



# DESIGN STUDY REPORT

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**FINAL**

May 2021

MOA Project #19-08

## LOIS DRIVE & WEST 32<sup>ND</sup> AVENUE PATHWAY BENSON BOULEVARD TO MINNESOTA DRIVE



Prepared for:



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## Executive Summary

### I. Introduction

The Municipality of Anchorage (MOA) is studying alternatives to upgrade Lois Drive (from Benson Boulevard to W. 32<sup>nd</sup> Avenue) and W. 32<sup>nd</sup> Avenue (from Lois Drive to Minnesota Drive) to improve non-motorized connectivity. This study will evaluate transportation network alternatives to improve the roadway conditions and enhance safety and accessibility for non-motorized users and vehicles. 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 Huddle AK (Public Involvement), Bettisworth North Architects and Planners (Landscape Architecture), and Solstice Alaska Consulting (Environmental Analysis and Permitting).

The two roadways in the project corridor lack continuous pedestrian facilities, sufficient drainage collection systems, and adequate street lighting. Both roadways have areas of pavement deterioration. Traffic volumes generated during drop off and pick up of students at Aquarian Charter School cause significant congestion and unsafe conditions.

Improvements may include:

- Improved roadway structural section
- Asphalt pavement and curbs and gutters
- Storm drain system infrastructure
- Pedestrian facilities
- Street lighting
- Signage and landscaping

The project is currently being funded through local road bonds for the planning/concept and design study phase. Additional funding will be necessary for design and pre-construction tasks (including any right-of-way acquisitions and utility relocations).

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

- Project Website and Interactive Project Map
- Direct Mailings and Electronic Newsletters
- Door-to-Door Business Outreach
- Spenard Community Council Meeting Presentation (1)
- Community Open House Meetings (2)
- Business Open House Meeting (1)
- Agency Coordination Meeting (1)



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 Design Criteria Manual (DCM) the preferred alternatives for the project corridor are as follows:

### A. Preferred Roadway Typical Cross Sections

1. Lois Drive: Alternative 2 is the preferred alternative for Lois Drive with two, 11-foot wide travel lanes with 3.5-foot wide shoulders and barrier (Type 1) curb and gutter (see [FIGURE 2](#)). A 10-foot wide paved pathway is proposed on the east side of the roadway and a 5-foot wide concrete sidewalk is proposed on the west side of the roadway. The non-motorized facilities would be detached from the back of curb by 4.5 feet. MOA Traffic Engineering has no adverse comments regarding this alternative. This is the recommended alternative because it allows for separation of both pedestrian facilities but minimizes impacts to adjacent properties.

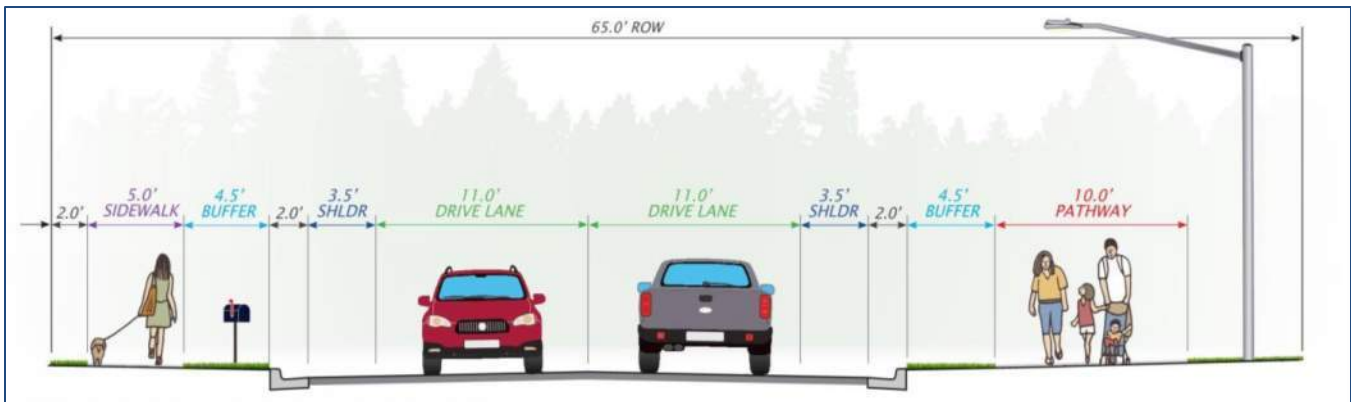


Figure 2 - Lois Drive Alternative 2 (preferred), looking north.

2. W. 32nd Avenue: Alternative 3 (3A and 3B) is the preferred alternative for W. 32nd Avenue (see [FIGURE 3](#)). Alternative 3A would be constructed along Parcel 123 (Aquarian Charter School) and includes two, 10-foot travel lanes with 1.0-foot wide shoulders and barrier (Type 1) curb and gutter. A 10-foot wide paved pathway would be constructed along the north side. The pathway would be separated from the back of curb with a 7-foot buffer to accommodate the existing transmission and distribution poles. No pedestrian facilities would be constructed along the south side of the roadway for this section.

Just east of Aquarian Charter School, the typical section would transition to 3B, which is identical to 3A except the 10-foot wide pathway would be located on the south side of the roadway and be attached to the back of curb. The pedestrian route would transition from the north side of the roadway to the south via a marked crosswalk. During detailed design, the location of the crossing will be further evaluated. Ideally, the pedestrian crossing would be located at an intersection if possible. Additionally, the curb type along the north side of



the roadway for Alternative 3B would be rolled (Type 2) to accommodate the full-frontage access to Parcel 122 (Anchorage Sands Apartments).

This is the recommended alternative because it minimizes impacts to adjacent properties, especially full acquisition requirements, but still provides for improved drainage, roadway, and pedestrian facilities.

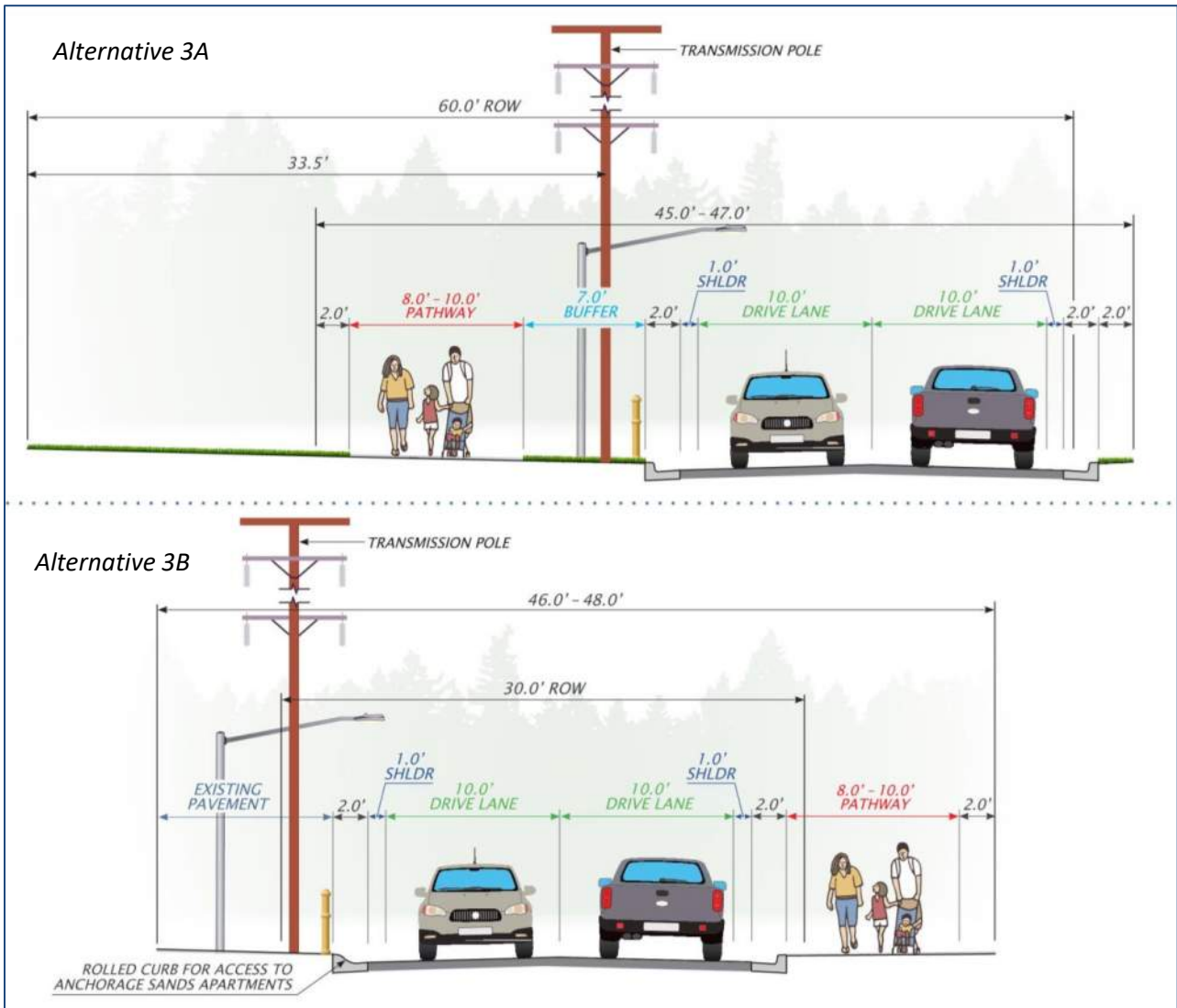


Figure 3 - W. 32<sup>nd</sup> Avenue Alternative 3 (preferred), looking east. Alternative 3A (top) would be constructed along the west end of W. 32<sup>nd</sup> Avenue (along Aquarian Charter School). Alternative 3B (bottom) would be constructed along the east end of W. 32<sup>nd</sup> Avenue (along Anchorage Sands Apartments).

### B. Preferred Intersection Alternative

Alternative 3 (roundabout) is the preferred alternative for the intersection of Lois Drive and W. 32<sup>nd</sup> Avenue (see [FIGURE 4](#)). The roundabout is shifted towards the northeast to minimize and/or eliminate impacts to existing infrastructure and transmission poles. The resulting locations requires

combining the south and west legs prior to entering the roundabout, resulting in a three-leg roundabout. Property acquisition is still required with this alternative but not full acquisitions of any parcels.

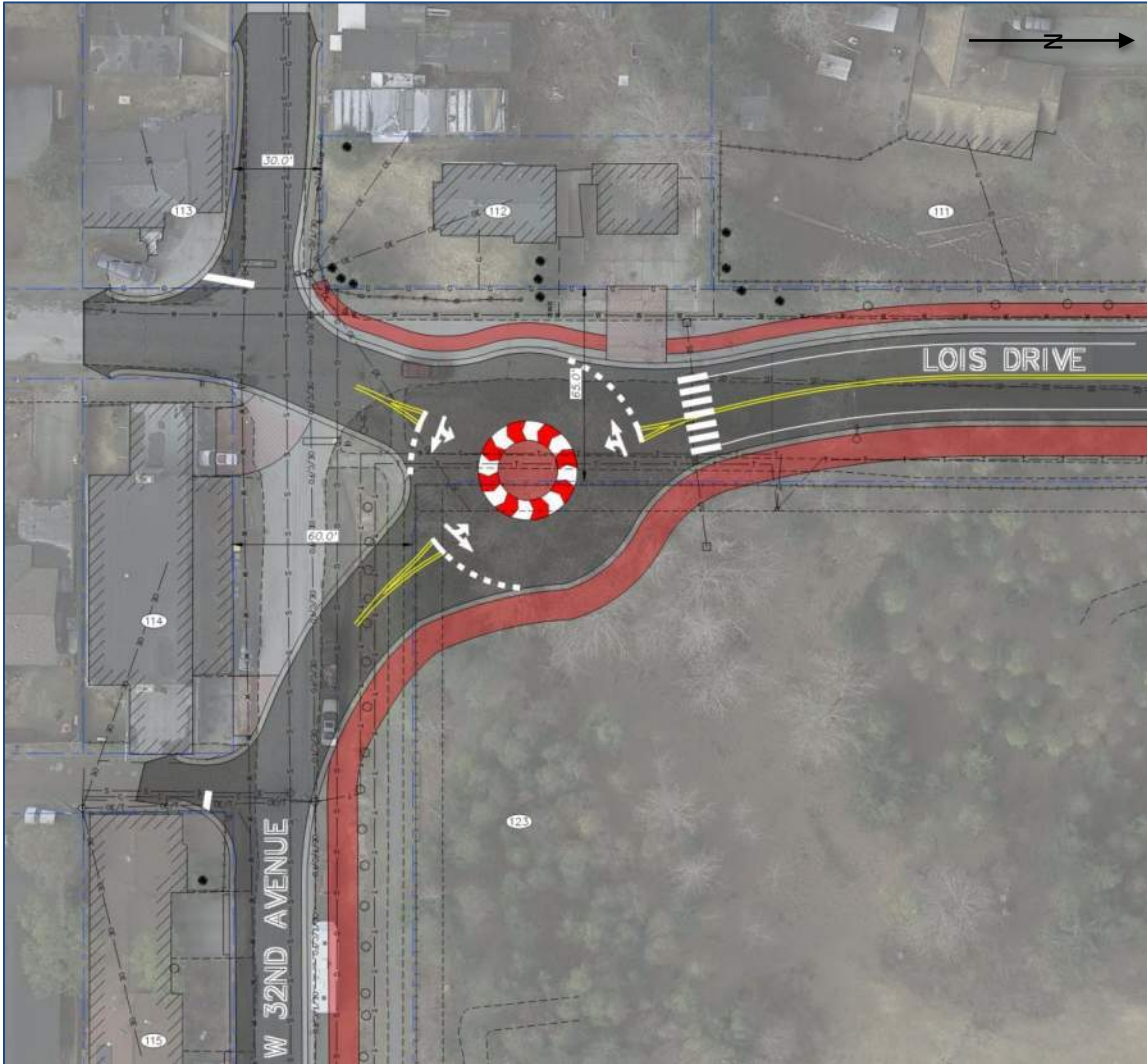


Figure 4 - Intersection Alternative 3 (preferred)

### C. Other Recommended Improvements

1. Roadway Markings: Along Lois Drive (a collector road), roadway markings would include centerline and shoulder markings. No centerline or shoulder markings are proposed along W. 32<sup>nd</sup> Avenue (a local road), but a marked crosswalk would transition the pedestrian route from the north side to the south side of the roadway.
2. Roadway Horizontal and Vertical Alignment: The project roadways will typically follow the center of the ROW. The proposed profile for Lois Drive and W. 32<sup>nd</sup> Avenue will force high/low spots by raising the grades to a minimum of 0.65%, with 0.80% through intersections.

3. Design and Posted Speed Limit: Maintain the current posted speed limit of 25 MPH. A Design speed of 30 MPH is proposed.
4. Lighting: A continuous LED lighting system, consistent with current MOA standards will be installed along the roadway.
5. Landscaping: Proposed landscaping will be in character with the adjacent residential, business, school, and park properties. Landscaping will focus on retaining existing vegetation where feasible and installing new landscaping and features that fit the context of the corridor. Where new landscaping elements are installed it will maintain clear sight lines and avoid creating comfortable or hidden areas where transients may loiter or sleep. Existing landscaping will be maintained where practical to preserve the benefits of mature landscaping (ex. habitats, storm water capture) but will be pruned or include selective removal as needed to provide clear sight lines and discourage transient behavior.
6. Retaining Walls: Retaining walls will be installed to reduce impacts to adjacent infrastructure and properties. It is anticipated that a short, sidewalk-type retaining wall will only be required adjacent to Parcel 117, but the exact locations and extents of retaining walls will require further refinement during the design phase.
7. Storm Drain: The proposed drainage improvements consist of the following:
  - Replace and upsize the aging storm drain on Lois Drive, between 29th Avenue and W. 32<sup>nd</sup> Avenue, to align with new roadway improvements
  - Replace 170 feet of undersized and aging CMP storm drain pipe on 31st Avenue from the Lois Drive and 31st Avenue intersection to the downstream manhole
  - Extend the Lois Drive system to W. 32<sup>nd</sup> Avenue to provide continuous storm drain system and runoff collection at the intersection
  - Replace and upsize the aging storm drain on W. 32<sup>nd</sup> Avenue to align with new roadway improvements
  - Extend the W. 32<sup>nd</sup> Avenue system to the west to capture runoff at all designed low points
  - Install catch basins at new roadway low points and other low lying areas to alleviate ponding issues
  - Replace catch basins and leads as required to match new curb and gutter
  - Provide positive roadway drainage to minimize ponding
  - Provide water quality treatment for storm runoff
  - Provide freeze protection for storm drain systems.
8. Traffic Calming: No traffic calming features are proposed.
9. Intersections: The existing all-way stop-controlled intersections at Lois Drive and W. 32<sup>nd</sup> Avenue will be removed. Stops signs will be installed on the minor roadway, W. 32<sup>nd</sup> Avenue. Channelization and intersection layouts at Benson Boulevard and Minnesota Parkway will be unchanged.



10. Driveways: Curb returns will be installed at commercial properties (including 8-plexes and greater) and curb cuts will be installed for residential homes (7-plex and less). Driveway access for Parcel 122 will be by rolled curb to accommodate required on-site parking and access.

### III. Construction Schedule, Phasing and Project Costs

It is anticipated that the project will be phased over multiple construction seasons to accommodate funding availability. The earliest construction could occur is in 2022 if funding becomes available.

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

*Table 1 - Summary of Estimated Project Costs*

Category	Lois Drive Alternative 2	W. 32 <sup>nd</sup> Avenue Alternative 3	Intersection Alternative 3
Design & Management Total (estimated)	\$325,000	\$427,000	\$112,000
ROW Acquisition Total	\$55,000	\$616,000	\$53,000
Utility Relocation (15% Contingency) Total	\$184,000	\$551,000	\$195,000
<b>A. Design, ROW Acquisition, Utility Relocation</b>	<b>\$564,000</b>	<b>\$1,594,000</b>	<b>\$360,000</b>
<b>Construction</b>			
Roadway Improvements	\$1,154,000	\$1,149,000	\$239,000
Drainage Improvements	\$287,000	\$418,000	\$96,000
Illumination Improvements	\$136,000	\$186,000	\$117,000
<i>Construction Subtotal</i>	\$1,577,000	\$1,753,000	\$452,000
<i>Construction Contingency (15%)</i>	\$237,000	\$263,000	\$68,000
<i>Construction Mgmt. / Inspection / Testing</i>	\$177,000	\$196,000	\$80,000
<b>B. Total Estimated Construction Cost (rounded)</b>	<b>\$1,991,000</b>	<b>\$2,212,000</b>	<b>\$600,000</b>
<b>C. Overhead / Accounting</b>			
	\$450,000	\$672,000	\$169,000
<b>W. 32<sup>nd</sup> Avenue and Lois Drive: Total Estimated Project Cost (A + B + C)</b>	<b>\$3,005,000</b>	<b>\$4,478,000</b>	<b>\$1,129,000</b>
<b>Total:</b>	<b>\$8,612,000</b>		



## Table of Contents

I.	Introduction .....	1
A.	Project Background .....	1
B.	Project Purpose and Goals .....	1
C.	Project Approach .....	2
D.	Evaluation Factors .....	2
II.	History .....	4
A.	Anchorage Bowl 2020 Comprehensive Plan (2001) .....	4
B.	2035 Metropolitan Transportation Plan (MTP) (2012) .....	4
C.	Official Streets & Highways Plan (OS&HP) (2014) .....	4
D.	Anchorage 2040 Land Use Plan (2017).....	5
D.	Area Specific Plans: West Anchorage District Plan (2012) .....	9
E.	Other Applicable Plans .....	10
III.	Existing Conditions .....	11
A.	Area Description .....	11
B.	Roadway Characteristics and Function .....	11
C.	Pedestrian Facilities .....	12
D.	Right-of-Way.....	12
E.	Schools.....	14
F.	Transit.....	14
G.	Community Council .....	14
H.	Zoning and Land Use .....	14
I.	Environmental .....	17
J.	Lighting .....	17
K.	Landscaping .....	17
L.	Utilities.....	20
IV.	Drainage Analysis .....	23
A.	Existing Conditions .....	23
B.	Hydrologic and Hydraulic Analysis .....	27
V.	Geotechnical Analysis .....	29
A.	Existing Conditions .....	29
B.	Recommendations.....	29
VI.	Traffic and Safety Analysis .....	31
A.	Existing Traffic Volumes and Operations.....	31



B.	Traffic Volumes.....	31
C.	Traffic Characteristics .....	32
D.	Speeds .....	33
E.	Traffic Calming.....	33
F.	Collision Data .....	34
G.	Side Street Intersections/Access Control .....	35
H.	Level of Service Analysis .....	35
I.	All-Way Stop Analysis .....	36
J.	Sight Distance Analysis .....	37
K.	Parking Study.....	38
L.	Pedestrian and Bicycle Study.....	38
M.	Traffic Calming & Pedestrian Safety .....	39
VII.	Design Criteria and Standards.....	41
A.	Project Design Standards.....	41
B.	Design Criteria Summary .....	41
C.	Specific Design Criteria .....	43
VIII.	General Design Considerations .....	48
A.	Complete Streets.....	48
B.	Right-of-Way Acquisition.....	48
C.	Retaining Walls.....	49
D.	Mailboxes .....	49
E.	Pedestrian Crossings.....	49
F.	Lighting .....	50
G.	Landscaping .....	52
H.	Nonconformities.....	52
IX.	Project Specific Design Considerations .....	54
I.	Existing Data .....	54
J.	Buffers .....	54
K.	Driveways and Parking .....	54
L.	Driveway Grades and Landings .....	55
M.	Other Design Challenges .....	56
X.	Project Alternatives and Analysis.....	57
A.	No Build Alternative .....	57
B.	One-Way Alternative .....	57
C.	Roadway Cross Sections .....	57

D.	Pathway Width: .....	70
E.	Roadway Markings .....	70
F.	Horizontal Alignment.....	70
G.	Vertical Alignment .....	71
H.	Design and Posted Speed .....	71
I.	Landscaping .....	71
XI.	Drainage Improvements.....	73
A.	Hydrologic and Hydraulic Model Results.....	73
B.	Replace Lois Drive System – 29 <sup>th</sup> Avenue to W. 32 <sup>nd</sup> Avenue .....	74
C.	Replace 31 <sup>st</sup> Avenue Upstream Pipe Segment .....	74
D.	Extend Lois Drive System – Lois Drive and W. 32 <sup>nd</sup> Avenue Intersection.....	74
E.	Replace W. 32 <sup>nd</sup> Avenue System – Minnesota Drive to West of Greenland Drive.....	75
F.	Extend W. 32 <sup>nd</sup> Avenue System – West of Greenland Drive to Oregon Drive .....	75
G.	Replace existing Catch Basins and Leads.....	76
H.	Minimize Ponding.....	76
I.	Water Quality Treatment .....	76
J.	Freeze Protection .....	77
XII.	Right-of-Way Impacts.....	78
XIII.	Utility Impacts .....	79
XIV.	Permitting and Agency Approvals.....	80
XV.	Construction Schedule and Phasing.....	81
XVI.	Quantity and Cost Estimates.....	82
XVII.	Stakeholder Coordination/Public Involvement.....	85
A.	Stakeholder Involvement Activities.....	85
B.	Project Website .....	87
C.	Community Council Meetings .....	87
D.	Agency Stakeholder Meeting .....	87
E.	Open House Events .....	88
XVIII.	Design Recommendations .....	90
A.	Preferred Roadway Typical Cross Sections.....	90
B.	Preferred Intersection Alternative .....	90
C.	Other Recommended Improvements .....	91
XIX.	Proposed Variances from Design Criteria Manual .....	93
A.	AMC Title 21 .....	93
A.	MOA DCM.....	93

## List of Figures

---

Figure 1 - Project Location and Vicinity Map .....	3
Figure 2. Projected areas of growth and change by 2040 .....	7
Figure 3 - Anchorage 2040 LUP Land Use Designations .....	8
Figure 4 - Parcel Map .....	13
Figure 5 - Project Area Zoning, Street Classifications, Transit Stops, and ASD Bus Stops. ....	16
Figure 6 - Existing Storm Drain System Map.....	25
Figure 7 - Alternative 1 typical cross sections.....	60
Figure 8 - Alternative 2 typical cross sections.....	62
Figure 9 - Alternative 3 Lois Drive typical section.....	65
Figure 10 - Alternative 3 W. 32 <sup>nd</sup> Avenue typical cross sections .....	66
Figure 11 - Alternative 4 Lois Drive typical cross section.....	68
Figure 12 - Alternative 4 W. 32 <sup>nd</sup> Avenue typical cross sections. ....	69
Figure 13 - Interactive comment form from website .....	87



## List of Tables

---

Table 1 - Traffic Data Summary.....	31
Table 2 - AADT Traffic Data.....	32
Table 3 - Existing and Future Traffic Characteristics.....	33
Table 4 - Observed Speeds.....	33
Table 5 - Project Area Collision History: 2012-2018 .....	34
Table 6 – Lois Drive and W. 32 <sup>nd</sup> Avenue Level of Service Analysis .....	36
Table 7 - All-Way Stop Analysis.....	37
Table 8 - Pedestrian 24 Hour Counts .....	38
Table 9 - Bicycle 24 Hour Counts .....	39
Table 10 - Design Criteria Summary.....	42
Table 11 - Illuminance for Intersections (MOA DCM Table 5-5).....	51
Table 12 - Summary of Nonconforming Determinations (NCD) .....	53
Table 13 - Property Summary for Potential Nonconformities.....	55
Table 14 – Neighborhood Collector Street Design Values.....	57
Table 15 - Secondary Urban Street Design Values.....	58
Table 16 – Lois Drive: Estimated Right-of-Way Easements / Permits .....	78
Table 17 – W. 32 <sup>nd</sup> Avenue: Estimated Right-of-Way Easements / Permits.....	78
Table 18 – Intersection Alternatives: Estimated Right-of-Way Easements / Permits .....	78
Table 19 – Lois Drive: Summary of Estimated Roadway Costs.....	82
Table 20 – W. 32 <sup>nd</sup> Avenue: Summary of Estimated Roadway Costs.....	83
Table 21 – Intersection Alternatives: Summary of Estimated Costs.....	84
Table 22 – Preferred Improvements: Summary of Estimated Costs .....	84
Table 23 - List of Stakeholders .....	85
Table 24 - Stakeholder Coordination/Public Involvement Events .....	86

## Appendices

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Appendix A:	Existing Utilities Drawings
Appendix B:	Roadway Plan & Profile Drawings
Appendix C:	Storm Drain Plan & Profile Drawings
Appendix D:	Storm Drain Modeling Data and CCTV Storm Drain Condition Assessment Memo
Appendix E:	Geotechnical Information
Appendix F:	Traffic Data, Reports, and Studies
Appendix G:	Intersection Departure Sight Triangles
Appendix H:	Existing ROW Maps and Easement Spreadsheets
Appendix I:	Project Cost Estimates
Appendix J:	Public Involvement
Appendix K:	Concept Report
Appendix L:	Summary of Driveway Grades
Appendix M:	Resolution from Planning and Zoning Commission

## I. Introduction

The Municipality of Anchorage (MOA) is studying alternatives to upgrade Lois Drive (from Benson Boulevard to W. 32<sup>nd</sup> Avenue) and W. 32<sup>nd</sup> Avenue (from Lois Drive to Minnesota Drive) to improve non-motorized connectivity. This study will evaluate transportation network alternatives to improve the roadway conditions and enhance safety and accessibility for non-motorized users and vehicles.

Project development will follow Complete Streets methodologies to balance corridor improvements for all users, including motorists, bicyclists, pedestrians, and persons with disabilities, while minimizing impacts to existing residences and facilities in the project area. A Complete Streets approach considers all forms of transportation – motorized and non-motorized – as 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:

- Huddle AK (Public Involvement)
- Bettisworth North Architects and Planners (Landscape Architecture)
- Solstice Alaska Consulting (Environmental Analysis & Permitting)

### A. Project Background

This project was originally proposed by the Spenard Community Council as a pedestrian improvement project: “Lois Drive Pathway – Benson Boulevard to W. 32<sup>nd</sup> Avenue”. Due to poor roadway condition and traffic congestion related to pick up and drop off times at Aquarian Charter School, W. 32<sup>nd</sup> Avenue between Lois Drive and Minnesota Boulevard was added to the project scope.

### B. Project Purpose and Goals

The two roadways in the project corridor lack continuous pedestrian facilities, sufficient drainage collection systems, and adequate street lighting. Both roadways have areas of pavement deterioration. Traffic volumes generated during drop off and pick up of students at Aquarian Charter School cause significant congestion and unsafe conditions.

Improvements may include:

- Improved roadway structural section
- Asphalt pavement and curbs and gutters
- Storm drain system infrastructure
- Pedestrian facilities
- Street lighting
- Signage and landscaping



### **C. Project Approach**

Prior to beginning this Design Study Report (DSR), the project team organized several meetings with the public, area businesses, and agency stakeholders to identify and document issues and concerns that could potentially be addressed as part of this project. Public meetings included (see [SECTION XVII](#) for a full summary of Stakeholder Coordination/Public Involvement):

- Public Open House #1 (November 13, 2019)
- Business Stakeholder Meeting (November 14, 2019)
- Agency Stakeholder Meeting (November 14, 2019)

Comments from these meetings were used to identify project issues and concerns. 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 April 29, 2020. The Concept Report appeared as an Informational Item in front of MOA PZC on May 11, 2020. A copy of the Concept Report can be in [APPENDIX K](#).

For each roadway, Lois Drive and W. 32<sup>nd</sup> Avenue, four typical section alternatives were developed, incorporating various design elements for the roadway corridors. In addition, three alternatives were developed for the intersection of Lois Drive and W. 32<sup>nd</sup> Avenue. A meeting was held with MOA PM&E on June 30<sup>th</sup>, 2020 to discuss the proposed design elements and project area challenges. PM&E's comments and feedback were used to further refine the alternatives, which were virtually presented for public input at Public Open House #2 on August 27, 2020. Input and comments received from all stakeholders can be found in [APPENDIX J](#).

### **D. Evaluation Factors**

The Design Study Report will consider the following factors during the evaluation of improvements for the project corridor.

- Stakeholder input and needs
- 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
- Area drainage patterns and infrastructure
- Environmental impacts
- Right-of-Way (ROW) restrictions
- Adjacent neighborhood and property owner impacts
- Emergency access
- Utility relocation requirements
- Project costs



Figure 1 - Project Location and Vicinity Map

## II. History

The entire project is located within the Spenard Community Council. Lois Drive is listed as the Spenard Community Council’s highest priority capital improvement project for 2019. Development for the project corridor is guided by the following plans and associated policies, goals, etc. as detailed below:

### A. Anchorage Bowl 2020 Comprehensive Plan (2001)

The Anchorage Bowl 2020 Comprehensive Plan (Anchorage 2020 Plan) was developed in 2001. Policy 1 of the Anchorage 2020 Plan states: “The Land Use Policy Map shall guide land use decisions until such time as other strategies are adopted that provide more specific guidance.” Strategies include Neighborhood, District, or Functional Plans. Thus, the West Anchorage District Plan (see below), supersedes the Anchorage 2020 Plan.

### B. 2035 Metropolitan Transportation Plan (MTP) (2012)

The MTP guides the development and implementation of transportation system improvements within the Anchorage Metropolitan Area Transportation Solutions (AMATS) boundaries. The MTP addresses all modes and components of a comprehensive transportation system. The following projects and goals relevant to this project are identified in the MTP:

- Construct missing sidewalk on W. 32<sup>nd</sup> Avenue (Lois Drive to Minnesota Drive).
- Construct missing sidewalk on Lois Drive (Northern Lights Blvd. to 36<sup>th</sup> Avenue).
- Goal 5: Establish community connectivity with safe, convenient, year-round automobile and non-automobile travel routes within and between neighborhoods, commercial centers, and public facilities.
- Goal 7: Provide a transportation system that provides viable transportation choices among various modes.

### C. Official Streets & Highways Plan (OS&HP) (2014)

The OS&HP provides a means to prepare for the future by establishing location, classification, and minimum rights-of-way (ROW) for streets and highways to accommodate transportation needs of the community. The OS&HP consists of the policies and standards that guide the community in establishing and developing the transportation system. Within the OS&HP, roadways are classified to best reflect its primary use, both current and projected.

Lois Drive is classified as a Class IC Neighborhood Collector. Collector Street properties and functions are summarized below:

- Collect traffic from local streets and move it to higher classified streets or to local traffic generators such as shopping centers.
- Provide priority to through traffic movement with limited land access to adjacent properties.



- Provide pedestrian facilities to allow for safe access between activity centers such as schools and parks.
- Have two lanes and a minimum ROW width of 60 feet.

W. 32<sup>nd</sup> Avenue is classified as a local road; properties and function of a local road are summarized below:

- The primary function of local roads is to provide access to abutting properties.
- Local roadway design varies depending on the type of development being served and the physical characteristics of the land.
- Local roads should have two lanes and a minimum ROW width of 50 – 60 feet.

#### **D. Anchorage 2040 Land Use Plan (2017)**

The Anchorage 2040 Land Use Plan (2040 LUP) is a visual guide for growth and development in the Anchorage Bowl and is aligned with the visions and goals of the Anchorage 2020 Plan. The 2040 LUP supplements the Anchorage 2020 Plan and incorporates the adopted neighborhood and district plans, public facility plans, and recent analysis into a land use amendment element of the Anchorage 2020 Plan. The 2040 LUP features policies and strategies and a land use plan map, which recommends future land development patterns and shows where land uses may occur within the Anchorage Bowl to accommodate future growth.

Specific policies and identifications from the 2040 LUP that are directly related to this project are listed below:

- Policy 3.2: Promote the development of main street, transit-oriented, and mixed use corridors that help meet the city’s need for retail, services, jobs, and housing and that support these uses and adjoining neighborhoods with access to multiple modes of travel and attractive pedestrian environments.
- 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 8.2 Provide new and improved trails, greenbelts, and other pedestrian facilities as alternative travel ways of connecting open spaces, neighborhoods, and centers.
- The project area is designated as a Transit-Supportive Development Corridor.
- Areas of Growth and Change: the project corridor is expected to have significant growth (northeast side of the project corridor), moderate growth (west side of the corridor), and little growth (north and south sides of the corridor) by 2040 (see FIGURE 2).
- Land Use Designations along the project corridor consist of (see FIGURE 3):
  - Compact Mixed Residential – Low:
    - Provides for a compatible, diverse range of single-family, attached, and smaller-scale apartment housing choices in the same neighborhood.
    - Provides a transition from more intense uses or traffic volumes to lower intensity residential areas.

- Primarily R-2M zoning with R-2D zoning in transition areas.
- Neighborhood Corridor
  - Provides small- to medium-size retail centers that serve one or more surrounding neighborhoods.
  - Urban design reduces dependence on motor vehicle travel to local services
  - B-1A and B-1B zoning.
- Town Center
  - A. Provides a focal point of activity for a group of neighborhoods and serves as a destination for shopping, entertainment, and services.
  - B. Integrated with adjoining compact medium-density neighborhoods with convenient, direct walking and bicycle connections to adjoining neighborhoods.
  - C. B-3, B-1B, R-3, and R-3A zoning.
- Community Facility or Institution
  - Provides for a public or institutional facility that is integrated with the neighborhoods and provide a community service or focus for the area.
  - Pedestrian connectivity is provided to schools and community institutions.
  - Uses include schools, community recreation centers, fire stations, libraries, etc.
  - PLI, I-1, and I-2 zoning.



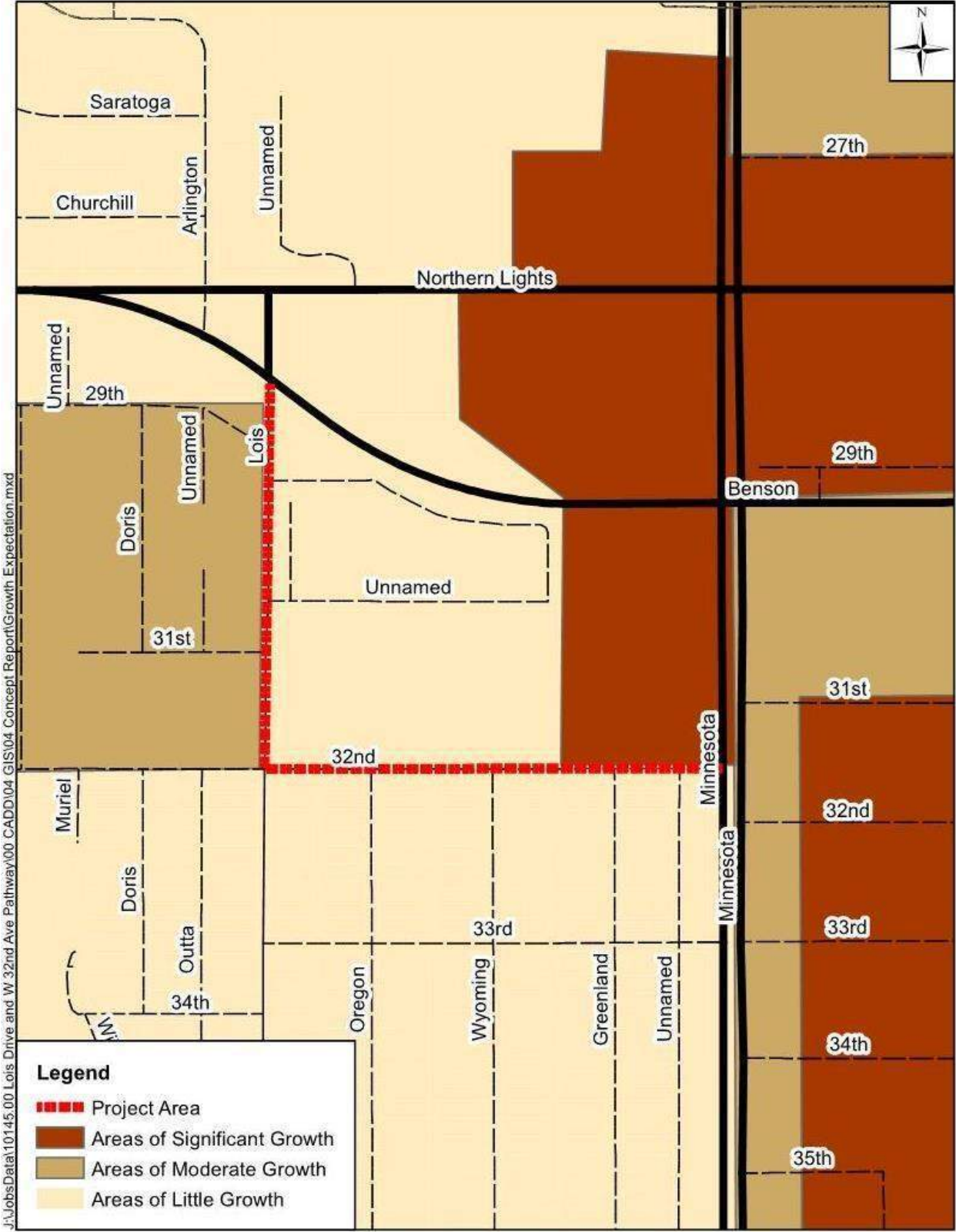


Figure 2. Projected areas of growth and change by 2040





Figure 3 - Anchorage 2040 LUP Land Use Designations



#### **D. Area Specific Plans: West Anchorage District Plan (2012)**

As recommended in the Anchorage 2020 Plan, the West Anchorage District Plan was developed to establish a framework for making future development decisions that align with long-range land use recommendations in the Anchorage 2020 Plan. It also supplements the policies of existing functional plans to support the vision outlined in the Anchorage 2020 Plan. Specific goals from the West District Anchorage Plan directly related to this project are listed below:

- Transportation goal: plan for and maintain a safe, efficient, cost-effective, and context sensitive multi-modal transportation system.
- Transportation objectives:
  - Objective #2: Expand or complete trail connections that link residential areas and key destinations such as businesses, schools, and employment centers.
  - Objective #3: Plan for and develop an efficient road network that accommodates current and future traffic volumes appropriately, including the safe movement of passenger vehicles, trucks, freight movement, bicycles, and pedestrians.
  - Objective #4: Develop roads and other transportation facilities that support and enhance surrounding land uses.
- Neighborhood goal: encourage the protection and enhancement of unique neighborhoods and offer a diverse range of housing options that respond to our northern climate.
- Neighborhood objectives:
  - Objective #1: Protect neighborhood character and quality of life through context sensitive planning of road improvements, enforcing improved residential and commercial design standards, and maintaining convenient access to recreation/open space opportunities.
- Parks, Recreation, and Open Space goal: integrate recreation amenities and natural open spaces into the urban fabric of West Anchorage and showcase Kincaid Park and the Tony Knowles Coastal Trail for enjoyment by residents and visitors alike.
- Parks, Recreation, and Open Space objectives:
  - Objective #3: Maintain motorized and non-motorized access to a safe and functioning network of parks, waterways, trails, lakes, and natural open spaces for the use of residents and visitors.
- Land Use Designations along the project corridor:
  - Low/Medium Intensity (= 2040 LUP Compact Mixed Residential – Low)
  - Office – Low Intensity (= 2040 LUP Neighborhood Corridor)
  - Town Center (= 2040 LUP Town Center)
  - Schools and Community Institutions (= 2040 LUP Community Facility or Institution)
- Identified projects/plans within the project area:

- Lois Drive from the West/Romig campus to W. 31<sup>st</sup> Avenue is identified as an “all-inclusive connectivity” route.
- Lois Drive and W. 32<sup>nd</sup> Avenue, within the project area, are identified as “existing and planned pedestrian facilities per Functional Plans.”

#### **E. Other Applicable Plans**

- Pedestrian Plan (2007)
  - Missing sidewalk: W. 32<sup>nd</sup> Avenue (Lois Drive to Minnesota Drive) (priority #23).
  - Missing sidewalk: Lois Drive (Northern Lights to 36<sup>th</sup> Avenue) (priority #94).
- Wetlands Management Plan (July 2014)
  - There are no wetlands along the project corridor.
- Neighborhood Traffic Calming Program Qualified Streets List
  - Lois Drive (Benson Boulevard to W. 36<sup>th</sup> Avenue) is listed in the 2019 Neighborhood Traffic Calming Program Qualified Streets list.
- Chugach Electric Association (CEA) Undergrounding 5-year Plan (2018-2022)
  - Project corridor is not included in the Distribution Facilities Undergrounding Plan.
- Historic Seismic Zones
  - Zone 2 (moderately-low ground failure susceptibility) and Zone 4 (high ground failure susceptibility).

### III. Existing Conditions

#### A. Area Description

The project area is located southwest of the busy Northern Lights Blvd./Benson Blvd. couplet and Minnesota Drive intersection. This area, with several large business complexes, generates non-motorized trips originating from the residential areas along the project corridor.

The project corridor includes approximately 1,000 feet of Lois Drive and 1,300 feet of W. 32<sup>nd</sup> Avenue. There are 12 side streets along the project corridor, including Benson Boulevard, Minnesota Drive, and the intersection of Lois Drive with W. 32<sup>nd</sup> Avenue. The roadways abut 26 separate parcels consisting of a mixture of single family homes, multi-family homes, apartments, an office building, businesses, a school, and a park. See [FIGURE 4](#) for parcel location maps.

##### 1) Lois Drive

At the north end of the project corridor, a business complex building with spaces for four businesses is located on the east side of Lois Drive. A small medical office is located off of W. 29<sup>th</sup> Avenue on the west side of Lois Drive. South of the businesses, single family residences and duplex style condominiums are located on the west side of the roadway with driveways accessing Lois Drive. Minnesota Commons condominiums is on the east side of the roadway and has eight buildings with twelve to fifteen units per building. Two driveways access Lois Drive from Minnesota Commons. Aquarian Charter School is adjacent to Lois Drive to the northeast of the intersection of Lois Drive and W. 32<sup>nd</sup> Avenue.

##### 2) W. 32<sup>nd</sup> Avenue

W. 32<sup>nd</sup> Avenue primarily serves single, duplex, and triplex family homes along the south side. Along the north side is Aquarian Charter School (at the west end) and the 86-unit garden apartment complex, Anchorage Sands Apartments, (at the east end). The only access to Aquarian Charter School and Anchorage Sands Apartments is from W. 32<sup>nd</sup> Avenue. At the east end of the project, south of W. 32<sup>nd</sup> Avenue, Minnesota Park runs parallel to Minnesota Drive, with direct pedestrian access from W. 32<sup>nd</sup> Avenue.

#### B. Roadway Characteristics and Function

##### 1) Facility Description

Both roadways are strip-paved, two-lane roadways with paved widths between 20 and 24 feet throughout the entire length of the project. There are no curbs or gutters along the project corridor, except at the intersections with Benson Boulevard and Minnesota Drive; roadway grades are relatively flat. The posted speed limit is 25 miles per hour. Currently, the road has no on-street parking restrictions.



## 2) Roadway Function

The functional classification of a roadway determines the basic design criteria including such aspects as design speed, the number of lanes, lane and shoulder width, ROW width, distance between intersections, and alignment. As stated above, the most current version of the OS&HP lists Lois Drive as a Class IC Neighborhood Collector and W. 32<sup>nd</sup> Avenue as a local road.

## 3) Condition of Facilities

The existing conditions of the roadway pavement along W. 32<sup>nd</sup> Avenue in the project area includes significant pavement distress, potholes, and cracking. The pavement along Lois Drive is generally in adequate conditions except near its intersection of W. 32<sup>nd</sup> Avenue, but the roadway shoulders along both roads contain potholes in many locations due to the lack of adequate drainage infrastructure.

## C. Pedestrian Facilities

A pathway is located for only about 400 feet along the east side of Lois Drive, separated from the roadway and adjacent to the Aquarian Charter School property. The pathway is currently bordered by trees on each side, which overhang the pathway and limit visibility. The pathway terminates at the north end of the school property and also does not continue south of W. 32<sup>nd</sup> Avenue. Pedestrians and bicyclists must then share the narrow roadway with vehicular traffic.



*Pathway along Lois Drive is not continuous*

At the intersection of Lois Drive and W. 32<sup>nd</sup> Avenue, the separated pathways turns east and continues for about 400 feet along the north side of W. 32<sup>nd</sup> Avenue, separated from the roadway and adjacent to Aquarian Charter School. The pathway terminates at the western driveway of the school parking lot. There are no other pedestrian facilities along the remainder of the project corridor.

## D. Right-of-Way

The ROW width along the project corridor for Lois Drive is primarily 65 feet wide, except at the northern end, where it is 60 feet. South of W. 32<sup>nd</sup> Avenue, the ROW width for Lois Drive narrows to only 30 feet.

Along W. 32<sup>nd</sup> Avenue, the ROW width adjacent to Aquarian Charter School is 60 feet wide, but east of this parcel, the ROW width for W. 32<sup>nd</sup> Avenue narrows to 30 feet until entering State of Alaska ROW at Minnesota Drive. West of Lois Drive, the ROW width on W. 32<sup>nd</sup> Avenue is 30-feet wide.



*Narrow ROW along W. 32<sup>nd</sup> Ave. (looking east)*





## E. Schools

Project area students are within the following Anchorage School District (ASD) school boundaries:

- Turnagain Elementary School (north of W. 32<sup>nd</sup> Avenue)
- Northwood ABC Elementary School (south of W. 32<sup>nd</sup> Avenue)
- Romig Middle School
- West Anchorage High School

Transportation is provided by ASD for students who live more than 1.5 miles from their neighborhood school. Students who live within 1.5 miles of their neighborhood school are within the designated walking boundary. ASD offers bus transportation for the two elementary schools, but middle and high school students along the project corridor are within the walking radii for their respective schools and bus transportation services are not provided.



*Children waiting for school bus at the intersection of Lois Dr. and W. 32<sup>nd</sup> Avenue (note truck parked in ROW).*

Along the project corridor, school bus stops are located at the following locations:

- Lois Drive at 29<sup>th</sup> Avenue
- Lois Drive at W. 32<sup>nd</sup> Avenue
- W. 32<sup>nd</sup> Avenue at Greenland Drive

Aquarian Charter School is located on the northeast corner of Lois Drive and W. 32<sup>nd</sup> Avenue. Aquarian Charter School is a lottery charter school and does not provide student transportation. Therefore, all students must either walk, bike, or be driven to and from Aquarian Charter School.

## F. Transit

There are no transit stops along the project corridor; the nearest transit stops (for Route 10) are located on Benson and Northern Lights Boulevards, just east of Minnesota Drive.

## G. Community Council

The project area is within the boundaries of the Spenard Community Council. This project is ranked #5 (out of 23) for priorities for the Spenard Community Council area.

## H. Zoning and Land Use

The project corridor is immediately bordered by R-2M, R-3, R-4, R-O, and PLI zoning (see [FIGURE 5](#)).

- R-2M (Mixed Residential) is intended for a variety of single-family, two-family, and multi-family dwellings, with gross densities between 5 and 15 dwelling units per acre. The minimum lot size varies between 2,400 to 20,000 square feet depending on the number of dwelling units. Minimum setbacks on R-2M zoned properties are 20 feet for the front, 5 or 10 feet for the sides depending on the number of dwelling units, and 10 feet for the back.
- R-3 (Mixed Residential) zoning is intended primarily for multi-family and townhouse development with low-rise, multistory buildings with gross densities between 15 and 40 dwelling units per acre. The minimum lot size varies depending on the number of dwelling units. Minimum setbacks on R-3 zoned properties are 20 or 10 feet for the front depending on the number of dwelling units, 5 feet for the sides, and 20 or 10 feet from the back depending on the number of dwelling units and if the lot is abutting an alley.
- R-4 (Multifamily Residential) zoning allows medium to high density residential construction. It allows multi-family, single family, duplex, and townhome development. Multi-story development is intended to include pedestrian connections to nearby commercial services. Minimum setbacks on R-4 zoned properties are 20 or 10 feet for the front, 5 feet for the sides, and 10 feet for the back.
- R-O (Residential-Office) allows for small- to medium- sized office buildings for professional, business, and medical outpatient service use. This zoning also allows for multifamily residential, group living, and visitor accommodations. The minimum lot size is 6,000 square feet. Minimum setbacks on R-O zoned properties are 10 feet for the front, 5 or 10-15 for the sides depending on use and building height, and 10 or 15 for the rear depending on adjacent zoning.
- PLI (Public Lands and Institutions) zoning is for major public and quasi-public civic, administrative, and institutional uses and activities. Minimum setbacks are 25 feet for all sizes when abutting DR, PR, PLI, or residential zonings, or equal to the abutting zoning districts for other zones. Maximum building height for the PLI zoned property in the project area is 45 feet.

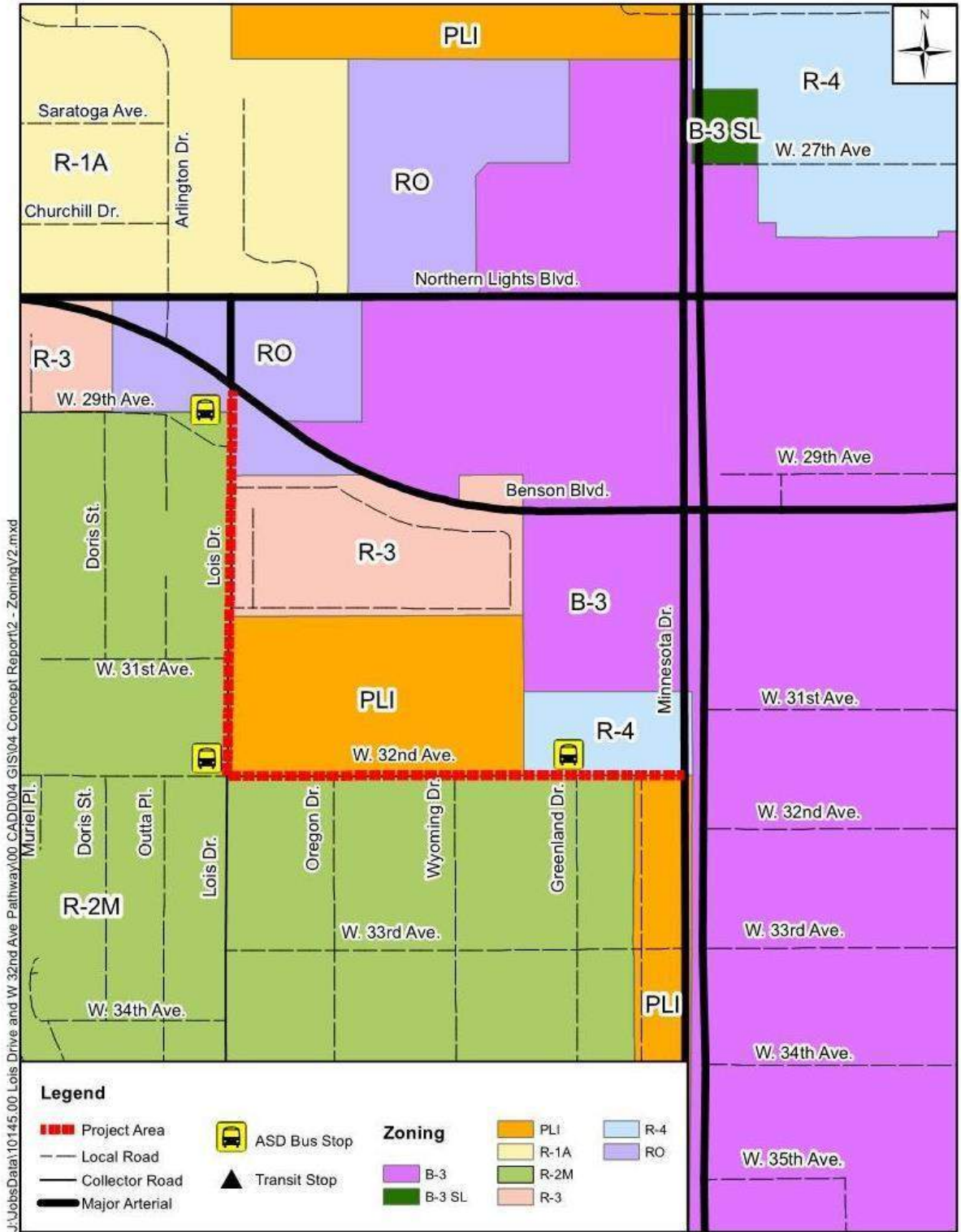


Figure 5 - Project Area Zoning, Street Classifications, Transit Stops, and ASD Bus Stops.



## I. Environmental

### 1) Wetlands/Creeks

There are no mapped wetlands, creeks, or other water bodies along the project corridor based on MOA Watershed Management Services (WMS) Wetland Mapping data.

### 2) Contaminated Sites

According to the Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Program Database, there are no active contaminated sites within the project area. Parcel 123 (Aquarian Charter School) was determined to be “Cleanup Complete – Determination Issued” by ADEC in 1999.

### 3) Flood Plain

A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map Panel #0200050733D shows no floodplains within the project corridor.

## J. Lighting

Street lighting ownership is split between MOA and CEA for the scope of the project, with MOA luminaires along Lois Drive and CEA utility poles with luminaires running down 32<sup>nd</sup>. The intersection of Lois Drive and W. 32<sup>nd</sup> Avenue has both an MOA and CEA luminaire. The existing lights are Light-Emitting Diode (LED) for both roadways, with one exception being the high pressure sodium luminaire on the southwest corner of the Lois Drive and Benson Boulevard intersection. The luminaires to the west and southwest of the Lois Drive/Benson Blvd. intersection are MOA owned.

## K. Landscaping

### 1) Lois Drive – West Side

There is a grove of native aspen and unmaintained landscape between Benson Boulevard and W. 29<sup>th</sup> Avenue. This unmaintained landscape is within the W. 29<sup>th</sup> Avenue R.O.W.



*Native trees in W. 29<sup>th</sup> Ave ROW on west side of Lois Drive*



*Duplex residential conditions on west side of Lois Drive*



*Residential landscape conditions on west side of Lois Drive*



*Residential landscape condition on west side of Lois Drive  
between W. 31<sup>st</sup> and W. 32<sup>nd</sup> Avenue*

From W. 29<sup>th</sup> Avenue south to W. 32<sup>nd</sup> Avenue, Lois Drive is lined with duplexes and single-family homes. Landscaping at the duplexes consists of low maintenance landscape beds with rock mulch, young spruce and birch trees, and several shrubs. One of the beds includes a mature pine tree that appears to be older than the duplexes and may have been protected in place during construction.

Further south, at the single-family homes, the terrain slopes up slightly from the roadway edge to a well-maintained lawn, a stone wall, and a chain link fence.

Between W. 31<sup>st</sup> Avenue and W. 32<sup>nd</sup> Avenue, the landscape becomes unmaintained. Mature trees consisting of birch, aspen, spruce, and cottonwood and unmaintained ground vegetation line the road edge between the residential chain link and cedar picket fences. There is a larger difference in grade between the roadway and the adjacent properties in this area.

## 2) Lois Drive – East Side

The Benson Boulevard and Lois Drive intersection includes a small pedestrian island between the roadway and the right turn slip lane that includes a formal planting bed of roses and a pedestrian crossing signal. Landscaping near the northeast corner of the Benson Boulevard and Lois Drive consists of compacted dirt and unmaintained grass between the



*Pedestrian Island at Lois Drive and Benson Boulevard*

asphalt walk and road edge and a mix of volunteer native vegetation including birch, aspen, and spruce next to the parking lot for Parcel 125.



*Desire line along Parcel 124 on Lois Drive*

There are no pedestrian facilities linking the pedestrian facilities at the Benson Boulevard/ Lois Drive intersection to Parcel 124 (Minnesota Commons Condominiums), however, a desire line paralleling the road through the existing trees at the condominium property does exist. The desire line starts at the condominium's north driveway and ends at the south drive. Between the two access drives to the condominiums, the landscape consists of mature birch, aspen, spruce, and cottonwood. The northern end is denser with understory vegetation, and the southern end contains maintained lawn between the trees. The desire line is clearly visible and well used.

At Parcel 124's south drive, a roughly 5-foot-wide asphalt paved path begins and is separated from Lois Drive by a dense stand of mature cottonwood, aspen, spruce, birch, and willows with dense undergrowth. Visibility to the pathway from the road is poor because of the dense vegetation, which poses safety concerns for users on the pathway. Possibly because of the poor condition of the pathway and the dense stand of vegetation separating the pathway from the road, there is a clearly visible desire line directly adjacent to Lois Drive where pedestrians have regularly chosen to walk next to the road rather than using the official pathway.



*Pathway on Lois Drive along Aquarian Charter School*

### **3) W. 32<sup>nd</sup> Avenue – North Side**

From the intersection of W. 32<sup>nd</sup> Avenue and Lois Drive, the buffer between the existing path and W. 32<sup>nd</sup> consists of immature aspen and unmaintained low vegetation that partially screens the path from the road and poses a potential visibility safety issue. Between the two Aquarian Charter School (Parcel 123) access driveways, the landscape becomes an open gravel space that is used for parking by parents and visitors to Aquarian Charter School. Little to no vegetation is growing in this area.



The Anchorage Sands Apartment complex (Parcel 122) is located between Aquarian Charter School and Minnesota Drive. Mature trees including mountain ash and birches are planted at the base of the stairway entries to the apartment buildings.



*Vegetated buffer on north side of W. 32<sup>nd</sup> Avenue*



*Vegetation at Anchorage Sands Apartment (Parcel 122)*

#### **4) W. 32<sup>nd</sup> Avenue – South Side**

At the corner of Lois Drive and W. 32<sup>nd</sup> Avenue, the landscape is minimal and primarily consists of residential driveways and compacted dirt with small patches of lawn. Between Oregon Drive and Greenland Drive, the terrain slopes up from the roadway edge to the residential fences. There are few mature birch trees within this space and the lawns are inconsistently maintained.

Minnesota Park is located between the most eastern alley and Minnesota Drive. South of the roadway, there is mowed lawn with a chain link fence delineating the park edge.



*South side of W. 32<sup>nd</sup> Avenue residential landscaping*

### **L. 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 utility). The location of utilities in the project planning documents and drawings are based on utility company facility maps and utility company locates.

#### **1) Water**

The project area is served by a public, piped water system owned and operated by Anchorage Water and Wastewater Utility (AWWU.) A water main runs on the west side of Lois Drive for the extent on the project. This main is 8-inch ductile iron (DI) between Benson Boulevard and 31<sup>st</sup> Avenue and 6-inch asbestos concrete (AC) between 31<sup>st</sup> and W. 32<sup>nd</sup> Avenue. According to record drawings (AWWU Plan Sets 40394 and 40395), this main was installed in 2012 and has approximately 10 feet of cover. The 6-inch AC water line was installed in 1958 and has

approximately 10 feet of cover (AWWU Plan Set 7600.) A 6-inch AC main connects to the Lois system at 31<sup>st</sup> Avenue.

An 8-inch cast iron (CI) water main runs along the south side of W. 32<sup>nd</sup> Avenue for the extent of the project. Installed in 1966, these lines have approximately 10 feet of cover (AWWU Plan Set 7605.) A 6-inch AC water mains connect to W. 32<sup>nd</sup> Avenue at Oregon, Wyoming, and Greenland Drives.

Service lines, fire hydrants, valves, and other water appurtenances are present throughout the project area. No wells are reported to be in the project area.

AWWU has plans to replace 350 feet of the 6-inch AC water line along Lois Drive, between 31<sup>st</sup> and 32<sup>nd</sup> Avenues (AWWU project #2019-040). AWWU has not yet secured funding for this project. Coordination with AWWU will continue throughout the design phase.

## 2) Sanitary Sewer

The project area is also served by a public, piped sewer system owned and operated by AWWU. The gravity sewer mains in the project area are mainly 18 inches in diameter and cast iron with 8-inch sewer connections that are DI and AC pipe. An 8-inch CI sewer main runs diagonal under Lois Drive from Benson Boulevard to the driveway at Parcel 125, providing service to Parcel 125. According to record drawings, this main was installed with a minimum of 7 feet of cover in 1973. No other sewer mains are present on Lois Drive in the project area.

An 18-inch CI sewer main runs on the south side of W. 32<sup>nd</sup> Avenue in the project area. Record drawings were not available for this line. 8-inch sewer mains connect to this line in the alleys along W. 32<sup>nd</sup> Avenue.

Service lines, manholes, cleanouts, and other sewer appurtenances are present throughout the project area.

AWWU has plans to replace three, non-standard sewer manholes on W. 32<sup>nd</sup> Ave. (AWWU project #2019-041.) AWWU is also investigating replacing the sewer line on W. 32<sup>nd</sup> Avenue, but no decision has been made yet. Coordination with AWWU will continue throughout the design phase.

## 3) Storm Drain

See SECTION IV for summary of the existing storm drain facilities in the project area.

## 4) Electric

Chugach Electric Association (CEA) owns and operates overhead (OH) and underground (UG) electric transmission and distribution lines, junction boxes, below grade vaults, switch cabinets, roadway lights, and utility poles in the project area. The majority of parcels on Lois Drive are served from the back of the property



*Overhead electric, cable, and telephone lines on W. 32<sup>nd</sup> Avenue*



via overhead lines in an easement. Two underground single phase electric lines cross under Lois Drive north of 29<sup>th</sup> Avenue to provide service to Parcel 125. Parcel 112 is served electricity from an overhead line on W. 32<sup>nd</sup> Avenue.

OH electric transmission and distribution lines run down the middle of the 60-foot wide ROW along W. 32<sup>nd</sup> Avenue ROW and continue along the north edge of the ROW when it reduces to 30 feet wide along Parcel 122. Most parcels along W. 32<sup>nd</sup> Avenue are served by overhead electric lines located in alleys along the back of the property. These lines connect to the W. 32<sup>nd</sup> Avenue system. Additionally, CEA provides street lighting via luminaires on CEA poles on W. 32<sup>nd</sup> Avenue.

## **5) Telephone**

Alaska Communications (ACS) owns and operates OH and UG telephone and fiber optic lines within the project area. ACS has an underground 1200 pair telephone line that runs along Lois Drive for the extent of the project. This line runs on the west side of the road starting at Benson Boulevard and crosses to the east side of Lois Drive at Parcel 104, continuing on the east side until just north of W. 32<sup>nd</sup> Avenue. An additional UG 200 pair telephone line crosses under Lois Drive just south of Benson Boulevard to provide service to Parcel 125.

Two underground 600 pair lines and one 500 pair line run along the west side of Lois Drive starting at approximately 200 feet north of the W. 32<sup>nd</sup> Avenue intersection. These lines continue south towards W. 32<sup>nd</sup> Avenue then turn east and continue on the north side of W. 32<sup>nd</sup> Avenue. One line crosses W. 32<sup>nd</sup> Avenue at Alley #1 and the other lines continue east and then turn north in an easement along the east side of Parcel 123. An OH fiber optic line transitions to UG at Parcel 123 to provide service to the school at Station 36+30. A 100 pair OH telephone line runs on CEA's poles from Station 33+10 to Station 36+30. A 50 pair OH telephone line runs on CEA's poles between Station 38+00 and Station 44+00.

## **6) Cable**

General Communications, Inc. (GCI) owns and operates UG and OH cable and fiber optic lines within the project area. An OH 0.750 coaxial cable and fiber optic line run on CEA's poles on W. 32<sup>nd</sup> Avenue for the extent of the project. UG coaxial cable lines cross W. 32<sup>nd</sup> Avenue at Station 33+20 and 39+80.

## **7) Natural Gas**

ENSTAR Natural Gas (ENSTAR) owns and operates natural gas facilities within the project area. A 2-inch steel gas main runs along the west side of Lois Drive for the extent of the project. Parcels along Lois Drive are served from this main. A 2-inch steel main crosses Lois Drive at Station 15+80 and 20+12. A 3-inch steel gas main runs along the north side of W. 32<sup>nd</sup> Avenue for the extent of the project. 1-<sup>1</sup>/<sub>4</sub>-inch steel mains cross W. 32<sup>nd</sup> Avenue at Oregon, Wyoming, and Greenland Drives to provide gas service to surrounding properties. There are no pressurized transmission gas mains within the project area.

## IV. Drainage Analysis

Lois Drive and W. 32<sup>nd</sup> Avenue each have one piped storm drain system within the project limits. Both storm drain systems are at the upstream end of a much larger system and have no other systems connecting from side streets. The two storm drain systems eventually discharge into Fish Creek to the west and south of the 29<sup>th</sup> Avenue and Willow Street intersection.

The majority of Lois Drive and W. 32<sup>nd</sup> Avenue is strip paved and lacks typical urban residential roadway features such as curb and gutter and stormwater infrastructure to help convey stormwater runoff. While storm drain systems do exist along the project corridor, there are no structures to collect runoff at the western portion of W. 32<sup>nd</sup> Avenue and the intersection of Lois Drive and W. 32<sup>nd</sup> Avenue. This has resulted in a number of drainage issues within the project area that include widespread ponding issues and deteriorating roadway surfaces. Additionally, the pipe systems were installed in the 1970s and 80s and are nearing or are at the end of their design life. One of the primary goals for this project is to improve drainage along the entire project corridor to alleviate these issues and extend the life of the proposed road and pedestrian improvements.

In order to evaluate the infrastructure currently in place, a condition assessment of the existing storm drain piping and structures was conducted. Additionally, a hydrologic and hydraulic (drainage) analysis was performed to determine if the existing piping is adequately sized to meet MOA design criteria.

The information gathered from the condition assessment and the existing conditions drainage analysis will be used to develop the proposed storm drain system. The proposed improvements are discussed in SECTION XI.

### A. Existing Conditions

#### 1) Drainage Basin Delineation

The drainage basins that contribute runoff to the project area were delineated using several methods, including topographical mapping, aerial photography, parcel boundaries, and MOA WMS's hydrography geodatabase (HGDB). Based on HGDB data, the project area is located within the Fish Creek watershed boundary (MOA Subbasins 772 & 775) in the Spenard area. Refer to FIGURE 1, APPENDIX D which illustrates the project location and watershed boundaries.

The larger scale watershed and subbasins identified from HGDB mapping were further refined for this project to better reflect the drainage contributing directly to the project corridor. For this drainage study, a total of 5 catchments were delineated within Subbasins 772 and 775 for the existing condition of the Lois Drive and W. 32<sup>nd</sup> Avenue systems. See FIGURE 3, APPENDIX D for the refined catchment areas.

The contributing catchments are characterized primarily by densely spaced single family homes, multi-family housing, school property, some grass coverage, and some wooded areas. The density of the housing increases the impervious surfaces (roofs and driveways) throughout the project area, resulting in increased runoff. The majority of stormwater runoff from these catchments is generally directed toward the adjacent roadways, where it is conveyed overland

by poorly defined drainage ways along the shoulder of the road. These systems are described in more detail in [SECTION IV.A.3](#)).

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. The composite curve number 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 (Tc) 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. There are several different methods available to compute Tc. 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 D](#).

## 2) Floodplains

Floodplains are not mapped in the project area based on FEMA maps. No additional investigation and analysis into floodplains is anticipated.

## 3) Conveyance Systems

The following provides a description of the existing storm runoff conveyance systems within the project area that influence drainage. The drainage systems described below are owned and maintained by MOA. See [FIGURE 6](#) for existing storm drain systems map.

a) Lois Drive System

The Lois Drive storm drain system extends north towards 29<sup>th</sup> Avenue and south towards W. 32<sup>nd</sup> Avenue from a manhole located at the intersection of 31<sup>st</sup> Avenue. The north and south legs each consist of one manhole and connecting catch basins on either side of the road. Parcels 123 and 124 have catch basins located on-property that also tie into this system. Runoff from the north and south legs converge at the 31<sup>st</sup> Avenue manhole, where flow is then routed west along 31<sup>st</sup> Avenue and eventually discharges into Fish Creek. Storm drain pipe within the Lois Drive system ranges in size from 10-inch to 15-inch and was constructed

of corrugated metal pipe (CMP) in 1980s. This segment of Lois Drive currently does not have curb and gutter, except at a 45-foot driveway near the north end of the project, at Benson Boulevard.

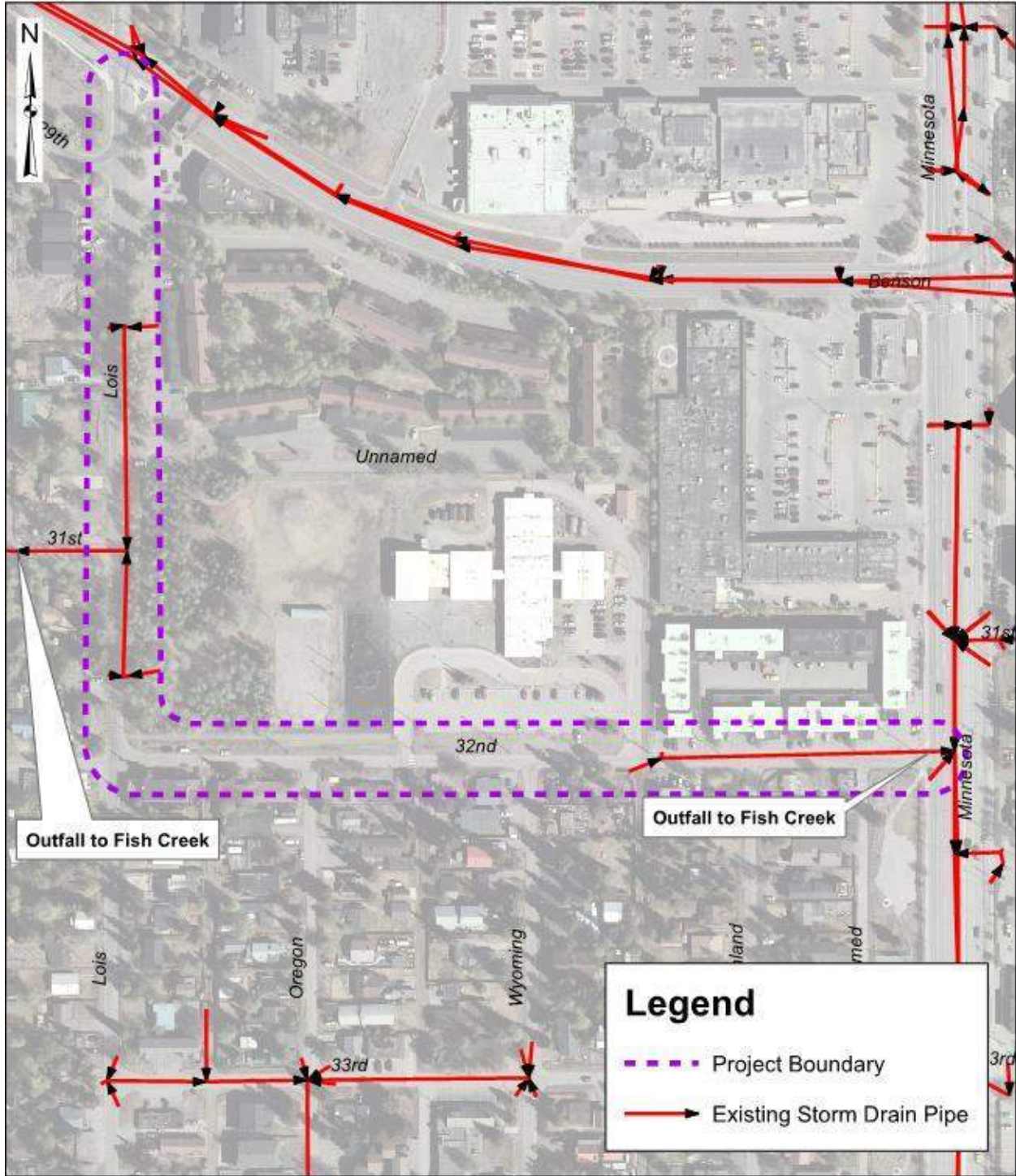


Figure 6 - Existing Storm Drain System Map



b) West W. 32<sup>nd</sup> Avenue System

The W. 32<sup>nd</sup> Avenue storm drain system extends from Minnesota Drive to a manhole located in the roadway near an unnamed alley (Alley #3), 130 feet west of Greenland Drive. Two inlets located on the north and south side of W. 32<sup>nd</sup> Avenue connect to this manhole to intercept roadway and adjacent area runoff. Stormwater from W. 32<sup>nd</sup> Avenue flows east into the Minnesota Drive system, which eventually discharges into Fish Creek at the same location as the Lois Drive system discussed above. The W. 32<sup>nd</sup> Avenue system consist of 12-inch CMP and 15-inch reinforced concrete pipe (RCP) that were constructed in 1972. An unmapped 8-inch corrugated polyethylene pipe (CPEP) connects to the W. 32<sup>nd</sup> Avenue manhole from the northwest. Additional investigation may be required to determine the source of this pipe. The W. 32<sup>nd</sup> Avenue roadway segment from Lois Drive to Minnesota Drive currently does not have curb and gutter installed.

**4) Water Quality Treatment**

Based on available storm drain record drawings and HGDB data, water quality treatment is not being provided for both Lois Drive and W. 32<sup>nd</sup> Avenue systems. No Green Infrastructure (GI), also referred to as Low Impact Development (LID), is currently being implemented along the project corridor.

**5) Storm Drain Condition Assessment**

From December 2019 to May 2020, MOA Street Maintenance inspected the existing storm drain systems using a closed circuit television (CCTV) camera along W. 32<sup>nd</sup> Avenue and the system consisting of pipes along Lois Drive and 31<sup>st</sup> Avenue. Refer to APPENDIX D for the complete CCTV Storm Drain Condition Assessment Memorandum.

The data collected for each pipe was used to assess the condition of the infrastructure to determine if replacement was warranted. The storm drain condition assessment identified several issues with many of the pipes installed along Lois Drive and W. 32<sup>nd</sup> Avenue. These issues included pipes with significant debris buildup, mineralization/infiltration at pipe joints, pipe length exceeding 300-foot max manhole spacing, and a segment of the 15-inch RCP not meeting the minimum 0.3% pipe slope. Pipes along the project corridor were installed in the 1970s and 80s are nearing the end of their design life. Between pipe age and conditions, it is assumed that all pipes require replacement. A full report of the deficiencies can be found in the Storm Drain CCTV Inspection Summary Table in the Condition Assessment Memorandum in APPENDIX D.

**6) Drainage Concerns**

Significant ponding occurs throughout the project limits due to flat grades, no existing curb and gutter, and inadequate storm runoff collection and conveyance systems. Poor drainage typically leads to roadway degradation, such as heaving, cracking, and pavement failure over time. Lois Drive and W. 32<sup>nd</sup> Avenue are showing significant signs of pavement distress due to these issues throughout the project boundaries.

## B. Hydrologic and Hydraulic Analysis

A hydrologic and hydraulic analysis provides 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 helps determine where problem areas for the existing system are located and ensures the proposed storm drain system is properly sized. Preparation and evaluation of the drainage model was performed in accordance with the ASM. Supporting data and modeling for the drainage analysis can be found in APPENDIX D.

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. As noted above, there is no known existing treatment provided along the project corridor. Proposed methods for treatment will be discussed in SECTION XI.

### 1) Updated MOA Stormwater Management Policies

MOA updated their stormwater-related design criteria to meet the most recent Alaska Pollutant Discharge Elimination System (APDES) and Municipal Separate Storm Sewer System (MS4) permit requirements and policies. These updates are reflected in the ASM, which was adopted by the Anchorage Assembly. As of January 2019, all projects must comply with the stormwater design criteria.

Some of the more notable changes to the updated stormwater design criteria that will impact this project include increased design storm depths and the preferred use of Green Infrastructure for water quality treatment.

### 2) Design Storm Depth and Distribution

The new design storms outlined in the ASM are based on data from the National Oceanic and Atmospheric Administration (NOAA) released Volume 7 of Atlas 14, Precipitation-Frequency Atlas of the United States (Atlas 14). Atlas 14 is considered the most up-to-date design storm analysis available for Alaska and for the majority of the United States.

Per ASM Table 4.2-1 (MOA Design Storm Depths), the following design storms and depths were evaluated to predict runoff response and meet design requirements:

- Water Quality Treatment: 90<sup>th</sup> Percentile, 24-hour: 0.52-inches.
- Conveyance Design and Peak Flow Control: 10-year, 24-hour: 2.28-inches.
- Project Flood Bypass: 100-year, 24-hour: 3.59-inches.

It should be noted that both the volume and peak intensity for the majority of Atlas 14 design storms increased significantly compared to the previous MOA design storms. This increase often results in existing storm water piping being undersized to handle the new design storms, as older systems were designed to convey lower flows.

Similar to the design storm depths, the storm distribution was also updated based on Atlas 14 data to better reflect the shape of storms in the Anchorage and Eagle River areas. 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.

### **3) Orographic Factor**

Based on project location, a 1.00 orographic factor was applied to the design storm volumes (see to [FIGURE 2](#) in [APPENDIX D](#)).

### **4) Model Information**

A drainage model was assembled to analyze the existing and proposed conditions of each contributing catchment, as well as the conveyance systems within the project area. The model was developed using 2019 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. As noted above, 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 MOA-provided LIDAR data, record drawings, and information from the condition assessment report. This information includes pipe size, type, inverts, and slopes.

### **5) Model Results**

A total of 5 contributing catchments were delineated and evaluated for runoff response for the existing condition. These catchments were grouped based on the piped system to which the runoff will be conveyed. The peak stormwater runoff during the 10-year, 24-hour design storm event for each of these catchments is shown on [FIGURE 3](#) in [APPENDIX D](#). The peak flow being conveyed from the project corridor at specific design points is also shown on this figure.

The modeling effort indicates that the existing storm drain pipe is undersized and inadequate to accommodate the 10-year, 24-hour design storm event in several pipe segments along Lois Drive, W. 32<sup>nd</sup> Avenue, and 31<sup>st</sup> Avenue. The peak flow during the simulated storm causes pipes to surcharge, overtop manholes, and flow into the roadway at many locations. Additionally, the model does not account for the volume of runoff that overtops manholes. The overtopping flow, in effect, is removed from the model, decreasing peak flows in the respective storm drain systems. Complete modeling results for the existing drainage systems described in [SECTION XI.A](#) are provided in [APPENDIX D](#), as well as maps that can be used to identify the location of each pipe segment to help correlate with the pipe results from SSA.

## V. Geotechnical Analysis

### A. Existing Conditions

For the Design Study phase of this project, a review of existing geotechnical data was conducted by CRW. No new borings were completed during this study. MOA has previously performed a geotechnical investigation along W. 32<sup>nd</sup> Avenue from Lois Drive to the Minnesota Drive, but the exact year of this investigation is unknown. For the MOA investigation, 14 borings were completed along the roadway to depths between 8 and 12 feet below ground surface (BGS). The borehole logs indicate that the existing subgrade generally consists of sand or gravelly sand to about 8 feet BGS underlain by gray sandy silt. About one foot of surficial silty or sandy gravel was found at many boring locations. Near the intersection of W. 32<sup>nd</sup> Avenue and Greenland Drive, the sandy layer thins to about five feet, overlain by 2 feet of silty gravel. The strata profile at this soil boring is unique among the historical borings.

No historical data was found directly along Lois Drive. The closest boring found was approximately 200 feet west of Lois Drive along Benson Boulevard, drilled in 2013 by Enterprise Engineering, Inc. This boring was advanced to a depth of 31.5 feet BGS. From the ground surface to about 15.5 feet BGS, the soil is described as sand with trace silt and gravel. Below this, a gray, clayey silt was observed. A distance of 1,100 feet separates this boring from the nearest historic boring along the project corridor, so no conclusions can be drawn about the depths or detailed subsurface conditions along Lois Drive. However, the findings from the 2013 historic borehole corresponds approximately to the findings from the historic borings along W. 32<sup>nd</sup> Avenue. Additional investigations will be required to determine the properties of the subsurface conditions encountered in the project corridor.

Perched groundwater was observed at about 8 feet BGS near the east entrance of the Aquarian Charter School, along W. 32<sup>nd</sup> Avenue. Groundwater was not observed in any other historic borings along the project alignment. The soil boring 200 feet west of Lois and Benson notes groundwater at 13 feet BGS.

No frozen ground was noted on any historical logs. Historical boring logs are provided in APPENDIX E.

### B. Recommendations

It is recommended to remove the top two feet of the existing soils along the entire roadway corridors for W. 32<sup>nd</sup> Avenue and Lois Drive. By removing the top two feet, the remaining subgrade along W. 32<sup>nd</sup> Avenue is not expected to be frost susceptible to 6.5 feet BGS. The silt below 6.5 feet BGS is frost susceptible and thus, it is recommend to still install insulation in the roadway section. No geotechnical data is available along Lois Drive, but based on offset soil borings, for design estimating purposes, it is conservatively assumed to be similar to the existing conditions along W. 32<sup>nd</sup> Avenue.

The recommended structural section totals 28 inches and includes:



- 2 inches of asphalt
- 2 inches of leveling course
- 16 inches of MOA Type II-A classified material
- 2 inches of rigid board insulation (R4.5 per inch minimum)
- 6 inches of MOA Type II classified material
- Separation geotextile
- Subgrade (native sand and gravel)

Board insulation is recommended to extend a minimum of four feet beyond the back of the curb or one foot beyond the back of the sidewalk. When a sidewalk/pathway is present, the insulation should extend one foot minimum beyond the back of the sidewalks/pathway; however, the pathway/sidewalk will not perform as well as the curb.

Longitudinal transitions between insulated and non-insulated sections should include extending the insulation 8 to 12 feet into the non-insulated section and reducing the insulation thickness along the extension to minimize the possibility of differential heave. The insulation can be tapered from two-inches to one-inch in the transition zone. The subgrade transition should be tapered at a 10 horizontal to 1 vertical (H:V) slope, if construction distances permit, but should not be steeper than 5H:1V.

A geotextile should be used for separation between the structural section and the existing subgrade. The geotextile should be placed on top of the existing subgrade soils prior to placement of classified fill and any insulation and extended up the sides of the excavation.

No subdrains are required as part of the project based on historic groundwater levels.

The gradations of existing soils in the roadway section is unknown; therefore, they are conservatively not anticipated to be available for re-use as MOA Type II and Type II-A classified fill. The potential for re-use will be re-evaluated once geotechnical borings are completed during design and gradations performed.

All utilities should be bedded, backfilled, and compacted per each utility owner's or pipe manufacturer's recommendations.

## VI. Traffic and Safety Analysis

### A. Existing Traffic Volumes and Operations

Existing traffic data was gathered from MOA and the State of Alaska for the project area. The State of Alaska maintains traffic data for major streets in Anchorage including Lois Drive, Minnesota Drive, and Benson Blvd. Additionally, new traffic data was gathered in select locations by CRW. It is important to note that traffic counts in 2020 were influenced by the COVID-19 pandemic, and traffic counts taken during this time were typically lower than average conditions. The following table summarizes traffic data used for this study.

*Table 1 - Traffic Data Summary*

Location	Date	Speed	Bike/Ped Count	Volume (Link counts)	Turning Movements
Lois Dr. and W. 32nd Ave.	8/15/2017				X
Lois Dr. north of W. 32nd Ave.	3/27/2019	X		X	
W. 32nd Ave. east of Lois Dr.	4/02/2019	X		X	
W. 32nd Ave. west of Minnesota Dr.	4/04/2019	X		X	
W. 32nd Ave. and Minnesota Dr.	5/21/2020 5/23/2020		X		X
Lois Dr. and W. 32nd Ave.	5/07/2020 5/14/2020		X		X
Lois Dr. and Benson Blvd.	5/27/2020 5/29/2020		X		X

### B. Traffic Volumes

The existing annual average daily traffic (AADT) volume on Lois Drive was determined using the State of Alaska AADT data for the year 2018 and adjusting it for the current year. Existing AADT volume on W. 32nd Avenue was determined using volume data (link counts) taken at W. 32nd Avenue in April of 2019 and the turning movement counts at Lois Drive in August of 2017. Seasonal adjustments were factored into the W. 32nd Avenue AADT using the nearest permanent traffic recorder on Northern Lights Blvd. west of Forest Drive.

The Anchorage Metropolitan Area Transportation Solutions (AMATS) travel demand model includes forecasted future daily traffic volumes for higher volume roadways. Updated traffic model information is not yet available at the time of this printing. The model does not include future traffic volumes for W. 32nd Avenue.

Much of the area surrounding the project is built out and traffic volumes on the roadways are anticipated to increase as the local population grows. However, due the age and character of the

neighborhood and the designations in the West Anchorage District Plan, this area may be redeveloped in the future. Furthermore, Aquarian Charter School could grow in student population in the future leading to increase traffic on W. 32<sup>nd</sup> Avenue and Lois Drive. However, since Aquarian Charter School currently leases this property from ASD, there is no guarantee that the school will be located at this site long-term. Aquarian Charter School did receive funding through local bonds in April of 2020 to make infrastructure repairs to their buildings on this property, so relocation is not likely. Local population rates were obtained from the Anchorage 2040 Land Use Plan which estimates population growth between 0.3% and 1.1% with a 0.8% annual growth rate. A 0.8% growth rate was used to determine traffic volumes in the anticipated construction year (2025) and the design year (2045).

The following table summarizes AADT for W. 32<sup>nd</sup> Avenue and Lois Drive.

*Table 2 - AADT Traffic Data*

Roadway	Location	2020 Daily Traffic Volumes <sup>1</sup>	2025 Projected Traffic Volumes <sup>1</sup>	2045 Projected Daily Traffic Volumes <sup>1</sup>
Lois Drive	Benson Blvd. to W. 32 <sup>nd</sup> Ave.	2,560	2,670	3,130
W. 32 <sup>nd</sup> Ave.	Lois Dr. to Minnesota Dr.	1,120	1,180	1,380

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

### C. Traffic Characteristics

Lois Drive is primarily residential with a mix of single family and multi-family residences. One office building is located at the south east corner of Benson Boulevard and Lois Drive. Parcels along Lois Drive are fully built out. Vehicle trips generated by properties on Lois Drive are typically origin based trips. Aquarian Charter School lies on the north east corner of the intersection of Lois Drive and W. 32<sup>nd</sup> Avenue. ASD does not provide transportation to the school and children that attend the school must either walk, bike, or be driven. This generates significant traffic on both Lois Drive and W. 32<sup>nd</sup> Avenue during school pickup and drop off times. Besides the school, development along W. 32<sup>nd</sup> Avenue is primarily single family and multi-family residential with a park on the south west corner of W. 32<sup>nd</sup> Avenue and Minnesota Drive.

Development and zoning in the project area is not anticipated to change substantially and traffic characteristics are expected to remain relatively consistent for the life of the project.

Design hour volume (DHV) represents traffic volumes during the peak hour and was estimated using the 30<sup>th</sup> 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 were determined using available link counts and turning movement counts. The Equivalent Single Axle Load (ESAL) is a measure of the equivalent number of 18,000 pound-force

single-axle loads that would produce the same amount of damage on the roadway and is used for pavement design.

Traffic data for each segment is summarized in the following table and provided in APPENDIX F.

*Table 3 - Existing and Future Traffic Characteristics*

Location	DHV	DD	PHF	ESAL
Lois Dr. – Benson Blvd to W. 32nd Ave.	10.3%	60/40	.92	317,000
W. 32nd Ave. – Lois Dr. to Minnesota Dr.	10.3%	80/20	.70	140,000

#### D. Speeds

The current posted speed limit for Lois Drive and W. 32nd Avenue is 25 miles per hour (mph). The 85<sup>th</sup> percentile speed is the speed at which 85 percent of the drivers are driving at or below and is typically used to determine a reasonable posted speed limit for a given roadway. The remaining 15 percent of drivers whose speed is above the 85<sup>th</sup> percentile are the minority and considered to be exceeding the reasonable speed. Posted speed limits are often set at the 85<sup>th</sup> percentile speed but can be set lower where high volumes of pedestrians and bicyclists are present. The traffic speed analyses conducted by CRW in March and April of 2019 recorded the 85<sup>th</sup> percentile speed as follows:

*Table 4 - Observed Speeds*

Road Segment	Location	Date	85 <sup>th</sup> Percentile Speed	
			Eastbound/ Northbound	Westbound/ Southbound
Lois Dr.	North of W. 32nd Ave.	03/27/2019	29 mph	30 mph
W. 32nd Ave.	East of Lois Dr.	4/02/2019	21 mph	23 mph
W. 32nd Ave.	West of Minnesota Dr.	04/04/2019	24 mph	24 mph

#### E. Traffic Calming

The roadway may be considered eligible for installation of traffic calming measures if the observed 85<sup>th</sup> percentile speeds exceed the posted speed limit by more than 6 miles per hour. The 85<sup>th</sup> percentile speeds along Lois Drive are 4-5 mph higher than the posted speed limit and 1-4 miles lower than the posted on W. 32nd Avenue. A previous speed study from 2014 found slightly higher 85<sup>th</sup> percentile speeds (6 mph above the speed limit.)

However, speed is not the only criterion used to determine the need for traffic calming measures. Improvements to the roadway may increase speeds on Lois Drive and W. 32<sup>nd</sup> Avenue due to wider street sections and smoother driving surface. The probability of serious injury or death to a pedestrian struck by a vehicle increases substantially with vehicle speed. A study by the insurance company AAA found that the risk of severe injury for a pedestrian struck by a vehicle 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 struck by a vehicle travelling 23 mph and increases to 90% when the vehicle is travelling 58 mph. Limiting traffic speeds on the project corridor through future traffic calming measures could help improve pedestrian and bicyclist safety if speeds increase as a result of the roadway improvements.

## F. Collision Data

The MOA collects collision information obtained from the Anchorage Police Department, Alaska State Troopers, University of Alaska Anchorage Police, and Ted Stevens International Police. This collision data was reviewed for the project area between 2012 and 2018. A total of 38 collisions were reported within the project corridor during that time period. A summary of these collisions, including their locations and characteristics, is provided in TABLE 5 below and included in APPENDIX F.

*Table 5 - Project Area Collision History: 2012-2018*

Intersection	Collision Type							Total Collisions*
	Angle	Side-Swipe	Rear End	Head On	Fixed Object	Ped/ Bike	Parked Vehicle	
Lois Dr. at Benson Blvd.	8	5	1		4			18
Lois Dr. at W. 32 <sup>nd</sup> Ave.	2				1			3
W. 32 <sup>nd</sup> Ave. at Greenland Dr.					2			2
W. 32 <sup>nd</sup> Ave. at Minnesota Dr.	3	2	5		1	2		13

*\*No fatalities were reported in the collision data.*

The MOA provides a summary of all collisions, including collision related statistics, every year in their Annual Traffic Report. The 2018 Annual Traffic Report was consulted for a comparison between project area collisions and citywide collision statistics. The Annual Traffic Report recommends the use of the Highway Safety Improvement (HSIP) Manual for ranking intersection safety versus average collision rates for similar intersections. The average collision rate represents the approximate number of collisions that are expected at a study intersection based on the total number of vehicles entering the intersection. Only intersections with over 3 collisions within the seven year study period were analyzed. Collisions that occurred on Minnesota Drive and Benson Boulevard are outside of the project study area and were not analyzed.

The intersection collision rate for Lois Drive and W. 32<sup>nd</sup> Avenue was 0.34 during the 2012-2018 time period. This rate is below the HSIP average intersection rate for a four-leg stop controlled intersection (0.55 for 2018).

## **G. Side Street Intersections/Access Control**

The proposed design will incorporate MOA driveway access standards wherever possible to improve the safety and operations of the corridor. However some of these parcels may require non-conforming rights determinations to continue to function.

### **1) Lois Drive**

The intersection of Lois Drive and Benson Boulevard is a signalized intersection. Northbound right turns from Lois Drive onto Benson Boulevard is a channelized slip lane. West 29<sup>th</sup> Avenue and West 31<sup>st</sup> Avenue intersect Lois Drive in three way stop controlled intersections with Lois Drive being the major, unstopped approach. Lois Drive has one commercial driveway and ten residential driveways. The intersection of Lois Drive and W. 32<sup>nd</sup> Avenue is a four way, all-way stop controlled intersection.

### **2) W. 32<sup>nd</sup> Avenue**

The intersection of W. 32<sup>nd</sup> Avenue and Minnesota Drive is a three way, minor street stop controlled intersection where W. 32<sup>nd</sup> Avenue is the stop-controlled movement. Left turns from W. 32<sup>nd</sup> Avenue onto Minnesota Drive are prohibited. Oregon Drive, Wyoming Drive, Greenland Drive and four alleyways intersect W. 32<sup>nd</sup> Avenue, with these streets as the stop-controlled movements and W. 32<sup>nd</sup> Avenue being the major, unstopped movement. W. 32<sup>nd</sup> Avenue has two commercial drives, eight residential driveways, and one full-frontage, multi-family drive that serves Parcel 122 (Anchorage Sands Apartments). Full frontage configurations make access and circulation unclear to drivers and increases conflict points between vehicles utilizing the driveways and the street traffic.

## **H. 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 Lois Drive and W. 32<sup>nd</sup> Avenue. 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. LOS analysis was not completed for Lois Drive/Benson Boulevard and W. 32<sup>nd</sup> Avenue/Minnesota Drive intersections because proposed roadway improvements do not extend through the intersection.

The Lois Drive and W. 32<sup>nd</sup> Avenue intersection was analyzed for each intersection alternative for both the construction and design years. The results of this analysis are summarized below:

Table 6 – Lois Drive and W. 32<sup>nd</sup> Avenue Level of Service Analysis

Intersection Configuration	NB	SB	EB	WB	Intersection
<b>Construction Year 2025</b>					
Two Way Stop	--	--	LOS B (11.7 s)	LOS B (10.9 s)	LOS A (3.9 s)
All Way Stop	LOS A (8.6 s)	LOS A (8.1 s)	LOS A (8.0 s)	LOS A (8.0 s)	LOS A (8.3 s)
Roundabout	LOS A (4.9 s)	LOS A (4.4 s)	LOS A (3.9 s)	LOS A (5.0 s)	LOS A (4.7 s)
<b>Design Year 2045</b>					
Two Way Stop	--	--	LOS B (12.5 s)	LOS B (11.6 s)	LOS A (4.1 s)
All Way Stop	LOS A (9.0 s)	LOS A (8.2 s)	LOS A (8.3 s)	LOS A (8.0 s)	LOS A (8.6 s)
Roundabout	LOS A (5.2 s)	LOS A (4.7 s)	LOS A (4.0 s)	LOS A (5.4 s)	LOS A (5.0 s)

### I. All-Way Stop Analysis

An all-way stop analysis based on current conditions was performed on the intersection of Lois Drive and W. 32<sup>nd</sup> Avenue utilizing recommendations from the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD) guidelines. Currently, the intersection operates as an un-signalized, all-way stop intersection.

The MUTCD provides warrants for when an all-way stops should be considered at an intersection. Applicable warrants for the intersection include:

- **Crash rate:** five or more crashes in a 12-month period that are susceptible to correction by installation of a multi-way stop.
- **Intersection Volume:** (must meet *both* of the following conditions):
  - The combined minimum vehicular volume from the major street approaches averages at least 300 vehicles per hour for any eight hours during an average day.
  - The combined minimum vehicular volume from the minor street approaches averages at least 200 vehicles per hour for the same eight hours.
- **Combination:** Where no single criterion is established but 80% of their minimum values for the crash rate and major and minor intersection volumes are met.

The MUTCD also allows the option of installing an all-way stop on residential streets of similar classification where installing the all-way stop will improve the traffic operations of the intersection.

The MOA Traffic Engineering Department often uses a minimum side-street volume (including all modes: motor vehicles, pedestrians, and cyclists) percentage of 40% of the total entering vehicles to

minimize the use of all way stop sign controls on comparatively low volume side-streets on high volume corridors.

The intersection of Lois Drive and W. 32<sup>nd</sup> Avenue was analyzed to determine if it met the criteria for an all-way stop.

- Six years of crashes were reviewed to determine the number of crashes in the highest year.
- Existing intersection count data was reviewed to determine the eight highest hours of vehicular volumes for the intersection.

Results of the analysis are summarized in TABLE 7 below. The Lois Drive/W. 32<sup>nd</sup> Avenue intersection currently does not meet the warrants for an all-way stop.

*Table 7 - All-Way Stop Analysis*

Intersection	Crashes in a 12 month period	Crash Warrant Met?	Highest Hour Intx. Volume		Intersection Warrant Met?	Combined Warrant Met?
			Major (Lois Drive)	Minor (W. 32 <sup>nd</sup> Avenue)		
Lois Dr and W. 32 <sup>nd</sup> Ave.	2	No	326	160	No	No

**J. Sight Distance Analysis**

Adequate sight distance is necessary at intersections to allow the driver of a stopped vehicle at a minor road a sufficient view of the intersecting main roadway to decide when to enter or cross the main roadway. If the available sight distance for a minor-road vehicle is at least equal to the required stopping sight distance of the major road vehicle, 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.

The intersection departure sight triangles, per requirements of the MOA Design Criteria Manual (DCM), have been drawn at each intersection within the project area for each alternative to determine any potential issues (see APPENDIX J for intersection departure sight triangles). Features listed below that hinder the sight triangle should be removed or reset outside of the intersection departure sight triangles where feasible. Existing light poles and utility poles are not specifically noted in the list below. Existing items within intersection departure sight triangles are:

1. Various locations: existing trees and landscaping over two feet tall, parked vehicles
2. Lois Drive and W. 32<sup>nd</sup> Avenue: trees, landscaping, fence, structures, parked vehicles
3. W. 32<sup>nd</sup> Avenue and Wyoming Drive: fencing, structures and landscaping
4. W. 32<sup>nd</sup> Avenue and Greenland Drive: fencing and trees
5. W. 32<sup>nd</sup> Avenue and alley intersections: parked vehicles, fencing, and trees



New landscape plantings will be limited to areas outside of the intersection departure sight triangles. New light poles will also be located outside 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. However, Title 21 requires: “sight distance triangles shall be unobstructed as required by the traffic engineer” for development (21.06.030.C.8) and “all landscaping and screening materials shall comply with the clear vision area requirements of the traffic engineer” (21.07.080.F.2.b), which requires property developers and owners to comply with clear sight distance triangles.

### K. Parking Study

Two parking studies were conducted along the project area, one along Lois Drive and W. 32<sup>nd</sup> Avenue and a second at Parcel 123 (Aquarian Charter School). The parking study on Lois Drive and W. 32<sup>nd</sup> Avenue was completed in June 2020. Due to school closures caused by the pandemic, aerial photography from May 3<sup>rd</sup>, 2019 was utilized to study the parking at the Aquarian Charter School. The purpose of the studies were to document the existing use of on-street parking and to approximate the demand for on-street parking along the project corridor for consideration in the design of proposed improvements. The Lois Drive and W. 32<sup>nd</sup> Avenue study was based upon observations from four separate site visits, documenting parked vehicles located along the roadway and within visible adjacent parking lots. Site visits were organized to include one weekday afternoon/evening and one weekend afternoon/evening. The aerial photography at the school was taken during afternoon student pickup times.

The parking studies showed that there was sufficient off-street parking for most of the project area with only a few locations along W. 32<sup>nd</sup> Avenue that had vehicles parked on the street. This occurred primarily on the weekend. The parking studies are included in APPENDIX F.

### L. Pedestrian and Bicycle Study

Twenty-four hour pedestrian and bicycle counts were collected at the intersections of Lois Drive/Benson Boulevard, Lois Drive/W. 32<sup>nd</sup> Avenue, and W. 32<sup>nd</sup> Avenue/Minnesota Drive in May of 2020. The collected pedestrian and bicycle volume data will be used to help determine bicycle and walking patterns, set performance measures such as level of service, and prioritize improvements. The counts were taken during a weekday and a weekend at each intersection. TABLE 8 below summarizes the 24-hour pedestrian counts and TABLE 9 summarizes the 24-hour bicycle counts.

*Table 8 - Pedestrian 24 Hour Counts*

Intersection:	Date	East-bound	West-bound	Total East/Westbound	North-bound	South-bound	Total North/Southbound
Lois Dr. @ Benson	Thursday, 05/28/20	31	26	57	36	26	62
Lois Dr. @ Benson	Saturday, 05/30/20	24	19	43	32	25	57
Lois Dr. @	Thursday,	31	21	52	39	37	76

W. 32 <sup>nd</sup> Ave.	05/14/20						
Lois Dr. @ W. 32 <sup>nd</sup> Ave.	Saturday, 05/16/20	12	9	21	17	27	44
W. 32 <sup>nd</sup> Ave. @ Minnesota	Thursday, 05/21/20	14	6	20	37	30	67
W. 32 <sup>nd</sup> Ave. @ Minnesota	Saturday, 05/23/20	8	15	23	53	48	101

Table 9 - Bicycle 24 Hour Counts

Intersection:	Date	East-bound	West-bound	Total East/ Westbound	North-bound	South-bound	Total North/ Southbound
Lois Dr. @ Benson	Thursday, 05/28/20	12	7	19	20	2	22
Lois Dr. @ Benson	Saturday, 05/30/20	18	13	31	32	28	60
Lois Dr. @ W. 32 <sup>nd</sup> Ave.	Thursday, 05/14/20	15	21	36	33	48	81
Lois Dr. @ W. 32 <sup>nd</sup> Ave.	Saturday, 05/16/20	21	10	31	35	47	77
W. 32 <sup>nd</sup> Ave. @ Minnesota	Thursday, 05/21/20	10	4	14	29	22	51
W. 32 <sup>nd</sup> Ave. @ Minnesota	Saturday, 05/23/20	4	1	5	31	30	61

### M. Traffic Calming & Pedestrian Safety

Survey results from the project questionnaire (see SECTION XVII for Public Involvement) indicated that speeding was not a significant concern among most residents. Based on public comment and results of the speed studies, traffic calming is not proposed along Lois Drive or W. 32<sup>nd</sup> Avenue.

Alternatives 3 and 4 include a separated pathway along the north side of W. 32<sup>nd</sup> Avenue from Lois Drive to the east driveway of Parcel 123 (Aquarian Charter School). The pathway switches to the south side of W. 32<sup>nd</sup> Avenue at the east school driveway and continues on the south side until to Minnesota Boulevard. Pedestrians traveling on W. 32<sup>nd</sup> Avenue will be required to cross W. 32<sup>nd</sup> Avenue to remain on the pathway.

Even though Aquarian Charter School is a charter school and is not the neighborhood school, the presence of the playground will encourage children to access the school from the surrounding neighborhood. The 2017 MOA School Area Traffic Safety Manual (SATSM) provides guidance for pedestrian amenities in school areas. The SATSM identifies Aquarian Charter School as a Class A improvement area and requires a more urbanized level of school walking route improvements. The SATSM recommends a crosswalk be installed at this location if more than 15 children use the proposed sidewalk during school start or end times. Due to the COVID-19 pandemic and schools

operating virtually, a pedestrian study could not be accurately completed. However, it is likely that this crossing would meet the minimum crossing requirements; an additional pedestrian crossing study should be completed once school is in operation.

## VII. Design Criteria and Standards

Project design criteria are based on the roadway characteristics, functional classification, and road or facility ownership. Lois Drive is classified as a Neighborhood Collector (Class IC) and W. 32<sup>nd</sup> Avenue is classified as a secondary (local) urban residential roadway; both roadways are owned and maintained by MOA.

### A. Project Design Standards

The PM&E DCM provides detailed design criteria for the development of roadways and infrastructure within the MOA. The documents listed below provide additional design guidance, standards and requirements for this project.

- Anchorage Pedestrian Plan, 2007, MOA.
- Anchorage Bicycle Plan, 2010, MOA.
- Official Streets and Highways Plan (OS&HP), 2014, MOA.
- Anchorage Bowl 2020 Comprehensive Plan, 2001, MOA.
- Anchorage 2040 Land Use Plan, 2017, MOA.
- 2035 Metropolitan Transportation Plan (MTP), 2012, MOA.
- Anchorage Stormwater Manual (ASM), July 2017, MOA.
- Neighborhood Traffic Calming Policy Manual, 2016, MOA Traffic Engineering.
- MOA School Area Traffic Safety Manual (2017)
- 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, 7th Edition (AASHTOGB), 2018, AASHTO.
- Manual on Uniform Traffic Control Devices (MUTCD), 2009 with Revisions 1 and 2, Federal Highway Administration (FHWA).
- Alaska DOT&PF Preconstruction Manual (PCM), 2019, ADOT&PF.
- Alaska Traffic Manual (ATM), 2015, ADOT&PF.
- Proposed Accessibility Guidelines for Pedestrians in Public Right-of-Way (PROWAG), 2011, United States Access Board.
- Anchorage Municipal Code Title 21 – Land Use Planning.
- A Strategy for Developing Context Sensitive Transportation Projects, 2008, MOA.
- Vision Zero Final Report, 2016, MOA.

### B. Design Criteria Summary

A summary of roadway design criteria pertinent to this project can be found in [TABLE 10](#) below. Potential deviations from design criteria are described in [SECTION XIX](#). Detailed lighting design criteria is discussed in [SECTION VIII.F](#).

Table 10 - Design Criteria Summary

	Criteria	Design Standard Value		Reference
		Lois Drive	W. 32 <sup>nd</sup> Avenue	
Traffic Data	Functional Classification	Neighborhood Collector	Secondary Street: Urban Residential	OSH&P
	AADT – 2025	2,670	1,180	Assumed Growth
	AADT – 2045	3,130	1,380	Assumed Growth
	Design Vehicle	CITY-BUS	CITY-BUS	DCM 6.4 B
	Design Structural Loading	HS 20	HS 20	ASM 5.3.10
	Design Speed	35 MPH	30 MPH	DCM Tables 1-4 and 1-6
	Posted Speed	30 MPH	25 MPH	Table 1-4 and DCM 1.5.E
Horizontal Alignment	Horizontal Curve Radius, Minimum, No Super-elevation	600 ft	150 ft	DCM Table 1-9
	Stopping Sight Distance, Min	250 ft	200 ft	DCM Figure 1-20
	Clear Sight Triangle Length	390 ft	335 ft	DCM Figure 1-19
Vertical Alignment	Vertical Grade, Maximum	6.0%	6.0%	DCM 1.9.D.2.b
	Vertical Grade, Minimum	0.5% for street w/ curb and gutter	0.5% for street w/ curb and gutter	DCM 1.9.D.2.a
	Vertical Curve K-Value, Min, Crest	29	19	DCM Figure 1-16
	Vertical Curve K-Value, Min Sag	49	37	DCM Figure 1-17
Cross Section	Number of Moving Lanes	2	2	DCM Tables 1-4 and 1-6
	Moving Lane Width	10-11 ft	10 ft	DCM Tables 1-4 and 1-6
	Number of Parking Lanes	1	2 (1 if single loaded)	DCM Tables 1-4 and 1-6
	Parking Lane Width	7 ft	7 ft	DCM Tables 1-4 and 1-6
	Shoulder Width (No Parking Lane)	3.5 ft	3.5 ft	DCM Tables 1-4 and 1-6
	Curb & Gutter	Type 2 (DCM) Type 1 (Title 21)	Type 2 (DCM) Type 1 (Title 21)	DCM Figure 1-13 Title 21.08.050.G
	Side slopes	2H:1V max	2H:1V max	DCM 1.9.D.5
	Clear Zone	12 feet min	12 feet min	See SECTION VII.C.4)
	Sidewalk Requirements & Width	Both sides of roadway, 5 ft	Both sides of roadway, 5 ft	DCM Figures 1-11 & 1-13, Title 21.07.060.E.2
	Sidewalk Separation from Back of Curb	0-7 ft	N/A for local road	DCM Figure 1-11 and Section 4.2 G



	Criteria	Design Standard Value		Reference
		Lois Drive	W. 32 <sup>nd</sup> Avenue	
<b>Intersections &amp; Driveways</b>	Curb Return Radius at Residential Side Streets	30 ft	20 ft	DCM Figure 1-22
	Curb Return Radius at Arterial Side Streets	30 ft	30 ft	DCM Figure 1-22
	Driveway width: ≤ 7-plex	14 – 20 ft; (28 ft with restrictions)	14 – 20 ft; (28 ft with restrictions)	DCM Appendix 1D
	Driveway width: commercial or ≥ 8-plex	24 – 34 ft	24 – 34 ft	DCM Appendix 1D
	Max driveway grade: residential	± 10%	± 10%	DCM Appendix 1D
	Max driveway grade: commercial, ≥ 8-plex	± 8%	± 8%	DCM Appendix 1D
	Landing grade/length: residential	± 2% for 12 ft	± 2% for 12 ft	DCM Appendix 1D
	Landing grade/length: commercial, ≥ 8-plex	± 2% for 20 ft	± 2% for 20 ft	DCM Appendix 1D

### C. Specific Design Criteria

The appropriate street section is determined by traffic volumes and land use. Based on Title 21 Land Use Zoning, Lois Drive and W. 32<sup>nd</sup> Avenue are both “urban” streets. Urban streets are required to include a paved surface, curb and gutter, sidewalks or trails, street lights, traffic control devices, street signs, landscaping, and storm drains.

#### 1) Design Speed

The design speed governs various geometric features of the roadway 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 more reaction time and braking distance to respond to roadway obstacles.

The DCM required design speed for each roadway is listed in [TABLE 10](#) above. However, because the roadways along the project corridor are being designed for both motorized and non-motorized users, a lower posted and design speed is likely appropriate for Lois Drive, which, as a Collector Roadway, has a required design speed of 35 MPH. The likelihood of a pedestrian or bicyclist being seriously injured or killed in a collision with a vehicle increases exponentially with the speed of the vehicle. Therefore, a posted speed of 25 MPH, to match the existing posted speed limits, and a design speed of 30 MPH is recommended for both Lois Drive and W. 32<sup>nd</sup> Avenue.

## 2) Accessibility Guidelines

The current requirements for accessibility in the MOA are based on the Americans with Disabilities Act (ADA). The project uses guidelines published in Proposed Accessibility Guidelines for Pedestrian Facilities in Public Right-of-Way, July 26, 2011 (ADA Guidelines) by the United States Access Board. A summary of some of the ADA design criteria pertinent to the project is provided below:

- R302.3 – The continuous clear width of pedestrian access routes shall be 4.0 feet minimum.
- R302.4 – Where the clear width of pedestrian access routes is less than 5.0 feet, passing spaces shall be provided at intervals of 200 feet maximum.
- R302.5 – Where pedestrian access routes are contained within a street or highway right-of-way, the grade of pedestrian access routes shall not exceed the general grade established for the adjacent street or highway.
- R302.5.1 – Where pedestrian access routes are contained within pedestrian street crossings, the running grade of the pedestrian access route shall be 5% maximum.
- R302.6 – The cross slope of pedestrian access routes shall be 2% maximum.
- R304.3 – Parallel curb ramps shall include a turning space with minimum dimensions of 4.0 feet x 4.0 feet at the bottom of the ramp.
- R304.3.2 – The running slope of the curb ramp shall be in-line with the direction of sidewalk travel and shall be 5% minimum and 8.33% maximum but shall not require the ramp length to exceed 15.0 feet maximum. The running slope of the turning space shall be 2% maximum in any direction.
- R304.5.1 – The clear width of curb ramp runs and turning spaces shall be 4.0 feet minimum.
- R304.5.2 – Grade breaks at the top and bottom of curb ramp runs shall be perpendicular to the direction of the ramp run.
- R304.5.3 – The cross slope of curb ramps and turning spaces shall be 2% maximum.

The Public Rights-of-Way Accessibility Guidelines recognize 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. The guidelines state:

*Where existing physical constraints make it impractical for altered elements, spaces, or facilities to fully comply with new construction requirements, compliance is required to the extent practicable within the scope of the project. Existing physical constraints include, but are not limited to, underlying terrain, right-of-way availability, underground structures, adjacent developed facilities, drainage, or the presence of a notable natural or historic feature.*

All elements included in the project that cannot meet the ADA Guidelines due to technical infeasibility should be documented. Due to the relatively flat grades along the project corridor, challenges meeting the ADA Guidelines are not anticipated.

### 3) Roadway Cross Section

The roadway cross section required by the DCM varies with the roadway classification and, for secondary streets, with the AADT of the roadway. Specific roadway cross section information is shown in TABLE 10 above.

It is preferable for pathways/sidewalks to be separated from the roadway to provide pedestrian comfort and safety and provide room for snow storage. However, separation from back of curb is not required for a local roadway.

A clear area of 7 feet beyond the back of curb is required for snow storage. The sidewalk can be considered as part of the snow storage area. Roadway sections with narrow shoulders 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.

An on-street parking lane may be provided on only one side of a neighborhood collector roadway. For a local roadway, if there are houses only along one side of the roadway (i.e. single loaded), one parking lane may be replaced with a 3.5-foot shoulder.

### 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 DCM references AASHTO's Roadside Design Guide (RDG) for rural conditions (i.e. no curb and gutter) but it is unclear as to the applicability of the clear zone concept to curbed urban roadways. In 2011, FHWA published on their website the following guidance regarding clear zone along curbed roadways:

*Since curbs are now generally recognized as having no significant containment or redirection capability, clear zone should be based on traffic volumes and speeds, both without and with a curb.*

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 urban roadway with a design speed of <40 MPH and an ADT of 1,500 to 6,000 is 12 to 14 feet, with a foreslope of 6H:1V or flatter.

However, the AASHTOGB, similar to the DCM, recognizes the impracticability of constructing a full clear zone in urban areas in accordance with the RDG.

*Where establishing a full-width clear zone in an urban area is not practical due to right-of-way constraints, consideration should be given to establishing a reduced clear zone or incorporating as many clear zone concepts as practical, such as removing roadside objects or making them crashworthy.*

The typical minimum roadway cross section for a local or collector road will meet the minimum clear zone width of 12 feet specified in the RDG (3.5-foot wide shoulder + 2-foot wide curb + 5-foot wide sidewalk + 1.5-foot wide sidewalk shoulder = 12 feet). However, the recommended typical section may result in less than 12 feet of available clear area.

Additionally, as a winter city, plowing operations, snow storage requirements, and icy road conditions should be considered in regards to infrastructure located close to the travel lane (ex. bollards or utility poles).

## **5) Landscaping**

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. In cases where trees and shrubs are not able to be saved due to construction, consideration will be given to replacement of the plant material. If on-property landscaping is affected due to the construction, property owners will be consulted and informed on what species and size of replacement plants could be provided. Low profile landscaping and/or hardscape options that can reduce maintenance and increase visibility and safety along the corridor will be reviewed.

All roads designated as collector and greater, which includes Lois Drive, must be reviewed for landscaping by the Urban Design Commission 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. The DCM does not require that any specific landscape treatment be applied to W. 32<sup>nd</sup> Avenue, since it is classified as a local roadway. However, landscape work for this project will meet the General Considerations for Landscape Installation and Maintenance in the DCM Section 3.3.

## **6) Storm Drain**

A summary of the pertinent storm drain design criteria per the Anchorage Stormwater Manual (ASM) is provided below:

- Storm drain pipes shall be corrugated polyethylene pipe (CPEP) due to corrosion issues in Anchorage area.
- Minimum diameter of storm drain pipe is 12 inches.
- Minimum pipe slope is 0.30%.
- The storm drain system shall not be surcharged during the design storm event.
- At the design flow, minimum pipe flow velocity is two feet per second (fps). Maximum pipe flow velocity is 13 fps.
- Minimum depth of cover over a gravity storm drain pipe without thaw protection is four feet.
- Insulation is required for pipes if the depth of cover is less than four feet. If storm drain pipe is located under a roadway structural section and insulation is included in roadway section, additional insulation for pipe is not required.
- A thaw system is required if the depth of cover is less than three feet.
- Maximum manhole spacing is 300 feet.

- Minimum invert elevation difference across a manhole is 0.05 feet

The outfall invert elevation of a storm drain or subdrain outfall shall be the highest of the following:

- The one foot above the ordinary high water surface elevation of lakes and ponds,
- One foot above the 100-year water surface elevation of regulated streams,
- One foot above the bank-full water surface elevation for non-regulated streams, or
- The highest elevation practical based on high water and the incoming pipe slope.



## VIII. General Design Considerations

### A. Complete Streets

A complete streets network is a roadway network that is safe, comfortable, and convenient for users of all ages and abilities and all modes of transportation. Complete streets should provide facilities that balance the needs of pedestrians, bicyclists, transit users, motorists, and movement of goods. A network-based complete streets approach recognizes that, while all roadway users need to be accommodated within a given neighborhood or corridor, no single street can accommodate and prioritize all transportation users at all times. Through a network-based approach, MOA can designate priority streets for a given mode to create a high quality experience for those users, while providing a high-quality facility for other modes on parallel but equally convenient routes.

### B. Right-of-Way Acquisition

A key element for the successful completion of any 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.

The 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, the *Relocation Services for Residential Property* brochure, and the *Relocation Services for Businesses, Farms & Non-Profit Organizations* brochure. Individual parcel's acquisition details are determined on a case-by-case basis and negotiated privately between the MOA and the property owner.

In general, public use easements (PUE) are required in areas where the footprint of the improvements exceeds the ROW. Slope easements (SE) are required for areas where the cut and fill slopes are outside of the ROW and need to be maintained. Storm drain easements (DE) are required for drainage facilities installed on private property. Temporary construction permits (TCP) 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 (TCE) allow contractors temporary access onto private property to construct improvements that are within the ROW but where there is insufficient space within the ROW to conduct the work.

Property owners who have 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 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.

### **C. Retaining Walls**

Retaining walls should also be installed as needed to minimize impacts to utilities, the environment, and adjacent properties. However, the decision to construct a retaining wall should balance the cost of installing a retaining wall with the overall impacts to current and future utilities, construction noise and vibration, and adjacent property limits.

Preliminary analysis indicates a short retaining wall will most likely be required along Parcel 117 to accommodate adjacent terrain. The retaining wall is anticipated be less than two feet tall and thus can be constructed per MASS Standard details. If the wall height is less than 30 inches, no railing is required.

### **D. Mailboxes**

The project corridor consists of a mixture of single family and multi-family residences, apartment complexes, and an office building. For the latter two, mail is delivered to secure boxes located on or within the apartment buildings or to front offices. Along W. 32<sup>nd</sup> Avenue for the single family and multi-plex homes, mailboxes are located off of the project corridor (either in an alley or elsewhere). However, along Lois Drive, mailboxes are located along the west side of the roadway. Newer construction (parcels 102 through 105) includes cluster mailboxes but the other parcels have individual mailboxes. The project anticipates impacting these mailboxes.

Previous communication with the United States Postal Service (USPS) indicates that in order to change from individual to cluster mailboxes the following must occur:

- Every affected resident must agree to the change from individual mailboxes to cluster. If even one resident doesn't agree, the mailboxes cannot be switched to cluster style. In order to officially make the change in mail service, a signed concurrence from each owner is required.
- MOA is required to purchase the cluster mailboxes and install concrete foundations.

From past PM&E project experiences, it is very hard to gain concurrence from all affected residents, thus this project plans to re-install individual mailboxes. For individual mailboxes, if a new sidewalk is proposed, the sidewalk will need to be separated from the curb by a minimum of 3 feet so that the mailbox can be installed between the curb and the sidewalk. Individual mailboxes can be re-used where feasible. If the existing mailboxes do not meet current postal standards, they will be replaced with new boxes that meet current standards. If cluster mailboxes are elected, the design team will work with the USPS and residents to determine appropriate installation locations.

### **E. Pedestrian Crossings**

Pedestrian crossings are ideally located at stop controlled or signalized intersections where vehicles will be stopped to allow safe navigation by pedestrians. However, marked crosswalks at uncontrolled approaches or mid-block locations may be warranted where a high number of pedestrians are known to cross the roadway, where the pedestrian facility requires crossing of the roadway, or where a signalized/controlled crossing is not located nearby. Marking a mid-block

crosswalk formalizes the location where pedestrians should cross, helps increase the likelihood of drivers yielding to crossing pedestrians, and helps make pedestrian crossing behavior more predictable. Marked crosswalks increase the visibility of pedestrians crossing the roadway but must be placed in areas with adequate sight distance for vehicles to yield and for pedestrians to make the decision to cross the roadway. Marked crossings at street intersections should be considered first, with mid-block crossing eliminated to the extent practical. The ATM, Table 3B-101 provides a matrix to decide when a location is a candidate for a marked crosswalk based on vehicle volumes, the number of lanes, and roadway speed limit. Select pages and tables from the ATM can be found in [APPENDIX F](#).

Treatments for pedestrian crossings at uncontrolled approaches and mid-block locations can include a range of options including roadway crosswalk markings, warning signs, median refuge islands, flashing beacons, and traffic signals. Part 4 of the ATM provides a warrant analysis matrix where appropriate measures can be selected depending on various intersection criteria. Measures are broken up into three main categories: non-electric, electric warning, and electric regulatory.

- Non-Electric: these include sight distance, markings, standard or high visibility signs, and median refuge islands. For markings, MOA Traffic Engineering prefers longitudinal crosswalks with gaps in accordance with Figure 3B-100 of the ATM. Median refuge islands should be considered when pedestrian crossing distances are long and where adequate gaps are not present for pedestrians to cross multiple lanes.
- Electric Warning: these include street lights, sign borders, in-pavement lighting, rapid flashing beacons, and other overhead beacons.
- Electric Regulatory: these include pedestrian hybrid beacons and mid-block signals.

The analysis of appropriate treatment options requires information such as recurring hourly pedestrian volumes, collision history, average gaps in traffic per minute, and sight distance. There are no locations within the project corridor where Electric Warning or Electric Regulatory measures are warranted. Non-Electric crossing treatments should be chosen from the decision matrix in the ATM based on site conditions.

## **F. Lighting**

Lighting systems shall be designed to the DCM's Chapter 5 criteria and enhance 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, crosswalks, stand-alone pathways, and intersections.
- Minimize construction and maintenance costs.
- Avoid adverse impacts to adjacent properties.
- Reveal hazards to pedestrians and vehicular traffic.

The MOA has retrofitted many existing luminaire poles with luminaires that use 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 local roadway with low pedestrian activity, the DCM recommends a minimum maintained average of 0.4 foot-candles with an average-to-minimum uniformity ratio no greater than 6:1 and a veiling luminance ratio no greater than 0.4.

For a collector roadway with low 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.

**2) Pedestrian Facilities:**

It is anticipated that pedestrian activity along the project roadways will be in the low range per Chapter 5 of the DCM. For pedestrian facilities within the low pedestrian volume criteria, the DCM requires a minimum maintained average of 0.4 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 MOA DCM street classifications):

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

Below, in TABLE 11, is a summary from the DCM of lighting for intersections. This table will be used to design lighting improvements at the project intersections. Intersection lighting classifications for the project intersections will be based upon the design year AADT.

*Table 11 - Illuminance for Intersections (MOA DCM Table 5-5)*

Functional Lighting Classification	Average Maintained Illuminance (low pedestrian area)	Maximum Uniformity Ratio
Major/Major	1.8	3.0
Major/Collector	1.5	3.0
Major/Local	1.3	3.0
Collector/Collector	1.2	4.0
Collector/Local	1.0	4.0
Local/Local	0.8	6.0

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.

All luminaire poles and light fixtures within the project area will be removed with the exception of the luminaire poles at the Lois Drive/Benson Blvd. intersection. A new continuous lighting system with LED luminaires will be installed to meet minimum illumination requirements.

## **G. Landscaping**

The overall goal of the landscape design is to limit impacts to existing vegetation where feasible and provide new landscape amenities where space allows. The existing ROW provides limited room for new landscape improvements in some segments.

Landscape design considerations for this project include the following:

- Green Infrastructure stormwater systems where appropriate.
- Landscape amenities that reference the design language neighborhood, such as providing decorative retaining walls and fall protection fencing similar in color and style to other landscape amenities in the area, if needed.
- Protection of existing mature trees in the ROW, and on private property adjacent to the proposed improvements, wherever possible.
- Proper sizing and placement of planting beds for tree health.
- Protection of new plantings from moose grazing.
- A selection of plant material that is appropriate to the application, neighborhood aesthetics, expected maintenance, and site microclimate.

Additional landscape design considerations will include proper placement of new plant materials to account for snow storage and clearing within the ROW. Placement of new planting will also respect requirements for clear sight lines at intersections per AMATS Vision Zero goals for transportation safety.

## **H. Nonconformities**

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 don’t 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 that was 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.



Improvements made to the structure or lot that require a permit from Building Safety may require dedicating a portion of the construction cost to bring the affected areas towards compliance with current codes. However, if improvements do not require a permit, the area is not subject to upgrading to current standards. For example, per current code, improvements to lots that place fills (including pavement) less than 1 foot in depth, on natural terrain with a slope flatter than 5H:1V, and do not obstruct drainage courses do not require a building safety permit.

Three parcels along the project corridor have previously established nonconforming status. [TABLE 12](#) below provides a summary of these existing parcels and the relevant nonconformities (see [FIGURE 4](#) for the parcel location map). Some of these parcels also may have additional nonconforming features associated with the lots that have not yet established nonconforming status, including:

- Driveway widths exceed two-fifths of the frontage of the lot.
- Vehicles not able to enter abutting street in forward

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 the MOA is making improvements to the ROW with this project, the project team will work with the owners of the lots in order to gain approval from them to submit a Nonconforming Determination application on their part. The MOA Planning Department will review the application 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 provide the safest possible roadway design.

*Table 12 - Summary of Nonconforming Determinations (NCD)*

Parcel No.	Year NCD Issued	Nonconformity
114	1971*	<ul style="list-style-type: none"> <li>• The lot has less than the minimum area for a 4-plex</li> <li>• Carport extends into front yard setback</li> </ul>
115	1991	The lot has less than minimum area for a triplex is legal nonconforming.
122	1998	<ul style="list-style-type: none"> <li>• The lot has less than minimum area for 88 dwelling units</li> <li>• Buildings on the east side encroach 12.1 feet into the required 20 foot primary setback</li> <li>• Useable yard requirements are not met and are all legal nonconforming.</li> </ul>

\* Parcel 114 has “Record of Non-Conforming Use” on file and not a “Nonconforming Determination”

## **IX. Project Specific Design Considerations**

### **I. Existing Data**

Analysis and preliminary design of the project is currently based on limited field survey, existing record drawing, GIS data, field visits, and topographic LIDAR data. A full topographic survey will be conducted during the design phase. Roadway profile grades, cut and fill limits, driveway grades, and side-street grades are based on existing LIDAR data and not topographic survey points.

### **J. Buffers**

Buffers between the curb and pedestrian facilities are desirable to provide better separation from moving vehicles and to provide space for plowed snow to be stored during winter. Ideally, pedestrian facilities are separated from the back of curb by a 7-foot wide buffer space to maximize separation from the travelled way and space for snow storage. However, limited right-of-way, existing utilities, close spacing of driveways and roadways, and existing buildings set close to the property line limit the areas where wide buffers can be provided without acquiring easements, moving infrastructure, and/or relocating utilities.

Additionally, residents may perceive the existing grassed ROW area in front of their house as part “of their front yard.” Expanding the improvements to include wide buffers may be perceived as impacting private property. Some private improvements also extend into the ROW. At driveway crossings, it is ideal for the pedestrian facility to be within at least 3 feet of the back of curb for increased visibility to drivers exiting or entering the driveway.

### **K. Driveways and Parking**

Curb and gutter only exists along the project corridor at the intersections with Benson Blvd. and Minnesota Drive; the remainder of the project corridor lacks curb and gutter. The lack of curb allows for full frontage access to properties, however, the majority of properties along the project corridor have established access through designated driveways. Additionally, the majority of parcels are single-, two-, and three-family residences without large parking demands. The exceptions to this are: the commercial property at the intersection with Benson Blvd. (Parcel 125), Minnesota Commons (Parcel 124), Aquarian Charter School (Parcel 123), and Anchorage Sands Apartments (Parcel 122). Each of these parcels have designated driveways with off-street circulation and parking, with the exception of Parcel 122, which has full-frontage access and parking located immediately adjacent to the ROW.

Installation of barrier (Type 1) curb along Parcel 122 will limit property access to driveway curb cut locations and could affect the ability for residents to access parking spaces. Alternatives 1 and 2 would require acquisition of Parcel 122 and thus barrier curb would be proposed for those alternatives; Alternative 3 would not require acquisition of Parcel 122 and thus rolled curb would be proposed along the north side of W. 32<sup>nd</sup> Avenue (Alt. 3B) along Parcel 122.

Several properties appear to have nonconforming rights, based on the year of construction; this may allow the parcel to maintain full-frontage access and lack of on-site parking. These properties were reviewed for conformance to Anchorage Municipal Code (AMC) Title 21 parking requirements and DCM driveway requirements. Properties were analyzed against current requirements to see if an expanded corridor footprint may reduce available on-site parking stalls and/or result in a non-compliant property. Parcels where wide or full-frontage access, full frontage parking, and/or available parking areas are a concern are described below in TABLE 13:

*Table 13 - Property Summary for Potential Nonconformities*

Parcel No.	Construct- ion Year	Item not to current MOA Code
112	1982	<ul style="list-style-type: none"> <li>• Driveway width is ~51 feet; maximum allowable driveway width is 28 feet. Lot was developed prior to this requirement.</li> <li>• Distance between the building and ROW line at parking is ~17.5 feet; required parking space length is 20 feet.</li> </ul>
113	1951	Driveway width is ~41 feet; maximum allowable driveway width is 28 feet. Lot was developed prior to this requirement.
114	1970	There are 4 garage parking spaces but no available space on site for any additional parking; 7 parking spaces are required per current standards.
118	1962	Driveway on Wyoming Drive is exceeds maximum allowable driveway width of 28'.
119	1970	There is space for 5 parking spaces on the lot; per current code, 7 parking spaces are required.
122	1966	<ul style="list-style-type: none"> <li>• Driveway widths and numbers exceed allowable per current code; lot was developed prior to current code requirements.</li> <li>• There are 91 parking spaces available; per current code, 97 parking spaces are required. Lot was developed prior to this requirement.</li> </ul>

#### **L. Driveway Grades and Landings**

There are 21 existing driveways/access areas along the project corridor. Driveways will need to be reconstructed to match into 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 L. Proposed conceptual plan view driveway locations are shown on the roadway plan and profile drawings in APPENDIX B.

Many driveways do not have the DCM required landings and have relatively steep grades (11-19%) up to the existing structure or parking lot. Proposed improvements will most likely widen the

roadway and install pedestrian facilities. Any pedestrian facility that is installed will be ADA compliant (2% max cross slope). Where pedestrian facilities cross driveways, the ADA compliant pedestrian facility will function as a partial driveway landing. The proposed driveway grades shown in APPENDIX L reference the grade beyond the pedestrian facility.

### **M. Other Design Challenges**

Roadway grades are typically flat, as low as 0.4% percent in some locations. Roadway improvements will require forced high and low spots to facilitate adequate drainage. Grading beyond the roadway improvements may be a challenge with the forced high spots combined with the addition of curb and gutter.

## X. Project Alternatives and Analysis

Roadway plan and profile drawings depicting alternatives for upgrades to the project and the locations of individual parcels can be found in APPENDIX B.

### A. No Build Alternative

The No-Build alternative would make no improvements to the roadway corridors. Because improvements to the corridor are supported by stakeholders and the No Build Alternative does not meet the project goals of improving pedestrian safety and drainage, it was not further considered in this report. Pedestrians would continue to be forced to share the vehicular travel way for much of the project corridor and the existing roadway pavement would continue to deteriorate with the lack of adequate drainage facilities.

### B. One-Way Alternative

During the November open house, area residents mentioned they would support one-way road options along the project corridor. A meeting was held with MOA Traffic Engineering, PM&E, and MOA ROW on July 8, 2020 to discuss the project, including the one-way street option. A full traffic analysis of the surrounding network of roadways would be required, including area volumes, circulation, and patterns, in order to analyze the impacts of one-way streets. In addition, a secondary street in the area would likely also need be designated as a one-way street (in the opposite direction) to complete a couplet and balance traffic volumes. Obtaining accurate information to provide the analysis in the current COVID-19 pandemic would be difficult due to lower than typical traffic volumes and school closures. MOA Traffic Engineering also expressed their concern with compliance for one-way streets in this neighborhood which has adjacent, major one-way streets (Benson Blvd. and Minnesota Drive). MOA Traffic Engineering directed the team to not further pursue the option of one-way streets as part of this DSR.

### C. Roadway Cross Sections

The standard cross section for a Neighborhood Collector roadway has two 10 to 11-foot lanes, a 7-foot parking lane on one side, and two detached 5-foot to 10-foot sidewalks/pathways, as shown in TABLE 14 below.

*Table 14 – Neighborhood Collector Street Design Values*

Lane Width <sup>1</sup>	Shoulder Width <sup>2</sup>	Number of Lanes		Curb & Gutter Type	Sidewalk/ Pathway Buffer <sup>5</sup>	Sidewalk/ Multi-use Path width	Design Speed (mph)
		Moving	Parking <sup>2, 4</sup>				
10' - 11'	3.5' – 5' <sup>3</sup>	2	One side	Type 1 (barrier)	0' – 7'	5' / 8'	35

1. Lane width varies per ADT
2. When a parking lane is provided, the lane width must be 7'
3. For a 7' sidewalk/pathway buffer, provide minimum 3.5' shoulder; varies to 5' shoulder for adjacent sidewalk/pathway.
4. When allowed
5. From back of curb



The standard cross section for a Secondary Urban Street has two detached 5-foot sidewalks and the roadway width varies depending on the ADT, as shown below in [TABLE 15](#).

*Table 15 - Secondary Urban Street Design Values*

AADT	Street Width <sup>1</sup>	Number of Lanes		Shoulder Width	Curb & Gutter Type	Pedestrian facilities <sup>4</sup>	Design Speed (mph)
		Moving	Parking <sup>2</sup>				
> 1,000	38'	Two 10' lanes	Two 7' lanes	3.5'	Type 2 <sup>3</sup> (rolled)	5-foot wide, both sides	30

1. Street width is measured from back of curb to back of curb.
2. When off street parking is utilized, the parking lane may be eliminated
3. Anchorage Municipal Code 21.08.050.G requires the use of vertical, Type 1 curb and gutter.
4. Anchorage Municipal Code 21.07.060.E.2 also requires sidewalks to be installed on both sides of all streets in Class A zoning districts. This area falls under Class A per 21.08.050.B, Table 21.08-1.

Four different typical cross section alternatives were developed and are discussed below.

**1) Roadway and Intersection Alternative 1**

Roadway Alternative 1 meets the DCM requirements for roadway shoulders, pedestrian facilities, and separation buffers (see [FIGURE 7](#)).

a) Lois Drive:

Alternative 1 for Lois Drive includes two, 11-foot wide travel lanes with 3.5-foot wide shoulders and barrier (Type 1) curb and gutter for a total roadway width (measured from back of curb) of 33.0 feet. A 10-foot wide paved pathway is proposed on the east side of the roadway and a 5-foot wide concrete sidewalk is proposed on the west side of the roadway. Non-motorized facilities would be detached from the back of curb by 7 feet. Driveway access would be by curb return (commercial, including 8-plex and greater) or curb cut (residential). MOA Traffic Engineering has no adverse comments regarding this alternative. However, this alternative requires acquisition of PUEs and slope easements along the full length of the roadway and thus is not recommended.

b) W. 32<sup>nd</sup> Avenue

Alternative 1 for W. 32<sup>nd</sup> Avenue includes two, 11-foot wide travel lanes with a 3.5-foot wide shoulder on the south side and a 7-foot parking lane on the north side and barrier (Type 1) curb and gutter. A 6-foot wide center median (measured from back of curb) with barrier curb and gutter would be constructed at the existing transmission poles to protect the poles. It is not ideal for transmission poles to be located between travel lanes, even when they are located within a curbed median; MOA Traffic Engineering has also expressed concerns with transmission poles located between travel lanes.

Where a curbed median is not constructed, the center area would be marked with 18 inch diagonal yellow lines. The total roadway width (measured from back of curb) is 46.5 feet. A 10-foot wide paved pathway is proposed on the north side of the roadway and a 5-foot wide concrete sidewalk is proposed on the south side of the roadway. Non-motorized facilities

would be detached from back of curb by 7 feet. Driveway access would be by curb return (commercial, including 8-plex and greater) or curb cut (residential). The turn lane and median for the north bound left turns from Minnesota Drive to W. 32<sup>nd</sup> would be adjusted to accommodate the new lane locations along W. 32<sup>nd</sup> Avenue.

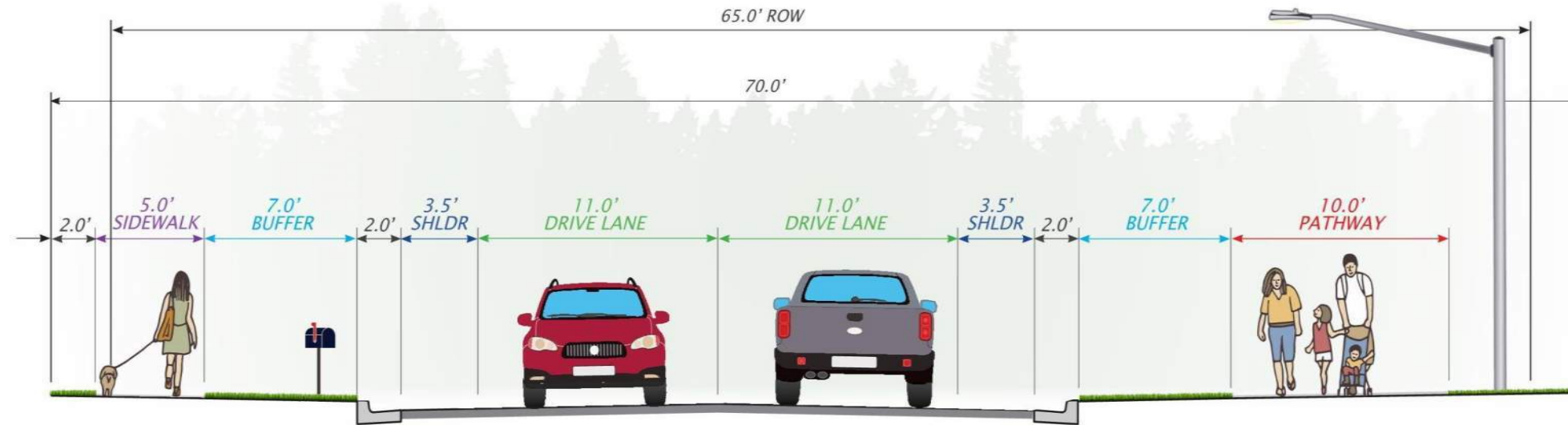
This alternative would require full acquisition of Parcels 117 and 122 and relocation of affected residents. Relocation of Parcel 122 would be very complex and costly and thus this alternative is not recommended. MOA Traffic Engineering has stated that they cannot support this alternative.

c) Intersection of Lois Drive and W. 32<sup>nd</sup> Avenue

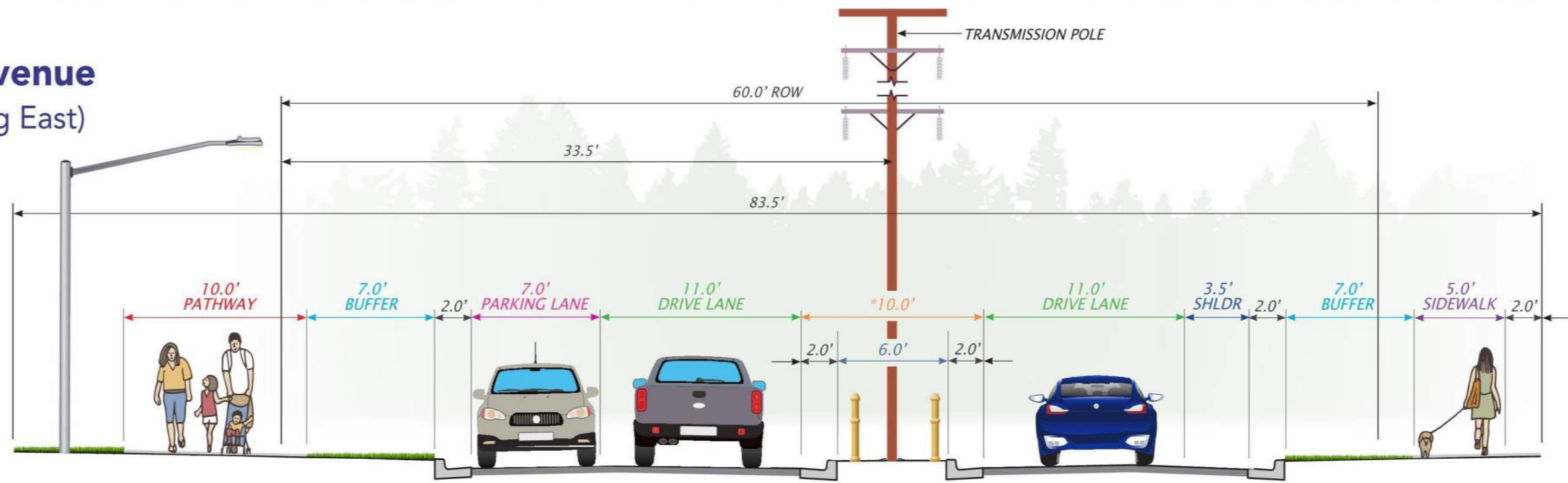
The ROW widths of Lois Drive and W. 32<sup>nd</sup> Avenue are only 30 feet to the south and west of the Lois Drive/W. 32<sup>nd</sup> Avenue intersection but 60 feet to the north and east of the intersection. The ROWs are offset across the intersection (see APPENDIX H for ROW maps). Intersection Alternative 1 centers the roadway within the ROW of the south and west legs of the intersection, resulting in a roadway centerline that is off-set from the ROW centerline of the north and east legs. Appropriate transition lengths on the north and east legs transition the roadway centerline back to the existing ROW centerline along the project corridor. This alternative would require full acquisition of Parcel 114 and would require a significant portion of Parcel 112, which may will not be acceptable to the homeowner and thus result in full acquisition of Parcel 112 also. This alternative also would require relocation of the transmission pole located at the northwest corner of the intersection. Because of the significant property and utility impacts and full acquisition requirements, this intersection alternative is not recommended.

# ALTERNATIVE 1

## Lois Dr. (Looking North)



## 32<sup>nd</sup> Avenue (Looking East)



\*Center median only to be constructed at transmission and distribution poles

Figure 7 - Alternative 1 typical cross sections

## 2) Roadway and Intersection Alternative 2

Roadway Alternative 2 reduces the separation buffer between the back of curb and the pedestrian facilities to reduce impacts to adjacent properties (see [FIGURE 8](#)).

### a) Lois Drive:

Alternative 2 for Lois Drive is similar to Alternative 1, except the pedestrian facilities would be separated from the back of curb by 4.5 feet instead of 7 feet. Driveway access would be by curb return (commercial, including 8-plex and greater) or curb cut (residential). This alternative requires minimal PUE and slope easement acquisitions along Lois Drive. MOA Traffic Engineering has no adverse comments regarding this alternative.

### b) W. 32<sup>nd</sup> Avenue

Alternative 2 for W. 32<sup>nd</sup> Avenue is also similar to Alternative 1, with the exception that pedestrian facilities would be attached to the back of curb and the width of the pathway may be reduced to 8-feet wide to reduce ROW impacts. Additionally, this alternative provides the option to retain not only the existing transmission poles but also the existing distribution poles by constructing the curbed center median along the length of the project. Similar to Alternative 1, it is not ideal for the transmission and distribution poles to be located between travel lanes, even when they are located within a curbed median. Median breaks would be constructed at the intersections with Oregon Drive, Wyoming Drive, the east school driveway access, and Greenland Drive. The median would continue across the intersections with the four alleys because there are existing utility poles at these locations that need to be retained with the construction of a median. Driveway access would be by curb return (commercial, including 8-plex and greater) or curb cut (residential). The turn lane and median for the north bound left turns from Minnesota Drive to W. 32<sup>nd</sup> would be adjusted to accommodate the new lane locations along W. 32<sup>nd</sup> Avenue.

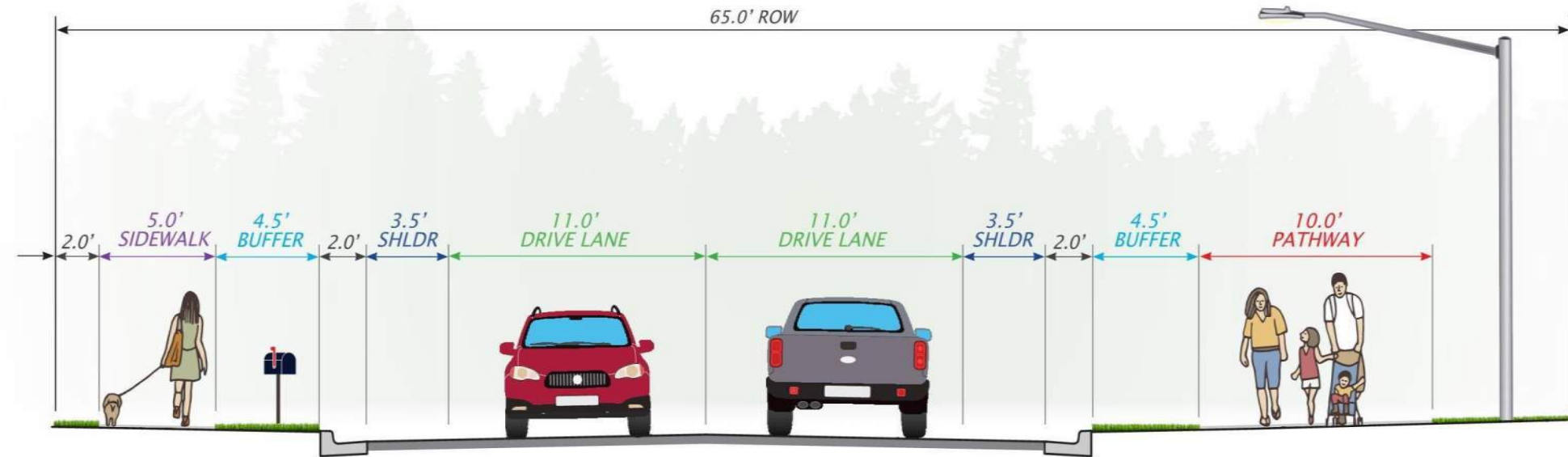
This alternative would require full acquisition of Parcel 122 and relocation of affected property owners. Relocation of Parcel 122 would be very complex and costly and thus this alternative is not recommended. MOA Traffic Engineering has stated that they cannot support this alternative.

### c) Intersection of Lois Drive and W. 32<sup>nd</sup> Avenue

Intersection Alternative 2 centers the roadway within the ROW on the north and east legs of the intersection, resulting in a roadway centerline that is off-set from the ROW centerline for the south and west legs. Appropriate transition lengths on the south and west legs would shift the roadway centerline to the existing ROW centerline to match the existing roadways. A center median would be located on the west leg of the intersection to accommodate the existing transmission pole. This alternative would require full acquisition of Parcel 114. Because of the full acquisition requirements, this intersection alternative is not recommended.

## ALTERNATIVE 2

**Lois Dr.**  
(Looking North)



**32<sup>nd</sup> Avenue**  
(Looking East)

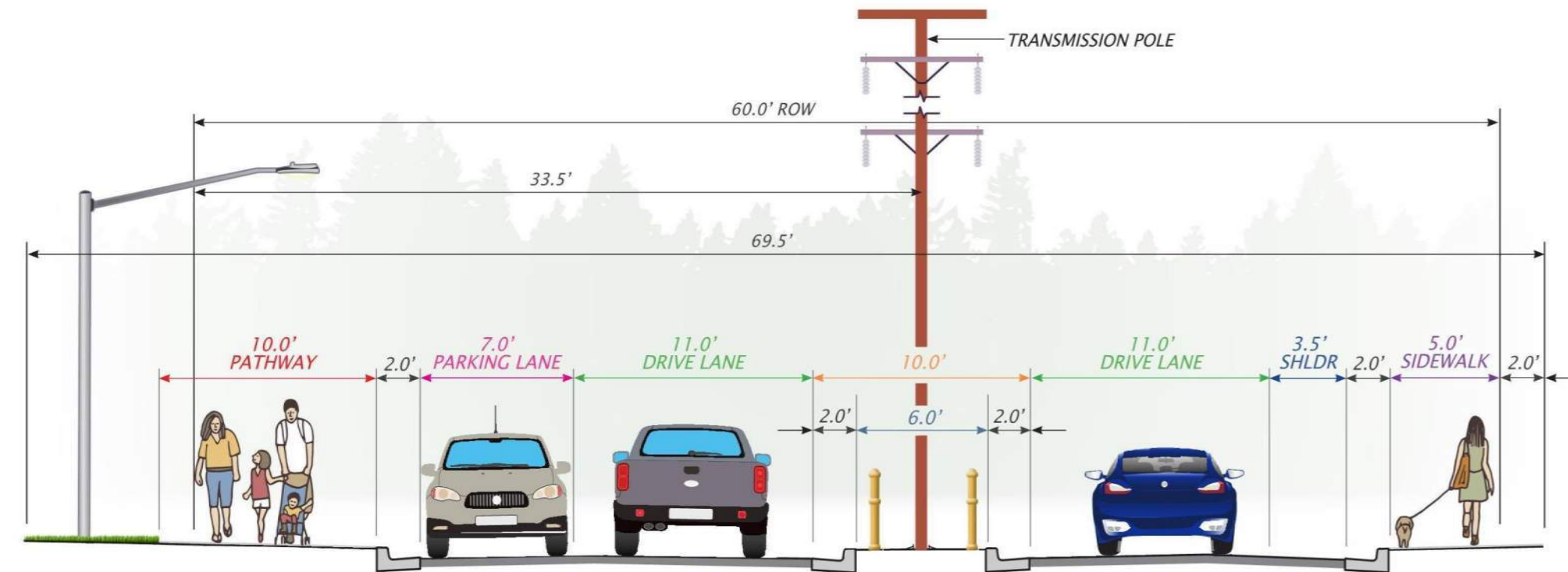


Figure 8 - Alternative 2 typical cross sections



### 3) Roadway and Intersection Alternative 3

Roadway Alternative 3 further reduces the typical section to minimize impacts to adjacent properties.

a) Lois Drive:

Alternative 3 for Lois Drive is has a similar roadway cross section to Alternatives 1 and 2, except the pathway on the east side would be attached to the back of curb and the sidewalk on the west side would be separated from the back of curb by 3 feet in order to provide space to install the individual mailboxes (see [FIGURE 9](#)). Driveway access would be by curb return (commercial, including 8-plex and greater) or curb cut (residential). This alternative requires no PUEs and minimal slope easement acquisitions along Lois Drive.

b) W. 32<sup>nd</sup> Avenue

Alternative 3 for W. 32<sup>nd</sup> Avenue is divided into two segments, 3A (west end of roadway) and 3B (east end of roadway), to minimize impacts to the existing infrastructure along the roadway (see [FIGURE 10](#)). Alternative 3A would be constructed along Aquarian Charter School and includes two, 10-foot travel lanes with 1.0-foot wide shoulders and barrier (Type 1) curb and gutter. The total roadway width (measured from back of curb) of Alternative 3A is 26.0 feet. An 8 to 10-foot wide paved pathway would be constructed along the north side. The pathway would be separated from the back of curb with a 7-foot buffer to accommodate the existing transmission and distribution poles. No pedestrian facilities would be constructed along the south side of the roadway for this section. Driveway access would be by curb return (commercial, including 8-plex and greater) or curb cut (residential).

Just east of Aquarian Charter School, the typical section would transition to 3B which locates the 8 to 10-foot wide pathway on the south side of the roadway; the pathway would be attached to the back of curb. The pedestrian route would transition from the north side of the roadway to the south via a marked crosswalk near the eastern driveway of Aquarian Charter School. During detailed design, this location will be further evaluated to determine the best location for the crossing. Ideally, the pedestrian crossing would be located at an intersection if possible. Additionally, the curb type along the north side of the roadway for Alternative 3B would be rolled (Type 2) to accommodate the full-frontage access and parking along Parcel 122 (Anchorage Sands Apartments). Rolled curb and gutter is proposed due to the close spacing between the direct/full-frontage parking access and on-site drive aisles on Parcel 122. The wider driveway (i.e. full frontage access) is anticipated to be a legally non-conforming feature based on the date of construction of the property.

Driveway access would be by curb return (commercial, including 8-plex and greater), curb cut (residential), and rolled curb for Parcel 122. The existing transmission and distribution poles would remain and be located behind the back of curb along the north side. No adjustments to the curbed median in Minnesota Boulevard are required. Alternative 3 would require full acquisition of Parcel 121.

c) Intersection of Lois Drive and W. 32<sup>nd</sup> Avenue

Intersection Alternative 3 constructs a mini-roundabout/traffic circle. Various roundabout location were analyzed to:

- Minimize impacts to existing infrastructure (i.e. houses)
- Minimize or avoid impacts to existing utilities
- Locate the existing transmission pole outside of the roadway and roundabout roadway (i.e. not within the center or splitter islands)

The recommended location shifts the intersection towards the northeast, onto the undeveloped area of Parcel 123 (Aquarian Charter School), which requires combining the south and west legs, resulting in a three-leg roundabout. The roundabout was then shifted further northeast to allow adequate vehicle storage space on the newly combined southwest leg. The existing transmission pole at the northeast corner of the existing intersection would be located behind the back of curb and not require relocation. This alternative also does not require full acquisition of any properties. However, to avoid relocation of the transmission poles, roadway improvements would be constructed within close proximity to infrastructure located on Parcel 113. As shown in SECTION VI, a roundabout would function adequately at this intersection.

## ALTERNATIVE 3

**Lois Dr.**  
(Looking North)

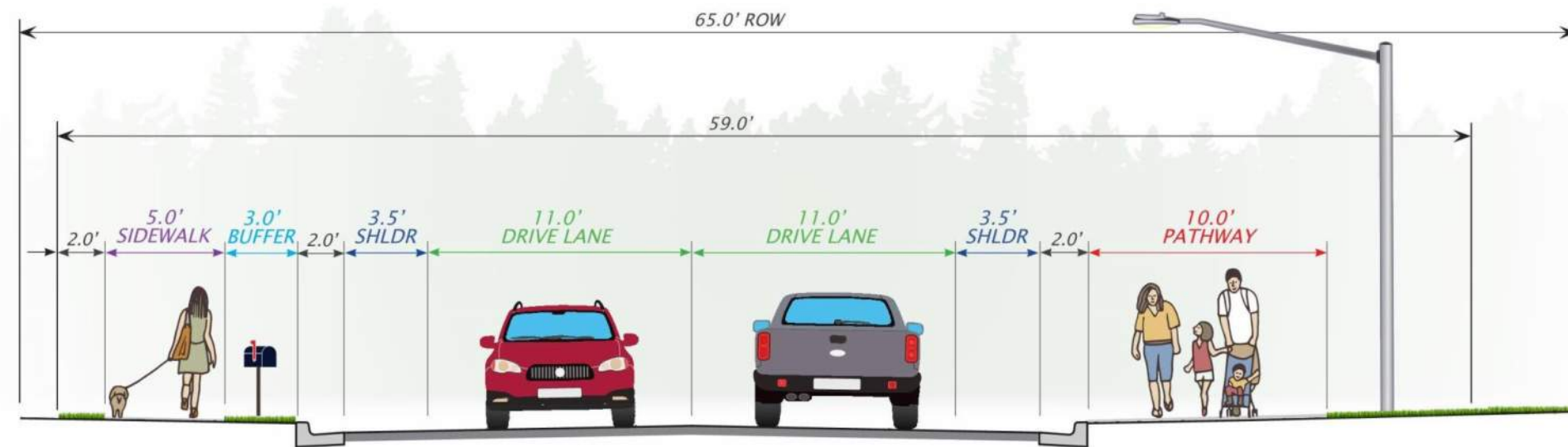
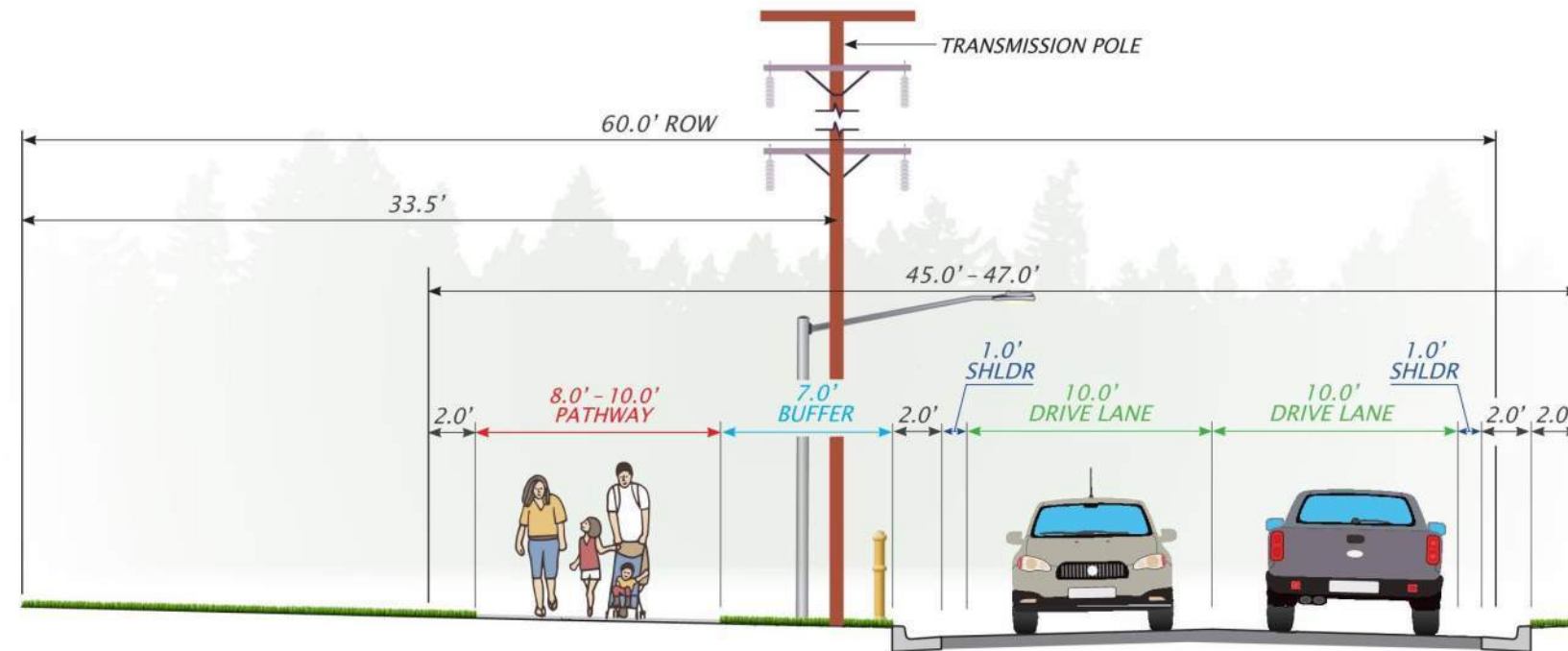


Figure 9 - Alternative 3 Lois Drive typical section

# ALTERNATIVE 3

## 32<sup>nd</sup> Avenue Alternative 3A – West End (Looking East)

Alternative 3A would be constructed along the west end of 32<sup>nd</sup> Avenue (along Aquarian Charter School)



## 32<sup>nd</sup> Avenue Alternative 3B – East End (Looking East)

Alternative 3B would be constructed along the east end of 32<sup>nd</sup> Avenue (along Anchorage Sand Apartments)

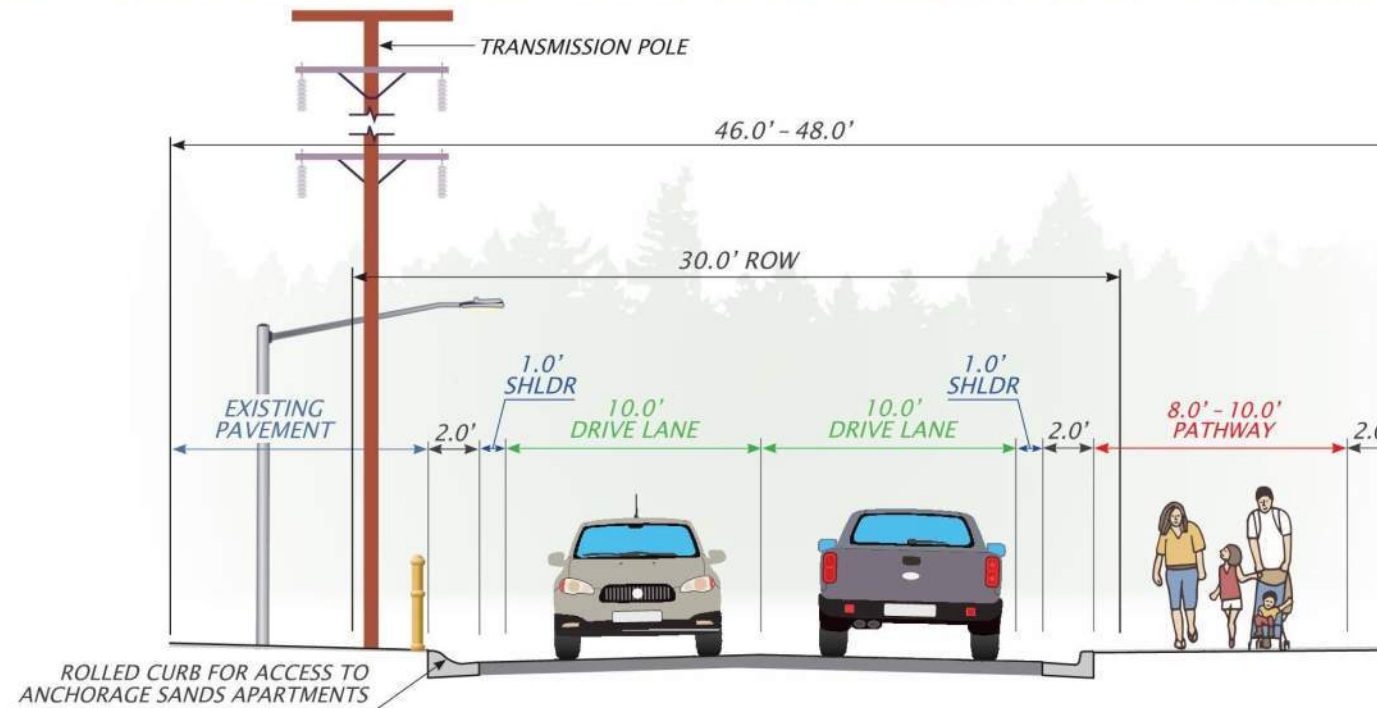


Figure 10 - Alternative 3 W. 32<sup>nd</sup> Avenue typical cross sections

#### 4) Roadway Alternative 4

Roadway Alternative 4 is a “Pathway only” option and only construct pedestrian facilities along the project corridor.

d) Lois Drive:

Alternative 4 for Lois Drive constructs an 8-foot wide pathway only along the east side of the roadway (see FIGURE 11). The pathway would be separated from the existing edge of pavement by 8 – 19 feet to avoid impacting existing infrastructure (light poles, commercial signs, and drainage infrastructure). No other improvements or impacts are proposed.

e) W. 32<sup>nd</sup> Avenue

Alternative 4 for W. 32<sup>nd</sup> Avenue is divided into two segments, 4A (west end of roadway) and 4B (east end of roadway) (see FIGURE 12Figure 11). Alternative 4A constructs an 8 to 10-foot wide pathway along the north side of the roadway, separated from the existing edge of pavement by a 15 – 20 foot buffer. Just east of Aquarian Charter School, the typical section would transition to 4B, which includes barrier curb and gutter and an 8 to 10-foot wide pathway along the south side of the roadway only. The curb and gutter would be constructed at the edge of the existing pavement. A new, 10-foot wide pathway would be attached to the back of curb. The curb and gutter is proposed in order to provide separation between the travel lanes and the pathway. The pedestrian route would transition from the north side of the roadway to the south via a marked crosswalk. No other improvements or impacts are proposed.

Alternative 4 would still require full acquisition of Parcel 121.



## ALTERNATIVE 4

**Lois Dr.**  
(Looking North)

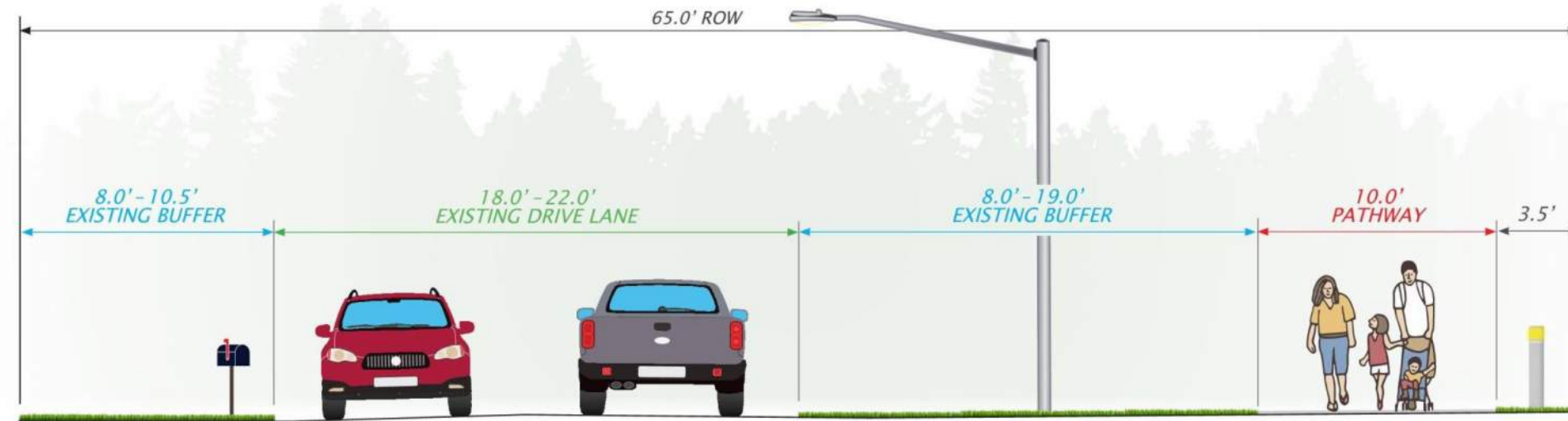
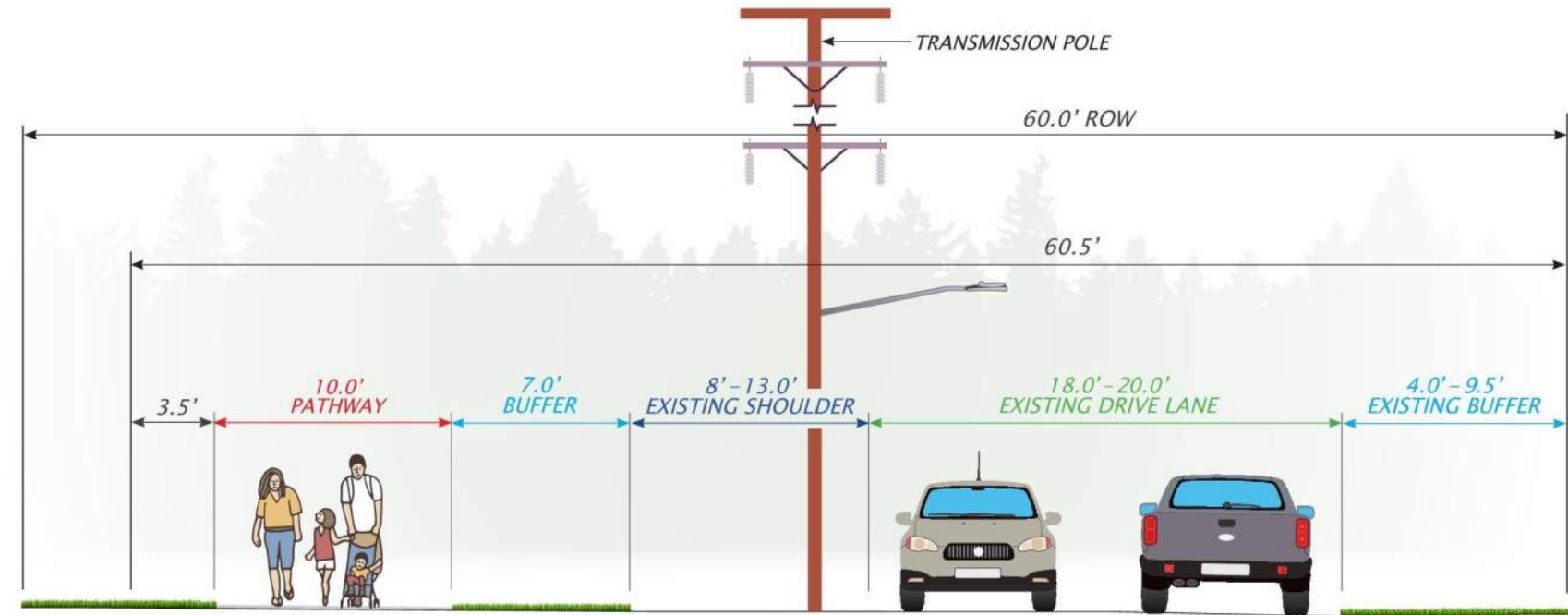


Figure 11 - Alternative 4 Lois Drive typical cross section

# ALTERNATIVE 4

## 32<sup>nd</sup> Avenue Alternative 4A – West End (Looking East)

Alternative 4A would be constructed along the west end of 32<sup>nd</sup> Avenue (along Aquarian Charter School)



## 32<sup>nd</sup> Avenue Alternative 4B – East End (Looking East)

Alternative 4B would be constructed along the east end of 32<sup>nd</sup> Avenue (along Anchorage Sand Apartments)

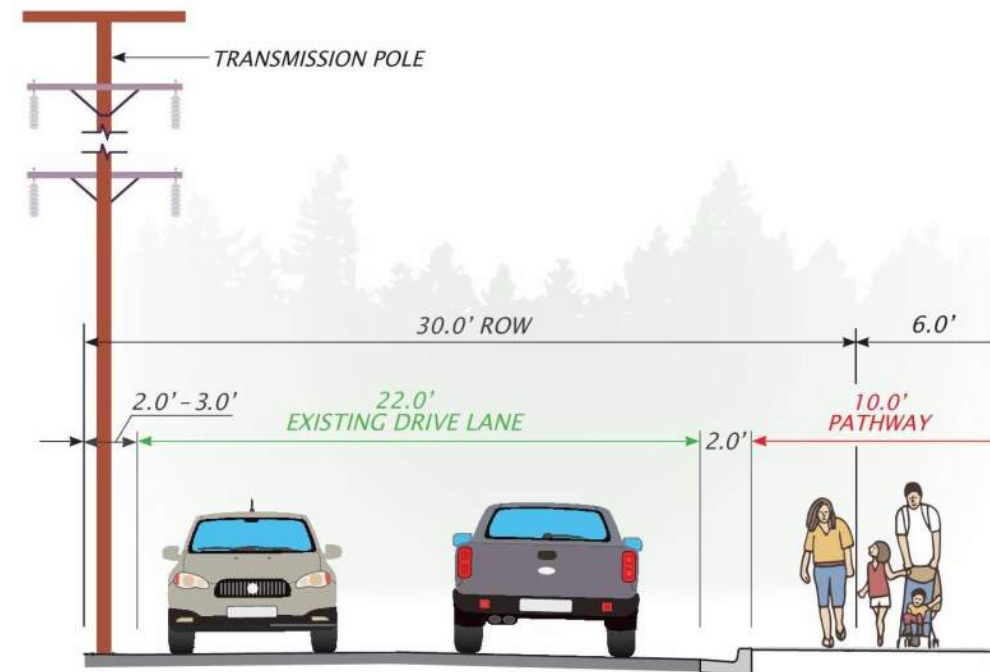


Figure 12 - Alternative 4 W. 32<sup>nd</sup> Avenue typical cross sections.

#### **D. Pathway Width:**

Two pathway widths were analyzed: 8-feet and 10-feet wide. The current DCM requires a minimum pathway width of 8-feet. MOA prefers pathways be 10-feet wide where possible and where the additional width will not require acquisition of private property. Along Lois Drive, the 10-foot wide pathway does not generally require the acquisition of additional ROW compared to an 8-foot wide pathway. Where it does, ROW impacts can be mitigated by narrowing of pathway buffers and shifting of the roadway centerline.

Along W. 32<sup>nd</sup> Avenue, a 10-foot wide pathway increases the amount of ROW acquisition in some locations relative to an 8-foot wide pathway. Use of an 8-foot pathway may still require the full acquisition of specific properties (ex. parcel 121 for Alternative 4). The final pathway width on W. 32<sup>nd</sup> Avenue will be determined during design after full field survey of the corridor has been completed and the ROW impacts can be more accurately determined..

#### **E. Roadway Markings**

Roadway markings along Lois Drive (a collector road) would include double-yellow centerlines and white shoulder striping. No centerline or shoulder markings are proposed along W. 32<sup>nd</sup> Avenue as it is a local road. However, Alternatives 1 and 2 for W. 32<sup>nd</sup> Avenue would include 18-inch yellow diagonal markings where the curbed center median is not constructed. Diagonal markings are necessary because the median width is not sufficient for construction of left turn lanes. Both Lois Drive and W. 32<sup>nd</sup> Avenue would include marked stop-bars at stop-signs as appropriate. Alternatives 3 and 4 also includes a marked crosswalk on W. 32<sup>nd</sup> Avenue, just east of Aquarian Charter School. Intersection Alternative 3 (roundabout) includes appropriate markings for approaching and traveling through the roundabout.

#### **F. Horizontal Alignment**

The existing roadways along the project corridor are generally not centered in the existing ROW. Within the project limits, Lois Drive is currently offset to the west, with the center of existing roadway located approximately 8.5 feet west of the center of the ROW centerline. South of the project limits, where the ROW for Lois Drive is reduced to 30 feet, the existing roadway is centered in the ROW.

Within the project limits, W. 32<sup>nd</sup> Avenue is currently offset to the south, with the center of existing roadway located approximately 10 feet south of the existing ROW centerline. At the east end of the project limits, where the ROW for W. 32<sup>nd</sup> is reduced to 30 feet, the existing roadway is centered in the ROW. West of the project limits, where the ROW for W. 32<sup>nd</sup> is reduced to 30 feet, the existing roadway is centered in the ROW.

The proposed roadways will be typically centered within the ROW, however during design development the proposed roadway centerline locations may be adjusted to balance improvements within the ROW and limit impacts to adjacent properties and utilities.

## G. Vertical Alignment

The overall intent of the roadway profile is to maintain adequate grades for drainage along the project corridor while minimizing adverse effects on surrounding driveways, side streets, and infrastructure. The more the proposed roadway grade is changed from the existing grade, the more the cut and fill slopes will impact adjacent properties. Driveways and side streets must also be adjusted to match the new roadway grades. The proposed conceptual roadway profiles for each Alternative are shown in [APPENDIX B](#). Existing and proposed roadway profiles were developed based on existing record drawing, GIS data, field visits, and topographic LIDAR data.

During design development the proposed profiles will be iteratively modified in more detail to provide a well-balanced design that minimizes impacts to adjacent properties and provides acceptable driveway grades.

The existing roadway grades in the project area are generally very flat, between 0.1% and 0.8% with the exception near the intersection with Benson Boulevard, with a grade of approximately 2.8%. While flat grades can be beneficial for matching side street and driveway slopes and minimizing impacts to adjacent properties, it can cause drainage issues and ponding. To ensure adequate grades for positive drainage, alternate low and high spots will be built into the roadway profile, with drainage inlets installed at the low points to catch surface drainage.

## H. Design and Posted Speed

Based on comments from local residents, speeding was not mentioned as a concern along Lois Drive or W. 32<sup>nd</sup> Avenue. However, improved roadway conditions could potentially increase vehicle speeds with a smoother, wider roadway. The roadways along the project corridor are being designed for both motorized and non-motorized users, and as such, a lower posted and design speed is likely appropriate for Lois Drive, which, as a Collector Roadway, has a required design speed of 35 MPH. Through coordination with MOA Traffic Engineering, it has been decided that a posted speed of 25 MPH is appropriate. Therefore, a posted speed of 25 MPH, to match the existing posted speed limits, and a design speed of 30 MPH is recommended for both Lois Drive and W. 32<sup>nd</sup> Avenue.

## I. Landscaping

Specific landscape features for consideration on Lois Drive and W. 32<sup>nd</sup> Avenue are as follows:

1) Lois Drive – West Side:

Protect existing mature vegetation where possible along the roadway corridor. This could include narrowing buffers behind curb in select locations to preserve specific trees.

2) Lois Drive – East Side

Reduce the width of the access drive to the business building near the corner of Lois Drive and Benson Boulevard and add a planting buffer between the parking lot and roadway edge.

Maintain a vegetated buffer between the paved pathway and roadway and preserve select trees where possible. Clear and grub vegetation smaller than 2-inch caliper for improved visibility and replace with shrubs with a mature height below 24-inch or with Schedule A lawn seed mix.

3) W. 32nd Avenue – North Side

Thin existing low vegetation and preserve healthy trees in the buffer between existing paved path on north side of 32<sup>nd</sup> Avenue and the roadway edge for better visibility.

4) W. 32nd Avenue – South Side

Protect existing mature vegetation where possible along the roadway corridor and within Minnesota Park.



## **XI. Drainage Improvements**

The condition assessment and drainage analysis discussed in [SECTION IV](#) identified a number of deficiencies in the existing storm drain systems within the project limits. One of the primary goals for this project is to improve drainage and correct any issues within the project corridor.

The proposed drainage improvements consist of the following:

- Replace and upsize the aging storm drain on Lois Drive, between 29<sup>th</sup> Avenue and W. 32<sup>nd</sup> Avenue, to align with new roadway improvements
- Replace 170 feet of undersized and aging CMP storm drain pipe on 31<sup>st</sup> Avenue from the Lois Drive and 31<sup>st</sup> Avenue intersection to the downstream manhole
- Extend the Lois Drive system to W. 32<sup>nd</sup> Avenue to provide continuous storm drain system and runoff collection at the intersection
- Replace and upsize the aging storm drain on W. 32<sup>nd</sup> Avenue to align with new roadway improvements
- Extend the W. 32<sup>nd</sup> Avenue system to the west to capture runoff at all designed low points
- Install catch basins at new roadway low points and other low lying areas to alleviate ponding issues
- Replace catch basins and leads as required to match new curb and gutter
- Provide positive roadway drainage to minimize ponding
- Provide water quality treatment for storm runoff
- Provide freeze protection for storm drain systems.

The proposed storm drain configuration as described below is shown on the plan and profile sheets in [APPENDIX C](#). The configurations shown are based on the preferred roadway alternatives.

### **A. Hydrologic and Hydraulic Model Results**

A hydrologic and hydraulic (drainage) model was developed for the proposed storm drain conveyance system, similar to the existing conditions drainage model. The purpose of the proposed drainage model is to properly size the new stormwater system and correct any issues identified in the existing system. The two primary systems that will be upgraded are the Lois Drive system between 29<sup>th</sup> Avenue and W. 32<sup>nd</sup> Avenue and the W. 32<sup>nd</sup> Avenue system between Lois Drive and Minnesota Drive.

A total of 6 contributing catchments were delineated and evaluated for runoff response for the proposed condition. One existing contributing catchment within the project boundary was subdivided into two catchments based on the addition of new curb inlets planned along W. 32<sup>nd</sup> Avenue. Existing catchment F-1.2 was subdivided into new catchments F-1.2 and F-2.3 in the proposed model to better evaluate the overall effectiveness of the proposed W. 32<sup>nd</sup> Avenue system.

Peak runoff and pipe flows for the proposed drainage systems are reflected in [FIGURE 5](#), [APPENDIX D](#). The complete SSA modeling results can also be found in [APPENDIX D](#). Note that the full flow capacity

for each proposed pipe exceeds the peak flow condition, demonstrating that the pipe is adequately sized to handle the design storm event.

### **B. Replace Lois Drive System – 29<sup>th</sup> Avenue to W. 32<sup>nd</sup> Avenue**

The existing storm drain pipe on Lois Drive between 29<sup>th</sup> Avenue and W. 32<sup>nd</sup> Avenue is constructed of CMP and was installed approximately 40 years ago. The mainline pipe was assessed using CCTV and was found to have debris buildup, mineralization/infiltration at pipe joints, root intrusions, visible soil, and a significant gouge through one of the pipes. Based on the modeling results, the existing pipe along this segment of roadway is undersized to convey the design storm event. In addition, one pipe segment of 345 feet exceeds the maximum allowed manhole spacing of 300 feet. Pipe and structures along this stretch of roadway will be removed and replaced to allow alignment with curb and gutter.

The proposed storm drain pipe for Lois Drive consists 18-inch corrugated polyethylene pipe (CPEP). To meet separation distance from the water utility, the main line pipe will be relocated to the roadway's east side. Type II catch basin manholes (CBMH) will be installed under the east curb line to collect curb flow while also providing safer maintenance access through a manhole opening off the roadway. Connecting catch basins are located at the west side to intercept curb flow on the roadway's west side at designed low points. Two existing field inlets and the associated leads will be removed and replaced that capture runoff from adjacent low lying properties (Parcels 123 and 124).

### **C. Replace 31<sup>st</sup> Avenue Upstream Pipe Segment**

The Lois Drive system discussed above flows into the 31<sup>st</sup> Avenue system, which conveys runoff westward and eventually discharges into Fish Creek. The first segment of pipe along 31<sup>st</sup> Avenue from Lois Drive is a 15-inch CMP and was constructed in the 1980's. This pipe was assessed using CCTV and was found to have moderate debris buildup, mineralization/infiltration at pipe joints, and significant joint separation. The existing 170-foot pipe is undersized to convey the design storm event due to the pipe material and slope, which creates a bottleneck effect for flows entering the system from Lois Drive. While this pipe is outside the project limits, it is recommended that this segment be removed and replaced due to its age and restriction on the overall system.

The proposed storm drain pipe would replace the 15-inch CMP with 18-inch CPEP. The proposed pipe follows a similar layout as the existing pipe and connects the proposed type II CBMH on Lois Drive with the existing manhole on 31<sup>st</sup> Avenue. Replacement of the pipe segment allows proper flow capacity to prevent surcharging and back-up of flows into the Lois Drive system.

### **D. Extend Lois Drive System – Lois Drive and W. 32<sup>nd</sup> Avenue Intersection**

There is currently no storm drain infrastructure at the intersection of Lois Drive and W. 32<sup>nd</sup> Avenue. This has led to ponding and poor drainage at the intersection. Runoff from this intersection will be collected at proposed inlets and conveyed to the proposed system on Lois Drive.

The proposed storm drain system extension will consist of installing 180 feet of 18-inch CPEP. To meet separation distance requirements from the water and sewer utilities, the storm drain pipe

extension will follow the Lois Drive system's layout and be installed on the east side of the intersection. Type II CBMHs are installed under curb line to collect curb flow, while also providing safer maintenance access through a manhole opening off the roadway. A Type I manhole would be installed in the roadway intersection to allow connection with catch basins on W. 32<sup>nd</sup> Avenue. These improvements will provide a continuous storm drain system and allow runoff collection at the Lois Drive and W. 32<sup>nd</sup> Avenue intersection.

#### **E. Replace W. 32<sup>nd</sup> Avenue System – Minnesota Drive to West of Greenland Drive**

The existing storm drain pipes on W. 32<sup>nd</sup> Avenue between Minnesota Drive and west of Greenland Drive are constructed of reinforced concrete pipe (RCP) and CMP. The mainline pipe was assessed using CCTV and was found to have significant debris buildup and offset joints. The existing pipe along this segment of roadway is undersized to convey the design storm event. One pipe segment (of 395 feet) exceeds the maximum allowed manhole spacing of 300 feet. In addition, based on record drawings, a 64-foot portion of the pipe that connects with the Minnesota Drive system has a 0.2 percent slope which does not meet the minimum required 0.3 percent slope per the ASM. Pipe and structures along this stretch of roadway will be removed and replaced based on the issues noted above and to allow alignment with proposed curb and gutter.

The proposed storm drain pipe for W. 32<sup>nd</sup> Avenue consists of installing CPEP ranging in size from 18-inch to 24-inch from Minnesota Drive to West of Greenland Drive. Existing water and sewer mains are located on the south and center of the roadway, respectively. To meet separation distance requirement from these utilities, the storm drain pipe will be installed along the north side of the roadway. Type II CBMHs will be installed under the north curb line to collect curb flow, while also providing safer maintenance access through a manhole opening off the roadway. Connecting catch basins are located at the south side to intercept curb flow on the roadway's south side.

Once the location of each proposed inlet is confirmed, the unmapped existing 8-inch CPEP will be connected to a proposed manhole or CBMH.

#### **F. Extend W. 32<sup>nd</sup> Avenue System – West of Greenland Drive to Oregon Drive**

There is currently no storm drain infrastructure between Oregon Drive and Wyoming Drive. This has led to ponding, poor drainage, and roadway degradation along W. 32<sup>nd</sup> Avenue. Runoff from this portion of the roadway will be collected at proposed inlets at designed roadway low points and then conveyed to the proposed system on W. 32<sup>nd</sup> Avenue.

The proposed storm drain system extension will consist of installing 18-inch CPEP from where the existing system currently terminates to Oregon Drive. To meet separation distance requirements from the water and sewer utilities, the storm drain pipe extension will follow the eastern segment of W. 32<sup>nd</sup> Avenue system described above and be installed on the north side of the roadway. Type II CBMHs will be installed under the north curb line to collect curb flow, while also providing safer maintenance access through a manhole opening off the roadway. Connecting catch basins on W. 32<sup>nd</sup> Avenue will be located at the south side to intercept curb flow. These improvements will

provide a continuous storm drain system along this segment of W. 32<sup>nd</sup> Avenue and will alleviate drainage issues identified above.

### **G. Replace existing Catch Basins and Leads**

The proposed roadway layout will install new curb line along the entire project corridor. In most cases, the locations of the existing catch basins will not line up with the proposed curb line. Therefore, these existing catch basins will need to be removed. New catch basins and connecting leads will be installed to match the proposed curb line.

### **H. Minimize Ponding**

The proposed roadway profile is designed to establish high and low points throughout the project corridor. These high and low points 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 and extend the life of the roadway.

### **I. Water Quality Treatment**

The new permit requirements referenced in ASM Section 3.B.1 state that stormwater management systems are to provide water quality treatment through the use of Green Infrastructure (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 determined to be infeasible due to site constraints such as poorly infiltrating soils, high ground water, on-site space constraints, shallow bedrock, etc. For cases where GI treatment is determined to be infeasible, water quality treatment may be provided through the use of traditional gray infrastructure such as an oil and grit separator (OGS).

Section 3.3.2.1 of the ASM also states that roadway projects with narrow ROW (60-feet or less) may choose to provide stormwater treatment through either GI or traditional treatment, regardless of site constraints. The ROW width within project limits ranges from 30 to 65 feet.

Due to the limited amount of ROW along the project corridor and the desire to provide pedestrian facilities, providing water quality treatment solely through GI will not be achievable. However, implementing small GI features at select locations along W. 32<sup>nd</sup> Avenue and Lois Drive are being considered and evaluated. Continued coordination is anticipated with MOA Watershed Management Services, Traffic Engineering, and Street Maintenance to discuss options to meet the GI treatment requirement while maintaining other project goals. Potential options include bioretention and/or vegetative swales located within a buffer between the back of curb and sidewalk to provide intermittent treatment.

There are no existing OGSs that treat runoff for the Lois Drive and W. 32<sup>nd</sup> Avenue storm drain systems. Where practical and feasible, OGSs and additional GI features will be implemented to

provide water quality treatment for these subsystems. A bypass system will be installed in conjunction with the OGS for maintenance of the structure.

## **J. 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 roadway structural section includes insulation for this project, so additional insulation will not be required for storm drain pipe that is located between three and four feet of cover. A thaw system is anticipated for the W. 32<sup>nd</sup> Avenue storm drain system due to lack of cover over several pipe segments at the west end. Additional review and consideration for this area will be discussed with MOA Street Maintenance as the project moves forward. Heat trace system is currently included in the DSR project costs.



## XII. Right-of-Way Impacts

Preliminary estimated easement and permit requirements are summarized in TABLE 16 below and are detailed in APPENDIX H. As the planning and design of this project progresses, the required easements and temporary construction permits will be refined.

*Table 16 – Lois Drive: Estimated Right-of-Way Easements / Permits*

Alternative	Purchase Entire Property	Public Use Easements (PUE)	Slope Easements (SE)	Temporary Construction Easements (TCE)	Temporary Construction Permits (TCP)
1	0	15	13	0	15
2	0	3	4	0	13
3	0	0	2	0	12
4	0	0	2	0	3

*Table 17 – W. 32<sup>nd</sup> Avenue: Estimated Right-of-Way Easements / Permits*

Alternative	Purchase Entire Property	Public Use Easements (PUE)	Slope Easements (SE)	Temporary Construction Easements (TCE)	Temporary Construction Permits (TCP)
1	2	7	7	2	7
2	1	3	5	5	9
3	1	7	6	4	13
4	1	3	4	2	6

*Table 18 – Intersection Alternatives: Estimated Right-of-Way Easements / Permits*

Alternative	Purchase Entire Property	Public Use Easements (PUE)	Slope Easements (SE)	Temporary Construction Easements (TCE)	Temporary Construction Permits (TCP)
1	2	1	0	0	1
2	1	3	2	0	2
3	0	4	0	1	3

### **XIII. 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 will be notified if relocation of any of these lines are required.

In the ROW, the Municipality requires a minimum burial depth of 42 inches for buried gas lines, electric cables, fiber optic lines, 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 the facility. In some locations, the structural section excavation will impact utilities. In these locations the utilities will either require relocation or will require support in place for the contractor to work around the utility.

AWWU requires a minimum depth of cover of 10 feet over their water mains and 8 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 assumed roadway cross section includes 2-inches of rigid board insulation which would mitigate some reduction in cover above water and sewer mains.

The utility relocation cost estimates for each Alternative are shown in APPENDIX I. Utility relocation estimates do not include planned improvements by AWWU, which separate projects.

## **XIV. Permitting and Agency Approvals**

Permits and agency approvals required for construction of the proposed improvements will be limited. Because Lois Drive is classified as a collector roadway, it will be necessary to obtain approval of the DSR from the Planning and Zoning Commission (PZC) and approval of the Preliminary Design (65% design) from the Urban Design Commission.

A meeting was held with MOA Planning on July 14, 2020 to discuss the project and its alternatives to ensure the project follows the necessary process for the various improvement levels associated with the alternatives (i.e. if Alternative 4, which only constructs a pathway, is selected, is the full PZC review process required?) From that meeting and MOA Planning's research, the project will follow the full review process, regardless of the recommended alternative, including submitting the DSR to the PZC for review and approval. For this project, the PZC will have the authority to review and approve variance requests for roadway/pedestrian improvements with the DSR review. Additionally, because it is anticipated that the project will include variance requests, the project would become a public hearing.

Anticipated permits and agency approvals required for design include:

- MOA Watershed Management Services Stormwater Plan Approval
- ADEC Approval to Construct Storm Drain Improvements and Separation Waivers (assumed)
- Department of Natural Resources (DNR) Temporary Water Use Permit for dewatering

Coordination with ADOT for upgrading the existing storm drain system along W. 32<sup>nd</sup> Avenue that connects to their system along Minnesota Drive will occur during the design phase. Additional permits may be identified as the design develops.

## **XV. Construction Schedule and Phasing**

The project is currently being funded through local road bonds for the planning/concept and design study phase; the project is currently only funded through the design study phase. Additional funding will be necessary for design and pre-construction tasks (including any right-of-way acquisitions and utility relocations).

It is anticipated that the project will be phased over multiple construction seasons to accommodate funding availability. The earliest construction could occur is in 2022 if funding becomes available.

## XVI. Quantity and Cost Estimates

A summary of estimated project costs for the proposed improvements is presented below for each alternative. The final recommended improvements may include elements from each alternative and could be higher or lower than the estimated costs provided below. The cost estimates shown below are for the entire project corridor. A breakdown of the ROW, construction, utility, design, and management cost estimates can be found in APPENDIX I. Individual estimates are shown in TABLE 19, TABLE 20, and TABLE 21, for Lois drive, W. 32<sup>nd</sup> Avenue and the intersection, respectively, with a summary of estimates for the preferred alternative shown in TABLE 22.

Table 19 – Lois Drive: Summary of Estimated Roadway Costs

Category	Alternative 1	Alternative 2 (preferred)	Alternative 3	Alternative 4
Design & Management Total (estimated)	\$326,000	\$325,000	\$323,000	\$110,000
ROW Acquisition Total	\$140,000	\$55,000	\$13,000	\$10,000
Utility Relocation (15% Contingency) Total	\$177,000	\$184,000	\$83,000	\$0
<b>A. Design, ROW Acquisition, Utility Relocation</b>	<b>\$643,000</b>	<b>\$564,000</b>	<b>\$419,000</b>	<b>\$120,000</b>
<u>Construction</u>				
Roadway Improvements	\$1,184,000	\$1,154,000	\$1,018,000	\$144,000
Drainage Improvements	\$287,000	\$287,000	\$287,000	\$0
Illumination Improvements	\$136,000	\$136,000	\$136,000	\$200,000
<i>Construction Subtotal</i>	\$1,607,000	\$1,577,000	\$1,441,000	\$344,000
<i>Construction Contingency (15%)</i>	\$241,000	\$237,000	\$216,000	\$52,000
<i>Construction Management / Inspection / Testing</i>	\$180,000	\$177,000	\$161,000	\$61,000
<b>B. Total Estimated Construction Cost (rounded)</b>	<b>\$2,028,000</b>	<b>\$1,991,000</b>	<b>\$1,818,000</b>	<b>\$457,000</b>
<b>C. Overhead / Accounting</b>	<b>\$471,000</b>	<b>\$450,000</b>	<b>\$395,000</b>	<b>\$102,000</b>
<b>Lois Drive Roadway: Total Estimated Project Cost (A + B + C)</b>	<b>\$3,142,000</b>	<b>\$3,005,000</b>	<b>\$2,632,000</b>	<b>\$679,000</b>



Table 20 – W. 32<sup>nd</sup> Avenue: Summary of Estimated Roadway Costs

Category	Alternative 1	Alternative 2	Alternative 3 (preferred)	Alternative 4
Design & Management Total (estimated)	\$437,000	\$435,000	\$427,000	\$110,000
ROW Acquisition Total	\$4,649,000	\$3,958,000	\$616,000	\$526,000
Utility Relocation (15% Contingency) Total	\$1,113,000	\$481,000	\$551,000	\$7,000
<b>A. Design, ROW Acquisition, Utility Relocation</b>	<b>\$6,199,000</b>	<b>\$4,874,000</b>	<b>\$1,594,000</b>	<b>\$643,000</b>
<b>Construction</b>				
Roadway Improvements	\$1,813,000	\$1,722,000	\$1,149,000	\$232,000
Drainage Improvements	\$418,000	\$418,000	\$418,000	\$0
Illumination Improvements	\$186,000	\$186,000	\$186,000	\$269,000
<i>Construction Subtotal</i>	\$2,417,000	\$2,326,000	\$1,753,000	\$501,000
<i>Construction Contingency (15%)</i>	\$363,000	\$349,000	\$263,000	\$75,000
<i>Construction Management / Inspection / Testing</i>	\$261,000	\$251,000	\$196,000	\$70,000
<b>B. Total Estimated Construction Cost (rounded)</b>	<b>\$3,041,000</b>	<b>\$2,926,000</b>	<b>\$2,212,000</b>	<b>\$646,000</b>
<b>C. Overhead / Accounting</b>				
	\$1,631,000	\$1,377,000	\$672,000	\$227,000
<b>W. 32<sup>nd</sup> Avenue Roadway: Total Estimated Project Cost (A + B + C)</b>	<b>\$10,871,000</b>	<b>\$9,177,000</b>	<b>\$4,478,000</b>	<b>\$1,516,000</b>

Table 21 – Intersection Alternatives: Summary of Estimated Costs

Category	Alternative 1	Alternative 2	Alternative 3 (preferred)	Alternative 4
Design & Management Total (estimated)	\$106,000	\$106,000	\$112,000	\$0
ROW Acquisition Total	\$2,145,000	\$1,338,000	\$53,000	\$0
Utility Relocation (15% Contingency) Total	\$186,000	\$44,000	\$195,000	\$0
<b>A. Design, ROW Acquisition, Utility Relocation</b>	<b>\$2,437,000</b>	<b>\$1,488,000</b>	<b>\$360,000</b>	<b>\$0</b>
<b>Construction</b>				
Roadway Improvements	\$138,000	\$148,000	\$239,000	\$0
Drainage Improvements	\$96,000	\$96,000	\$96,000	\$0
Illumination Improvements	\$35,000	\$35,000	\$117,000	\$0
<i>Construction Subtotal</i>	\$269,000	\$279,000	\$452,000	\$0
<i>Construction Contingency (15%)</i>	\$40,000	\$42,000	\$68,000	\$0
<i>Construction Management / Inspection / Testing</i>	\$48,000	\$50,000	\$80,000	\$0
<b>B. Total Estimated Construction Cost (rounded)</b>	<b>\$357,000</b>	<b>\$371,000</b>	<b>\$600,000</b>	<b>\$0</b>
<b>C. Overhead / Accounting</b>				
	\$493,000	\$328,000	\$169,000	\$0
<b>Intersection Improvements: Total Estimated Project Cost (A + B + C)</b>	<b>\$3,287,000</b>	<b>\$2,187,000</b>	<b>\$1,129,000</b>	<b>\$0</b>

Table 22 – Preferred Improvements: Summary of Estimated Costs

Category	Lois Drive preferred: Alt 2	W. 32 <sup>nd</sup> preferred: Alt 3	Intersection preferred: Alt 3 (roundabout)	Total:
<b>Total Estimated Project Cost (A + B + C)*</b>	<b>\$3,005,000</b>	<b>\$4,478,000</b>	<b>\$1,129,000</b>	<b>\$8,612,000</b>

\*From Tables 19, 20, and 21 above.

## XVII. Stakeholder Coordination/Public Involvement

Using the MOA CSS process, the project team began public and agency outreach in November 2019 with the identification of over 1,000 project stakeholders. [TABLE 23](#) shows a list of stakeholders. The goal of the CSS process is to collaborate with all stakeholders to improve the safety and accessibility of the project area, balance diverse community interests, and to find areas of compromise that address budget and environmental concerns. At the time of printing, 243 separate comments were received from stakeholders through public meetings, comment forms, telephone calls, emails, the interactive website, on project scrolls, and documented in meeting records.

The public involvement format followed the traditional, in-person method until the advent of the COVID-19 pandemic in March of 2020. Following safety measures during the pandemic, the public outreach transitioned to a virtual format (ex. virtual open house). Through multiple mediums, including virtual presentations, direct email, and the interactive comment map on the project website, stakeholders could use various methods to communicate with the project team.

*Table 23 - List of Stakeholders*

MOA Agencies	Other
Project Management & Engineering Traffic Engineering Planning Transit AWWU Parks & Recreation Solid Waste Services Municipal Light & Power Anchorage Fire Department Street Maintenance Anchorage Police Department Mayor’s Office Assembly Anchorage School District	Area property owners, business owners, property managers, employees and residents Spenard Community Council Alaska DOT&PF Alaska Communications Systems (ACS) GCI Chugach Electric ENSTAR Representative Harried Drummond’s Office Senator Elvi Gray-Jackson

### A. Stakeholder Involvement Activities

Distribution of project information and meeting announcements included a combination of a project-specific website, mailed postcards, Spenard Community Council meeting, email notices, and in-person delivery of meeting notices to businesses along the project corridor. All public outreach activities are summarized in [TABLE 24](#). Copies of the mailing area, announcements, emails, meeting sign-in sheets, displays, meeting summaries, and other communications are included in [APPENDIX J](#).

Between October 2019 and September 4, 2020, the following activities were deployed to solicit stakeholder feedback:

*Table 24 - Stakeholder Coordination/Public Involvement Events*

<b>Outreach</b>	<b>Item</b>	<b>Date(s)</b>
Website	Project website: <a href="http://lois-32ndupgrades.com/">http://lois-32ndupgrades.com/</a>	Launched November 1, 2019
	Interactive map on website (see more information below)	Launched November 1, 2019
Spenard Community Council	Presentation to the Spenard Community Council	Wednesday, November 6, 2019
Open House #1	Post Card Announcing Public Open House	October 30, 2019
	Email Announcement of Open House #1	November 4, 2019
	Open House #1 at Aquarian Charter School	November 13, 2019, 6 – 8 PM
	Email Announcement thanking stakeholders for attending Open House #1	December 3, 2019
Business Stakeholder Meeting	Business Stakeholder Meeting handbill delivered to businesses in the project area	November 11 & 12, 2019
	Business Stakeholder Meeting at Aquarian Charter School	November 14, 2019, 6 – 7:30 PM
Agency Stakeholder Meeting	Agency Stakeholder Meeting	November 14, 2019, 10 – 11 AM
Open House #2	Post Card Announcing Public Open House	August 4, 2020
	Website Updated	August 5, 2020
	Email Announcement of Open House #2	August 5, 2020
	Email Reminder of Open House #2	August 24, 2020
	Email Announcement thanking stakeholders for attending Virtual Open House #2	August 31, 2020
	<a href="https://arcg.is/0K1rnC">Virtual Tour</a>	<a href="https://arcg.is/0K1rnC">https://arcg.is/0K1rnC</a>

## B. Project Website

The project website (<http://lois-32ndupgrades.com/>) has been developed for ease of project information sharing and soliciting comments from the public. Website 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 to allow users to place comments along the project corridor on a map (<http://lois-32ndupgrades.com/interactive-map/>) (see [FIGURE 13](#)). The website will be updated as the project progresses.

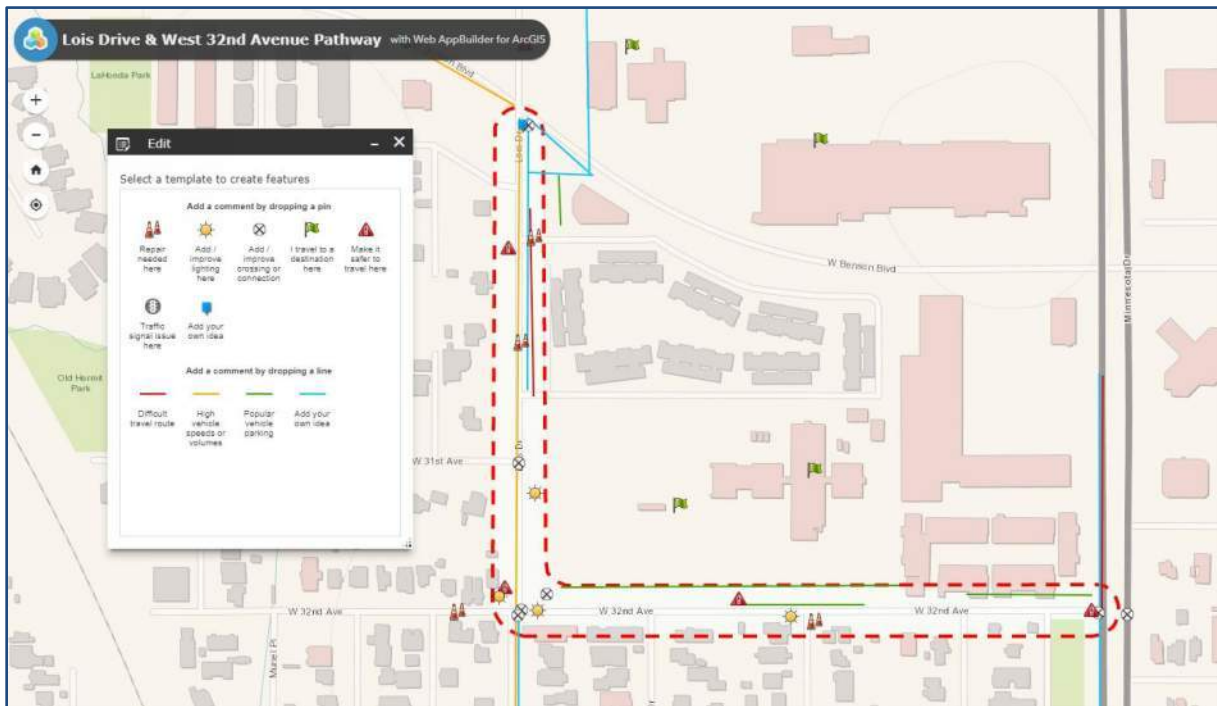


Figure 13 - Interactive comment form from website

## C. Community Council Meetings

The project team attended the Spenard Community Council meeting on November 6, 2019 to provide information about the kick-off of the project, answer any initial project questions, listen to preliminary comments and feedback from council members, and extend an invitation to Open House #1.

## D. Agency Stakeholder Meeting

Agency, utility, regulatory stakeholders, and key decision makers were invited via email to participate in a meeting to introduce the project and collect initial feedback defining project issues. The purpose of this meeting was to hear from agency stakeholders regarding potential issues and ideas.

The agency stakeholders scoping meeting took place on November 14, 2019 from 9:30 to 10:30 a.m. at the MOA office Training Room. CRW gave a power point presentation of the project background, purpose, schedule, issues, and challenges. Following the presentation, attendees were invited to share concerns, comments, and general discussion items.

## E. Open House Events

The goal of the open houses was to present the project to the community and businesses in an open format where attendees could talk to project representatives one-on-one, provide general feedback, and have their questions, comments, and concerns addressed by project staff.

For the Public Open House #1 and Business Stakeholder Open House, the project team had a variety of project information presented on boards and scrolls including: a project location map, project fact sheet, project timeline, project area map, and existing conditions map with inset images of existing conditions and concerns. Two project aerial photograph background graphics were displayed as large table-top scrolls so that attendees could provide location-specific comments by writing directly on the scrolls. Attendees were encouraged to provide verbal feedback through conversations with project staff, written comment forms, and project map written comments. Materials presented at the open houses are included in [APPENDIX J](#).



*Public Open House #1 attendees speaking with project representatives.*

### Public Open House #1:

The first Open House for the project was held on Wednesday, November 13, 2019 from 6:00 to 8:00 pm at the Aquarian Charter School (Parcel 123) which is located within the project area; 28 attendees signed-in at the meeting.

### Business Stakeholder Open House

The Business Stakeholder Open House was held on Thursday, November 14 from 6:00 to 7:30 pm at the Aquarian Charter School (Parcel 123); one attendee signed-in at the meeting.

### Public Open House #2:

Originally, Open House #2 was planned to be held in the outdoor space outside of Aquarian Charter School, which is within the project area. Following safety protocols for COVID-19, the project team planned to set up multiple distanced tables, require masks of attendees, and have staff present to manage flow of attendees and remind participants to wear a mask. However, due to the ongoing pandemic and an increase in positive cases of covid-19 within the Municipality, Anchorage Mayor Ethan Berkowitz on July 31, 2020, issued Emergency Order EO-15 that went into effect on August 3,



2020, to slow the transmission and spread of the virus. This order re-established limitations on indoor and outdoor gatherings, and the project team decided to move this meeting to a virtual platform to protect people's health while also progressing the project forward.

The second Open House for Lois Dr. and W. 32<sup>nd</sup> Ave was held virtually on Thursday, August 27, 2020, from 5-6:30 pm using Microsoft Teams. The goal of the meeting was to review the project scope, background, and timeline and present the design solution alternatives for the roadways and intersection. Attendees were able to ask questions throughout the presentation using the chat box, and there was a question and answer session at the end of the presentation for questions and comments about the preferred alternatives. Attendees were able to voice support for their preferred design alternative. Attendees were able to participate using a smart phone, tablet, desktop computer, or a call-in number, and the link and phone number were posted on the website, in the e-newsletters, and on the postcard. Copies of the presentation were made available for pick-up at a public building in advance for anyone utilizing the call-in number.

The following information was presented during the open house:

- Project Location
- Project Timeline
- Area Conditions
- Concept Report Development
- Stakeholder Input
- Project Goals
- Significant Design Challenges
- Roadway Alternatives
- Next Steps
- How to Stay Involved and Submit Comments

A self-guided virtual tour was created for those who could not attend the Open House and made available on the project website. On 8/31/2020 a link to the virtual tour was provided to the email list serve via eNewsletter. Between 8/31/2020 and 9/8/2020 the virtual tour was viewed more than 200 times. Finally, a video recording of the Open House is available on the project website as well as all meeting presentation materials. A copy of all the meeting materials and a summary of comments are included as attachments to this report.

#### Summary of Public Comments Received

Comments were received from individuals through public and business stakeholder meetings, telephone calls, comment forms and on-line questionnaire responses. Additional comments were recorded on project scrolls, documented in meeting records (both in-person and virtual meetings), acquired from the interactive map on the project website, and received via direct email. All project comments that were received from the beginning of the project through September 4, 2020 are documented in the APPENDIX J.

The CSS process will be ongoing for the duration of the project. Stakeholders will have the continued opportunity to obtain information and gather feedback on the project website, interactive map tool, via e-newsletters, and through direct feedback phone calls and emails to project staff.

## XVIII. Design Recommendations

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

### A. Preferred Roadway Typical Cross Sections

1. Lois Drive: Alternative 2 is the preferred alternative for Lois Drive with two, 11-foot wide travel lanes with 3.5-foot wide shoulders and barrier (Type 1) curb and gutter. A 10-foot wide paved pathway is proposed on the east side of the roadway and a 5-foot wide concrete sidewalk is proposed on the west side of the roadway. The non-motorized facilities would be detached from the back of curb by 4.5 feet. MOA Traffic Engineering has no adverse comments regarding this alternative.

This is the recommended alternative because it allows for separation of both pedestrian facilities but minimizes impacts to adjacent properties.

2. W. 32nd Avenue: Alternative 3 (3A and 3B) is the preferred alternative for W. 32nd Avenue. Alternative 3A would be constructed along Parcel 123 (Aquarian Charter School) and includes two, 10-foot travel lanes with 1.0-foot wide shoulders and barrier (Type 1) curb and gutter. A 10-foot wide paved pathway would be constructed along the north side. The pathway would be separated from the back of curb with a 7-foot buffer to accommodate the existing transmission and distribution poles. No pedestrian facilities would be constructed along the south side of the roadway for this section.

Just east of Aquarian Charter School, the typical section would transition to 3B, which is identical to 3A except the 10-foot wide pathway would be located on the south side of the roadway and be attached to the back of curb. The pedestrian route would transition from the north side of the roadway to the south via a marked crosswalk. During detailed design, the location of the crosswalk will be further evaluated. Ideally, the pedestrian crossing would be located at an intersection if possible. Additionally, the curb type along the north side of the roadway for Alternative 3B would be rolled (Type 2) to accommodate the full-frontage access to Parcel 122 (Anchorage Sands Apartments).

This is the recommended alternative because it minimizes impacts to adjacent properties, especially full acquisition requirements, but still provides for improved drainage, roadway, and pedestrian facilities.

### B. Preferred Intersection Alternative

Alternative 3 (roundabout) is the preferred alternative for the intersection of Lois Drive and W. 32<sup>nd</sup> Avenue. The roundabout is shifted towards the northeast to minimize and/or eliminate impacts to existing infrastructure and transmission poles. The resulting locations requires combining the south and west legs prior to entering the roundabout, resulting in a three-leg roundabout.

### C. Other Recommended Improvements

1. Roadway Markings: Along Lois Drive (a collector road), roadway markings would include centerline and shoulder markings. No centerline or shoulder markings are proposed along W. 32<sup>nd</sup> Avenue (a local road), but a marked crosswalk would transition the pedestrian route from the north side to the south side of the roadway.
2. Roadway Horizontal and Vertical Alignment: The project roadways will typically follow the center of the ROW. The proposed profile for Lois Drive and W. 32<sup>nd</sup> Avenue will force high/low spots by raising the grades to a minimum of 0.65%, with 0.80% through intersections.
3. Design and Posted Speed Limit: Maintain the current posted speed limit of 25 MPH. A Design speed of 30 MPH is proposed.
4. Lighting: A continuous LED lighting system, consistent with current MOA standards will be installed along the roadway.
5. Landscaping: Proposed landscaping will be in character with the adjacent residential, business, school, and park properties. Landscaping will focus on retaining existing vegetation where feasible and installing new landscaping and features that fit the context of the corridor. Where new landscaping elements are installed it will maintain clear sight lines and avoid creating comfortable or hidden areas where transients may loiter or sleep. Existing landscaping will be maintained where practical to preserve the benefits of mature landscaping (ex. habitats, storm water capture) but will be pruned or include selective removal as needed to provide clear sight lines and discourage transient behavior.
6. Retaining Walls: Retaining walls will be installed to reduce impacts to adjacent infrastructure and properties. It is anticipated that a short, sidewalk-type retaining wall will only be required adjacent to Parcel 117, but the exact locations and extents of retaining walls will require further refinement during the design phase.
7. Storm Drain: The proposed drainage improvements consist of the following:
  - Replace and upsize the aging storm drain on Lois Drive, between 29th Avenue and W. 32<sup>nd</sup> Avenue, to align with new roadway improvements
  - Replace 170 feet of undersized and aging CMP storm drain pipe on 31st Avenue from the Lois Drive and 31st Avenue intersection to the downstream manhole
  - Extend the Lois Drive system to W. 32<sup>nd</sup> Avenue to provide continuous storm drain system and runoff collection at the intersection
  - Replace and upsize the aging storm drain on W. 32<sup>nd</sup> Avenue to align with new roadway improvements
  - Extend the W. 32<sup>nd</sup> Avenue system to the west to capture runoff at all designed low points
  - Install catch basins at new roadway low points and other low lying areas to alleviate ponding issues

- Replace catch basins and leads as required to match new curb and gutter
  - Provide positive roadway drainage to minimize ponding
  - Provide water quality treatment for storm runoff
  - Provide freeze protection for storm drain systems.
8. Traffic Calming: No traffic calming features are proposed.
9. Intersections: The existing all-way stop-controlled intersections at Lois Drive and W. 32<sup>nd</sup> Avenue will be removed. Stops signs will be installed on the minor roadway, W. 32<sup>nd</sup> Avenue. Channelization and intersection layouts at Benson Boulevard and Minnesota Parkway will be unchanged.
10. Driveways: Curb returns will be installed at commercial properties (including 8-plexes and greater) and curb cuts will be installed for residential homes (7-plex and less). Driveway access for Parcel 122 will be by rolled curb to accommodate required on-site parking and access.

## **XIX. Proposed Variances from Design Criteria Manual**

### **A. AMC Title 21**

AMC Title 21.08.050.G requires that curb and gutters be in accordance with the DCM and MASS. However, it also states that “Curbs shall be of the American Association of State Highway and Transportation Officials (AASHTO) vertical type.” Type 2 (rolled) curb is recommended along W. 32<sup>nd</sup> Avenue, along Parcel 122 only, to accommodate the required on-site parking and access. A variance requesting relief from these requirements has been obtained from the MOA Planning and Zoning Commission. Additional variances may be required, including:

- Buffer separation between back of curb and pedestrian facility – Title 21.07.060.E.2.a requires sidewalk design to comply with the standards of the DCM and MASS. A variance may also be required for pedestrian facilities that do not meet the DCM.
- Pedestrian facilities – Title 21.07.060.E requires sidewalks to be installed on both sides of all streets in Class A zoning districts. This area is identified as Class A per 21.08.050.B and Table 21.08-1. A variance will be required to install a single pedestrian facility along W. 32<sup>nd</sup> Avenue.

A variance requesting relief from these requirements has been obtained from the MOA Planning and Zoning Commission and can be found in [APPENDIX M](#).

### **A. MOA DCM**

The proposed variances from the DCM for this project will be justified and approved under a separate document during the design process. There are several design criteria that may not be able to meet the MOA DCM. Below is a list of potential variances for this project for the preferred alternative. Additional variances may be required as the design progresses:

- Roadway width – for urban residential roadways with over 1,000 ADT, the DCM requires a roadway width of 38 feet (measured from back of curb). Due to ROW and utility constraints, the proposed roadway width for W. 32<sup>nd</sup> Avenue is 26 feet.
- Curb Type – DCM Section 1.9.F requires Type 2 (rolled) curb on local roadways Type 1 (barrier) curb is recommended along the W. 32<sup>nd</sup> Avenue, except along Parcel 122, to delineate driveways and prevent unnecessary full-frontage access.
- Driveway Width – the DCM allows for driveway widths up to 34 feet for commercial driveways (including 8-plexes and greater). Parcel 122 exceeds this width and the structure was constructed before adoptions of the code that restricted driveway widths. Full frontage access (via rolled curb) will be required for Parcel 122 because a reduced driveway width would impede access to required on-site parking.
- Number of Driveways – The DCM allows frontages with 50 feet to 1,000 feet to have up to two driveways. Parcel 122 currently has unrestricted, full-frontage access to four driveway aisles and direct parking. Eliminating driveway and parking access to Parcel 122 with reduced driveways would impede access to required on-site parking.

- Design Speed - the DCM requires a design speed of 35 MPH for a neighborhood collector. The proposed design speed for Lois Drive is 30 MPH with a posted speed of 25 MPH to match the current posted speed of 25 MPH. The lower design speed allows for the vertical curves proposed along the alignment to better match into the existing topography and ROW.
- Driveway landings and grades – The DCM requires that residential driveways have a minimum 12-foot landing length and a maximum grade of  $\pm 10\%$ ; commercial driveways must have a 20-foot landing length with a maximum driveway grade of  $\pm 8\%$ . The grade of the landings must be 2% maximum. Some of the driveways will not be able to meet these landing or grade requirements due to existing infrastructure and grades.
- 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 50 feet for a collector roadway and 40 feet for a local roadway (with less than 10 vehicles per hour). Several existing driveways do not currently meet to this requirement. Driveways will typically be replaced in the same location because existing improvements on property restrict relocating the driveways.

**\*\*\* End of Report \*\*\***