanization, including the conversion of vacant land to commercial and residential developments, has increased impervious surfaces cumulatively throughout the study area. This has affected the natural hydrology and water quality of the streams in the area. Non-point contamination from impervious surfaces, such as petroleum products, fertilizers, pesticides, and animal waste, is carried to surface waters as storm runoff. Historically, water quality protection from storm runoff was not provided in new development projects, resulting in a gradual degradation of water quality from non-point source pollution. Under current regulations, stormwater controls are required for all new developments. This has helped to mitigate the effects of development on water quality.

4.4 Mitigation

Mitigation measures for potential impacts to water quality include continued coordination with CDOT and developers regarding drainage design. Permanent stormwater quality BMPs to treat stormwater runoff from the site will be used. Probable BMPs include grass buffer strips (ditches); regrading, seeding and revegetating soils and slopes; mulch protection for new plantings; and stormwater control channels for use in conjunction with water quality basin and detention ponds where required. All runoff from the park-n-ride, kiss-n-ride, and bridges will be detained by existing and future regional detention/water quality ponds. The area north of Lincoln Avenue where runoff would be discharged from the LRT bridge is not covered by a regional detention pond. Therefore, runoff from the bridge will be mitigated by a water quality structure, such as a stormceptor or equivalent. CDOT’s municipal separate storm sewer system (MS4) permit, as required by RTD’s MS4 permit, will be adhered to where applicable. If necessary, additional permanent stormwater retention ponds will be developed. Native vegetation will be reestablished, decreasing the potential for erosion. If any permanent water quality degradation occurs, waters shall be mitigated to appropriate water quality standards (existing conditions prior to impact).

A stormwater management plan (SWMP) will be developed and implemented that specifies BMPs to minimize soil erosion, and methods for monitoring conditions before, during and after construction. Approval of the SWMP will be coordinated with CDOT for impacts on CDOT’s
right-of-way. Stabilization BMPs, such as mulching, temporary seeding, or erosion control blankets, will be used. Temporary erosion control BMPs will be used to reduce disturbance, such as staging construction, minimizing access areas, temporary seeding, early final grading and seeding of completed areas, clean water diversions, silt fences, erosion bales, erosion control blankets, sediment traps, sediment basins, soil stockpile management, and temporary diversion structures. These BMPs will be installed prior to ground disturbance activities.

A spill control plan as required by RTD and CDOT MS4 permits will be developed. Staff will be trained in proper fueling procedures and procedures to contain spills to minimize the impact potential for surface and groundwater. Operational monitoring and supply wells will be protected or replaced in the same or similar location depending on the site conditions. Non-operational monitoring and supply wells will be abandoned in accordance with state requirements. RTD will adhere to its adopted sustainability policy that includes objectives for environmental sustainability, one of which is to enhance water quality and lower water use.

Ballasted track areas do not require any water quality mitigation.
Chapter 5.0 References


APPENDIX

SOUTHEAST CORRIDOR DRISCOLL ANALYSIS