48TH AVENUE & CORDOVA STREET Reconstruction

MOA Project #06-26

DESIGN STUDY REPORT

DRAFT

AUGUST 2019

Prepared for:

Municipality of Anchorage
Project Management &
Engineering Department
632 West 6th Avenue, Anchorage, Alaska 99501

Prepared by:

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Executive Summary

I. Introduction

The Municipality of Anchorage Project Management and Engineering Department (PM&E) has contracted with CRW Engineering Group, LLC (CRW) for professional services to evaluate alternatives to improve E. 48th Avenue and Cordova Street in Midtown Anchorage.

The roadways have deteriorated over time, with damaged and cracked pavement evident on many segments, and the entire corridor lacks pedestrian facilities and lighting. Cordova Street also lacks piped drainage facilities between E. International Airport Road and E. 48th Avenue. An increase in vehicle traffic occurred with the 2015 extension of E. 48th Avenue from Cordova Street to C Street. Traffic volumes are expected to further increase with the current and planned developments in the project area, including a new health clinic, hotels, and apartment complexes.

Proposed improvements within the project corridor include:

- Roadway reconstruction and/or resurfacing
- New curbs and storm drain improvements
- New sidewalks and/or pathways
- New street lighting
- New signage and landscaping

The project is currently funded through the Design Study phase only. Additional funding will be necessary for detailed design and construction of the project.

Stakeholder comments were solicited using the Context Sensitive Solutions (CSS) process through the following venues:

- Project Web Site and Interactive Project Map
- Direct Mailings and Electronic Newsletters
- Project Questionnaires
- Midtown Community Council Meeting Presentations (3)
- Community Open House Meetings (2)
- Pop-Up Meetings (2)
- Agency Coordination Meetings
- Business Stakeholder Meetings

The Design Study Report (DSR) evaluates existing and future conditions and a range of conceptual design alternatives. Preliminary recommended improvements are summarized below.

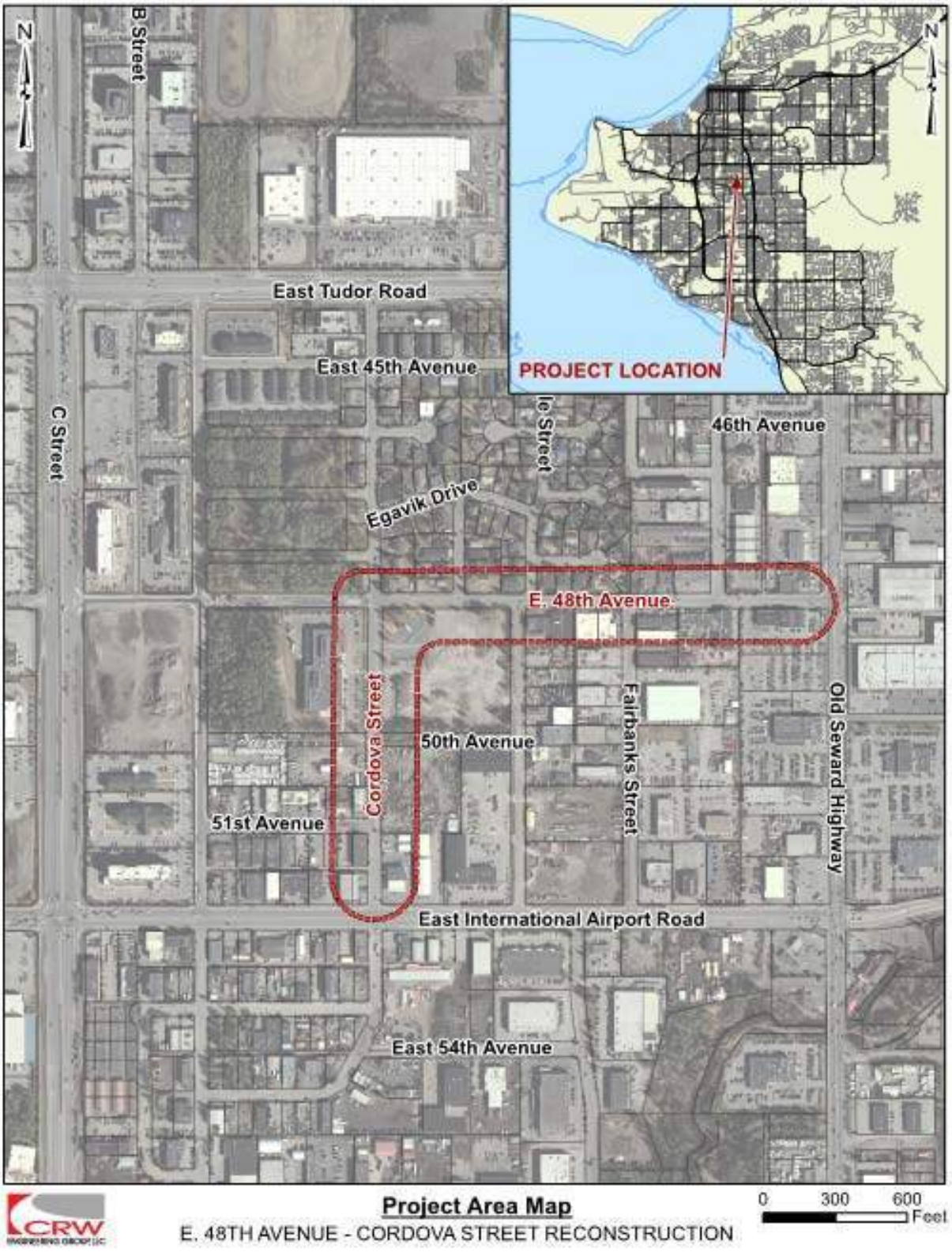

Figure 1 - Project Location and Vicinity Map

II. Recommended Improvements

Based on comments received from public, agency, and business stakeholders and requirements of MOA Title 21 and the MOA Design Criterial Manual, the preferred alternatives for the project corridor is as follows:

A. Preferred Alternative Typical Cross Sections

1. E. 48th Avenue: Alternative 3 - two 12-foot wide travel lanes, a 7-foot wide parking lane, curb and gutter, and a 10-foot wide pathway on the north side of the roadway.

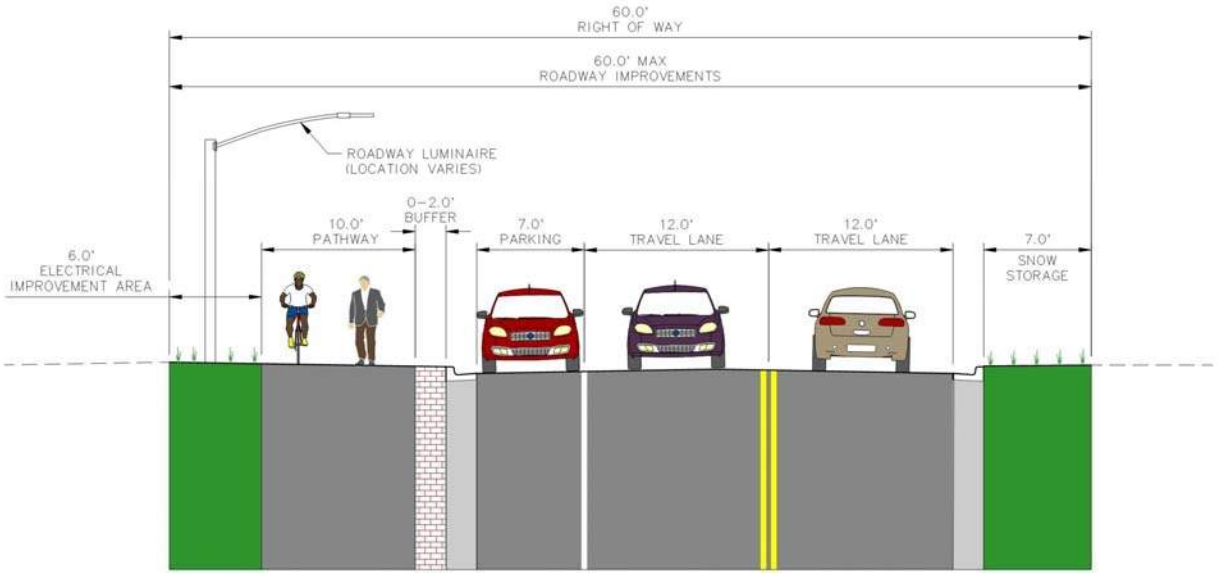

Figure 2 – E. 48th Avenue – Alt. 3

2. Cordova Street: Alternative 2 - two 11-foot wide travel lanes, a 7-foot wide parking lane, and two 5-foot wide sidewalks on each side of the road.

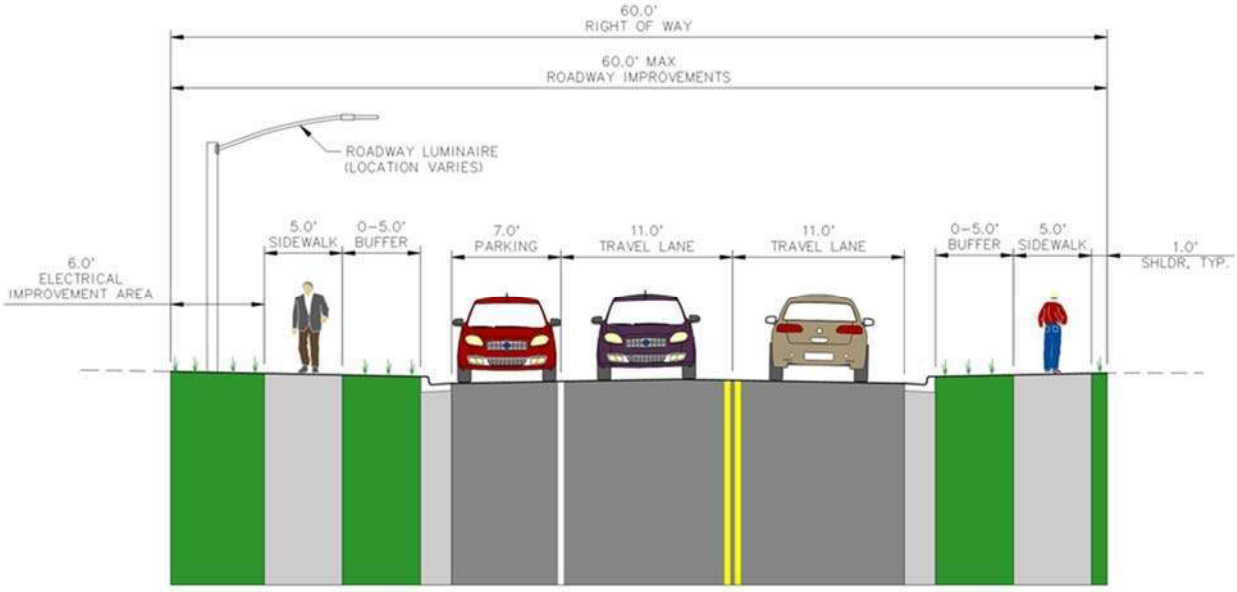

Figure 3 – Cordova Street – Alternative 2

B. Other Recommended Improvements

1. Posted Speed Limit: Maintain the current posted speed limit of 25 mph in the project corridor. Design speeds are 5 mph over the posted speed limit.

2. Landscaping: Proposed landscaping will be in character with the adjacent residential, business, institutional, and industrial properties. New landscaping and features will fit the context of the corridor. Where new landscaping elements are installed, they will maintain clear sight lines and avoid creating comfortable or hidden areas where transients may loiter or sleep.

3. Lighting: A continuous LED lighting system consistent with current MOA standards will be installed along the roadways.

4. Storm Drain: The proposed drainage system is made up of three, separate drainage systems distributed throughout the project corridor. Site topography and constraints from existing storm drain systems necessitate keeping these systems separate for design. The storm drain systems discharge into existing piped systems that eventually drain to Fish Creek and Campbell Creek. The proposed drainage improvements consist of the following:

    - Replace and upsize the aging storm drain on E. 48th Avenue from Gambell Street to Old Seward Highway with larger-diameter pipe.
    - Install new subdrain pipe on E. 48th Avenue from Fairbanks Street to Gambell Street, and from Eagle Street to Cordova Street.

- Install new subdrain pipe on Cordova Street from International Airport Road to E. 48th Avenue.
- Install catch basins at new roadway low points and replace catch basins and leads as required to match new curb.
- Provide water quality treatment for storm runoff.

5. Traffic Calming: No additional traffic calming improvements are proposed within the project corridor. The presence of on-street parking will construct the roadway width which can help slow vehicle speeds. An existing neckdown is also present at the intersection of E. 48th Avenue and Cordova Street and will remain in place.

6. Intersections: The existing stop-controlled intersections on E. 48th Avenue and Cordova Street will all remain after construction, as they will have a LOS within acceptable limits for the design year.

7. Driveways: Where full-frontage driveways will be present after improvements are constructed, it is recommended that MOA Type 2 curb be installed to allow vehicle access over the curb.

III. Cost Estimate, Project Phasing and Construction Schedule

A. Project Costs

Following is a summary of estimated project costs for the preferred alternative:

Category	E. 48th Ave (Alt 3)	Cordova St (Alt 2)*	Total
Design & Management Total (estimated)	$650,000	$440,000	$1,090,000
ROW Acquisition Total	$17,000	$41,000	$58,000
Utility Relocation (10% Contingency) Total	$1,030,000	$310,000	$1,340,000
A. Design, ROW Acquisition, Utility Relocation	***$1,697,000***	***$791,000***	***$2,488,000***
Construction Roadway Improvements	$1,982,000	$1,322,000	$3,304,000
Drainage Improvements	$512,000	$307,000	$819,000
Illumination Improvements	$223,000	$127,000	$350,000
Construction Subtotal	*$2,717,000*	*$1,756,000*	*$4,473,000*
Construction Contingency (15%)	$408,000	$263,000	$671,000
Construction Management / Inspection / Testing	$293,000	$197,000	$490,000
B. Total Estimated Construction Cost (rounded)	***$3,418,000***	***$2,216,000***	***$5,634,000***
C. Overhead / Grant Accounting	***$902,000***	***$530,000***	***$1,432,000***
Total Estimated Project Cost (A + B + C)	***$6,017,000***	***$3,537,000***	***$9,554,000***

B. Project Phasing and Schedule

It is anticipated that the project will be phased over multiple construction seasons to accommodate funding availability. The preliminary phasing limits are as follows:

- Phase 1: Cordova Street – E. 48th Avenue to 50th Avenue ROW (approximately 600 feet)
- Phase 2: Cordova Street – 50th Avenue ROW to International Airport Road (approximately 700 feet)
- Phase 3: E. 48th Avenue – Cordova Street to Eagle Street (approximately 650 feet)
- Phase 4: E. 48th Avenue – Old Seward Highway to Eagle Street (approximately 1,250 feet)

The current schedule calls for design of the roadway to begin in spring of 2020 and construction of Phase 1 beginning in 2023.

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1. Introduction

The Municipality of Anchorage (MOA) is studying alternatives to reconstruct E. 48th Avenue (from Cordova Street to Old Seward Highway) and Cordova Street (from E. International Airport Road to E. 48th Avenue) to meet current MOA standards for collector roadways. Alternatives developed for analysis will follow Complete Streets design methodologies to balance corridor improvements for all users, including motorists, bicyclists, pedestrians, and persons with disabilities, while minimizing impacts to existing residences and businesses in the project area. A Complete Streets design considers walking, biking, and transit as efficient modes of transportation and of equal importance to vehicular modes.

MOA Project Management & Engineering (PM&E) has contracted with CRW Engineering Group, LLC (CRW) to provide professional services to develop and evaluate alternatives to upgrade the project corridor (see Figure 1 for project location and vicinity map). In addition to CRW, the project team includes:

- Solstice Alaska Consulting, Inc. (Public Involvement, Environmental Analysis, and Permitting)
- Bettisworth North Architects and Planners (Landscape Architecture)

A. Project Purpose and Goals

The two roadways in the project corridor have deteriorated over time, with damaged and cracked pavement evident on many segments, and the entire corridor lacks pedestrian facilities and lighting. Cordova Street also lacks piped drainage facilities between E. International Airport Road and E. 48th Avenue. An increase in vehicle traffic occurred with the 2015 extension of E. 48th Avenue from Cordova Street to C Street. Traffic volumes are expected to further increase with the current and planned developments in the project area, including a new health clinic, hotels, and apartment complexes. This project will evaluate transportation network alternatives to improve the roadway conditions and enhance safety and accessibility for vehicles and non-motorized users.

Improvements may include:

- Roadway reconstruction and/or resurfacing
- New curbs and storm drain improvements
- Sidewalks and/or pathways
- Street lighting
- Signage and landscaping
- Utility relocation as required due to roadway corridor improvements

B. Project Approach

Prior to beginning this Design Study Report (DSR), the project team organized several meetings with the public, area business, and agency stakeholders to identify and

document issues and concerns that could potentially be addressed as part of this project. Public meetings included:

- Public Open House #1 (December 4, 2018)
- Business Stakeholder Meeting (December 13, 2018)
- Agency Stakeholder Meeting (January 1, 2019)

Comments from these meetings were used to identify project issues and concerns with improvements along the corridor. Input and comments from the initial public involvement effort were summarized in a Concept Report, submitted to MOA and the Planning and Zoning Commission (PZC) on February 28, 2019. The Concept Report appeared as an Informational Item in front of MOA PZC on April 1, 2019. A copy of the Concept Report can be found on the project website (http://48th-cordovareconstruction.com/documents-resources/).

Three design alternatives were then developed incorporating various design concepts for the two roadway corridors and intersections. These alternatives were presented to MOA PM&E on April 12, 2019, to discuss proposed roadway design elements and project area challenges. PM&E's comments and feedback were used to further refine the alternatives, which were then presented for public input at Public Open House #2 on May 16, 2019. Alternatives presented to the public, as well as input and comments received from stakeholders, can be found in Appendix K.

Input and comments received from all stakeholders prior to publishing the Concept Report can be found in the Concept Report on the project website at the link above and those submitted after the Concept Report can be found in Appendix K.

C. Evaluation Factors

The Design Study Report will consider the following factors during the evaluation of improvements for the E. 48th Avenue and Cordova Street project corridor:

- Stakeholder Input and Needs
- Implementation of Vision Zero Goals and Objectives
- Conditions of Existing Area
- Neighborhood Connectivity
- Previous Planning and Design Documents
- Traffic, Pedestrian, and Bicycle Volumes and Crash History
- Vehicle Speeds and On-Street Parking
- Intersection and Driveway Sight Distances
- Existing Soil Conditions
- Area Drainage Patterns and Infrastructure

- Environmental Impacts
- Right-of-Way (ROW) Restrictions
- Adjacent Neighborhood and Property Owner Impacts
- Emergency Access
- Future Maintenance Costs
- Utility Relocation Requirements
- Street Lighting
- Landscaping
- Project Costs

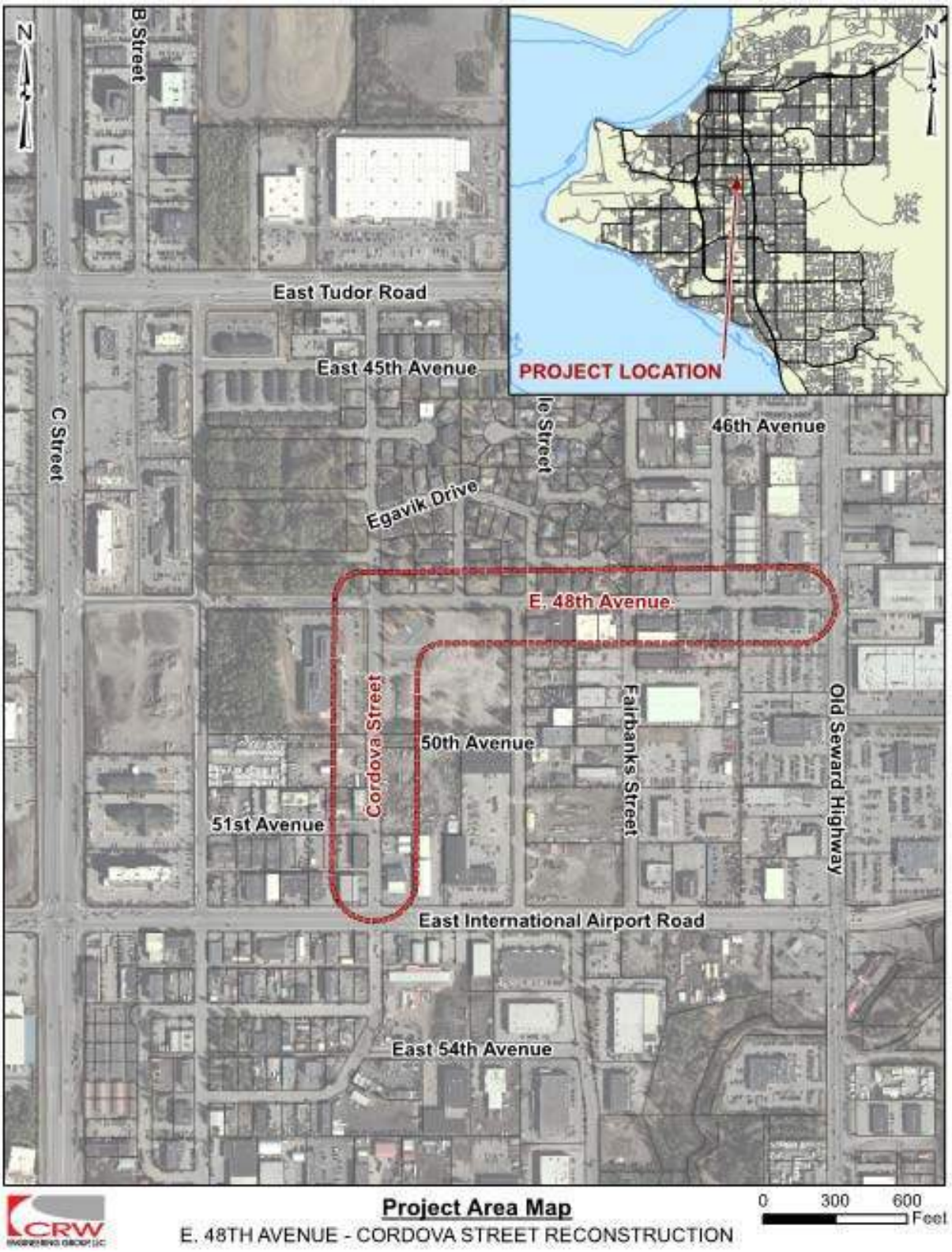

Figure 1– Project Location and Vicinity Map

2. Existing Conditions

A. Community Context

1. Area Context

E. 48th Avenue and Cordova Street both have a two-lane cross section with on-street parking. The corridor is generally residential to the north of E. 48th Avenue and industrial/business throughout the rest of the project area. The entire corridor has a posted speed limit of 25 miles per hour (mph). There are no transit routes that cross the project area.

a) *E. 48th Avenue (Cordova Street to Old Seward Highway [OSH])*

E. 48th Avenue serves a multifamily residential district along the north side of the western half and transitions to industrial and business centers on the east end. The area surrounding the roadway is zoned R-3 (Mixed Residential), B-3 (General Business), R-O (Residential-Office) and I-1 (Light Industrial). Public ROW is 60 feet wide.

Photo 1 - E. 48th Ave looking west from OSH

This 1,860-foot-long segment has a paved width of 32 feet. Parking is permitted on both sides of the road. The roadway has rolled curb with no sidewalks on either side of the road. No signalized intersections are present.

The intersections at Cordova Street and Old Seward Highway both lack lighting specific to the intersection. Roadway lighting is only provided in a few locations. Road grades are relatively flat (0.3% to 0.6%). Piped storm drain systems exist at most of the intersections, and in a segment along the road from Gambell Street to the Old Seward Highway.

The surrounding developments provide a source of non-motorized traffic between the residential neighborhoods and businesses. There are no existing sidewalks and pedestrians are often forced to walk in the roadway, despite vehicles that parallel park along or back directly into E. 48th Avenue over the rolled curb.

b) *Cordova Street (E. International Airport Road [IAR] to E. 48th Avenue)*

Cordova Street serves several office buildings and industrial lots, as well as St. Elias Specialty Hospital (St. Elias), owned by Providence Health and Services Alaska (Providence), at the northwest. The area surrounding Cordova Street is zoned I-1 and R-O. Public ROW is 60 to 65 feet wide.

Photo 2 - Cordova St looking north toward IAR

The roadway is approximately 1,250 feet long, and has a typical paved width of 32 feet. Parking is permitted on both sides of the road. The roadway has rolled curb with no sidewalks on either side of the road. No signalized intersections are present.

The intersection at Cordova Street and E. International Airport Road lacks lighting specific to the intersection. Roadway lighting is only provided in a few locations. Roadway grades are relatively flat (0.3% to 1.1%). Piped storm drain systems do not exist in the roadway, other than within the intersection with E. 48th Avenue.

The surrounding development generates a moderate amount of non-motorized traffic. There are no existing sidewalks and pedestrians are often forced to walk in the roadway.

Existing landscaping is present on the northern section of the roadway, along the St. Elias frontage. A large vacant lot east of St. Elias, across Cordova Street, currently provides extra parking for the hospital. According to Providence, there are no immediate plans to redevelop this lot.

2. Community Council

The entire project area is within the boundaries of the Midtown Community Council (Council). The Council meets on the 2nd Wednesday of each month at noon at 3000 C Street.

The Council was formed in February 2004 by combining parts of the North Star and Spenard Community Councils, and created primarily to better represent businesses in midtown Anchorage.

3. Existing Planning Documents

The following planning documents are applicable to the proposed roadway improvements:

a) *Anchorage Bowl 2020 Comprehensive Plan (2001)*

The Anchorage Bowl 2020 Comprehensive Plan (2020 Plan) does not highlight the project area in the Land Use Policy Map. Policies from the 2020 Plan affecting this project are listed below:

- Policy 37: Design, construct and maintain roadways or rights-of-way to accommodate pedestrians, bicyclists, transit users, the disabled, automobiles and trucks where appropriate.
- Policy 38: Design, construct and maintain roadways or rights-of-way to promote and enhance physical connectivity within and between neighborhoods.
- Policy 53: Design, construct and maintain roads to retain or enhance scenic views and improve the general appearance of the road corridor.
- Policy 54: Design and construct neighborhood roads and walkways to ensure safe pedestrian movement and neighborhood connectivity and to discourage high-speed, cut-through traffic.

b) *Anchorage Bowl 2025 Long Range Transportation Plan with 2027 Revisions (2007)*

The Anchorage Bowl Long Range Transportation Plan (LRTP) compliments the 2020 Plan and identifies how Anchorage's transportation system can be improved. The project area is identified as having Mixed-Use Street Typology, defined as follows:

- Located in areas characterized by a mix of high-intensity commercial, retail and residential areas with substantial pedestrian activity as defined by the employment and redevelopment designation in Anchorage 2020 Plan. Mixed-use streets typically consist of two to four travel lanes.

c) *Official Streets and Highways Plan (2014)*

The Official Streets and Highways Plan (OS&HP) provides classifications for major streets in the MOA. Roads not classified in the OS&HP are given a Local Road classification. The roadways in the project area are identified as follows:

- Functional Classification (E. 48th Avenue): Class IC Neighborhood Collector
- Functional Classification (Cordova St.): Class I Collector

Collectors function to collect traffic from local streets of all types and move this traffic to the arterial street system or to important trip-generating activities within small residential areas. They should be designed to provide priority to through traffic movement and provide limited land access function to adjacent properties. Pedestrian facilities should be provided to allow for safe access between activity centers such as schools and parks.

Neighborhood Collectors should have two lanes and a minimum ROW width of 60 feet.

d) *Anchorage 2040 Land Use Plan (MOA - 2017)*

The Anchorage 2040 Land Use Plan (2040 Plan) guides land use throughout the Anchorage Bowl. It provides a blueprint to the vision identified in the 2020 Plan. There are no Land Use Plan Actions identified for the area within the project corridor.

The 2040 Plan identifies the following Land Use Designations within the project corridor:

- Light Industrial / Commercial
  - Cordova Street from E. International Airport Road to E. 50th Avenue
  - E. 48th Avenue from Fairbanks Street to Gambell Street
  - E. 48th Avenue from Eagle Street to east of Gambell Street (south)
- Community Facility or Institution
  - Cordova Street from E. 50th Avenue to E. 48th Avenue
  - E. 48th Avenue from Cordova Street to Eagle Street
- Compact Mixed Residential
  - E. 48th Avenue from Cordova Street to Fairbanks Street
- Commercial Corridor
  - E. 48th Avenue from Gambell Street to Old Seward Highway

Specific policies from the 2040 Plan that affect this project are listed below:

- Policy 6.3: Adopt and execute a Complete Streets policy to design streets to serve all users including pedestrians, transit riders, and bicyclists, and align the design and scale of streets to be compatible with compact, accessible, and walkable land use patterns.
- Policy 9.2: Limit non-industrial uses that could displace or conflict with existing or potential industrial functions in industrially designated areas, in order to preserve these areas for primarily industrial development and ensure compatibility of adjacent uses and traffic.

e) *Anchorage Bicycle Plan (MOA - 2010)*

The Anchorage Bicycle Plan (Bike Plan) identifies routes throughout Anchorage for new bicycle infrastructure. The intent of the plan is to “integrate bicycle travel into the overall transportation planning process and promote the use of the bicycle as a legitimate means of transportation.” It identifies a bicycle network of on- and off-street facilities to safely and comfortably connect all parts of Anchorage. The project corridor is not included in the Recommended Bicycle Network list.

f) *Anchorage Pedestrian Plan (MOA - 2007)*

The Anchorage Pedestrian Plan (Ped Plan) provides a framework for improvements to enhance the pedestrian environment for walking as a mode of transportation. It identifies areas where improvements are needed and prioritizes specific pedestrian improvement projects. There are no Priority Projects identified in the Ped Plan within the project corridor.

g) *Vision Zero Final Report (MOA – 2016)*

The Vision Zero Final Report for Anchorage was completed in May 2016 with the goal of creating safer roadways for everyone, including pedestrians, bicyclists, and motorists. With the adoption of the report, Anchorage joined more than 30 other American cities that have implemented policies to reduce traffic fatalities. The report identified contributing factors associated with serious injuries, fatalities and traffic crashes, including:

- Speeding
- Distracted driving
- Alcohol and drugs
- Time of day
- Time of year

The report also identifies a High Injury Network in Anchorage where severe traffic crashes and fatalities occur more often than on typical roadways. Neither E. 48th Avenue nor Cordova Street are identified as being part of this network. The closest identified corridor is Tudor Road, just north of the project area, which was listed as having high crash rates for both pedestrians and vehicles.

An online survey conducted as part of the development of Vision Zero Anchorage indicated that residents have serious concerns about safety, road conditions, and traffic management for bicyclists and pedestrians. The online survey also found that of the 5 E's employed to reach MOA's Vision Zero goals (Engineering, Education, Evaluation, Enforcement, and Encouragement), residents see the highest value in engineering changes. In particular, residents noted the benefits of MOA's pedestrian count-down signals at crosswalks, improved lighting, and new roundabouts, and they emphasized Anchorage's need for improved road/winter maintenance; additional bike lanes, sidewalks, and crosswalks; more visible lane markings; and better connectivity of bicycle and pedestrian infrastructure.

h) *Vison Zero Action Plan (MOA – 2018)*

Anchorage published its Vision Zero Action Plan in November 2018, the goal of which is to "reframe how cities look at traffic fatalities - not as 'accidents' but as preventable incidents that can be addressed through a multidisciplinary approach involving road design, education, and enforcement." The plan has five main strategies to achieve this goal, including:

- Enhancing Processes and Collaboration
- Build Safer Streets for Everyone
- Create Safer Speeds
- Promote a Culture of Safety
- Improve Data Collection, Analysis, and Accessibility

The Vision Zero Action Plan recommends that roadway designs be sensitive to the context of the roadway, and recommends expanded context classifications for roadways to take into account the different needs of users along the corridor. It

also identifies that speed is a significant factor in crash survivability and recommends improved street design to support safer speeds.

i) *Additional Plans*

The following additional plans were reviewed and did not identify any specific projects or development requirements within the project area:

- Areawide Trails Plan (1997)
- Anchorage Bowl Park, Natural Resource and Recreational Facility Plan (2006)
- Wetlands Management Plan (2012)

4. Planned Area Development

The following sources were reviewed to identify potential planned area development projects within the project area:

- MOA Planning Status (http://www.muni.org/CityViewPortal/Planning/Locator)
- MOA Capital Improvement Program (2019-2024) (http://www.muni.org/Departments/budget/capitalBudgets/Documents/Web%2003%20-%20CIP%202019-2024.pdf)
- Anchorage Water and Wastewater Utility (AWWU) Water Master Plan (2012) (https://www.awwu.biz/about-us/master-plans)
- AWWU Wastewater Master Plan (2014) (https://www.awwu.biz/about-us/master-plans)
- MOA Neighborhood Traffic Calming Qualified Streets List (2019) (https://www.muni.org/Departments/traffic/Documents/2019%20NTCP%20Qualified%20Streets%20List.pdf)
- Anchorage Metropolitan Area Transportation Solutions (AMATS) Transportation Improvement Program (TIP) (2019 - 2020) (https://www.muni.org/Departments/OCPD/Planning/AMATS/Documents/2019_2022_TIP/2019_2022_TIP_Final_PC_Approved_12_20_18.pdf)
- State of Alaska Department of Transportation and Public Facilities (DOT&PF) Statewide Transportation Improvement Program (STIP) (2018-2021) (http://dot.alaska.gov/stwdplng/cip/stip/assets/STIP.pdf)
- Chugach Electric Association (CEA) Utility Undergrounding 5-year Plan (2018-2022) https://www.chugachelectric.com/system/files/regulatory_affairs/2018_project_list.jpg

The following future projects in the project area were identified:

a) *Old Seward Highway Surface Rehabilitation (2020)*

MOA is planning a pavement rehabilitation project on Old Seward Highway between Tudor Road and International Airport Road. The improvements will

intersect the project corridor at the intersection of E. 48th Avenue and Old Seward Highway. The surface rehabilitation project may include upgrades to curb ramps to comply with the requirements of the Americans with Disabilities Act (ADA) including curb returns at E. 48th Avenue.

b) *The Great Alaskan Kush Company (2019)*

This private development located at 360 E. International Airport Road has submitted a Special Land Use Permit to the MOA Planning Department. Development is not expected to directly impact the proposed roadway reconstruction project.

B. Project Area Considerations

1. Demographics

The overall population in Anchorage has grown steadily over the past decades while the population in midtown has declined. According to the 2012 Anchorage Indicators Report, published by the Anchorage Economic Development Corporation, the population within the Midtown Community Council area dropped by 7.6% between 2000 and 2010.

Published population projections by the State of Alaska show that Anchorage is expected to grow 0.7% annually over the next 35 years. The Anchorage 2040 Land Use Plan anticipates little growth in the project area.

2. Land Use

Existing zoning along E. 48th Avenue is a mixture of R-3, R-O, I-1, and B-3. Zoning adjacent to Cordova Street is R-O and I-1. See Figure 2 for a map of area zoning and land use.

- R-3 allows multifamily and townhouse residential construction, and is intended primarily for low-rise, multistory buildings. Minimum setbacks on R-3 zoned properties are 20 for the front (or 10 feet for three or more units), five feet for the sides, and 10 feet for the back.
- R-O allows professional, business, and medical services, or a mix of office and residential uses. Minimum setbacks on R-O zoned properties are 10 feet for the front, five feet for the sides (unless adjacent to a residential district, then 10 feet), and 10 feet for the back.
- I-1 is used primarily for light and general manufacturing, processing, storage, service, wholesale, and distribution centers. Many commercial uses are also allowed, with some limitations to promote efficient industrial land use. Minimum setbacks on I-1 zoned properties are 10 feet for the front, zero to five feet for the sides (unless adjacent to a residential district, then 20 feet) and zero to five feet for the back (unless adjacent to a residential district, then 20 feet).

- B-3 is intended for uses that provide commercial goods and services to residents of the community, and are dependent on automobile access and exposed to heavy automobile traffic. Multifamily residential uses are allowed in General Business Districts. Minimum setbacks on R-4 zoned properties are 10 feet for the front, zero to 15 feet for the sides and zero to 15 feet for the back.

a) *Housing*

Housing along the roadway is only present on E. 48th Avenue and includes single-family homes, duplexes, and condominiums/townhomes.

The 2012 Anchorage Indicators Report also lists the percentage of multifamily structures in the Midtown Census Tract as more than 75%. The same report identified only 20% to 40% of the housing units in the project area as owner occupied.

b) *Businesses*

Business are present on the eastern half of E. 48th Avenue and the southern half of Cordova Street. Nine business properties directly access E. 48th Avenue and six directly access Cordova Street. Of these, the underlying zoning of seven of them, all on E. 48th Avenue, is B-3, General Business, and include a variety of commercial operations. The remaining eight businesses are zoned I-1, Light Industrial, and consist of offices, storage yards, a commercial water delivery business, and two automotive shops.

Photo 3 - Businesses on E. 48th Ave

Two lots, one on E. 48th Avenue and one on Cordova Street, are undeveloped but used for parking and/or storage by adjacent businesses. Many of the businesses have full-frontage driveway access onto the roadways. Specific businesses identified along the project area are listed in Appendix L.

c) *Public Institutions*

St. Elias is located on the west side Cordova Street, south of E. 48th Avenue. The hospital is owned by Providence and caters to patients requiring long-term recovery from illness, injury, or addiction. Patients are routinely transported to the hospital via ambulance so access to the site must be maintained at all times.

Providence also owns a 6.4-acre site on the southeast corner of the Cordova Street and E. 48th Avenue intersection. The property was the location of an extended care center that was recently demolished. In a meeting in January 2019, Providence representatives stated that they had no specific development plans for the site.

d) *Schools*

Midtown area students along the project corridor are within the following school boundaries:

- Rogers Park Elementary School
- Romig Middle School
- West High School

Transportation is provided by the Anchorage School District (ASD) for students who live at least 1.5 miles from their neighborhood school. ASD bus service is currently provided for students living along the project corridor, with stops located at Cordova Street and 46th Avenue for elementary, middle, and high school children.

e) *Public Parks*

There are no public parks adjacent to the project corridor.

3. Environmental Constraints

a) *Wetlands/Creeks*

There are no mapped wetlands, streams, or other bodies of water along the project corridor based on MOA Watershed Management Wetland Mapping data.

b) *Contaminated Sites*

According to the Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Program Database, the following contaminated sites are present along the project corridor:

- Parcel 100 – 239 E. International Airport Road, Hazard ID 23954. The site previously contained an leaking underground storage tank containing oil. The contaminated soil was excavated and removed to an off-site treatment facility; cleanup is reported as being complete.
- Parcel 102 – 5024 Cordova Street, Hazard ID 25138. The site previously contained a leaking underground storage tank. No cleanup action was documented, however cleanup is reported as being complete.
- Parcel 107 – 4900 Eagle Street, Hazard ID 26334. Contamination is reported along a pipeline between a former underground storage tank and a generator building. The contaminated soil was excavated and removed to an offsite treatment facility; cleanup is reported as being complete.
- Parcel 107 – 4900 Eagle Street, Hazard ID 23106. Contamination was reported from a leaking underground storage tank containing diesel. The tank and surrounding soil were removed and the facility monitored; cleanup is reported as being complete.
- Parcel 121 – 4748 Old Seward Highway, Hazard ID 23658. This site is identified as an active contaminated site with groundwater contamination from gasoline and diesel release. Groundwater monitoring activities have been ongoing, with the most recent report (May 2019) indicating that contamination is still present.

It should also be noted that contaminated soils were encountered in two boreholes on E. 48th Avenue, west of Old Seward Highway, during the geotechnical investigation. Additional information can be found in Section 4.

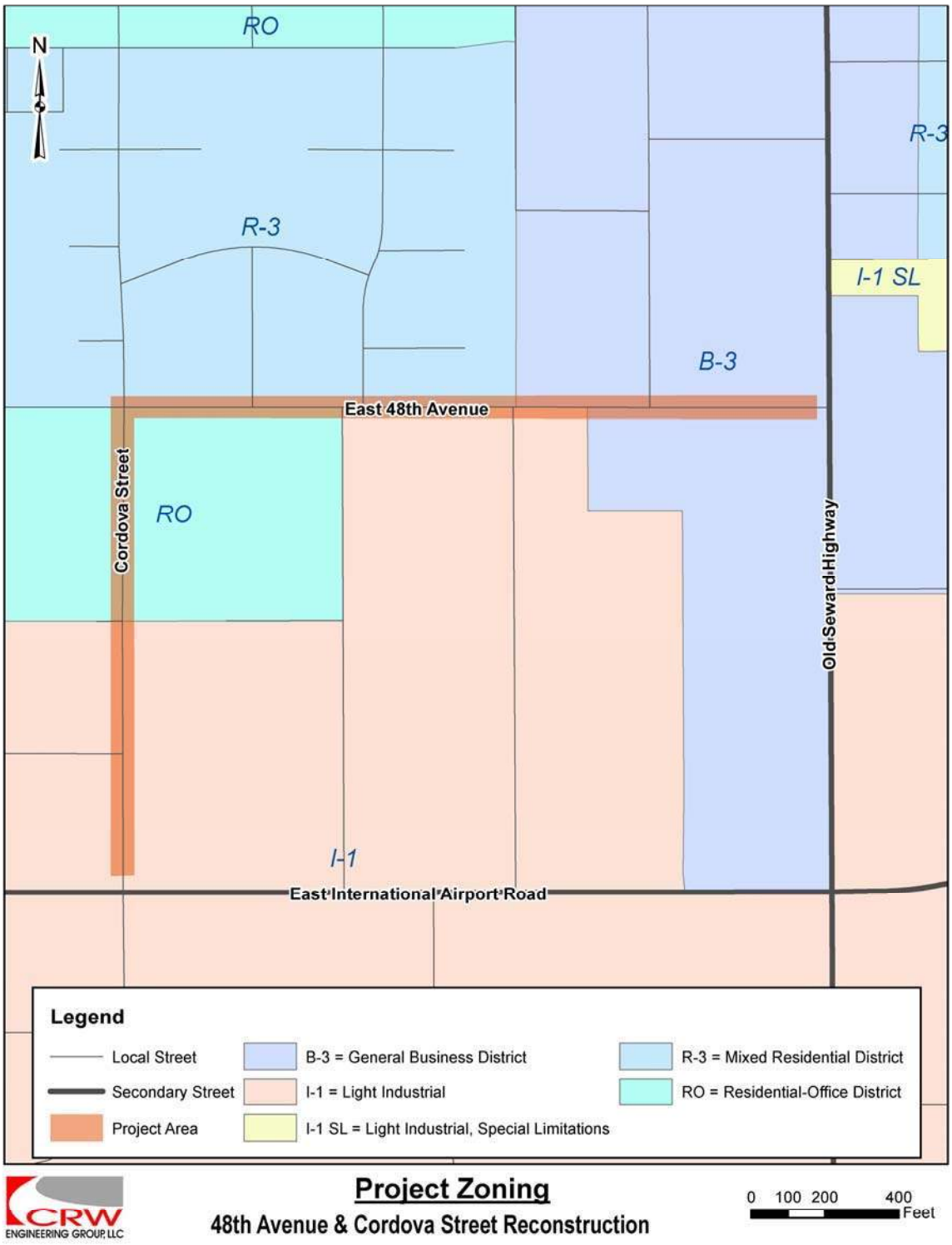

Figure 2 - Project Area Zoning

C. Roadway Characteristics & Function

1. Facility Description

a) *E. 48th Avenue (Cordova Street to Old Seward Highway)*

This 1,860-foot-long roadway has a paved width between curbs of 32 feet. Parking is permitted on both sides of the road.

The roadway has rolled curb with no sidewalks on either side. Vegetation is not commonly present along most of the corridor.

The following roadways intersect E. 48th Avenue within the project corridor:

- Cordova Street
- Denali Street
- Eagle Street
- Fairbanks Street
- Gambell Street
- Old Seward Highway

No signalized intersections are present. Roadway grades up to 3% are present along the roadway. Four, separate piped storm drains collect drainage from the entire segment, with three eventually joining to carry flow north of Tudor Road, and one carrying flow to the east to the Old Seward Highway.

On the western half of E. 48th Avenue, all area to the north is residential, and most of the area to the south is an empty lot (zoned R-O). The rest of E. 48th Avenue is surrounded by light industrial and businesses.

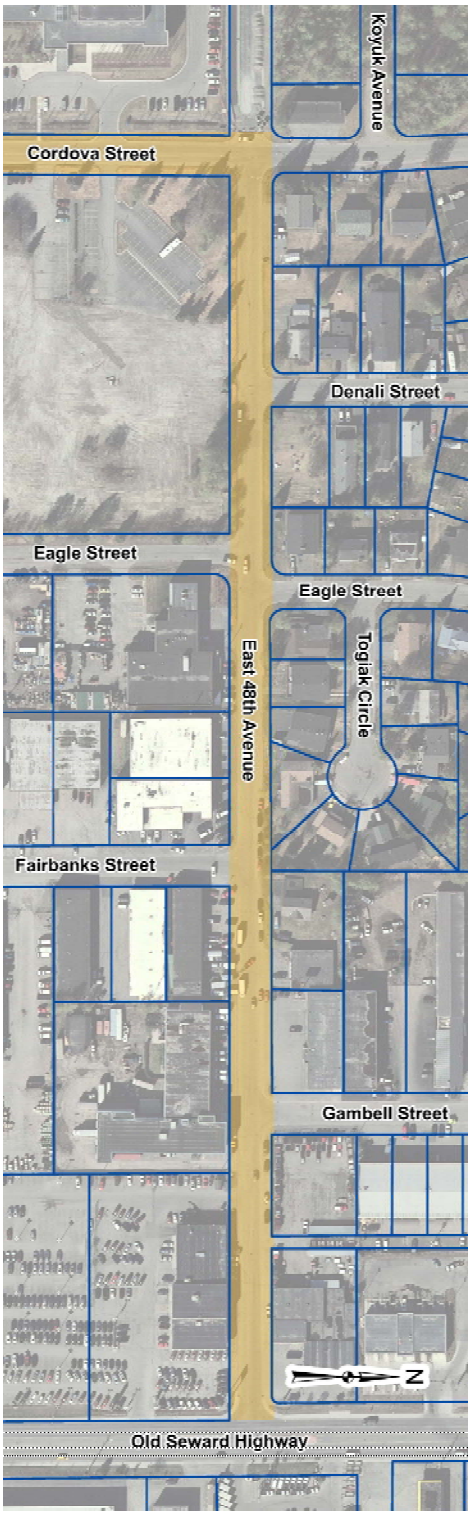

Figure 3- E. 48th Avenue

b) *Cordova Street (International Airport Road to E. 48th Avenue)*

Cordova Street is approximately 1,250 feet long and has a typical paved width between curbs of 32 feet. Parking is permitted on both sides of the road.

The roadway has rolled curb with no sidewalks on either side. Vegetation is not commonly present along most of the corridor, except at the north end near St. Elias.

The following roadways intersect Cordova Street within the project corridor:

- E. 48th Avenue
- E. 51st Avenue
- International Airport Road

No signalized intersections are present. Roadway grades are relatively flat (0.8% to 1.5%). The only drainage structures present on Cordova Street are at the intersection with E. 48th Avenue, and stormwater drainage is a known issue along this stretch of roadway.

On the northern half of Cordova Street, to the west is St. Elias, and the area to the east is an empty lot (zoned R-O). The remainder of Cordova Street to the south is light industrial.

Figure 4 - Cordova Street

2. Roadway Function

The functional classification affects the basic design criteria including design speed, number of lanes, lane and shoulder width, ROW width, distance between intersections, and alignment. The most current version of the OS&HP lists the following classifications for roadways along the project corridor:

- E. 48th Avenue – Class IC Neighborhood Collector
- Cordova Street – Class I Collector

The primary function of a local street is to provide access to abutting properties, whereas collector streets have a primary function to form a grid that collects traffic from local streets and carries it to the arterial system. Local streets typically have an Average Annual Daily Traffic (AADT) of less than 2,000 vehicles. Based upon access and traffic volumes, both E. 48th Avenue and Cordova Street function like collector streets.

D. Area Landscaping

1. E. 48th Avenue

Photo 5 – E. 48th Ave

At the intersection of E. 48th Avenue and Cordova Street, the park-like plantings of the R-O zoned property wrap around from Cordova Street to the south edge of E. 48th Avenue, all the way to Eagle Street, with large areas of lawn and a less-formal arrangement of deciduous and evergreen tree plantings and large shrubs (Photo 5). A lone spruce tree located mid-block on this section of E. 48th Avenue appears to be dead or dying (Photo 6). From Eagle Street, E. 48th Avenue is lined by I-1 properties which include only one landscaped area; a lawn with a berm and a well-maintained landscape bed at the southeast corner of the E. 48th Avenue and Eagle Street intersection, which includes well-established birch, spruce, and mugo pine shrubs (Photo 7).

Photo 6 – Lone spruce tree

Photo 7 – E. 48th Ave & Eagle St

The properties along the north side of E. 48th Avenue, from the Cordova Street intersection to the Fairbanks Street intersection, are zoned R-3 and comprised of small apartment buildings, duplexes, and single-family residences. These smaller lots have a wide range of landscaping that varies from primarily lawn and pavement to well-tended gardens with densely planted trees, shrubs, and perennials (Photo 9). Mature trees and shrubs screening the properties from the street are common in the ROW in this section of E. 48th Avenue (Photo 8).

Photo 8 – Mature trees on E 48th Ave

From the intersection of E. 48th Avenue and Fairbanks Street on the north side and E. 48th Avenue and Gamble Street to the south, the properties along both sides of E. 48th Avenue are zoned B-3 all the way to the Old Seward Highway, and with few exceptions, have little or no landscape features. The Salvation Army has a large raised planter with deciduous shrubs against one wall of their building along E. 48th Avenue, and the southwest corner of the E. 48th Avenue and Old Seward Highway intersection has a small area planted with lawn and mugo pine shrubs. The northwest corner of the same intersection has a small area of lawn.

2. Cordova Street

The north half of the project area on Cordova Street is zoned R-O and features well-maintained landscaping covering all areas not taken up by paved surfaces or structures. The landscaping lends the area a park-like feel with well-groomed lawns and tree and shrub plantings (Photo 10). The west side of Cordova Street in this area is lined by lawn and linear planting beds with regularly spaced deciduous tree plantings, while the east side landscape is less formally arranged, with long stretches of lawn and sporadic, naturally arranged tree plantings. Additionally, a hedge of

Photo 10 – Cordova St looking north

Photo 9 – Landscaping on E. 48th Ave

cotoneaster and deciduous tree plantings on the east side of Cordova Street helps to screen a large parking lot from the street.

The south half of the project area on Cordova Street is zoned I-1, and there are generally no lawns or formal planting areas (Photo 11). The land that isn't covered by a building or pavement is comprised of compacted dirt with little or no vegetation. These areas are used for parking or are vegetated with self-seeded weeds (Photo 12). The few exceptions include a small landscape bed with deciduous trees and shrubs at the northeast corner of the International Airport Road and Cordova Street intersection (Photo 13), and a couple of raised planters and landscape beds along the east side of Cordova Street, containing shrubs and evergreen and deciduous trees (Photo 14).

Photo 13 – Cordova St & IAR (West)

Photo 14 – Cordova St near 51st Ave (East Side)

Photo 11 – Cordova St & IAR (East)

Photo 12 – Cordova St near 51st Ave (West Side)

E. Lighting

Street lighting is inconsistent along the project corridor, and for much of the roadway, limited to street intersections. Existing lighting conditions for each roadway segment are summarized below:

1. E. 48th Avenue (Cordova Street to Old Seward Highway):

   There are two MOA street lights at the intersection of Cordova Street and E. 48th Avenue that will remain. CEA direct-buried steel light poles are located at the Denali Street and Eagle Street intersections. The poles are fed from underground conductors and have Light-Emitting Diode (LED) fixtures.

2. Cordova Street (E. 48th Avenue to E. International Airport Road):

   There are four, CEA wood light poles between E. 48th Avenue and E. 51st Avenue. All fixtures are fed from overhead conductors and the poles LED fixtures.

Photo 15 - Street light on Cordova Street

F. Utilities

Existing utilities within the project area include telephone, cable television, electric, fiber optic, storm drain, natural gas, water, and sanitary sewer (See Appendix A for the layout, size, and type of existing utilities). A list of all utilities within the project area, excluding AWWU's facilities, are provided in the utility relocation summary in Appendix J. The location of utilities in the project planning documents and drawings are based on utility company facility maps and locates collected via aerial imagery.

1. Water & Sanitary Sewer

   <u>Anchorage Water and Wastewater Utility</u>

   The project area is served by public, piped water and sewer systems owned and operated by AWWU. The water mains in the project area range in size from six inches to 12 inches in diameter and are made of cast iron (CI), asbestos concrete (AC), or ductile iron (DI). Depth of bury for the water mains is generally eight to 10 feet below ground surface (BGS). Service lines, hydrants, valves, key boxes, and other water appurtenances are located throughout the project area.

   The gravity sewer mains in the project area are limited to an 8-inch AC sewer line that runs on Cordova Street from International Airport Road to the alley just south of E. 51st Avenue and an 8-inch DI crossing at Denali Street and E. 48th Avenue. Service lines, manholes, cleanouts, and other sewer appurtenances are present in these locations.

2. Electric

Chugach Electric Association

CEA owns and operates overhead (OH) and underground (UG) electric lines, junction boxes, and utility poles in the project area, including UG power lines that run on the south side of E. 48th Avenue for the extent of the project. These lines cross E. 48th Avenue at Denali and Eagle Streets.

Photo 16 - Overhead Electric Crossing on Cordova Street

CEA owns the OH utility line and poles that run along the east side Cordova Street, which provides service to businesses south of 51st Avenue and lighting along Cordova Street.

3. Telephone

Alaska Communications

Alaska Communications owns and operates OH and UG telephone and fiber optic lines within the project area. Alaska Communications has an OH, 200 pair telephone line that runs on the east side of Cordova Street on CEA-owned poles. A UG, 400 pair telephone line runs on the west side of Cordova Street between 51st Avenue and E. 48th Avenue. A UG, 36 strand fiber optic line, 2400 pair telephone line, and 400 pair telephone line run on the south side of E. 48th Avenue. These lines cross E. 48th Avenue at Old Seward Highway. Alaska Communications infrastructure in the project area also includes telephone/fiber optic vaults and pedestals.

4. Cable

General Communications, Inc. (GCI)

GCI owns and operates UG and OH cable and fiber optic lines within the project area, including overhead coaxial lines on the CEA poles on Cordova Street. Additionally, a UG fiber optic line runs along the east side of Cordova Street between 50th Avenue and E. 48th Avenue. On E. 48th Avenue, a UG fiber optic line runs along the south side between Cordova and Eagle Streets. Additionally, UG coaxial lines run along the north side of E. 48th Avenue. GCI fiber optic and coaxial lines cross E. 48th Avenue just east of Eagle Street and just west of the Old Seward Highway. GCI infrastructure in the project area also includes cable/fiber optic vaults and pedestals.

5. Natural Gas

   ENSTAR Natural Gas (ENSTAR)

   ENSTAR owns and operates natural gas facilities within the project area, including a 2-inch steel line running on the west side of Cordova Street and the north side of E. 48th Avenue for the extent of the project. Numerous services (ranging in size from 1/-1/4 inch to 7/8 inch) cross Cordova Street and E. 48th Avenue. There are no pressurized transmission gas mains within the project area.

6. Storm Drain

   See Section 4 - Drainage Analysis for a summary of the existing storm drain facilities.

G. Right-of-Way and Easements

The existing dedicated ROW along the project corridor varies from 60 to 65 feet in width. The majority of the ROW was dedicated to the MOA by subdivision plat when the properties were subdivided. Existing ROW along the roadway corridor is described below, and detailed ROW maps can be found in Appendix I.

1. Cordova Street (E. International Airport Road to E. 48th Avenue)

   The ROW width along Cordova Street is 60 feet, centered on the ROW centerline with the exception of an additional five feet along Parcel 103 west of the centerline. The additional five feet of ROW was dedicated by plat 2013-87. Side street intersections with Cordova Street all have 60 feet of ROW. An alley extends west between Parcels 100 and 101 and has a 20-foot ROW width.

   A 10-foot-wide CEA easement exists on the east side of the roadway for the northern half of Parcel 109 and the entire length of Parcel 108. A 10-foot-wide by 15-foot-long CEA easement is located at the southwest corner of Parcel 107. A 10-foot-wide by 32-foot long CEA Aerial Guy Easement is located near the midpoint of Parcel 109.

   A 10-foot-wide electric and telecom easement exists along the entire length of the Parcel 104 east property line (St. Elias).

   A five-foot development setback exists along the entire length of the east property line of Parcel 103. Overlaying the development setback is a 10-foot electric and telecom easement, which is overlaid by an eight-foot, visual enhancement easement. A 60-foot-wide by 70-foot-long access easement is located on the northeast corner of Parcel 103.

   A preliminary plat has been developed which would vacate 60-feet of ROW on E. 50th Avenue from Cordova Street to Eagle Street. In return, five feet of the west property line along Parcel 108 would be dedicated to MOA ROW. It is not known at this time when the plat will be accepted.

2. E. 48th Avenue (Cordova Street to Old Seward Highway)

   E. 48th Avenue has a typical ROW width of 60 feet centered on the ROW centerline. Side street intersections with E. 48th Avenue have a typical width of 60 feet, with the exception of Eagle Street located north of E. 48th Avenue, which has 50 feet of ROW. An alley extends north between Parcels 120 and 121 and has a total ROW width of 20 feet.

   A five-foot-wide utility easement is located on the south property line of Parcel 106, which expands to 10-feet-wide on Parcel 110 and extends to Parcels 112 through 117. An additional 10-foot-wide utility easement is located on the north property line of Parcel 107.

   A 10-foot-wide electric easement is located on the south property line of Parcel 119 and along the east property line of Parcel 121. A 10-foot-wide electric and telecom easement is located on the south property line of Parcel 120 and terminates 40 feet east of Parcel 121.

   A public use easement is located along the entirety of the east property line of Parcel 122.

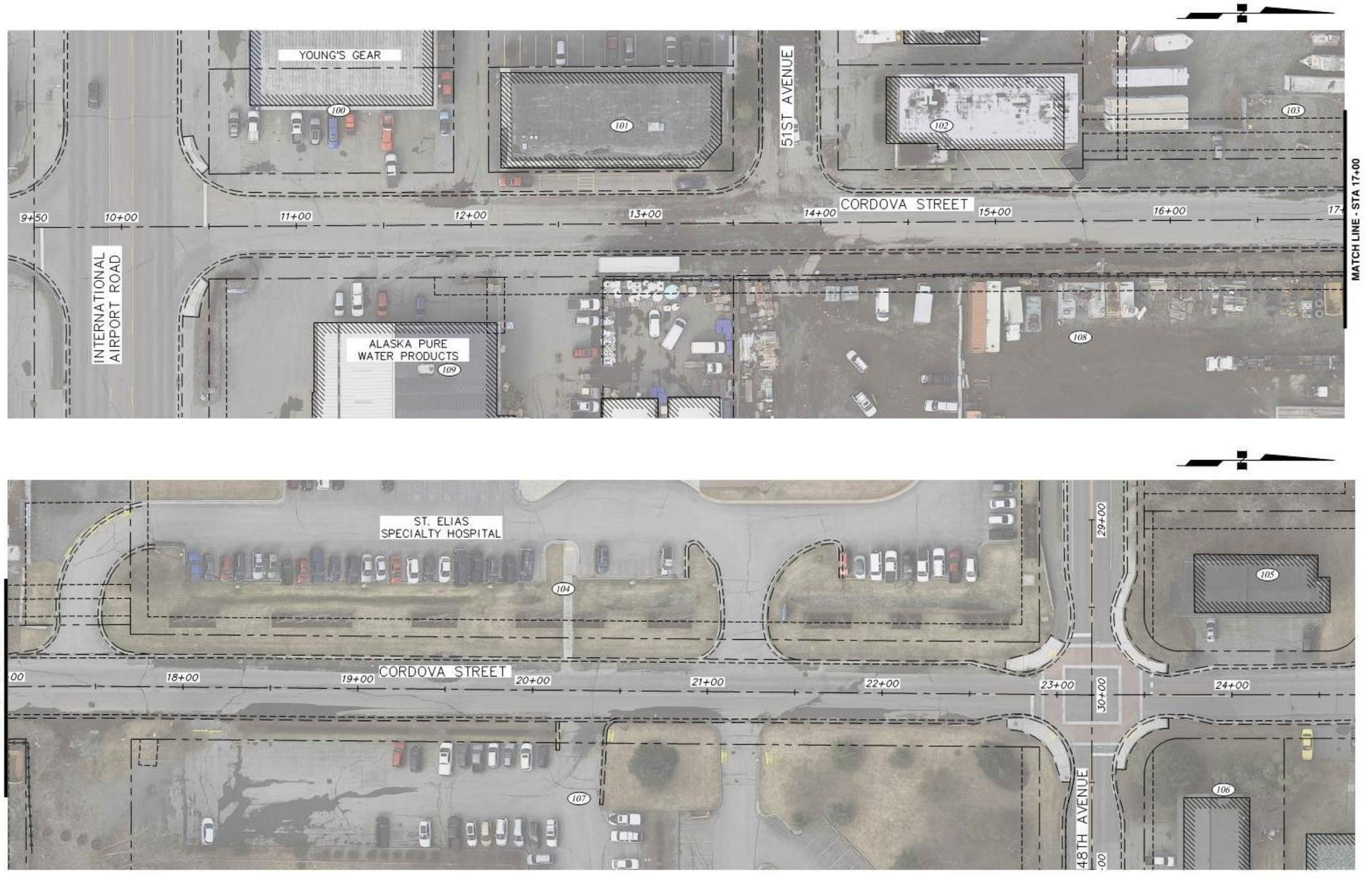

Figure 5 - Parcel Location Map (Sheet 1)

Figure 6 - Parcel Location Map (Sheet 2)

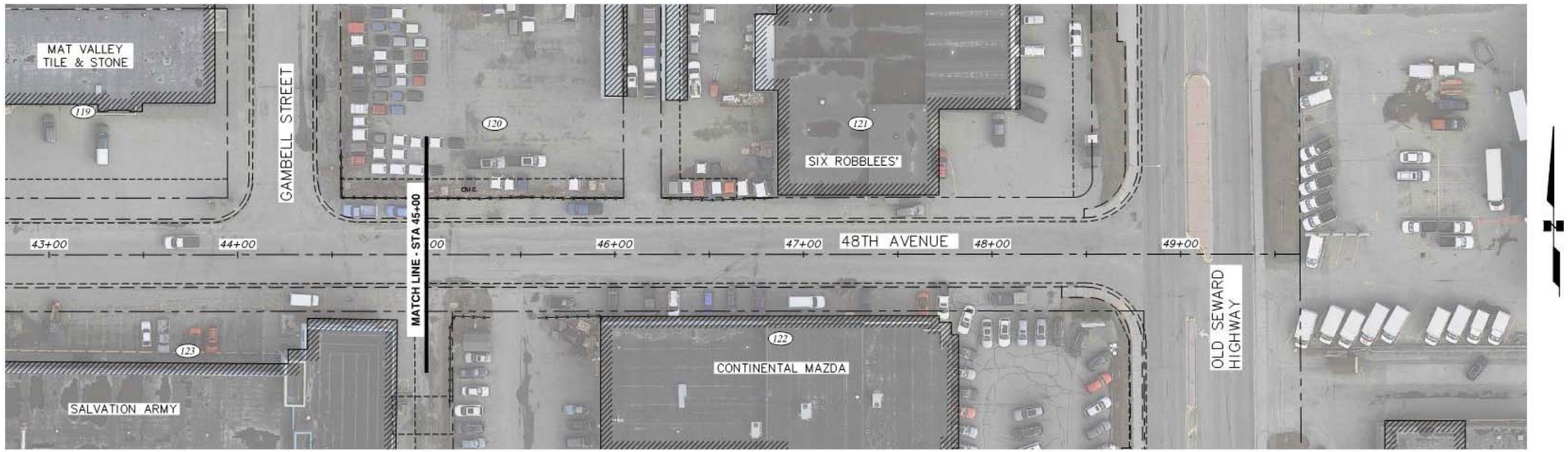

Figure 7 - Parcel Location Map (Sheet 3)

3. Drainage Analysis

A number of drainage concerns exist within the project area. From ponding issues to inadequate storm drain infrastructure, improving drainage along the project corridor is a primary goal. These improvements will preserve the new roadway and prevent future degradation.

To properly evaluate the existing infrastructure, a condition assessment of the storm drain structures and piping along E. 48th Avenue and Cordova Street was conducted. Additionally, a hydrologic and hydraulic analysis was performed to determine if the existing piping is adequately sized to meet current MOA design criteria.

The information gathered from the condition assessment and drainage analysis was used to develop a proposed storm drainage system that will provide the following:

- Replace aging/deficient infrastructure
- Improve current surface drainage
- Size new piping to convey design storm events
- Provide water quality treatment for storm runoff
- Minimize groundwater in the roadway structural section
- Extend the life of the roadway

Each of these topics is discussed in more detail below. The proposed drainage improvements are discussed Section 8.

A. Existing Conditions

1. Drainage Concerns

   Significant ponding occurs throughout the project limits due to flat grades and inadequate storm runoff collection and conveyance systems. Poor drainage leads to roadway degradation, such as heaving, cracking, and pavement failure over time. The entire project corridor shows significant signs of pavement distress due to these issues.

2. Existing Conveyance Systems

   The existing storm drain systems within the project limits are all along E. 48th Avenue and consist of four separate subsystems. Currently, there is no storm drain infrastructure within the project limits on Cordova Street, except at the intersection with E. 48th Avenue. The existing drainage systems are owned and maintained by MOA. Runoff from each of these systems is directed to larger mains, often referred to as trunk lines. Some segments were installed nearly 40 years ago, whereas others were constructed as recently as 2014.

Each E. 48th Avenue subsystem is described in further detail below, starting at the west end of the project and continuing east. Figure 8 shows the existing configuration of each of these subsystems and flow direction.

a) *Tudor Road / Fish Creek System*

Three of the existing storm drain systems along E. 48th Avenue (at Cordova, Denali, and Eagle Streets) eventually connect to a single system. These lines all run north and extend to a line located in E. Tudor Road, which is conveyed to the northwest to 36th Avenue, and eventually discharges into Fish Creek.

Storm drain pipe in the E. 48th Avenue and Cordova Street intersection ranges in size from 12-inch to 18-inch, corrugated polyethylene pipe (CPEP) and was installed in 2014. The pipe in this area was identified in the condition assessment report as being in good condition, aside from sediment and leaf buildup. Storm drain structures were also in good condition. Due to its recent installation and good condition, the system will remain in place. At this intersection, five catch basins and a private site all contribute to the system, which then runs north along Cordova Street.

The pipe in Denali Street is 12-inch, perforated corrugated metal pipe (CMP) installed in 1988. No issues were identified in the condition assessment report. This system will remain in place and continue to act as a subdrain line for Denali Street. This line starts with a single manhole (no catch basins) at the intersection of E. 48th Avenue and Denali Street, then runs north along Denali Street.

The three pipes in the Eagle Street intersection are all 12-inches in diameter. Two are perforated CMP installed in 1988, and one is 12-inch CPEP with an unknown install date. No major issues were identified in the condition assessment report; only cleaning is recommended. This system will likely remain in place, but may require adjusting locations of curb inlets to meet final roadway design. This line starts with a manhole and two catch basins at the intersection of E. 48th Avenue and Eagle Street, then runs north along Eagle Street.

b) *Old Seward Highway / Campbell Creek System*

The existing storm infrastructure on E. 48th Avenue near the Old Seward Highway is part of a subsystem that begins on Gambell Street. This line runs south on Gambell Street to E. 48th Avenue, then flows east on E. 48th Avenue to join with pipes flowing south on Old Seward Highway. This system flows to the south of the project area, then through an oil and grit separator (OGS) before discharging to Campbell Creek.

Storm drain pipe in this subsection along E. 48th Avenue is either 10-inch or 15-inch CMP and was mostly installed in 1982, though some pipes have an unknown install date. The pipe in this area was identified in the condition assessment report as being in moderate to poor condition. Some were deteriorated enough that a full replacement is recommended. Curb inlet locations may require adjusting to meet final roadway design.

3. Drainage Basin Delineation

The contributing drainage basins within the project area were delineated using several resources, including topographical mapping, aerial photography, parcel boundaries, and MOA Watershed Management's hydrography geodatabase (HGDB). Based on HGDB data, the project area is located within the Fish Creek and Campbell Creek watersheds and situated in Subbasins 775, 1317, and 1036 in the midtown area. Refer to Figure 1, Appendix E illustrating the boundaries of the subbasins.

The larger-scale watersheds and subbasins identified in the HGDB were further refined for this project to better reflect the drainage contributing directly to the existing storm infrastructure within the project corridor. For this drainage study, a total of eight catchments were delineated for the existing condition. See Figure 2, Appendix E for catchment areas.

The contributing catchments are characterized as a mix of industrial/commercial property, residential, and some areas of undeveloped land. Stormwater runoff from the catchments is generally directed to existing piped systems to the north or the east. In order to develop the drainage model, each catchment was characterized in terms of its area, ground cover type, imperviousness, slope, soil type, and various other factors. Some of the more influential factors are briefly discussed below:

a) *Composite Curve Number*

A composite curve number was calculated for each catchment area; this characterizes the storm runoff properties for a particular area based on ground cover and soil type. For example, high curve number values (such as 98 for paved areas) result in high runoff, with minimal losses. Lower values (such as 70 for naturally vegetated surfaces), correspond to an increased ability of the soil to retain rainfall, and will produce much less runoff than an impervious surface. The composite curve number combines the different ground cover types, weighting them by the percentage of area for that particular catchment.

b) *Time of Concentration*

Time of concentration (T_c) is defined as the time for runoff to travel from the hydraulically most distant point of a watershed to the design point or point of interest, per Section 4.6 of the Anchorage Stormwater Manual (ASM). Travel times can depend on many factors including catchment size, topography, land cover, and use. Several different methods are available to compute T_c. For this analysis, the SCS TR-55 method was used.

For a complete summary of each catchment and the input parameters used for the hydrologic and hydraulic analysis, refer to Appendix E.

4. Water Quality Treatment

Based on available storm drain record drawings and HGDB data, water quality treatment is not currently being provided along the project corridor. This also includes

treatment through the use of Green Infrastructure (GI) and gray infrastructure such as OGS.

5. Wetlands

   No wetland areas have been mapped in the project area based on HGDB data.

6. Floodplains

   No floodplains have been mapped in the project area based on HGDB data.

7. Storm Drain Condition Assessment

   CRW conducted a condition assessment of the existing storm drain lines based on MOA CCTV data collected in late 2018 and early 2019. For the complete report, refer to Appendix D.

   The inspection effort used a CCTV camera that drives down the pipe to record video. This allows the user to observe the pipe and refer to a video image of the pipe's interior on a later date.

   The data collected for each pipe and structure was used to score/grade the condition of the infrastructure to determine if replacement was warranted. Any pipe that is marked as "requires replacement" or "lining recommended" had significant structural defects. Figure 1, Appendix D summarizes the deficiencies identified.

8. Manhole Inspection Assessment

   CRW conducted an inspection of the existing storm drain manholes in May 2019. For the complete report, refer to Appendix D.

   Videos and photos were taken of all manholes within project limits as part of this effort, for documentation purposes. Manholes were observed by viewing from the top of the structure, and video was recorded using a camera on a swiveling arm, in order to see within the manholes easily.

   Inspection forms with condition grading scores were created for each manhole. Generally the condition of manholes followed a similar trend to the conditions of the pipes in the CCTV data (see previous section). Manholes with significant defects are anticipated to be replaced.

B. Hydrologic and Hydraulic Analysis

A hydrologic and hydraulic analysis was prepared to provide the basis for locating and sizing storm drain infrastructure within the project area. Analysis of the model includes calculating the peak discharge from each drainage basin and peak capacities of each pipe segment for both the existing and the proposed conditions. This process assists in determining the location of problem areas for the existing system and makes sure the proposed storm drain system is properly sized. Preparation and evaluation of the hydrologic and hydraulic model was performed in accordance with the ASM. Supporting data and modeling for the drainage analysis can be found in Appendix E.

In addition to sizing the conveyance systems, the drainage model provides runoff flows and volumes to size water quality treatment systems. Per the ASM, treatment must be provided for stormwater runoff generated from the first 0.52 inches of rainfall event. As noted previously, there is no known treatment provided along the project corridor.

1. Design Storm Depth and Distribution

   The current MOA design storms described in Chapter 2 of the Design Criteria Manual (DCM) and the supporting Drainage Design Guidelines (DDG) were developed based on data collected at Ted Stevens Anchorage International Airport. These design storms were recently updated in the ASM based on data from the National Oceanic and Atmospheric Administration's (NOAA) Volume 7 of Atlas 14, Precipitation-Frequency Atlas of the United States (Atlas 14).

   Per ASM Table 4.2-1 (MOA Design Storm Depths), the following design storms and depths (based on Atlas 14 data, plus an orographic factor of 1.02) were evaluated to predict runoff response and meet design requirements:

   - Water Quality Treatment: 90th Percentile, 24-hour – 0.53 inches
   - Conveyance Design and Peak Flow Control: 10-year, 24-hour – 2.33 inches
   - Project Flood Bypass: 100-year, 24-hour – 3.66 inches

   The design storm distribution used for drainage modeling is based on the hyetograph provided in Appendix D of the ASM, as required in Section 4.2.4 of the ASM.

   It should be noted that both the volume and peak intensity for the majority of Atlas 14 design storms increased significantly, as compared to the previous MOA design storms which the existing infrastructure was designed to.

2. Orographic Factor

   Based on project location, an orographic factor of 1.02 was applied to the design storm volumes. Refer to Figure 4.2-3 (Orographic Factor Map – Anchorage) in Appendix E.

3. Model Information

   A hydrologic and hydraulic (drainage) model was assembled to analyze the existing and proposed conditions of each contributing catchment, as well as the corresponding conveyance systems throughout the project area. The model was developed using Autodesk Storm and Sanitary Analysis (SSA) computer software.

   The NRCS SCS TR-55 TOC method was used to model precipitation loss and to estimate runoff from each catchment. A composite curve number was calculated based on land cover type for each catchment area. The drainage analysis approach is consistent with the guidelines provided in the ASM.

   The existing storm drain piping systems included in the model were input based on record drawings and information from the condition assessment report. This information includes pipe size, type, inverts, and slopes.

Supporting data, figures, and results for the stormwater analysis can be found in Appendix E.

4. Model Results

A total of eight contributing catchments were delineated and evaluated for runoff response for the existing condition. These catchments were grouped based on the piped system the runoff will be conveyed to. The existing and proposed peak stormwater runoff during the 10-year, 24-hour design storm event for each of these catchments is shown in the figures below, which also summarize the peak flow expected to leave the project area during the storm event. In the Old Seward system, flow is bottlenecked, due to undersized pipe along E. 48th Avenue. In some cases, the undersized pipes cause surcharging conditions, some of which are significant enough to cause manholes to overtop.

Peak pipe flows for the existing drainage systems at the outfall locations described in Section 3.A.4 and for the proposed drainage systems described in Section 8 are seen in Appendix E. Peak flows are based on the 10-year, 24-hour design storm event. Modeling has found that the existing storm drain is undersized in several locations and unable to accommodate the design storm event. The drainage model indicates peak flow conditions will cause stormwater to surcharge pipes, and overtop manholes and flow into the roadway. Results from modeling can be found in Appendix E, along with Model Pipe Layout maps.

Since some of the storm drainage systems currently in place were sized based on old design storms, they will be unable to adequately convey the current design criteria. This is demonstrated in the peak flow results and surcharging conditions.

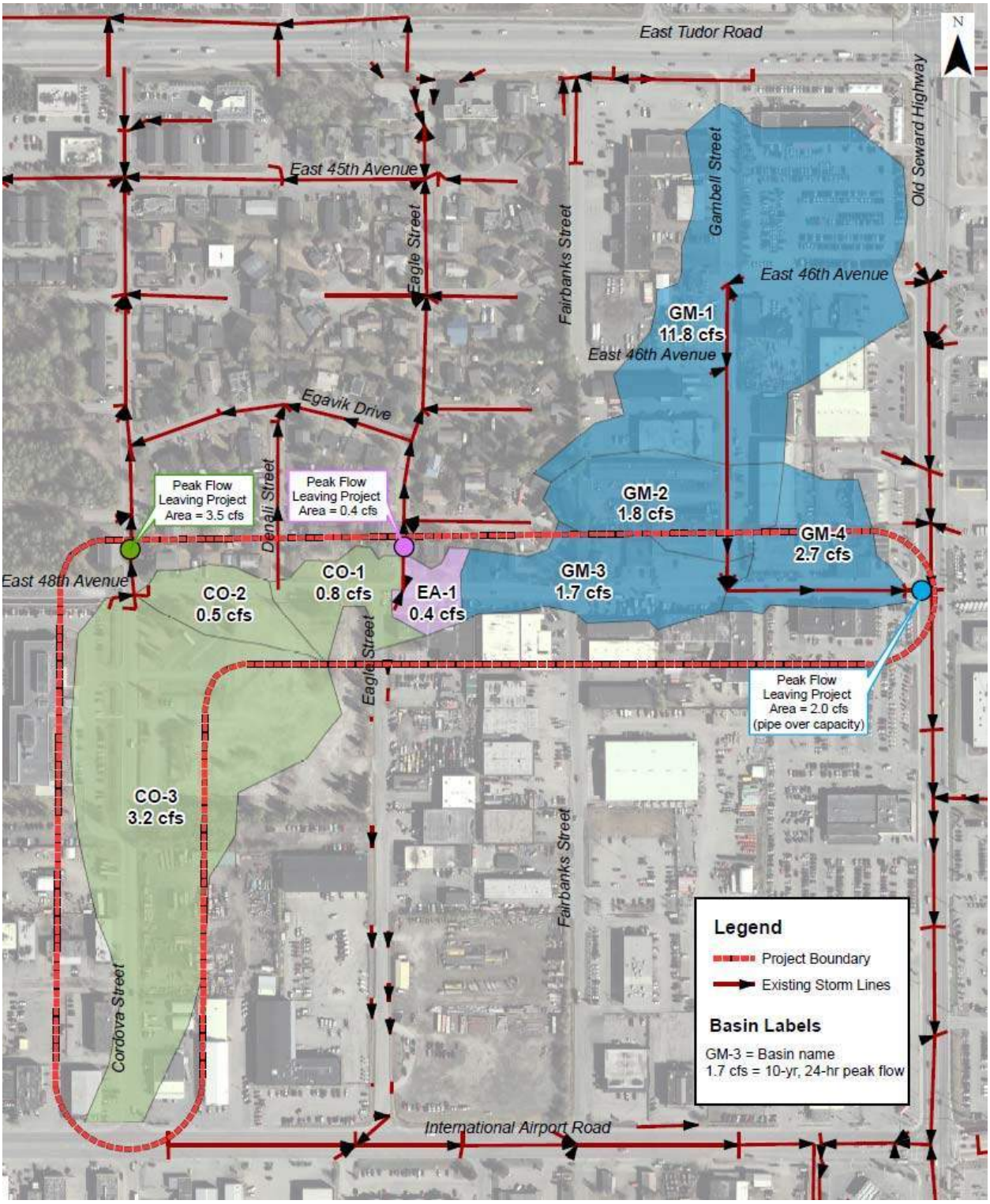

Figure 8 – Existing Storm Drain Map and Catchment Areas

4. Geotechnical Analysis

A. Existing Conditions

A geotechnical investigation was conducted by CRW for the design study phase of this project, which consisted of a review of existing historical borehole logs and completing a field investigation in the project area.

1. Historical Bore Logs

   Past investigations by R&M Consultants, Inc. (R&M) and MOA have been performed in the project area dating back to the mid-1970s through early 1980s. The borings were completed to depths of 10 to 12 feet BGS. The borehole logs indicate the area generally consists of a silty gravel fill determined to be four inches to two feet thick. Below the fill was a clayey to sandy silt containing traces of gravel. Peat was observed in one boring, closest to the Old Seward Highway, four to five feet BGS.

   Groundwater was not observed in any of the historic borings.

2. CRW Field Investigation

   CRW's geotechnical field investigation occurred in October and November 2018 and the draft Geotechnical Report can be found in Appendix F. The investigation included drilling and sampling 14 borings to a minimum of 15 feet BGS and installing nine piezometers for groundwater level monitoring. One of the 14 borings was installed along 51st Avenue.

   The pavement along the project varied from two to three inches based on measurements at the borehole locations.

   Subsurface conditions generally consisted of a two- to five-foot-thick layer of granular fill underlain with a mix of coarse- to fine-grained material. Coarse-grained materials ranged from clean gravel to silty/clayey gravel. The fine-grained material ranged from silt to clay with varying amounts of sand and gravel.

   Groundwater observed during drilling ranged from 2.5 to 7.5 feet BGS. Subsequent groundwater measurements were between 0.2 to 7.3 feet BGS. Groundwater was observed to be shallower towards the southern portion of Cordova Street and deeper towards the eastern portion of E. 48th Avenue.

   Significant seasonal frost was not observed in the borings at the time of drilling.

   Photoionization detector (PID) readings were collected for each sample during the field investigation. PID readings for borehole BH-12 and BH-13, the two easternmost borings along E. 48th Avenue, were noted to be contaminated. The field investigations scope did not include contaminated soil samples, therefore no analytical testing was performed.

B. Recommendations

The subgrade along Cordova Street and E. 48th Avenue is frost susceptible and therefore requires an insulated structural section. The recommended structural section totaled 44.5 inches and includes:

- 3.5 inches of asphalt concrete
- Two inches of leveling course
- 16 inches of MOA Type IIA classified material
- Two inches of rigid board insulation
- 21 inches of MOA Type II classified material
- Separation geotextile
- Subgrade

If the rigid insulation is increased from two inches to three inches, the Type II classified fill can be reduced from 21 inches to 12 inches.

Board insulation is recommended to extend a minimum of three feet beyond the back of the curb or one foot beyond the back of the sidewalk. Transitions between insulated and non-insulated sections should involve the extension of insulation out from the roadway section eight to 12 feet, with the thickness reduced in these area to minimize the possibility of differential heave.

A geotextile should be used for separation between the structural section and the existing subgrade. The geotextile should be placed on top of the excavated subgrade soils prior to placement of classified fill and any insulation, and extended up the sides of the excavation. Groundwater is shallow along portions of the project, therefore any excavations may require dewatering.

Edge subdrains are recommended for the project to help mitigate the effects of high groundwater levels to the structural section performance. Edge drains should consist of geotextile-wrapped, perforated PVC pipe with a minimum outer diameter (OD.) of four inches. If not feasible, a perforated center drained can be used. The design may consider limiting subdrains in areas were contaminated soils were encountered.

The existing fill does not generally meet the MOA Type II and Type II-A classified fill gradations, therefore this material is not anticipated for reuse.

Additional environmental assessments were recommended around borehole BH-11 through BH-13 to better define the extents of the contamination and impacts on project costs and schedule.

5. Traffic & Safety Analysis

A. Existing Traffic Volumes and Operations

Existing traffic data was gathered from MOA and the State of Alaska for the project area. Additionally, new traffic data was gathered in select locations by CRW. The following table summarizes traffic data used for this study.

Table 1 - Traffic Data Summary

Location	Date	Speed	Bike/Ped Count	Volume (Link)	Vehicle Turning Movements
E. 48th and Cordova	11/08/2018		X		
E. 48th and Cordova	11/8/2018				X
E. 48th and Old Seward	11/1/2018		X		
E. 48th Ave at Fairbanks St	04/09/2019	X		X	
Cordova St at E. 51st Ave	04/11/2019	X		X	
E. 48th Ave and Cordova St	05/18/2016				X
E. 48th Ave and Cordova St	05/17/2016				X
E. 48th Ave and Cordova St	05/22/212				X

The counts and studies are included in Appendix G.

B. Traffic Volumes

The existing AADT volume was determined by using the volume data (link counts) taken on E. 48th Avenue at Fairbanks Street and on Cordova Street at 51st Avenue in April 2019. Seasonal adjustments were factored into the AADT using the nearest permanent traffic recorder on International Airport Road at Fairbanks Street.

The AMATS travel demand model includes forecasted, future daily traffic volumes for higher volume roadways. The model does not include future traffic volumes for E. 48th Avenue or Cordova Street.

Although much of the project area east of Cordova Street is built out, traffic volumes on the roadway are anticipated to increase as the local population grows, since the majority of traffic on these roadways are destination based and will increase as the population rises. There are several, large undeveloped parcels on E. 48th Avenue (at Cordova Street) that when developed, are also expected to contribute to the projected traffic volumes. Local population rates were obtained from the Anchorage 2040 Land Use Plan which estimates population growths between 0.3% and 1.1% with a 0.8% annual growth rate.

The following table summarizes AADT for E. 48th Avenue and Cordova Street.

Table 2 - AADT Traffic Data

Roadway	Location	2020 Daily Traffic Volumes	2040 Projected Daily Traffic Volumes[1]
Cordova St	International to E. 48th	1180	1380
E. 48th Ave	Cordova to Old Seward	1240	1450

1. Annual Growth Rate of 0.8% Source: Anchorage 2040 Land Use Plan.

C. Traffic Characteristics

Cordova Street consists mainly of commercial and industrial development with larger industrial parcels (zoned I-1) on the south and medical facilities (zoned R-O) on the north. E. 48th Avenue is a mix of residential, commercial, and industrial properties with B-3 zoning to the east, I-1 to the southwest, and R-3 to the north. Development and zoning in the project area are not anticipated to change and traffic characteristics are expected to remain relatively consistent for the life of the project.

Design hour volume (DHV), representing traffic during the peak hour, was estimated using the 30th highest hour of the closest permanent traffic recorder. Directional distribution (DD), representing the distribution of traffic during the peak hour, was estimated using available link counts and turning movement counts. Peak hour factors (PHF) are a measure of the uniformity of the traffic and used to convert volumes to 15 minute increments for operations analysis. PHF for each segment was determined using available link counts and turning movement counts. Equivalent single axle loads (ESAL) is a representation of the equivalent number of 18,000-pound, single axle loads on a roadway from all types of traffic.

Traffic data for each segment is summarized in the following table and provided in Appendix G.

Table 3 - Traffic Characteristics

Location	DHV	DD	PHF	ESAL
Cordova St – International to E. 48th	10.70%	60/40	.80	140,000
E. 48th Ave – Cordova to Old Seward	10.70%	70/30	.75	147,000

D. Speeds

The current posted speed limit for E. 48th Avenue and Cordova Street is 25 mph. The traffic speed analysis (April 2019) conducted by CRW recorded the 85th percentile speed as follows:

Table 4 - Observed Speeds - 2019

Road Segment	Cross Street	Date	85th Percentile Speed			
			Northbound	Southbound	Eastbound	Westbound
E. 48th Ave	Fairbanks	4/9/2019	-	-	29 mph	31 mph
Cordova St	51st Ave	4/11/2019	30 mph	32 mph	-	-

The 85th percentile speed is the speed at which 85% of the drivers are driving at or below, and is typically thought to determine a reasonable posted speed limit of a given roadway. The remaining 15% of drivers above the 85th percentile are the minority of drivers who are considered to be exceeding the reasonable speed. Posted speed limits are often set at the 85th percentile speed but can be set lower where high volumes of pedestrians and bicyclists are present. Where observed 85th percentile speeds are higher than the posted speed limit, the roadway is a good candidate for installation of traffic calming measures. On average, observed speeds along E. 48th Avenue are five mph higher than the posted speeds and six mph higher on Cordova Street.

The likelihood of serious injury and death to a pedestrian struck by a vehicle increases substantially with vehicle speed. A study by the American Automobile Association (AAA) found that the risk of severe injury for a pedestrian is 10% when the vehicle speed is 16 mph but increases to 90% when the vehicle is traveling 46 mph. The risk of pedestrian death is 10% when the vehicle is travelling 23 mph and increases to 90% when travelling 58 mph. Limiting traffic speeds to levels unlikely to result in severe injury or death on the project corridor can help improve pedestrian and bicyclist safety.

E. Crash Data

Crash data was reviewed for the project area between 2010 and 2016. A total of 20 crashes occurred on or near E. 48th Avenue and Cordova Street during this time frame. Excluding those occurring on International Airport Road or the Old Seward Highway, 40% (8 crashes) occurred only within the project corridor. A summary of these crashes within the corridor, complete with their locations and characteristics, is provided in Table 5 below and in Appendix G. The following table summarizes the crash type and severity for each intersection where crashes occurred.

Table 5 – Project Corridor Crash History: 2010-2016

Intersection	Collision Type				Severity				Total
	Angle	Rear End	Head On	Fixed Object	Ped/ Bike	PDO	Minor Injury	Major Injury/Fatality	
Cordova Street									
Intl. Airport Road		1					1		1
51st Avenue		1					1		1
E. 48th Avenue									
Eagle Street	1		1			2			2
Gambell Street	2					2			2
Old Seward Highway	1			1	1	2			2

PDO = Property Damage Only

DOT&PF provides statewide average crash rates for a variety of intersection configurations based on the number of approaches and traffic control types. The average crash rate represents the approximate number of crashes expected at a study intersection based on the total number of vehicles entering the intersection. However, none of the intersections experienced a significant number of crashes; those that did had no fatalities or major injuries. Therefore, the intersections were not studied further.

F. Side Street Intersections/Access Control

Cordova Street and E. 48th Avenue intersect in a four-way stop controlled intersection. Both Cordova Street and E. 48th Avenue continue past the project area. Five additional side streets intersect E. 48th Avenue and one additional side street intersects Cordova Street within the project area. All of these are tee intersections. At the beginning of the project, Cordova Street intersects with International Airport Road. E. 48th Avenue intersects with the Old Seward Highway at the opposite end of the project.

Cordova Street has six commercial driveways with direct access; two of these extend the full-frontage of the lot. Six residential and eight commercial driveways access E. 48th Avenue directly. Almost all of the commercial driveways on E. 48th Avenue have wide access points and parking areas across full site frontage. These configurations lead to unclear access and circulation for drivers and increase conflict points between vehicles using the driveways and street traffic. Compounding this situation is the fact that most of these driveways have right-angle parking adjacent to the street, forcing vehicles to make back-in parking maneuvers in the street. The proposed design will incorporate MOA access standards wherever possible to improve the safety and operations of the corridor, however many of these parcels may have nonconforming rights, which is discussed in the General Design Considerations section below.

G. Level of Service Analysis

A Level of Service (LOS) analysis was performed in accordance with the Transportation Research Board's Highway Capacity Manual 2010 for each of the major intersections. The analysis used Trafficware Synchro (Version 10) software. The MOA intersection operation standard for urban areas allows a minimum LOS D during the design year.

1. Cordova Street and International Airport Road

   The intersection of Cordova Street and International Airport Road is a two-way stopped, controlled intersection with Cordova Street being the stopped intersection. There is currently one northbound approach and one southbound approach on Cordova Street. International Airport Road has two lanes in each direction with a two way, left center turn lane.

Photo 17 – Cordova St at International Airport Rd (Facing South)

The following table summarizes the PM peak hour LOS during the design year (2040) using the existing lane configurations.

Table 6 – Cordova St./International Airport Rd. Intersection - LOS Analysis

Movement	Design Year (2020)		Design Year (2040)	
	PM Peak	Queue Length	PM Peak	Queue Length
Existing Lane Configuration				
SB Approach	C (16.0 sec)	1	C (19.5 sec)	2
EB Left	A (8.9 sec)	1	A (9.3 sec)	1

Southbound Cordova Street will operate at an acceptable LOS during the peak hour for the construction year and the design year.

2. Cordova Street and E. 48th Avenue

The intersection of Cordova Street and E. 48th Avenue is an all-way stopped intersection with one approach lane in each direction. Concrete crosswalks run across each leg of the intersection.

The following table summarizes the PM peak hour LOS during the design year (2040) using the existing lane configurations. The intersection will operate at an acceptable LOS for both the construction year and design year.

Photo 18 – E. 48th Ave and Cordova St (looking east)

Table 7 – Cordova St and E. 48th Ave. Intersection - LOS Analysis

Movement	Current Year (2020)		Design Year (2040)	
	PM Peak	Queue Length	PM Peak	Queue Length
Existing Lane Configuration				
E. 48th Avenue				
EB Approach	A (7.6 sec)	1 vehicle	A (7.7 sec)	1
WB Approach	A (7.9 sec)	1 vehicle	A (8.0 sec)	1
Cordova Street				
NB Approach	A (7.7 sec)	1 vehicle	A (7.8 sec)	1
SB Approach	A (7.9 sec)	1 vehicle	A (8.3 sec)	1

3. E. 48th Avenue and Old Seward Highway

The intersection of E. 48th Avenue and Old Seward Highway is a tee intersection with stop control on the minor (E. 48th Avenue) street. E. 48th Avenue has one eastbound approach lane and is limited by a median in Old Seward Highway to right out only. Old Seward Highway has two lanes in each direction with a left turn lane at E. 48th Avenue.

The following table summarizes the PM peak hour LOS during the design year

Photo 19 – E. 48th Ave at Old Seward Hwy (looking east)

(2040) using the existing lane configurations. The intersection operates at acceptable LOS for both the construction and design year.

Table 8 – E. 48th Ave. and Old Seward Hwy. Intersection - LOS Analysis

Movement	Construction Year (2020)		Design Year (2040)	
	PM Peak	Queue Length	PM Peak	Queue Length
Existing Lane Configuration				
EB Approach	B (14.2 sec)	1	C (16.2 sec)	1
NB Left	B (11.9 sec)	1	B (13.5 sec)	1

H. Sight Distance Analysis

Sight distance is necessary at intersections to allow drivers of stopped vehicles at a minor road a sufficient view of the intersecting main roadway to decide when to enter the intersecting main roadway or to cross it. If the available sight distance for a minor-road vehicle is at least equal to the required stopping sight distance of the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases a major-road vehicle may need to stop or slow to accommodate the maneuver from the minor-road vehicle. Therefore, to provide safe traffic operations, intersection departure sight distances should exceed stopping sight distances along the major road.

Photo 20 - Intersection Sight Distance Obstructions (E. 48th Ave & Fairbanks St.)

The intersection departure sight triangles have been drawn at each intersection within the project area for the preferred alternative, per the guidelines of the PM&E DCM (Appendix N) in order to determine any potential issues. As part of this project, the features that hinder the sight triangle, as listed below, should be removed or reset to be outside of the intersection departure sight triangles where feasible. Existing light poles, signal poles, utility poles and parked vehicles are not specifically noted in the list below.

1. Existing items within intersection departure sight triangles:
    - Various locations: existing trees and landscaping (over two feet tall).
    - Cordova Street and Eagle Street intersection viewing west: telephone and cable pedestals.

New landscape plantings will be limited to areas not in conflict with the intersection departure sight triangles. New light poles and signal poles will also be located so as not be in conflict with the sight triangles where feasible. Existing features located on private

property that conflict with the intersection departure sight triangles are difficult to remove or relocate since they are outside of the ROW and not owned by the MOA.

I. Pedestrian & Bicycle Study

Pedestrian & bicycle counts were obtained using a video camera and computer analysis at the following locations along the project corridor:

- Cordova Street at E. International Airport Road
- E. 48th Avenue and Cordova Street
- E. 48th Avenue at Old Seward Highway

Video was recorded for a 24-hour period on a Thursday and a Saturday for each location listed. Recordings were completed over the span of multiple weeks, from mid-October to early November 2018. Video was uploaded for computer analysis of pedestrian and bicycle counts at each location. After the results were obtained, multiple peak 15-minute intervals were checked for quality assurance.

Pedestrian and bicycle counts are provided in Appendix H and summarized in Tables 14 and 15 below.

Photo 21 - Traffic Video Camera

Table 9 - Pedestrian Counts

Street Intersections	24 Hour Intersection Crossing Volumes			
	North Leg	South Leg	East Leg	West Leg
Cordova St and Intl. Airport Rd	-	-	9	3
E. 48th Ave & Cordova St	8	21*	3	7
E. 48th Ave & Old Seward Hwy	7	5	-	-

*Note: A group of joggers that passed the camera twice accounted for 18 of this total.

Table 10 - Bicycle Counts

Street Intersections	24 Hour Intersection Crossing Volumes			
	North Leg	South Leg	East Leg	West Leg
Cordova St and Intl. Airport Rd	-	-	0	2
E. 48th Ave & Cordova St	0	3	1	1
E. 48th Ave& Old Seward Hwy	0	1	-	-

J. Parking Study

An on-street parking study was conducted along the project corridor in November 2018, the purpose of which was to document the use of both on-street parking and perpendicular parking spots that require backing into the road. This helps to approximate the demand for on-street parking along this corridor for consideration in the design of proposed improvements.

On-street parking is permitted on both Cordova Street and E. 48th Avenue.

The parking study documented on-street parking during four separate site visits. In addition, parked vehicles in spots that required backing into the road were also documented. Site visits were organized to include one weekday afternoon, one weekday evening, one weekend afternoon, and one weekend evening.

Table 11 – Parking Study Summary

	Wednesday - November 2018				Saturday – November 2018			
	12:00-12:30 pm		8:00-8:30 pm		12:00-12:30 pm		8:00-8:30 pm	
Street Segment	**North**	**South**	**North**	**South**	**North**	**South**	**North**	**South**
E. 48th Avenue (Cordova to Old Seward)	11	30	0	17	2	21	0	16
	West	**East**	**West**	**East**	**West**	**East**	**West**	**East**
Cordova Street (Intl. Airport to E. 48th)	4	1	0	0	0	2	0	0

Note: Counts include possible unmoved cars in perpendicular spots alongside road

There were likely some unmoved vehicles observed during multiple counts along E. 48th Avenue. Generally, there were fewer on-street vehicles in the evening hours for all counts and locations.

On-street parking was heavily utilized during business hours and a high number of these vehicles are likely owned by employees of local business. One property owner reported that employees are required to park on the street to preserve on-property parking for visitors.

Photo 22 – A common on-street parking area for E. 48th Ave. near Old Seward Highway

Figure 9 – On-Street Parking – Cordova Street

Figure 10 – On-Street Parking – E. 48th Avenue

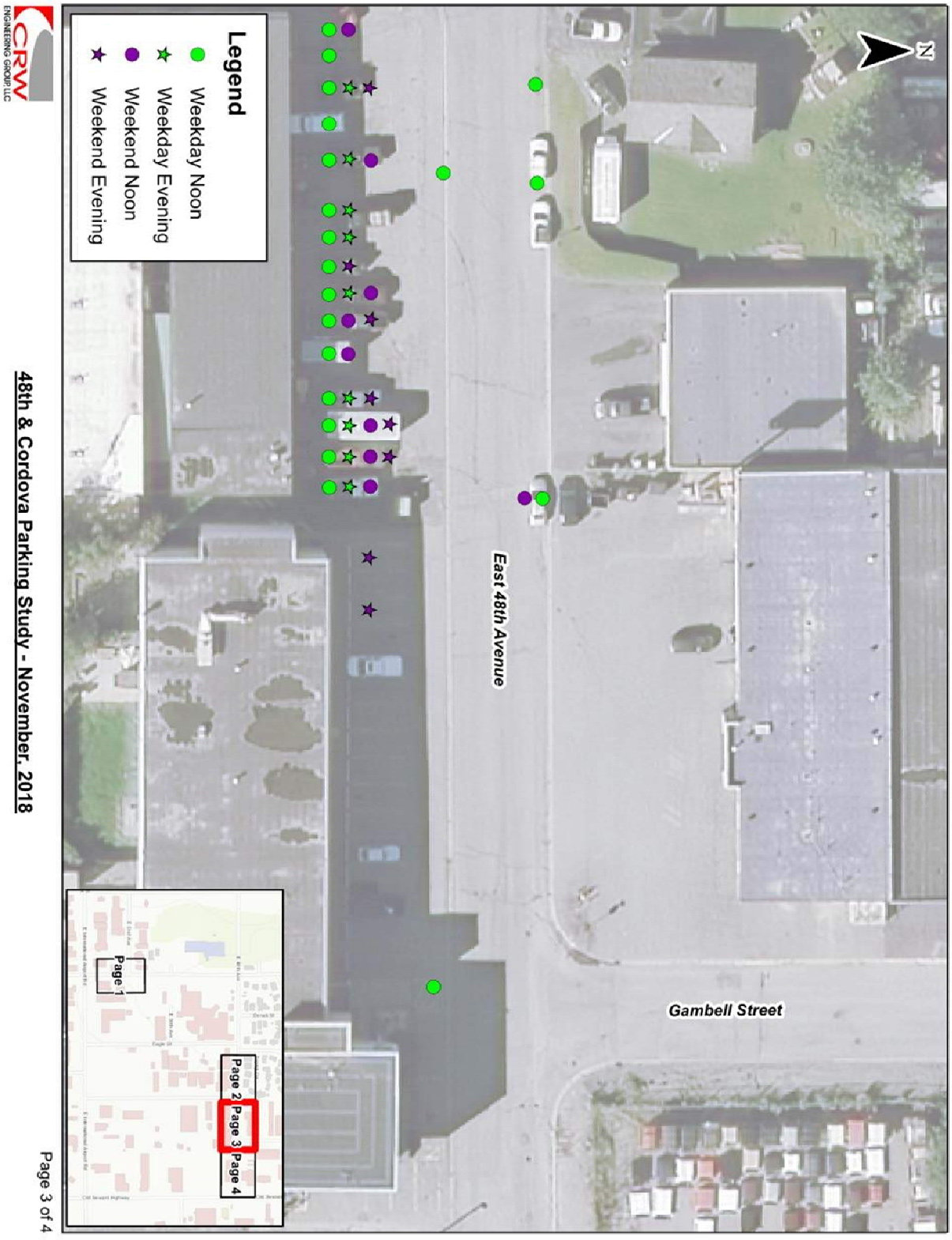

Figure 11 – On-Street Parking – E. 48th Avenue

Figure 12 – On-Street Parking – E. 48th Avenue

6. Design Criteria & Standards

Project design criteria are based on the roadway characteristics, functional classification, and road ownership. E. 48th Avenue is classified as a Neighborhood Collector, Class IC. Cordova Street is classified as a Collector, Class I. Both of these roadways are MOA owned and maintained.

A. Project Design Standards

Anchorage Municipal Code (AMC) Title 21: Land Use Planning, Section 21.08.030.F Streets states:

> "All streets shall comply with the standards of this chapter and section 21070.060 *Transportation and Connectivity*, the specifications of the *Design Criteria Manual*, and the following design standards."

The MOA PM&E DCM 2007 provides the primary basis for design criteria for the development of roadways within MOA. In addition to the requirements in the DCM and AMC Title 21, the documents listed below provide design guidance, standards, and requirements for this project.

- Municipality of Anchorage Standard Specifications (MASS)
- Areawide Trails Plan, 1997, MOA.
- Anchorage Pedestrian Plan, 2007, MOA.
- Anchorage Bicycle Plan, 2010, MOA
- Official Streets and Highways Plan, 2014 MOA.
- 2035 Metropolitan Transportation Plan, 2012, MOA.
- Anchorage Stormwater Manual, July 2017, MOA
- Traffic Calming Policy Manual, 2005, MOA.
- Roadside Design Guide (RDG), 4th Edition, 2011, American Association of State Highway and Transportation Officials (AASHTO).
- A Policy on Geometric Design of Highways and Streets, 6th Edition (AASHTOGB), 2011, AASHTO.
- AASHTO LRFD Bridge Design Specifications, 2012
- Manual on Uniform Traffic Control Devices, 2009 with Revisions 1 and 2, FHWA.
- Alaska DOT&PF Preconstruction Manual, 2005, ADOT&PF.
- Alaska Traffic Manual 2012, DOT&PF.
- Proposed Accessibility Guidelines for Pedestrians in Public Right-of-Way, 2011, United States Access Board.
- A Strategy for Developing Context Sensitive Transportation Projects, 2008, MOA.

B. Design Criteria Summary

A summary of design criteria pertinent to this project can be found in Table 12 below. Potential deviations from design criteria are described in Section 15.

Table 12 - Design Criteria Summary

Category	Criteria	Design Std. Value E. 48th Avenue	Design Std. Value Cordova Street	Reference
Traffic Data	Functional Classification	Neighborhood Collector (IC)	Collector (I)	DCM 1.3
	AADT – 2020	1,240 vpd	1,180 vpd	Field Data
	AADT – 2040	1,450 vpd	1,380 vpd	Assumed Growth
	Design Vehicle	WB-50	WB-50	DCM 6.4 B
	Design Structural Loading	HS 20	HS 20	AASHTO
	Design Speed	35 MPH	45 MPH	DCM Table 1-4
	Posted Speed	30 MPH	35-40 MPH	DCM Table 1-4
Horizontal Alignment	Horizontal Curve Radius, Minimum, No Super-elevation	600 ft	600 ft	DCM Table 1-9
	Stopping Sight Distance, Min	250 ft	360 ft	DCM Table 1-8
	Clear Sight Triangle Length	390 ft	500 ft	DCM Figure 1-19
Vertical Alignment	Vertical Grade, Maximum	6.0%	6.0%	DCM 1.9.D
	Vertical Curve K-Value, Min Crest Curve	29	61	DCM Figure 1-16
	Vertical Curve K-Value, Min Sag Curve	49	79	DCM Figure 1-17
Cross Section	Number of Lanes	2	2	DCM Table 1-4
	Lane Width	10 to 11 ft	10 to 11 ft	DCM Table 1-4
	Number of Parking Lanes	1 or 2	1 or 2	DCM Table 1-4
	Width of Parking Lanes	7 ft	7 ft	DCM Table 1-4
	Shoulder Width (No Parking)	3.5 ft	3.5 ft	DCM Table 1-4
	Curb & Gutter	Type 1 (DCM & Title 21)	Type 1 (DCM & Title 21)	DCM Figures 1-11 & 1-13, Title 21.08.050.G
	Side slopes	2H:1V, Max	2H:1V, Max	DCM 1.9.D.5
	Clear Zone	12 to14 ft	12 to 14 ft	*See Section 7.C.4

Table 12 Continued - Design Criteria Summary

Category	Criteria	Design Std. Value E. 48th Avenue	Design Std. Value Cordova Street	Reference
Misc.	Curb Return Radii at Residential Side Streets	30 ft	30 ft	Figure 1-22
	Curb Return Radii at Arterials	30 ft min, 50 ft for WB-50 Traffic	30 ft min, 50 ft for WB-50 Traffic	Figure 6-1
	Sidewalk Requirements	Both sides of roadway	Both sides of roadway	AMC 21.070.060 DCM Figures 1-11 & 1-13
	Sidewalk Width	5 ft	5 ft	DCM 1.5 G
	Sidewalk Separation from Back of Curb	0-7 ft	0-7 ft	DCM Figures 1-11 & 1-13
	Max driveway width, up to 7-plex	20 ft 28 ft w/ restrictions	20 ft 28 ft w/ restrictions	DCM Appendix 1D
	Max driveway width, 8-plex and greater	34 ft	34 ft	DCM Appendix 1D
	Max driveway grade, up to 7-plex	± 10%	± 10%	DCM Appendix 1D
	Max driveway grade, 8-plex and greater	± 8%	± 8%	DCM Appendix 1D
	Landing grade/length, up to 7-plex	± 2% for 12 ft	± 2% for 12 ft	DCM Appendix 1D
	Landing grade/length, 8-plex or greater	± 2% for 20 ft	± 2% for 20 ft	DCM Appendix 1D

*Lighting design criteria is discussed in Section 7.G of this DSR.

C. Specific Design Criteria

The appropriate street section is determined by considering project traffic volumes and land use.

1. Design Speed

   The design speed is a selected speed to which various geometric features of the roadway are coordinated to achieve a balanced design, and should be a logical speed with respect to anticipated speed limit, topography, and functional classification of the roadway. The design speed affects the length of sight distance available along the roadway's horizontal alignment and vertical profile, particularly at intersecting roadways and pedestrian facilities. As design speeds increase, longer sight distances

are required to provide additional reaction time and braking distance to respond to roadway obstacles. Additionally, higher design speeds require a more gradual change in horizontal and vertical alignment, which typically increases the extent of cut and/or fill near hills. In most cases, the design speed is slightly higher than the posted speed (typically 5 mph higher) to provide a margin of safety for drivers driving at the speed limit in unfavorable conditions such as poor weather. The design speeds for each roadway as indicated in the DCM are listed in Table 17 above.

2. Accessibility Guidelines

   Current MOA requirements for accessibility are based on the ADA. The project uses guidelines from the Proposed Accessibility Guidelines for Pedestrian Facilities in Public Right-of-Way (PROWAG), published July 26, 2011, by the United States Access Board.

   PROWAG recognizes that it is not always possible for altered elements (reconstruction of existing facilities) to fully comply with new construction requirements because of existing physical constraints. All elements included in the project unable to meet ADA requirements due to “technical infeasibility” should be documented.

3. Roadway Cross Section

   The roadway cross section required by the DCM varies with the roadway classification. The roadways in the project corridor should have a roadway width of between 27 and 40 feet (depending on on-street parking and travel lane width) measured from back of curb; two travel lanes; one or two parking lanes; 3.5-foot shoulders (in lieu of parking lanes if on-street parking lanes are not warranted); curb and gutter; and pedestrian facilities. The typical lane width for a collector roadway is 10 to 12 feet.

   Per AMC 21.070.060.E.2.b and the DCM Figure 1-11, sidewalks must be provided on both sides of a collector roadway. DCM Section 1.5 G Pedestrian Facilities specifics that the minimum width for pedestrian facilities is 5-feet. It is preferable for the sidewalks to be separated from the roadway to provide pedestrian comfort and safety, increase intersection sight distances, and provide room for snow storage. An area of seven feet beyond the back of curb is generally required for snow storage. Though not desirable, the sidewalk can be considered as part of the snow storage area.

   Roadway sections with narrow shoulders (3.5 feet) provide little room for snow storage on the street and require snow to be temporarily plowed behind the curb. This may impede pedestrian passage on an attached sidewalk and/or buffer area during major snow events until the snow is cleared.

4. Roadway Clear Zone and Horizontal Offset

   The DCM defines the roadway clear zone to be:

   > …the total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. The desired width of the clear zone is dependent on the traffic volume, design speed, and roadside geometry.

The recommended clear zone width is a function of the design speed, traffic volume, functional classification of the roadway, and the side slope of the roadway. The clear zone required for a rural roadway with a design speed of <40 mph and an ADT of 750 to 1,500 vpd is 10 to 12 feet. These values assume a foreslope of 1V:6H or flatter. Additional width is required when foreslopes are steepened to 1V:5H or 1V:4H.

The minimum roadway cross section for collector and secondary streets identified in the DCM will provide a minimum clear zone width of 12 feet specified in the RDG (3.5-foot-wide shoulder + two-foot-wide curb + five-foot-wide sidewalk + 1.5-foot-wide sidewalk shoulder = 12 feet).

5. Lighting Requirements

   The DCM's lighting requirements are based on the Illuminating Engineering Society of North America (IESNA) RP-8-00 American National Standard Practice for Roadway Lighting.

   For lighting design purposes, the project corridor is designated as a collector roadway but intersections will be treated as local roadway (projected traffic volumes are less than1,500 VPD) for lighting standards in the IESNA (Section 2.1).

   The IESNA does not make recommendations or provide guidelines for partial lighting of intersections only (Section 1.1); it provides recommendations "for designing continuous lighting systems for roadways."

   Several studies have shown the primary benefit of lighting intersections is a reduction in night pedestrian, bicycle, and fixed-object crashes (Section 3.6.2) and proper intersection lighting is a critical design component. Intersections should be illuminated to increase safety.

   To reduce the length of the sag vertical curves along the roadway profile, lighting is required for visibility and sight distance. If lighting were not installed, the vertical curves would be significantly longer and result in a wider roadway footprint, thus the impacts to adjacent properties drainage ways, and utilities would also be significantly larger.

6. Landscaping

   All roads designated as collector and greater must be reviewed for landscaping by the Urban Design Commission (UDC) per Municipal Code Section 21.03.090. There are no specific design requirements in the DCM pertaining to landscape reconstruction. However, existing mature tree, shrub, and other individual landscape elements may require attention.

   Per Section 3.3A of the DCM, existing plant material will be protected to the greatest extent possible. Trees and shrubs affected by construction will be reviewed on a case-by-case basis. When trees and shrubs are unable to be saved due to construction, consideration will be given to replacement of the plant material. Property owners will be consulted and informed on what species and size of replacement plants could be provided.

7. General Design Considerations

A. Right-of-Way Acquisition

A key element for the successful completion of this project is the acquisition of any required ROW, easements, and/or permits while providing fair and equitable treatment to all affected property owners, tenants, and lessees.

MOA has the authority to acquire private property for public projects. A primary goal of ROW acquisition is to acquire property rights from willing sellers through good-faith negotiations in accordance with all pertinent policies, statutes, laws, and regulations while treating all owners equitably.

MOA's process for residential and business acquisitions (partial or full) follows the guidelines addressed in the State of Alaska's Acquiring Real Property for Federal and Federal-Aid Programs and Projects brochure; Relocation Services for Residential Property brochure; and Relocation Services for Businesses, Farms, and Non-Profit Organizations brochure. Individual parcel acquisition details are determined on a case-by-case basis and negotiated privately between MOA and the property owner.

In general, public use easements are required in areas where the footprint of the improvements exceeds the ROW. Slope easements are required for areas where the cut and fill slopes are outside of the ROW. Storm drain easements are required for drainage facilities installed on private property. Temporary construction permits are required on private properties for matching new driveway grades to existing driveway grades, installation of storm drain footing services or water key boxes at the property line, and the relocation, removal or repair of improvements such as mailboxes, curbs, landscaping, fencing, and encroaching structures. Temporary construction easements allow contractors temporary access onto private property to construct improvements that are within the ROW, but have insufficient space within the ROW to conduct the work.

Property owners with personal improvements in the ROW, such as fences, retaining walls, or landscaping boulders, have the option of applying for encroachment permits for the improvements, removing them at their own expense, or allowing the corrective action to be incorporated into the project design. Encroachment permits for fences, rock gardens, planters, and decorative retaining walls within the roadway clear zone are usually not granted.

Each of the design alternatives will require ROW acquisitions in some form. Once the required ROW is determined, the acquisitions will begin with good faith negotiations with the affected property owners. Compensation for the acquisition will be based on fair market value.

B. Traffic Calming

Speeding is a concern for some residents living along the project corridor. Traffic calming measures are employed on roadways with the intention of slowing down or reducing vehicle traffic, which helps improve safety for motorists, bicyclists and pedestrians on the roadway. Features considered for use as traffic calming on this project are listed below:

1. Traffic Calming Methods

a) *Narrow Sections*

The use of a narrow street section can also help to lower speeds along the project corridor. However, it is not recommended to reduce the lane widths or eliminate the asphalt shoulder or parking lane due to the relatively high percentage of large trucks using the corridor and heavy use of on-street parking.

b) *Neckdowns and Chokers*

Neckdowns (also commonly referred to as “bulb outs”) are curb extensions at intersections to reduce roadway widths from curb to curb and visually break up a long, straight curb line. However, neckdowns may restrict vehicles with large turning radii from making maneuvers in or out of side streets without forcing encroachment into the opposite traffic lane. If these types of vehicles are expected to frequently make maneuvers onto side streets, then larger curb returns and wider side street widths may need to be incorporated. Chokers are curb extensions at mid-block locations that narrow the street. Both chokers and neckdowns reduce the total length of pedestrian crossings, but can inhibit continuous bike lanes adjacent to the roadway since roadway shoulders are eliminated at the neckdown/choker. This treatment is not considered appropriate for alternatives that include bike lanes.

c) *Speed Humps, Raised Intersections, Speed Table, Raised Pedestrian Crosswalks, and Speed Cushions*

Speed humps are short, vertical humps installed in the roadway to reduce traffic speeds. MOA has a program in place where residents can petition to have speed humps installed in their neighborhoods. Speed humps are not recommended on primary emergency routes or where heavy truck traffic is present.

Photo 23 - Raised intersection (88th Avenue)

Raised intersections are flat, elevated areas covering the entire intersection with ramps on all approaches. Vehicles entering the intersection are required to slow down before negotiating the ramp leading up to the intersection.

Speed tables are flat-topped speed humps with ramps. They are typically long enough for the entire wheel base of a passenger car to rest on top.

Raised pedestrian crosswalks are speed tables marked for pedestrian crossings. They require reduced vehicle crossing speeds and give higher priority to pedestrian crossing movements.

Speed cushions are speed humps with wheel cutouts to allow emergency vehicles to pass unaffected while still reducing passenger car speeds. The MOA Traffic Department has installed speed cushions in lieu of traditional speed humps in several locations since 2018.

d) *Patterned Crosswalks*

Patterned or colored concrete crosswalks can be used for crosswalks at higher volume side streets and in conjunction with other traffic calming measures. Patterned concrete crosswalks provide additional visual guides for motorists and allow for a safer pedestrian crossing. The patterned concrete can provide a more consistent and permanent demarcation of the crosswalk, unlike pavement markings that fade and wear off.

e) *Voluntary Speed Compliance Signs*

A voluntary speed compliance sign is a temporarily or permanently mounted sign display that measures traveling vehicle speeds and displays the numerical speed to drivers. When measured vehicle speeds violate the speed limit, the display flashes. The MOA Traffic Engineering Division recently installed battery-operated signs at select locations within the Municipality.

2. Traffic Calming Locations

The MOA Traffic Department maintains a Neighborhood Traffic Calming Program to identify streets where excessive speeds have been detected; it publishes a list of Qualified Streets for implementation of traffic calming measures. As of 2019, no streets within the Midtown Community Council boundaries have been identified on the Qualified Streets List.

Existing traffic calming measures were installed when E. 48th Avenue was extended to A Street in 2016. Those measures included a raised intersection with curb bulbs on E. 48th Avenue at the A Street and Cordova Street intersections.

C. Pedestrian Facilities

Pedestrian facilities along roadways are generally limited to sidewalks and pathways. Sidewalks provide a safe and comfortable path of travel for pedestrians, and physically separate moving vehicles from people walking. Curb ramps, sidewalk cross slopes, sidewalk grades, and pedestrian crossing areas of streets must conform to ADA requirements outlined in PROWAG.

1. Pedestrian Crossings

   a) *Intersection Crossings*

   Pedestrian crossings are preferred at stop-controlled or signalized intersections where vehicles will be stopped to allow safe navigation by pedestrians. Marked crosswalks are currently present at the four-way stop controlled intersection of E. 48th Avenue and Cordova Street. A sidewalk currently extends from St. Elias and directs pedestrians to cross Cordova Street approximately 250 feet south of E. 48th Avenue.

   b) *Mid-Block Crossings*

   Mid-block crossings can be warranted where a high number of pedestrians are known to cross the roadway and a signalized crossing is not located nearby. Mid-block crossings formalize pedestrian desire lines, increase the likelihood of drivers yielding to crossing pedestrians, and encourage more predictable pedestrian crossing behavior. They increase the visibility of pedestrians crossing the roadway, but must be placed in areas with adequate sight distance for vehicles to yield when pedestrians are present and for pedestrians to make the decision to cross the roadway. The Alaska Traffic Manual (ATM), Table 3B-101 provides a matrix to decide when a mid-block crossing is warranted based on vehicle volumes, the number of lanes, and roadway speed limit.

   A sidewalk currently extends from St. Elias and directs pedestrians to cross Cordova Street approximately 250 feet south of E. 48th Avenue. The primary users of this crossing would hospital employees and visitors parking on the east side of Cordova Street. Due to the proximity of the crossing at E. 48th Avenue, limited use of the crossing, and relatively low traffic volumes and speeds on Cordova Street, a mid-block crossing is not recommended at this location.

D. Bicycle Facilities

Bicycle-specific infrastructure, such as bike lanes, can help improve cyclist safety. It provides a designated space on the roadway for travel, encouraging predictable bicycle behavior and improving comfort for bicyclists. Bicycle facilities along roadways and at intersections can be provided in many configurations with varying degrees of separation from vehicles and pedestrians. The appropriateness of each bicycle facility varies depending on volumes and speeds of vehicles, bicyclists, and pedestrians.

This corridor is not identified in the Anchorage Bicycle Plan as being part of the bicycle network and is not heavily utilized by bicyclists. Unless specifically prohibited, bicyclists are legally allowed to use the travel lane on all roadways in Anchorage. As such, dedicated bicycle facilities are not planned for E. 48th Avenue or Cordova Street within the project corridor.

E. Defensive Design

Defensive design is a concept to construct public spaces in a manner to discourage use other than the original application. Public stakeholders have expressed concern with the presence of transients on the corridor; damage and/or defacement of property; and theft from area businesses. Although upgrades to the roadway cannot solve all of these issues, measures can be implemented to create an environment that is less conducive to loitering and provide an enhanced sense of safety and comfort to the majority of users. Such measures may include:

- Removal of vegetation or other objects that block clear sight lines and create areas hidden from view from the roadway.
- Installation of lighting along the corridor to improve sight distances for all users.
- Avoiding installation of benches and other amenities that promote sitting or loitering.
- Constructing retaining walls and other elevated structures so they are not comfortable to sit or lay on (rounded or sloped tops, etc.).
- Landscaping that generally hinders the ability for people to hide or sleep within.

F. Mailboxes

The project corridor consists of a mix of residential, commercial, and industrial facilities. Mail is delivered to secure boxes located within the residential properties or to front offices of commercial establishments. The exception is to the north side of the project on E. 48th Avenue near Denali Street, where an individual residential mailbox is present on the north side of the road.

G. Lighting

When installed, lighting systems shall be designed to the DCM's Chapter 5 criteria, enhancing traffic and pedestrian safety. A properly designed lighting system will:

- Provide the minimum, maintained average luminance and illuminance levels specified for roadways, sidewalks, and intersections.
- Provide a uniformity of lighting that does not exceed the maximum ratios specified for roadways, sidewalks, and intersections.
- Minimize construction and maintenance costs.
- Avoid adverse impacts to adjacent properties.
- Reveal hazards to pedestrians and vehicular traffic.

MOA has retrofitted many existing luminaire poles with luminaires using LEDs as the light source, and new roadway projects with lighting improvements now incorporate LED lighting into the design. The new, proposed LED lighting system for this project will be designed to provide the light levels specified in the DCM as summarized below:

1. Roadway (not including intersections)

   For a collector roadway with medium pedestrian activity, the DCM recommends a minimum maintained average of 0.6 foot-candles with an average-to-minimum uniformity ratio no greater than 4:1 and a veiling luminance ratio no greater than 0.4.

Photo 24 - Example Lighting (64th Avenue)

2. Pedestrian Facilities

   It is anticipated that pedestrian activity along Cordova Street and E. 48th Avenue will be in the medium range per Chapter 5 of the DCM. For adjacent pedestrian facilities within the medium pedestrian volume criteria, the DCM requires a minimum maintained average of 0.5 foot-candles with an average-to-minimum uniformity ratio no greater than 4:1.

3. Intersections

   For the purpose of lighting intersections, the DCM uses the following roadway classifications based upon the ADT (note these do not apply to standard street classifications):

   - Major: over 3,500 ADT
   - Collector: 1,500 to 3,500 ADT
   - Local: 100 to 1,500 ADT

   Below is Table 5-5 from the DCM based upon the ADT roadway classifications:

Table 13 - Illuminance for Intersections

Functional Lighting Classification	Average Maintained Illuminance (low pedestrian area)	Maximum Uniformity Ratio
Major/Major	2.6	3.0
Major/Collector	2.2	3.0
Major/Local	2.0	3.0
Collector/Collector	1.8	4.0
Collector/Local	1.6	4.0
Local/Local	1.4	6.0

Intersection lighting classifications for the project intersections will be based upon the design year AADT as shown in Section 5.

The luminaires will also provide a full cutoff light distribution to reduce the negative effects of casting light on nearby properties (especially residences) and illuminating the night sky. To minimize the trespass of light on adjacent properties and reduce glare, luminaires are to be installed 30 feet above the pavement and fixtures in certain areas should have backlight control optics.

H. Landscaping

1. Landscape Considerations

OSHP classifies Cordova Street as a collector (I) and E. 48th Avenue as a neighborhood collector (IC). The MOA PM&E DCM calls for five- to 10-foot pathways or sidewalks on collectors, along with a seven-foot separation for snow storage and water treatment between the sidewalk and street. Currently, there are no pedestrian or bicycle facilities along the project corridor, and other than the occasional vegetated areas, there are no additional landscape features such as street tree plantings, benches, decorative railings, or pedestrian lighting.

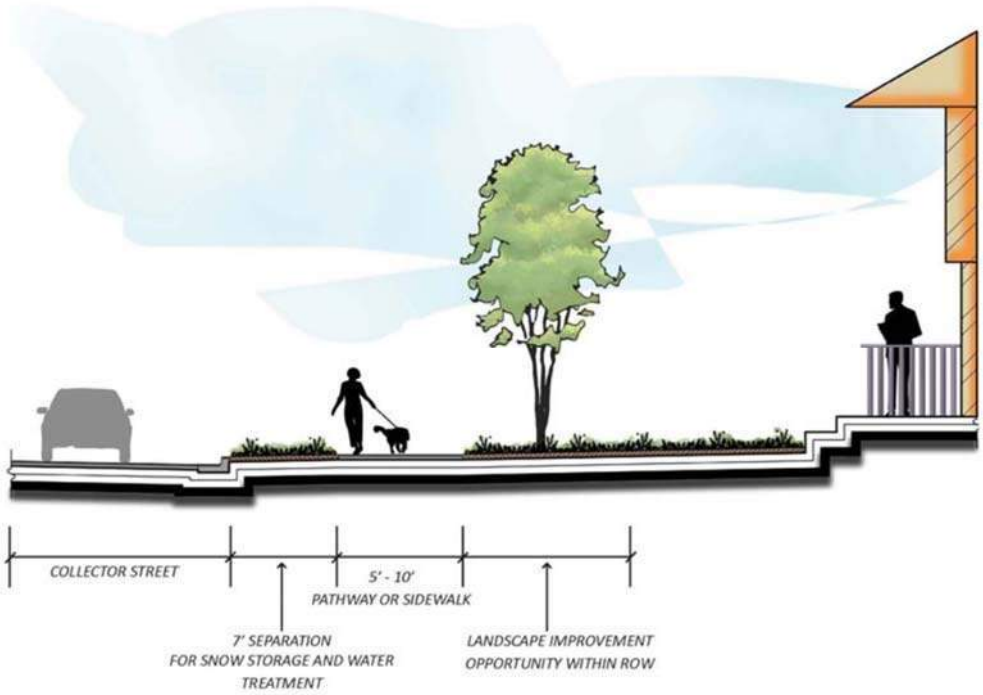

Figure 13- Illustration from MOA DCM standards for neighborhood collector streets.

The private parcels located along the Cordova Street and E. 48th Avenue project corridor have a wide range of landscape types, due to the multiple zoning districts in the area. With the exception of the R-O zoned area, the landscape features are haphazard and do not share unifying features. Tree coverage is sparse to non-existent in the I-1 and B-3 districts, but the R-3 and R-O areas include many established and mature deciduous and evergreen trees. Similarly, while the I-1 and B-3 districts are

made up of mostly impermeable and paved surfaces, the R-3 and R-O districts have a much higher percentage of permeable surfaces. Provision of sidewalks, a seven-foot snow storage buffer, and other landscape improvements within the ROW would bring Cordova Street and E. 48th Avenue in line with the DCM street design requirements.

2. New Landscaping Opportunities

   Street landscaping, where space allows, will consist of tree, shrub, and perennial plantings. New planting beds will be provided where space allows and in existing landscape beds affected by construction. Existing plants will be retained to the greatest extent possible. However, where the project requires elimination of material, new plants will be provided appropriate to the space and conditions available.

   As discussed above, Chapter 3 of the DCM notes that a grassed, seven-foot-wide snow storage area between the back of curb and sidewalk should be provided on collector streets. Due to the available ROW, the necessary space needed for vehicular and pedestrian facilities as well as the close proximity of existing features, it may not be possible to provide a grassed snow storage area the entire length of the project corridor. Tree and shrub plantings will be provided where ROW space allows. The design team will explore opportunities to place tree plantings in the snow storage buffer where possible.

   Plant selection will consider factors that may affect plant survivability, including microclimate, sun exposure, soils, wind, wildlife attraction, and moisture conditions. It is intended to use species that have been proven to survive and thrive in Anchorage.

Plant species currently considered for the project include:

a) *Street Trees*

- Acer platanoides 'Deborah' - Deborah Maple
- Betula papyfifera - Paper Birch

b) *Small/ Ornamental Trees*

- Malus 'spring snow' - Spring Snow Crabapple
- Populous tremula 'Erecta' - Columnar Aspen
- Sorbus aucuparia - European Mountain Ash

c) *Evergreen Trees*

- Larix sibirica - Siberian Larch
- Picea pungens 'glauca' - Colorado Blue Spruce
- Picea pungens - Colorado Spruce

d) *Shrubs and Ground Plane Perennial Plants:*

- Cotoneaster lucidus - Hedge Cotoneaster
- Potentilla fruiticosa 'Goldfinger' - Goldfinger Potentilla
- Pinus mugo pumilio - Dwarf Mugo Pine
- Rosa rugosa 'Hansa' - Hansa rose
- Spiraea x bumalda 'Goldflame' - Goldflame Spirea
- Iris setosa - Blue Flag Iris

Paving or curbing will retain the planning beds, which will be dressed with shredded bark mulch or rock mulch over weed barrier fabric.

3. Additional Landscape Design Opportunities

a) *Central Business District Streetscapes*

The Anchorage 2040 Land Use Plan identifies Old Seward Highway as a Commercial Corridor and International Airport Road as a Light Industrial/Commercial corridor. Reconstruction of Cordova Street and E. 48th Avenue near Old Seward Highway and International Airport Road provides an opportunity to improve the pedestrian experience around those intersections by providing a more pleasant "urban" streetscape, in line with the Central Business Streets streetscape guidelines in the MOA PM&E DCM.

In locations where the back of sidewalk is adjacent to a parking lot and space is insufficient for a planting bed, inclusion of a concrete delineation strip and/or steel bollards will help maintain the separation of pedestrian and vehicular circulation zones.

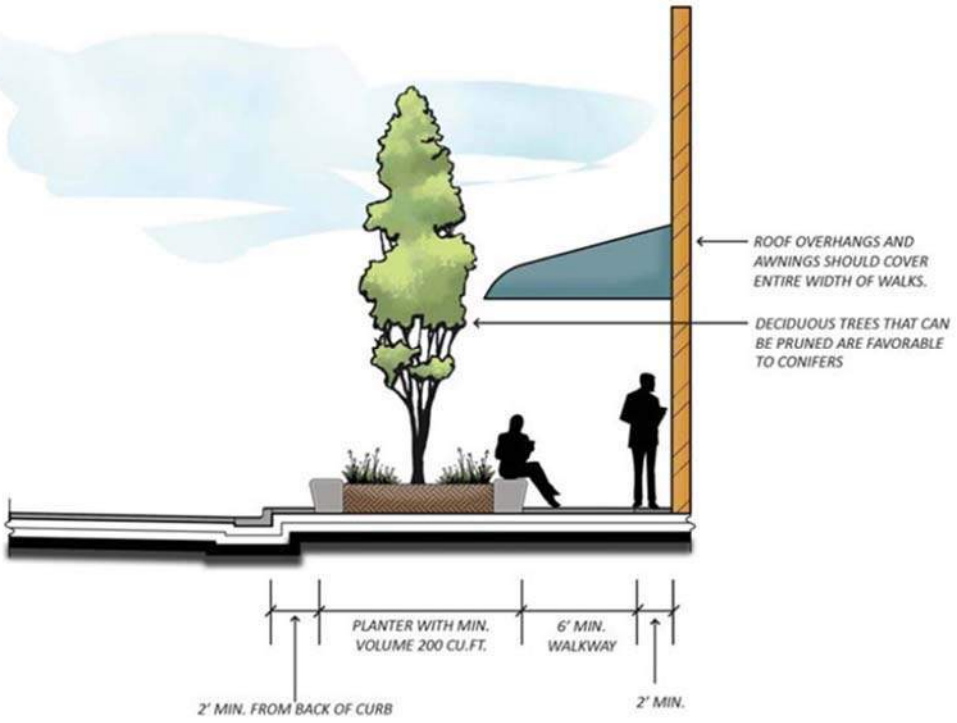

Figure 14 - Illustration from MOA DCM for Central Business District Streets

b) *Green Infrastructure*

Reconstruction of the corridor may provide opportunities to increase the amount of permeable surface in the I-1 and B-3 districts, reducing the stormwater volume currently produced by the extensive paved surface in the project area, and thus reducing stress on existing MOA stormwater facilities.

c) *Neighborhood Character and Decorative Elements*

Currently, no decorative landscape elements or overarching design language in the project corridor exists. Decorative landscape elements may be incorporated in standard street reconstruction materials and features, such as retaining walls, fall protection railing, and paving patterns.

From the Cordova Street and E. 48th Avenue intersection, residents of the area can walk to Cuddy Park in approximately 15 minutes and to Taku Lake in 25 minutes. On a bike, the intersection is approximately 12 minutes from Taku Lake Park and 14 minutes from Campbell Park via the Campbell Creek Trail. Although Cordova Street and E. 48th Avenue are not identified in the MOA Bicycle Plan, providing design elements similar to those used in MOA Park's wayfinding design language would help emphasize the area's close connection to local trails and parks. Such design elements may involve similar colors, materials, or forms to those used in the parks or on Campbell Creek Trail.

I. Nonconforming Property Analysis

MOA Code of Ordinances Title 21.12 defines "nonconformities" as legal uses, structures, lots, or signs established prior to the effective date of the current title, or future amendments to the current title, that do not conform to the requirements of the current title. The acknowledgement and relief granted to existing property, land uses, and structures are intended to minimize negative economic effects on development lawfully established prior to the current title. In all cases, the burden of establishing the existence of a legal nonconformity is solely the responsibility of the owner of the nonconformity. Verification of nonconforming status can be requested by the owner or on behalf of the owner by submitting a Nonconforming Determination application along with supporting documentation to the MOA Planning Department for a determination.

Four parcels along the project corridor have existing nonconforming status previously established for various features on the lot. Table 14 below provides a summary of these existing parcels and the relevant nonconformities. See Figures 5 through 7 for the parcel location maps. Some of these parcels may also have additional nonconforming features associated with the lots. These additional features include:

- Driveway exceeds two-fifths of the frontage of the lot
- Parking and maneuvering not located entirely on property
- Vehicles not able to enter abutting street in forward motion

Depending on the preferred design, these additional nonconformities may need to be established in order to construct the proposed project improvements and not negatively impact current development. Since MOA is improving the ROW with this project, the project team will work with lot owners to gain their approval to submit a Nonconforming Determination application on their behalf. The MOA Planning Department will review applications and determine whether a property has valid nonconformities. Once the nonconforming uses have been established, the design team will work with the MOA Traffic Department in order to finalize the roadway design.

Table 14 - Summary of Nonconforming Determination

Parcel No.	Year of Nonconforming Status Determination	Nonconformity
124	2018	Lack of on-site pedestrian facilities, lack of site perimeter landscaping are legal nonconforming
125-126	2017	Lack of parking spaces, lack of turning and maneuvering on lot, lack of separation between building and parking area and lack of perimeter landscaping are all legal nonconforming
127	2010	Lack of parking spaces and lack of landscaping are legal nonconforming

8. Project Alternatives

The Cordova Street and E. 48th Avenue corridor has six street intersections, two alley intersections, and driveways serving 27 separate parcels. Roadway plan and profile drawings depicting alternatives for upgrades to the project and the locations of individual parcels can be found in Appendix B. The drawings include conceptual proposed striping improvements in order to clarify the various alternatives.

A. Design Challenges

1. Buffers

   Buffers between curb and pedestrian facilities are desirable to provide better separation from moving vehicles and provide a space for plowed snow storage during winter. Limited ROW, and existing utilities and buildings with small setbacks from the property line, limit the areas where buffers can be provided without acquiring easements and/or moving structures and/or relocating utilities. It may be more cost effective to initially construct the improvements without a buffer, but the long-term, snow-hauling costs may be higher than the initial cost of acquiring property and relocating utilities.

   The proposed design should attempt to provide buffer space whenever possible and be as wide as possible (up to seven feet) to maximize available snow storage space.

2. Full-Frontage Driveways and Parking

   The existing rolled curb along Cordova Street and E. 48th Avenue allows full-frontage access to on-property parking. Installation of Type 1 barrier curb along the roadway will limit property access to driveway curb cut locations and could affect the ability for property owners to access parking spaces. In addition, several parcels have limited setback from the roadway for existing parking, without adequate space for driving lanes behind parking. Parcels where full-frontage parking is a concern are described below:

   - Parcel 100 (Young's Gear) is a business with approximately 13 parking stalls on the east side of the building adjacent to Cordova Street, including three spaces that lead to bay doors.
   - Parcel 101 is a business with five, parallel parking stalls on the east side of the building, which are all located in the ROW. An additional 30 parking stalls are located on the west side of the building.
   - Parcel 102 is an office building with five, 45-degree angled parking stalls that extend approximately seven feet into the ROW and back out directly onto Cordova Street. An additional five parking stalls are located on the south side of the building.
   - Parcel 109 is a business (Alaska Pure Water Products) with approximately 10 parking spaces directly accessing Cordova Street, including two spaces that lead to bay doors. Additional parking is available to the south of the building.

- Parcel 118 is a business (Warren and Son) with approximately five parking spaces directly accessing Cordova Street, including two spaces that lead to bay doors.
- Parcel 123 is a business (The Salvation Army Adult Rehabilitation Center) with approximately 17 parking spaces directly accessing E. 48th Avenue. Additional parking is available to the east and south of the building.
- Parcel 124 is a business (Alaska Spring and Performance) with approximately 18 parking spaces directly accessing E. 48th Avenue, including five spaces leading up to large bay doors. An additional four parking spaces are located to the west of the building directly accessing Fairbanks Street.
- Parcel 125 is a business (Solar Turbines) with approximately eight parking spaces directly accessing E. 48th Avenue. An additional 14 parking spaces are located to the east of the building.
- Parcel 126 is a business (Turnagain Herb Co.) with approximately eight parking spaces directly accessing E. 48th Avenue. No additional parking is available on this parcel.
- Parcel 127 is a business (Alaska Village Electric Cooperative) with approximately eight parking spaces directly accessing E. 48th Avenue. Parked cars extend approximately nine feet into the ROW. An additional parking area is located to the west with six spaces available. A parking lot with 45 spaces is also available to the south of the building.

3. Driveway Grades and Landings

   There are 29 existing driveways connected to the project roadways; these will need to be reconstructed to match the proposed roadway design grades. The length of driveway improvements will depend on the proposed grade adjustments required at each driveway. Proposed conceptual driveway grades were analyzed for the preferred alternative only and are summarized along with existing grades in Appendix M.

   Many of these driveways do not have required landings and have relatively steep grades (5-8%) up to the existing parking lots or structures. The proposed improvements will widen the roadway envelope and install ADA-compliant landings (2% max grade) for the pedestrian facilities that cross the driveways. With the implementation of ADA-compliant landings, a number of driveways may need to be constructed back to the building structure. The proposed driveway grades shown in Appendix M references the grade beyond the ADA-compliant pedestrian landing.

B. Roadway Cross Sections

The standard cross section for a collector roadway has two, 10- to 12-foot lanes; two, seven-foot parking lanes (38- to 42-foot-total-width Back of Curb (BOC) to BOC); and two, detached five-foot to 10-foot sidewalks/pathways. The final recommended improvements

may consist of differently numbered alternatives for each segment (i.e. Alternative 2 for Cordova Street and Alternative 3 for E. 48th Avenue.).

An on-street parking study was performed to determine whether parking lanes are warranted and found that on-street parking on Cordova Street and E. 48th Avenue is heavily used during the day. The recommended roadway cross section will include 11- or 12-foot-wide lanes and seven-foot-wide parking lanes depending on the alternatives presented. Three different typical cross section alternatives were developed for each of the two segments and are described below.

1. E. 48th Avenue (Cordova Street to Old Seward Highway) – Class IC Neighborhood Collector

   E. 48th Avenue has lower traffic volumes and speeds than Cordova Street. No sidewalks are currently present along either side of the corridor and parking is permitted. Driveway access is predominant on each side of the road. Residential properties make up the majority of the northern portion of the roadway segment west of Fairbanks Street. The entire south side of the corridor consists of commercial businesses, with the exception of a large, undeveloped parcel west of Eagle Street. Several businesses have continuous frontage driveways and will require pedestrian facilities to be attached to the back of curb. Separated facilities will be limited to the residential areas and along undeveloped parcels.

Alternative 1: This alternative follows a typical neighborhood collector cross section with an eigjt-foot pathway on the north side of the road and five-foot sidewalk to the south. Pathways and sidewalks will be separated by a seven-foot vegetative buffer from the back of curb where feasible. On-street parking will be included on the north side of the roadway in select areas absent of intersections and commercial driveways. Parking lanes will conclude at the intersections of Cordova Street and Old Seward Highway; in the absence of parking lanes at these locations, 3.5-foot shoulders will be present on each side of the travel lanes. These lanes will be 11 feet wide and the parking lane is seven feet wide. A 6-foot-wide, electrical improvement area will be present on the south side of the roadway from Cordova Street to Eagle Street, and on the north side from Eagle Street to Old Seward Highway to facilitate the installation of lighting improvements. The maximum width of this section is 67 feet and will require the most ROW acquisition to construct as well as significant utility relocation.

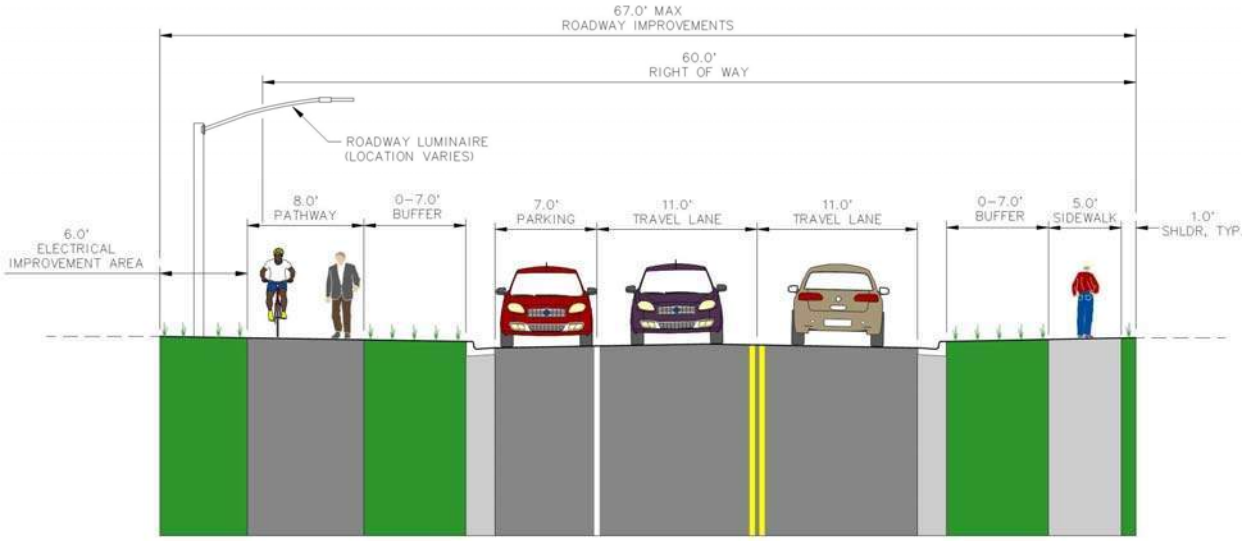

Figure 15 – E. 48th Avenue - Alternative 1

Alternative 2: This alternative reduces the overall cross section of the roadway improvements from Alternative 1 to 60 feet. It includes five-foot sidewalks on each side of the road separated by a five-foot buffer from the back of curb where feasible. On-street parking will be included on the south side of the roadway from Cordova Street to Denali Street, and on the north side from Denali Street to Old Seward Highway in select areas absent of intersections and commercial driveways. Parking lanes will conclude at the intersections of Cordova Street and Old Seward Highway. At the intersection with Cordova Street, the parking lane will be eliminated by a neckdown to transition to the existing intersection. At the intersection of Old Seward Highway, the parking lane will transition 3.5 feet to the north to provide shoulders on each side of the travel lanes. These lanes will be 11 feet wide and the parking lane is seven feet wide.

A 6-foot-wide, electrical improvement area will be present on the north side of E. 48th Avenue to facilitate the installation of lighting improvements. Retaining walls will be required along the north side of the road along Parcels 116-118 to reduce the amount of ROW acquisition for this alternative. The overall width of this cross section will fit within the existing 60-foot-wide ROW, but will require some easements to match the roadway improvements into the surrounding grade.

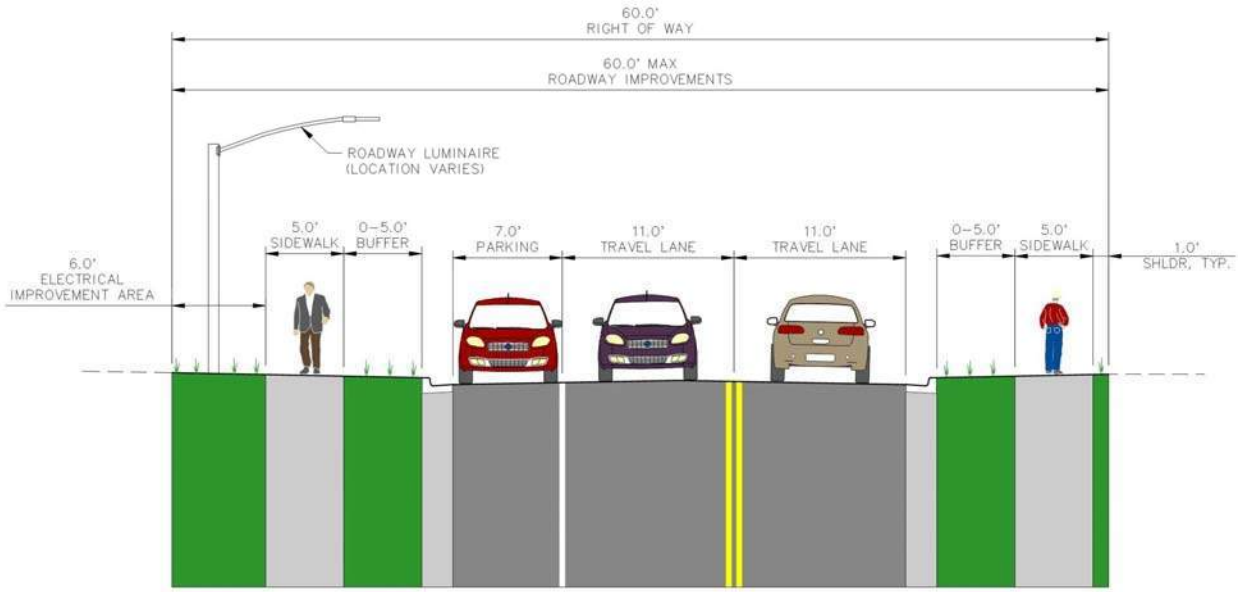

Figure 16 – E. 48th Avenue – Alternative 2

Alternative 3 (Preferred): This alternative has a similar, overall cross section width as Alternative 2 but includes a seven-foot snow storage area in select locations. Alternative 3 includes a 10-foot, multi-use pathway on the north side of the road separated by a two-foot concrete buffer from the back of curb where feasible. A five-foot sidewalk will be installed in one location on the south side of the road near the intersection of Cordova Street to provide an accessible pedestrian route from E. 48th Avenue to Parcel 107's parking lot. On-street parking will be included on the south side of the roadway from Cordova Street to Eagle Street, and on the north side of the road from Eagle Street to Old Seward Highway in select areas absent of intersections and commercial driveways. Parking lanes will conclude at the intersections of Cordova Street and Old Seward Highway. At the intersection with Cordova Street the parking lane will be eliminated by a neckdown to transition to the existing intersection. At the intersection of Old Seward Highway the parking lane will transition 3.5-feet to the north to provide shoulders on each side of the travel lanes. These lanes will be 12 feet wide to better accommodate commercial vehicle traffic and the parking lane is 7 feet wide.

A 6-foot-wide, electrical improvement area will be present on the north side of E. 48th Avenue to facilitate the installation of lighting improvements. A 7-foot-wide, snow storage area will be present on the south side of the road. Retaining walls will be required along the north side of the road along Parcels 116-118 to reduce the amount of ROW acquisition for this alternative The overall width of this cross section will fit within the existing, 60-foot-wide ROW but will require some temporary easements for matching finished grades adjacent to the proposed improvements.

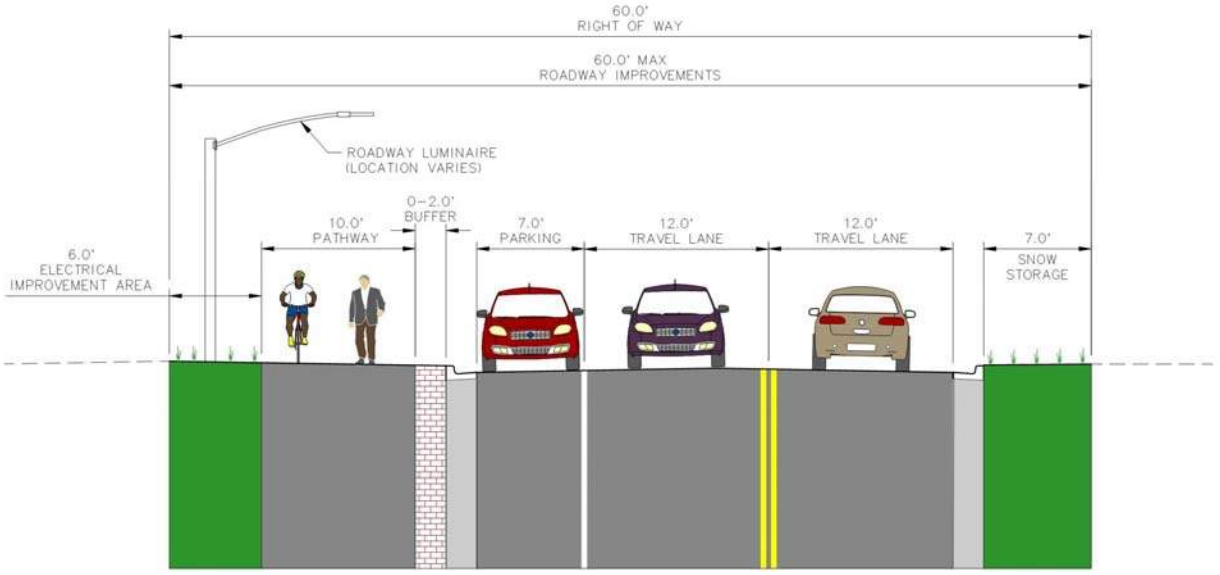

Figure 17 – E. 48th Avenue – Alternative 3

Type 1 barrier curb and gutter is recommended on both roadways; these delineate sidewalks better than rolled curb. Barrier curb also discourages parking on the sidewalks more effectively than rolled curb. Rolled curb may still be desirable in some locations to accommodate access to existing, on-property, full-frontage parking lots.

2. Cordova Street (E. International Airport Road to E. 48th Avenue) – Class I Collector

   Cordova Street has higher traffic volumes and speeds of the two roadways. No sidewalks are currently present along either side of the corridor and parking is permitted. Driveway access is predominantly on the west side of the road. Several commercial businesses are present south of 51st Avenue and will require attaching pedestrian facilities to the back of curb in these areas. Four large parcels constitute the northern portion of Cordova Street, including St. Elias, the former Habitat for Humanity ReStore, and an undeveloped parcel.

   Alternative 1: This alternative follows a typical neighborhood collector cross section with an eight-foot pathway on the west side of the road and five-foot sidewalk on the east side. Pathways and sidewalks will be separated by a seven-foot vegetative buffer from the back of curb where feasible. On-street parking will be included on the west side of the roadway in select areas absent of intersections and commercial driveways. Parking lanes will conclude at the intersections of E. International Airport Road and E. 48th Avenue, in the absence of parking lanes at these locations 3.5-foot shoulders will be present on each side of the travel lanes. Travel lanes will be 11 feet wide and the parking lane is seven feet wide. A six-foot-wide, electrical improvement area will be present on the west side of Cordova Street to facilitate the installation of lighting improvements. The maximum width of this section is 67 feet and will require the most ROW acquisition to construct as well as significant utility relocation.

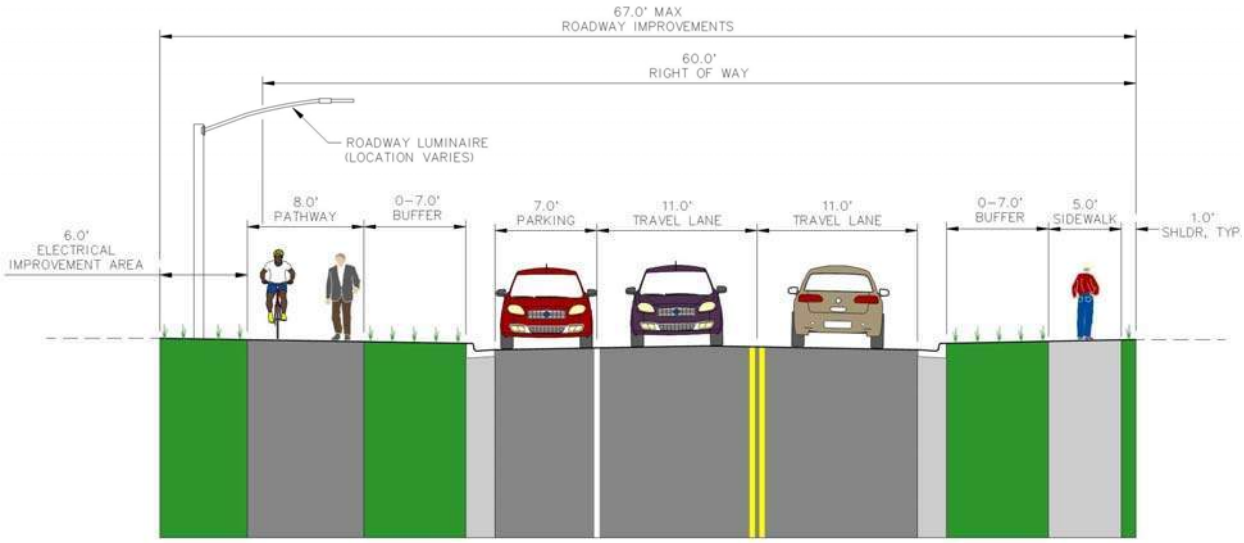

Figure 18 – Cordova Street - Alternative 1

Alternative 2 (Preferred): This alternative reduces the overall cross section of the roadway improvements from Alternative 1 to 60 feet. It includes five-foot sidewalks on each side of the road separated by a five-foot buffer from the back of curb where feasible. On-street parking will be included on the west side of the roadway in select areas absent of intersections and commercial driveways. Parking lanes will conclude at the intersections of E. International Airport Road and E. 48th Avenue, in the absence of parking lanes at these locations 3.5-foot shoulders will be present on each side of the travel lanes. Travel lanes will be 11 feet wide and the parking lane is seven feet wide.

A 6-foot-wide, electrical improvement area will be present on the east side of Cordova Street to facilitate the installation of lighting improvements. The overall width of this cross section will fit within the existing, 60-foot-wide ROW but will require some easements for grade matching.

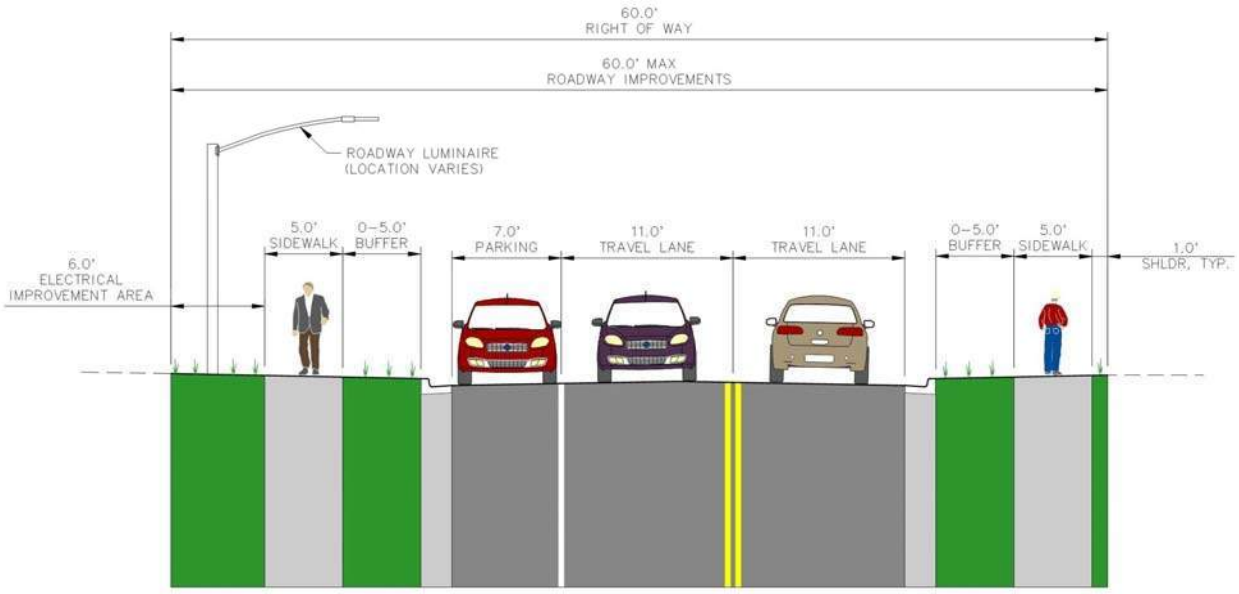

Figure 19 – Cordova Street – Alternative 2

Alternative 3: This alternative has a similar overall cross-section width as Alternative 2 but includes a seven-foot, snow storage area in select locations. Alternative 3 includes a 10-foot, multi-use pathway on the sidewalks on the west side of the road separated by a two-foot concrete buffer from the back of curb where feasible. A five-foot sidewalk will be installed in one location on the east side of the road near the intersection of E. 48th Avenue to provide an accessible pedestrian route from the Parcel 107 parking lot to E. 48th Avenue. On-street parking will be included on the west side of the roadway in select areas absent of intersections and commercial driveways. Parking lanes will conclude at the intersections of E. International Airport Road and E. 48th Avenue, in the absence of parking lanes at these locations 3.5-foot shoulders will be present on each side of the travel lanes. Travel lanes will be 12 feet wide to better accommodate commercial vehicle traffic and the parking lane is seven feet wide.

A six-foot-wide, electrical improvement area will be present on the west side of Cordova Street to facilitate the installation of lighting improvements. A seven-foot-wide, snow storage area will be present on the east side of the road. The overall width of this cross section will fit within the existing, 60-foot-wide ROW but will require some easements for grade matching.

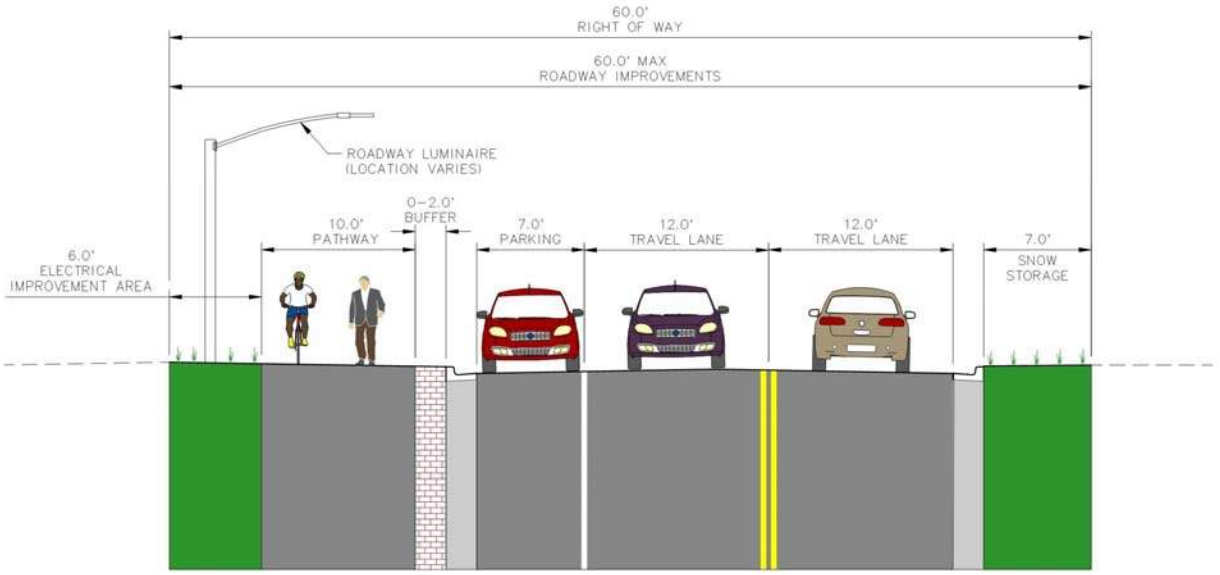

Figure 20 - Cordova Street – Alternative 3

C. Horizontal Alignment

The roadways within the project corridor are generally centered on the existing ROW centerlines. The proposed horizontal alignments vary based on the combination of behind curb facilities and parking lane locations. Below is a summary of the horizontal alignments for each alternative.

1. E. 48th Avenue

a) *Alternative 1*

The proposed centerline alignment of Alternative 1 begins centered on the ROW centerline at the intersection of E. 48th Avenue and Cordova Street. Approximately 200 feet east of the intersection, the alignment is shifted five feet to the south of the ROW centerline with the presence of parking lane on the north side of the roadway. When pedestrian facilities are separated from the back of curb, the proposed alignment locates the back of the pedestrian facilities at the edge of the ROW. The centerline transitions back to the existing ROW centerline approximately 100 feet west of the intersection of E. 48th Avenue and Old Seward Highway to eliminate the parking lane on the north side.

b) *Alternative 2*

The proposed centerline alignment of Alternative 2 begins centered on the ROW centerline at the intersection of E. 48th Avenue and Cordova Street. Approximately 200 feet east of the intersection, the alignment is shifted six feet to the south of the ROW centerline when the parking lane transitions from the south side of the roadway to the north. When pedestrian facilities are separated from the back of curb, the proposed alignment locates the back of the south sidewalk one foot away from the ROW and the north sidewalk six feet away from the ROW. The one-foot area on the south side allows the sidewalk shoulder to be constructed in the ROW and the six feet on the north side provides ample clearance from the back of sidewalk to install new light poles and associated electrical structures/conduit within the ROW. The centerline transitions back to the existing ROW centerline approximately 100 feet west of the intersection of E. 48th Avenue and Old Seward Highway to eliminate the parking lane on the north side.

c) *Alternative 3*

The proposed centerline alignment of Alternative 3 begins centered on the ROW centerline at the intersection of E. 48th Avenue and Cordova Street. Approximately 200 feet east of the intersection, the alignment is shifted nine feet to the south of the ROW centerline when the parking lane transitions from the south side of the roadway to the north. The proposed alignment locates the back of pathway six feet away from the ROW and the south back of curb seven feet away from the ROW. The six feet on the north side provides ample clearance from the back of sidewalk to install new light poles and associated electrical structures/conduit within the ROW. The seven-foot area on the south side of the roadway provides an area for snow storage.

2. Cordova Street

a) *Alternative 1*

The proposed centerline alignment of Alternative 1 begins centered on the ROW centerline at the intersection of E. International Airport Road and Cordova Street. Approximately 100 feet north of the intersection, the alignment is shifted five feet to the west of the ROW centerline with the presence of parking lane on the west side of the roadway. When pedestrian facilities are separated from the back of curb, the proposed alignment locates the back of the pedestrian facilities at the edge of the ROW. The centerline transitions back to the existing ROW centerline approximately 150 feet south of the intersection of E. 48th Avenue and Cordova to eliminate the parking lane on the west side.

b) *Alternative 2*

The proposed centerline alignment of Alternative 2 begins centered on the ROW centerline at the intersection of E. International Airport Road and Cordova Street. Approximately 100 feet north of the intersection, the alignment is shifted one foot to the east of the ROW centerline with the presence of parking lane on the west side of the roadway. When pedestrian facilities are separated from the back of curb, the proposed alignment locates the back of the west sidewalk one foot away from the ROW and the east sidewalk six feet away from the ROW. The one-foot area on the west side allows the sidewalk shoulder to be constructed in the ROW and the six feet on the east side provides ample clearance from the back of sidewalk to install new light poles and associated electrical structures/conduit within the ROW.

c) *Alternative 3*

The proposed centerline alignment of Alternative 3 begins centered on the ROW centerline at the intersection of E. International Airport Road and Cordova Street. Approximately 100 feet north of the intersection, the alignment is shifted nine feet to the east of the ROW centerline with the presence of parking lane on the west side of the roadway. The proposed alignment locates the back of pathway six feet away from the ROW and the east back of curb seven feet away from the ROW. The six feet on the west side provides ample clearance from the back of sidewalk to install new light poles and associated electrical structures/conduit within the ROW. The seven-foot area on the west side provides an area for snow storage.

D. Vertical Alignment

The overall intent of the roadway profile is to maintain adequate grades for drainage along the project corridor while minimizing the adverse effects on surrounding driveways and intersections. As can be expected, the more the proposed roadway grade is changed from the existing grade, the more cut and fill slopes impact adjacent properties. Driveways and side streets must also be adjusted to match the new roadway grades. The proposed roadway profile is shown in Appendix B.

The proposed road grade will generally follow the existing grade with slight variations. The proposed roadway profile was designed in an attempt to match the elevations of existing side streets, minimize easements on adjacent properties, and maintain proper drainage flow. The proposed roadway grade should typically be six inches lower than the existing grade in order to reduce the risk of surface runoff ponding behind the curb.

1. Cordova Street

   Roadway grades along the southern segment of Cordova Street are generally flat along the project corridor with existing slopes of less than 1% in many locations. While this can be beneficial for matching side street and driveway slopes, it may cause drainage issues. In order to ensure adequate grades for drainage, existing dips in the roadway will be lowered and new artificial low points will be built into the roadway profile. This will result in an undulating profile along the roadway which can make drivers uncomfortable if the hills and valleys are too large or too regular. Fortunately the sags are typically less than one foot below the adjacent crests. Low points for the preferred alternative are proposed at the following location:

   - Station 14+28 (50 feet north of 51st Avenue)

2. E. 48th Avenue

In most locations, the proposed vertical alignment will generally match the existing ground. The vertical alignment will also be adjusted to allow for adequate sight distance at crest curves and intersections and will be refined during the design process to reduce impacts on adjacent properties and utilities.

E. Traffic Calming

Currently there are no traffic calming devices on E. 48th Avenue and Cordova Street. Vertical measures such as speed humps are not recommended on either roadway due to heavy truck traffic. A proposed neckdown is proposed on all alternatives at the intersection of E. 48th Avenue and Cordova Street.

F. Drainage Improvements

The condition assessment and hydrologic and hydraulic analysis discussed in Section 3 identified a number of deficiencies in the existing storm drain systems within the project limits. This project will address these stormwater issues, along with other related drainage items such as treatment and ponding.

The proposed drainage improvements consist of the following:

- Replace and upsize the aging storm drain on E. 48th Avenue, from Gambell Street to the Old Seward Highway, with larger-diameter pipe
- Install new subdrain pipe on E. 48th Avenue from Fairbanks Street to Gambell Street, and from Eagle Street to Cordova Street
- Install new subdrain pipe on Cordova Street from International Airport Road to E. 48th Avenue

- Install catch basins to collect surface runoff
- Replace existing catch basins and leads as required to match new curb locations
- Provide positive roadway drainage to minimize ponding
- Provide water quality treatment for storm runoff
- Provide appropriate freeze protection

1. Hydrologic and Hydraulic Model Results

   In order to properly size the proposed conveyance systems, a drainage model was evaluated for the proposed conditions.

   A total of 10 contributing catchments were delineated and evaluated for runoff response for the proposed condition. The majority of the catchment remained unchanged from the existing condition. However, the existing catchment along Cordova Street from the existing condition was subdivided into three new catchments in the proposed model to reflect the new Cordova Street piped system.

   Peak runoff for the proposed drainage systems are shown on Figure 21.

   Note that the full flow capacity of the proposed pipes exceeds the peak flow condition for each pipe segment, and pipe sizing assumes future piping upstream is adequately sized. Surcharging is still likely occurring in the existing upstream reaches of the Gambell system due to undersized piping outside of the project area.

   The 90th percentile, 24-hour storm was also modeled for water quality treatment design purposes. Runoff volumes and peak flows are presented in Appendix E, Table 5. These values will be used to size the stormwater controls to meet water quality treatment requirements.

2. E. 48th Avenue (Fairbanks Street to Old Seward Highway)

   The majority of existing CMP pipe and storm drain structures along E. 48th Avenue from Gambell Street to the Old Seward Highway were graded poorly in the condition assessment report. This infrastructure was installed in the early 1980s and is likely nearing the end of its design life. In addition to being in poor condition, it is undersized to handle the design storm event. Pipe and structures along this stretch of roadway should be removed and replaced. In addition, this system will be expanded to extend west of Fairbanks Street.

   The proposed storm drain system will install minimum 18-inch, perforated CPEP, with 24-inch, non-perforated CPEP for the segment between Gambell Street and Old Seward Highway. Existing water mains are located on the north side of the roadway, where applicable. To meet the separation distance requirement from this utility as well as provide the best benefit to roadway drainage, the new storm drain pipe will be installed along the center of the road for the majority of the system. Standard catch basins will be installed along the proposed curb lines, and manholes will be Type 1.

Construction of storm drain piping between Gambell Street and Old Seward Highway will likely require excavation of contaminated soils as identified during the geotechnical investigation. Storm drain pipe in this area should be gasketed (watertight) and non-perforated to avoid transporting contaminated groundwater into the storm drain system and outfall to eventual surface water bodies.

The proposed storm drain configuration is shown on the plan and profile sheets in Appendix C.

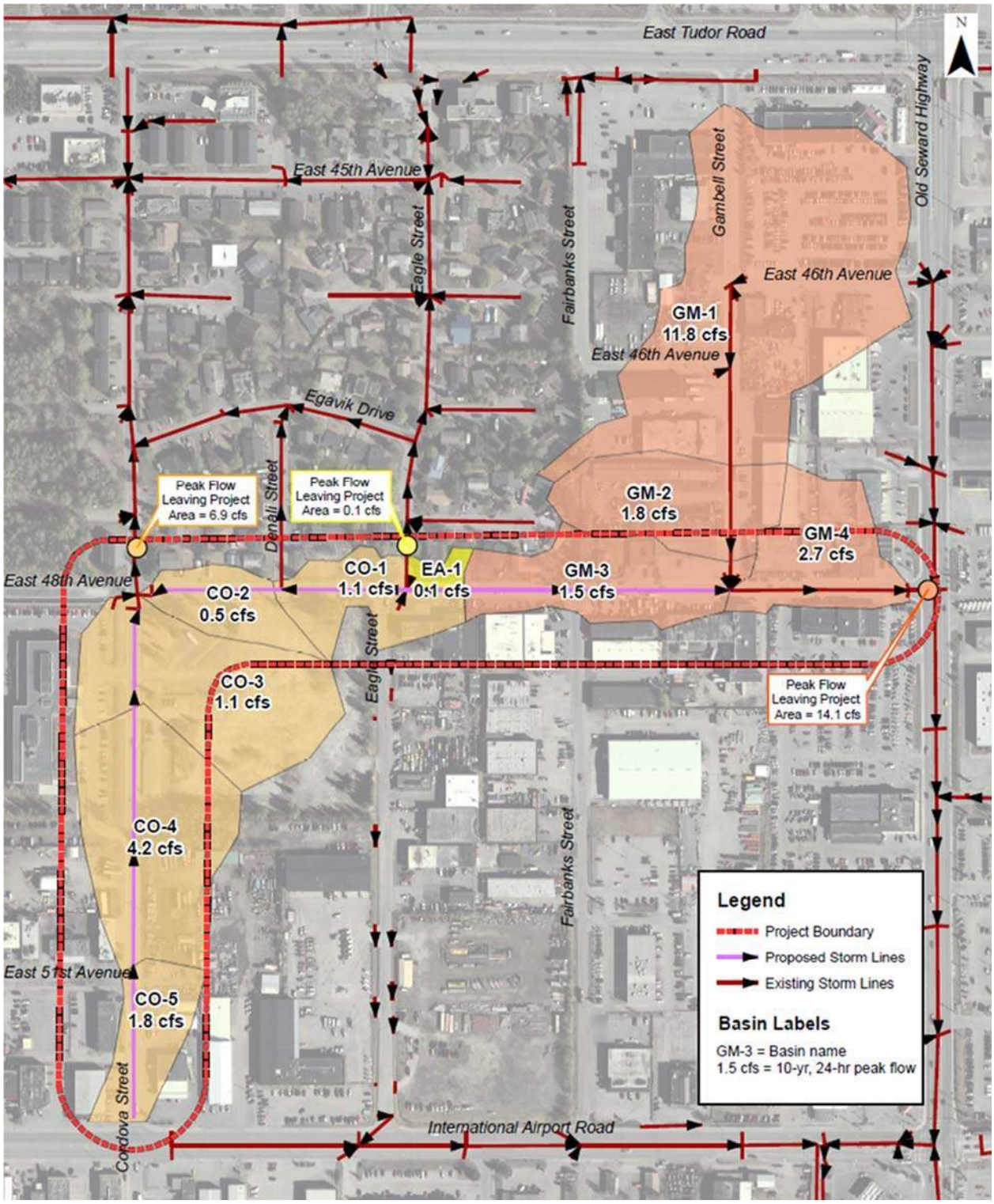

Figure 21 - Proposed Storm Drain Map & Catchment Areas

3. E. 48th Avenue (Eagle Street to Cordova Street)

   A piped storm drain system does not currently exist along E. 48th Avenue to the west of the Old Seward system, aside from a few limited catch basins at intersections that flow to the north. This section of roadway shows cracking damage and would benefit from a subdrain line.

   The proposed storm drain system will install 18-inch, perforated CPEP along E. 48th Avenue from east of Eagle Street to Cordova Street. Existing water mains are located on the north side of the roadway. To meet the separation distance requirement from this utility as well as provide the best benefit to roadway drainage, the new storm drain pipe will be installed along the center of the road for the majority of the system. Type 1 manholes will be installed at centerline, with connecting catch basins located to the north and south to intercept curb flow.

   The proposed storm drain configuration is shown on the plan and profile sheets in Appendix C.

4. Cordova Street (International Airport Road to E. 48th Avenue)

   There is currently no piped storm drain system along Cordova Street, aside from within the intersection with E. 48th Avenue. This roadway section has ponding issues and shows cracking damage, and would benefit from a subdrain line and storm drain catch basins.

   The proposed storm drain system will install 18-inch, perforated CPEP along Cordova Street to tie into the existing infrastructure at E. 48th Avenue. Existing water mains are located on the west side of the roadway on the north side, switching to the east about halfway down the project. To meet the separation distance requirement from this utility as well as provide the best benefit to roadway drainage, the new storm drain pipe will be installed along the center of the road. Type 1 manholes will be installed at centerline, with connecting catch basins located to the north and south to intercept curb flow.

   The proposed storm drain configuration is shown on the plan and profile sheets in Appendix C.

5. Replace Existing Catch Basins and Leads

   The proposed roadway layout will adjust the existing curb line along the entire project corridor, excepting the newer improvements at the intersection of E. 48th Avenue and Cordova Street which will be maintained. In most cases, the locations of the existing catch basins will not line up with the proposed curb line and these catch basins will need to be removed. New catch basins and connecting leads will be installed to match the proposed curb line.

6. Minimize Ponding

   The proposed roadway profile is designed to establish high and low points throughout the project corridor, which are used to direct roadway runoff to curb inlets. The curb inlets capture curb flow and direct runoff to the storm drain system, eliminating standing water. These improvements will help alleviate ponding issues along the entire project corridor. The most extensive ponding is located along Cordova Street, but is present along most of the project area.

   The roadway profile and curb inlets are depicted on the plan and profile sheets in Appendix C.

7. Water Quality Treatment

   The new permit requirements referenced in Section 4.B.1 state that stormwater management systems are to be designed to provide water quality treatment through the use of GI whenever feasible. GI treatment techniques include methods such as retention, infiltration, bioretention, evaporation, and/or any combination of these techniques.

   In some cases GI treatment may be be infeasible due to site constraints such as poorly infiltrating soils, high ground water, on-site space constraints, shallow bedrock, etc. In instances such as these, water quality treatment may be provided through the use of traditional gray infrastructure such as an oil OGS.

   Section 3.3.2.1 of the ASM also states that roadway projects within narrow ROW (60 feet or less) may choose to provide stormwater treatment through either GI or traditional treatment, regardless of site constraints.

   Implementing GI treatment was reviewed for this project, but is not likely viable due to limited ROW (60 feet) for the majority of the project corridor. The footprint of the proposed roadway and pedestrian facilities occupy the majority of usable area. Additional consideration will be given if adjacent land becomes available for use for GI treatment.

   The proposed improvements will implement OGS for water quality treatment. OGSs will be provided at the downstream end of the proposed storm drainage improvements to the east and south of the E. 48th Avenue and Cordova Street intersection, before these systems tie into existing infrastructure within the intersection. OGSs will be sized to treat the first 0.52 inches of rainfall from a 24-hour event, also referred to as the 90th percentile storm.

   Runoff volumes and peak flows for the 90th percentile storm are provided in Appendix E, Table 5. These results will be used to select the appropriate stormwater treatment control.

8. Freeze Protection

   According to ASM Section 5.3.3, the minimum depth of cover over a gravity storm drain pipe without thaw protection is four feet. Insulation is required for pipes with a

diameter less than 30 inches if the depth of cover is less than four feet. However, if a storm drain pipe is located under a roadway structural section with insulation, additional insulation for the pipe is not required. A thaw system is required if the depth if the depth of cover is less than three feet.

The storm drain design for this project maintains four feet of cover at all points within the roadway. Therefore, insulation and thaw systems will not be required.

9. Rehabilitation of Existing Storm Drain Pipe

   The CCTV storm drain condition assessment (Appendix D) identified four catch basin leads as potential candidates for rehabilitation in place using a lining construction method. Pipe lining, also referred to as cured in place pipe (CIPP), is a trenchless rehabilitation method used to repair existing pipelines. However, as noted above, the proposed roadway layout will require adjusting the existing curb line along the majority of the project corridor and will require new catch basins and leads. Consequently, lining the catch basin leads noted in the condition assessment will not be a viable option.

G. Lighting

For the design year AADT, Cordova Street and E. 48th Avenue are functionally classified as Collector roads for analyzing intersection lighting. For the design year AADT, all side streets are classified as Local roads, except E. International Airport Road and Old Seward Highway, which are classified as Major roads for intersection lighting. Roadway lighting between intersections will meet the DCM requirements for a low-speed urban road with medium pedestrian activity. Based upon the presented alternatives, the existing luminaire poles that currently exist along the project corridor will typically be impacted by construction and will require new luminaire poles be installed.

H. Retaining Walls

Two retaining walls are proposed for the Preferred Alternative along E. 48th Avenue as summarized below. The proposed walls will likely be concrete sidewalk retaining walls (similar to MASS Detail 30-15).

1. Retaining Wall No. 1

   Proposed retaining wall No. 1 is a cut wall extending from 39+70 to 41+70 LT and has a maximum cut of approximately 3.5 feet. A concrete sidewalk retaining wall is proposed at this location.

2. Retaining Wall No. 2

   Proposed retaining wall No. 2 is a cut wall extending from 42+00 to 42+75 LT and has a maximum cut of approximately four feet. A concrete sidewalk retaining wall is proposed at this location.

I. Right-of-Way Impacts

Preliminary estimated easement and permit requirements are summarized in Table 15 below and are detailed in Appendix I. As the planning and design of this project progresses, the required temporary construction permits and easements will be refined.

Table 15 – Estimated Right-of-Way Easements / Permits

Alternative	Public Use Easement (PUE)	Slope Easements (SE)	Temporary Construction Easements (TCE)	Temporary Construction Permits (TCP)
1	14	0	0	29
2	2	3	3	29
3	2	1	3	29

9. Utility Impacts

When roadway and drainage improvements are made in urban areas, impacts to utilities need to be analyzed. Existing utility facilities are shown in Appendix A. For safety, overhead and underground clearances must be maintained. A minimum of 18.5 feet of vertical clearance should be maintained between primary overhead electrical lines and the grade of the roadway. CEA and Municipal Light and Power will be notified in the event of relocation for any of these lines, as required.

In the ROW, MOA requires a minimum burial depth of 42 inches for buried gas lines, electric cables, telephone cables, and cable television lines. For the purpose of this report, it is assumed that the existing buried facilities in the project area are buried at the minimum depth. As a result, any reduction of cover or impacts from storm drain improvements over existing facilities will require relocation of said facility. In some locations the structural section excavation will impact utilities, these will either require relocation or support in place and will be worked around.

AWWU requires a minimum depth of cover of 10 feet over their water mains and eight feet over their sewer mains. Changes to the roadway grade along the corridor are minor and are not anticipated to substantially reduce the existing cover over the water and sewer utilities. The recommended roadway cross section includes two inches of rigid board insulation which would mitigate some reduction in cover above water and sewer mains.

The utility relocation cost estimates for project area are shown in Appendix J.

10. Permitting and Agency Approvals

The permits and agency approvals for the E. 48th Avenue and Cordova Street Reconstruction project required for construction of the proposed improvements will be limited. Because the roadways are classified as a Collectors, it will be necessary to obtain approval of the recommendations in the DSR from the Planning and Zoning Commission (PZC) and approval of the preliminary (65% level) design from the UDC. Anticipated permits and agency approvals required for design include:

- MOA Watershed Management Services Storm Water Plan Approval
- ADEC Approval to Construct Storm Drain Improvements and Separation Waivers (assumed)
- A Best Management Practices plan for when contaminated soils are encountering will need to be approved by ADEC prior to construction.

Additional permits may be identified as the design develops.

11. Construction Schedule

The project is currently funded only through the Design Study Phase, and additional funding will be necessary to complete design and construction. It is anticipated that the project will be phased over multiple construction seasons to accommodate funding availability of between $2 million and $3 million.

Based on the existing roadway conditions, current drainage patterns, and anticipated available construction funding, the following phases are recommended:

- Phase 1: Cordova Street – E. 48th Avenue to 50th Avenue ROW (approximately 600 feet)
- Phase 2: Cordova Street – 50th Avenue ROW to International Airport Road (approximately 700 feet)
- Phase 3: E. 48th Avenue – Cordova Street to Eagle Street (approximately 650 feet)
- Phase 4: E. 48th Avenue – Old Seward Highway to Eagle Street (approximately 1,250 feet)

The preliminary phasing limits are provided in Figure 22. The construction of improvements to Cordova Street would typically be recommended to occur in a single phase but the total cost of the improvements exceeds the single-year available budget. If additional funds are available, combining Phases 1 and 2 would be the preferred approach.

The current schedule calls for design of the roadway to begin in 2020 and be ready for construction in 2023.

Figure 22 - Phasing Limits

12. Quantity and Cost Estimates

A summary of estimated project costs for the proposed improvements is presented below. A breakdown of the construction, utility, design, and management cost estimates can be found in Appendix J.

A. Construction Costs (E. 48th Avenue)

Table 16 - Summary of Estimated Project Costs (E. 48th Avenue)

Category	Alternative 1	Alternative 2	Alternative 3 (Preferred)
Design & Management Total (estimated)	$650,000	$650,000	$650,000
ROW Acquisition Total	$106,000	$22,000	$17,000
Utility Relocation (10% Contingency) Total	$1,180,000	$1,040,000	$1,030,000
A. Design, ROW Acquisition, Utility Relocation	**$1,936,000**	**$1,712,000**	**$1,697,000**
Construction			
Roadway Improvements	$1,944,000	$1,938,000	$1,982,000
Drainage Improvements	$512,000	$512,000	$512,000
Illumination Improvements	$223,000	$223,000	$223,000
Construction Subtotal	*$2,679,000*	*$2,673,000*	*$2,717,000*
Construction Contingency (15%)	$402,000	$401,000	$408,000
Construction Management / Inspection / Testing	$289,000	$289,000	$293,000
B. Total Estimated Construction Cost (rounded)	***$3,370,000***	***$3,363,000***	***$3,418,000***
C. Overhead / Grant Accounting	$936,000	$895,000	$902,000
Total Estimated Project Cost (A + B + C)	***$6,242,000***	***$5,970,000***	***$6,017,000***

B. Construction Cost (Cordova Street)

Table 17 - Summary of Estimated Project Costs (Cordova Street)

Category	Alternative 1	Alternative 2 (Preferred)	Alternative 3
Design & Management Total (estimated)	$440,000	$440,000	$440,000
ROW Acquisition Total	$109,000	$41,000	$18,000
Utility Relocation (10% Contingency) Total	$360,000	$310,000	$260,000
A. Design, ROW Acquisition, Utility Relocation	**$909,000**	**$791,000**	**$718,000**
Construction			
Roadway Improvements	$1,388,000	$1,322,000	$1,383,000
Drainage Improvements	$307,000	$307,000	$307,000
Illumination Improvements	$127,000	$127,000	$127,000
Construction Subtotal	*$1,822,000*	*$1,756,000*	*$1,817,000*
Construction Contingency (15%)	$273,000	$263,000	$273,000
Construction Management / Inspection / Testing	$204,000	$197,000	$203,000
B. Total Estimated Construction Cost (rounded)	***$2,299,000***	***$2,216,000***	***$2,293,000***
C. Overhead / Grant Accounting	$566,000	$530,000	$531,000
Total Estimated Project Cost (A + B + C)	***$3,774,000***	***$3,537,000***	***$3,542,000***

13. Stakeholder Coordination/Public Involvement

The public involvement effort for the E. 48th Avenue and Cordova Street Reconstruction project followed the MOA Context Sensitive Solutions (CSS) process as a general guide for best practices. The goal of the CSS process is to collaborate with all stakeholders to improve the safety and accessibility of the corridor, balance diverse interests, find areas of compromise that address budget/environmental concerns, and solicit feedback/comments from stakeholders. The project team began the public and agency outreach in October 2018 with the identification of over 550 project stakeholders. See Table 18 below for the list of stakeholders.

Table 18 - List of Stakeholders

MOA Agencies	Other Stakeholders
• Project Management & Engineering • Traffic • Transit • Planning • Non-Motorized Transportation • Maintenance and Operations • Anchorage Water and Wastewater Utility	• Area property owners, business owners, property managers, employees and residents • People traveling through project corridor • Midtown Community Council • Alaska Communications and GCI • Chugach Electric Association • ENSTAR Natural Gas Company • Alaska DOT&PF

A. Stakeholder Involvement Activities

A variety of outreach methods were implemented to keep stakeholders aware of project meetings and updates, including website updates, direct mail pieces, and e-mail announcements, as well as in-person delivery of posters and meeting notices to businesses along the project corridor. A Concept Report was developed to gather public comment and document concerns prior to beginning the DSR. This was presented to the MOA PZC as an informational item on April 1, 2019. The Concept Report and public presentation materials are available through the project website (http://www.48th-CordovaReconstruction.com/documents-resources). Public comments received after the publication of the Concept Report are included in Appendix K.

Public involvement for the project consisted of open house style meetings, website updates, and in-person presentations during local community council meetings, agency scoping meetings, and business owner meetings. Table 19 below summarizes each major public involvement event for the duration of the project.

Table 19 - Summary of Public Outreach Activities

General Public Awareness	Dates
Door Hangers Introducing Project	10/26/18
Mailer #1 – Midtown Community Council (MTCC) Meeting Presentation	11/09/18
Email Announcement – MTCC Meeting Presentation	11/09/18
MTCC Meeting Presentation	11/14/18

Project Website – www.E. 48th-cordovareconstruction.com	Dates
Launch Date	10/15/18
Interactive Map Active	10/15/18
Virtual Open House Active	11/16/18

Public Open House Events	Dates
Mailing #2 – Introduce Project & Open House #1	11/09/18
Public Open House #1 Poster (on corridor)	12/03/18
E-newsletter Reminder of Open House #1	12/04/18
Public Open House #1	12/04/18
Mailing #5 – Open House #2	5/03/19
MTCC – Email Reminder – Open House #2	5/06/19
MTCC Meeting Presentation – Announce Open House #2	5/08/19
E-newsletter Reminder of Open House #2	5/08/19
Public Open House #2	5/16/19

Pop Up Meetings	Dates
Pop Up Meeting #1 (Gambell St & E. 48th Ave)	12/6/18
Pop Up Meeting #2 (E. 51st Ave & Cordova St.)	12/11/18

Business Stakeholder Meeting	Dates
Mailing #3 - Business Stakeholder Meeting	12/3/18
Project Email Reminder – Business Stakeholder Meeting	12/6/18
MTCC Email Reminder – Business Stakeholder Meeting	12/10/18
Business Stakeholder Meeting	12/13/18
Meeting with Providence Hospital	1/07/19
Flyer for Meeting at AK Spring (distributed by AK Spring)	1/14/19
Meeting with AK Spring, Salvation Army, & Continental Mazda	1/23/19

Agency Stakeholder Meeting	Dates
Agency Stakeholder Meeting Invites (by MOA)	1/8/19
Agency Stakeholder Meeting	1/16/19

Planning and Zoning Commission Meeting (Concept Report)	Dates
Mailer #4 Identified Project Issues & PZC Meeting Announcement	3/27/19
E-newsletter – Identified Project Issues & PZC Meeting Announcement	3/27/19
Planning and Zoning Commission Meeting Presentation	4/1/19

B. Project Website

The project website has been provided for ease of project information sharing and soliciting public comments. The content includes a project home page overview, how to get involved page, project documents and other resources page, project team contact information, a link to provide comments and sign up for project updates, and an interactive map page allowing users to place comments along the project corridor on a map. The website will be updated as the project progresses.

C. Agency Scoping Meeting

The agency scoping meeting held January 2019 included agency representatives from MOA Traffic, Street Maintenance, Maintenance and Operations, Planning, and PM&E. A complete list of attendees, a meeting summary, and the presentation slides are provided in the Concept Report.

D. Business Stakeholder Meeting

All project-adjacent business stakeholders were invited to attend an open house on December 13, 2018, held at St. Elias Specialty on the project corridor. A meeting summary can be found in in the Concept Report.

E. Public Open House Events

Two public meetings were held in an informal open house setting. Open House #1 (December 2018) was held at the Z.J. Loussac Library Atrium, with 14 attendees. It presented scrolls with aerial images of the existing layout of the project roadways, which attendees used to write comments on regarding known issues or concerns about conditions along the project corridor. Displays also included a project fact sheet, timeline, area zoning, and an area conditions map. Comment sheets were also provided for attendees to submit written comments. The materials presented at the Open House #1, comments received, and sign-in sheets are included in the Concept Report and posted on the project website.

Open House #2 (May 2019) was held at AWWU and had 11 attendees. It presented three alternatives on separate project scrolls with aerial images and cross sections along the

various sections of the roadway. Attendees were encouraged to review the alternatives, provide comments, or ask questions regarding the presented design alternatives. The displays included three separate typical cross section figures, a project timeline, area zoning, and area conditions map. Comment sheets were also provided for attendees to submit written comments. The materials presented at the Open House #2, comments received, and sign-in sheets are included in Appendix K and posted on the project website.

F. Mobile Project Meetings (Pop-Up Event)

Two mobile project meetings were hosted along the project corridor to connect with individuals who use the roadway but may not live or work within the mailing boundary. Pop-up events were held near the intersection of Gambell Street and E. 48th Avenue and on Cordova Street near E. 51st Avenue in December 2018. These events are documented in the Concept Report.

G. Summary of Public Comments Received

Over 65 separate comments were received from individuals through public meetings, comment forms, and online questionnaire responses. Additional comments were recorded on project scrolls, documented in meeting records, and acquired from the interactive map on the project website. All comments received from the beginning of the project through January 16, 2019, can be found in the Concept report and downloaded from the project website (http://www.48th-CordovaReconstruction.com/documents-resources). All project comments received after January 16, 2019, and before the publication of the draft DSR can be found in Appendix K.

During the development of the DSR, stakeholders and members of the public will have the continued opportunity to obtain information and provide feedback on the project website, interactive map tool, and through direct feedback via phone calls and emails to project staff.

14. Design Recommendations

Based on comments received from public, agency, and business stakeholders, and requirements of MOA Title 21 and the MOA Design Criterial Manual, the preferred alternatives for the project corridor are as follows:

A. E. 48th Avenue Cross Section

The preferred cross section alternative for E. 48th Avenue is Alternative 3, and it includes two, 12-foot-wide travel lanes; a seven-foot-wide parking lane; curb and gutter; and a 10-foot-wide pathway on the north side of the roadway. Buffers between the back of curb and pathway will be provided where the pathway is adjacent to on-street parking to provide room for opening the doors of parked vehicles. This alternative balances the industrial and commercial nature of the eastern end of E. 48th Avenue with the residential and institutional character of the western end. It also avoids placement of pedestrian facilities along extended sections of the roadway where full-frontage driveway access is present. ROW acquisition is not required to construct this alternative.

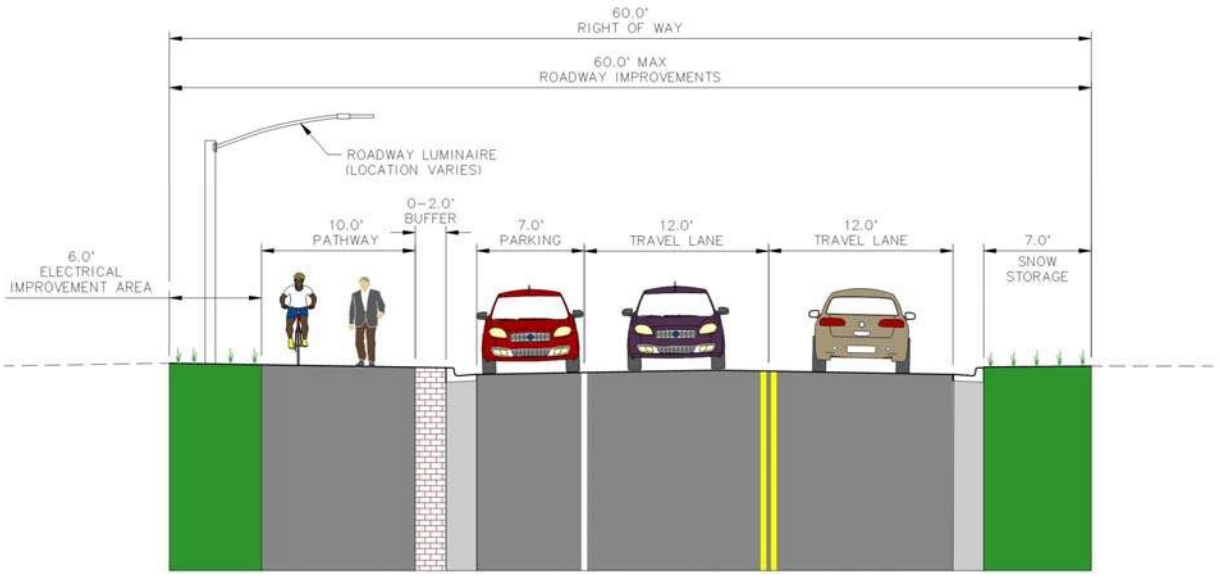

Figure 23 - E. 48th Avenue - Alternative 3

B. Cordova Street Cross Section

The preferred cross section alternative for Cordova Street is Alternative 2, and includes two, 11-foot-wide travel lanes; a seven-foot-wide parking lane; and two, five-foot-wide sidewalks on each side of the road. Buffers between the sidewalk and back of curb will be provided where possible to accommodate snow storage. This alternative provides pedestrian connectivity while accommodating the demand for parking along the roadway. This cross section can be constructed without acquiring additional ROW.

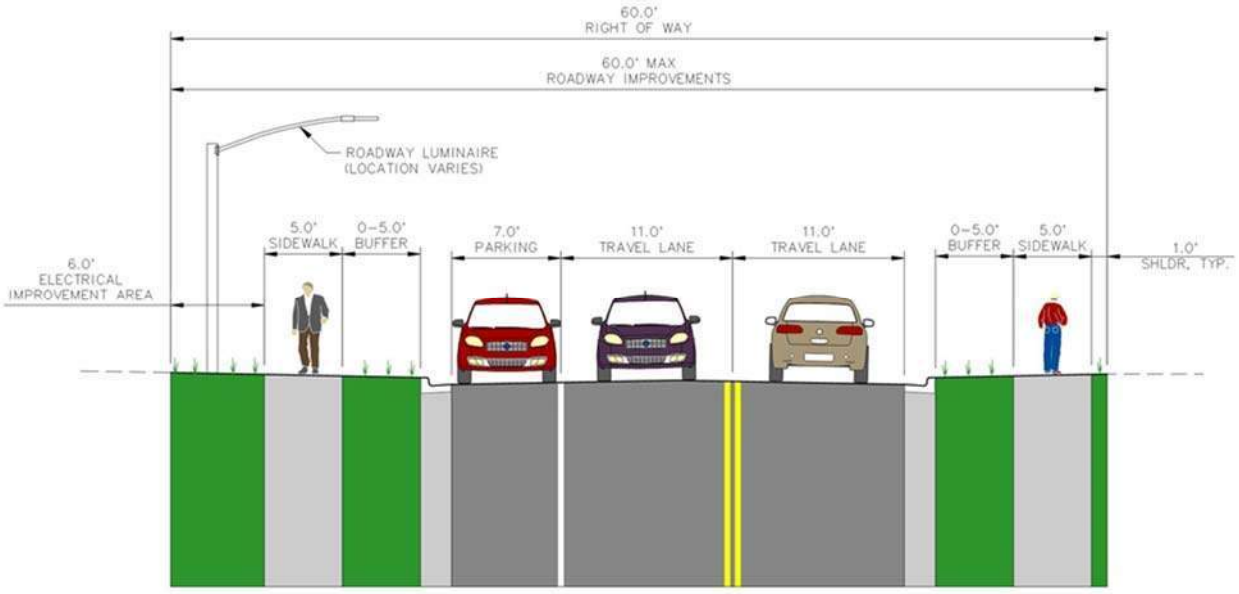

Figure 24 - Cordova Street - Alternative 2

C. Other Recommended Improvements

- Posted Speed Limit: Maintain the current posted speed limit of 25 mph in the project corridor. Design speeds are 5 mph over the posted speed limit.
- Landscaping: Proposed landscaping will be in character with the adjacent residential, business, institutional, and industrial properties. New landscaping and features will fit the context of the corridor. Where new landscaping elements are installed, they will maintain clear sight lines and avoid creating comfortable or hidden areas where transients may loiter or sleep.
- Lighting: A continuous LED lighting system consistent with current MOA standards will be installed along the roadways.
- Storm Drain: The proposed drainage system is made up of three, separate drainage systems distributed throughout the project corridor. Site topography and constraints from existing storm drain systems necessitate keeping these systems separate for design. The storm drain systems discharge into existing piped systems that eventually drain to Fish Creek and Campbell Creek. The proposed drainage improvements consist of the following:
  - Replace and upsize the aging storm drain on E. 48th Avenue from Gambell Street to Old Seward Highway with larger-diameter pipe.
  - Install new subdrain pipe on E. 48th Avenue from Fairbanks Street to Gambell Street, and from Eagle Street to Cordova Street.
  - Install new subdrain pipe on Cordova Street from International Airport Road to E. 48th Avenue.

  - Install catch basins at new roadway low points and replace catch basins and leads as required to match new curb.
  - Provide water quality treatment for storm runoff.

- Traffic Calming: No additional traffic calming improvements are proposed within the project corridor. The presence of on-street parking will construct the roadway width which can help slow vehicle speeds. An existing neckdown is also present at the intersection of E. 48th Avenue and Cordova Street and will remain in place.
- Intersections: The existing stop-controlled intersections on E. 48th Avenue and Cordova Street will all remain after construction, as they will have a LOS within acceptable limits for the design year.
- Driveways: Where full-frontage driveways will be present after improvements are constructed, it is recommended that MOA Type 2 curb be installed to allow vehicle access over the curb. The proposed grades for driveways along the project corridor are identified in Appendix M.

15. Proposed Variances from Design Criteria

A. AMC Title 21

The proposed installation of a single pedestrian facility for the preferred alternative on E. 48th Avenue will require relief to the requirements of AMC 21.07.060.E.2 from MOA PZC. The project will need to submit an Application for Subdivision Variance for approval at the same time the draft DSR is submitted for approval.

B. MOA DCM

The following proposed variances from the DCM for this project will be justified and approved under a separate document during the design process. Below is a list of potential variances for this project:

- Design Speed – A lower speed limit than the 30 mph criteria stated in the DCM may be warranted.
- Driveway Corner Clearance – The DCM recommends that the minimum distance from the nearest face of curb of an intersecting public roadway to the nearest edge of driveway is 40 feet for a local roadway with less than 10 vehicles per hour. Several existing driveways do not currently adhere to this requirement. Driveways will typically be replaced in the same location because existing improvements on property restrict relocating the driveways to adhere to the DCM.
- Number of Driveways and Distance Between Driveways – The DCM recommends frontages with 50 feet or less have one driveway; frontages of 50 feet to 1,000 feet have up to two driveways; and frontages over 1,000 feet have two or more driveways. The DCM also recommends that the minimum distance between two adjacent driveways on the same parcel, measured along the ROW line between adjacent edges of the driveways on a local roadway, is 35 feet if the hourly volume is less than or equal to 10 vehicles per hour. This may not be reasonable given some of the existing lot and driveway configurations.
- Pedestrian Facilities – The DCM requires that pedestrian facilities be installed on both sides of a collector road. The preferred alternative on E. 48th Avenue has a pedestrian facility on only one side due to conflicts with full-frontage driveways.
- Curb Type – DCM Section 1.9.F requires Type 1 curb on collector roadways. \ Due to the presence of full-frontage driveways, it may be necessary to use Type 2 curb along portions of the roadway.

End Report