

Minor Development Final Plat Staff Report

Date: February 23, 2026
To: Douglas County Board of County Commissioners
Through: Douglas J. Debord, County Manager
From: Kati Carter, AICP, Director of Community Development *SK for KCC*
CC: Carolyn Washee-Freeland, AICP, Senior Planner
Jeanette Bare, AICP, Planning Manager
Steven E. Koster, AICP, Deputy Director of Community Development
Subject: Highlands Ranch Filing 159 – Minor Development Final Plat
Project File: SB2023-022

Planning Commission Hearing:	March 2, 2026 @ 6:00 p.m.
Board of County Commissioners Hearing:	March 10, 2026 @ 2:30 p.m.

I. EXECUTIVE SUMMARY

The applicant requests a Minor Development Final Plat to establish one 9.69-acre lot. Proposed Highlands Ranch Filing 159 is zoned as part of the Highlands Ranch Planned Development (HRPD), Planning Area (PA) 79. A future site improvement plan for a proposed senior apartment development will follow the approval of the plat request.

The property is located on Plaza Drive, approximately one-half mile west of the Plaza Drive and Kendrick Castillo Way intersection, and less than one mile east of US Highway 85. The lot will be served by Highlands Ranch Water and Sanitation District and will take access from Plaza Drive.

The subject property is located within the Primary Urban Area as identified in the Douglas County 2040 Comprehensive Master Plan (CMP).

The Planning Commission will hear the request at its March 2, 2026, public hearing. Staff will provide an update to the Board at its March 10, 2026, Board hearing.

II. APPLICATION INFORMATION

A. Applicant

Dave Witte
Central Park at Highlands Ranch, LLC
6380 S. Fiddlers Green Circle, Suite 400
Greenwood Village, CO 80111

B. Applicant's Representative

Rob Oglesby, PE, Sr. Project Engineer
Redland
1500 West Canal Court
Littleton, CO 80120

C. Request

The applicant requests a Minor Development Final Plat to establish one 9.69-acre lot for future development of a senior apartment complex

D. Process

A Non-Residential and Multifamily Minor Development Final Plat application is processed pursuant to Article 6A of the Douglas County Subdivision Resolution (DCSR). Article 6A states the intent of the process is "to provide a streamlined review process for nonresidential and multifamily subdivisions."

Per Section 604A.08 of the DCSR, "The Board shall evaluate the minor development final plat application, staff report, referral agency comments, applicant responses, the Planning Commission recommendation, and public comment and testimony, and shall approve, approve with conditions, continue, table for further study, remand to the Planning Commission, or deny the minor development final plat. The Board's action shall be based on the evidence presented; compliance with adopted County standards, regulations, and policies; and other guidelines."

E. Location

The site is located on Plaza Drive, approximately one-quarter of a mile east of Erickson Boulevard, and immediately south of C-470; one-half mile west of the Plaza Drive and Kendrick Castillo Way intersection; and less than one mile east of US Highway 85. The project vicinity, zoning and aerial maps are provided in the attachments to this staff report.

F. Project Description

The applicant requests a Minor Development Final Plat to establish one 9.69-acre lot for a senior apartment development. The new lot will be accessed by a private off-site driveway connecting to Plaza Drive for which an easement has been obtained. Additionally, a new sidewalk easement will be dedicated to the County to complete a gap in the existing sidewalk segment adjacent to Plaza Drive. General-purpose utility easements will also be dedicated to the County via the plat.

III. CONTEXT

A. Background

The HRPD was originally approved in 1979. PA 79 is also referred to as the Highlands Ranch Plaza Center. As a use by right, PA 79 permits multiple family dwellings, for sale or lease, with a minimum of 10 units per building.

The project area has several existing easements that either border the site or are located within proposed Lot 1. These include existing water easements associated with the High Line Canal, an off-site access easement from Denver Water, a water and sanitary sewer line easement, and several Xcel Energy utility easements.

B. Adjacent Land Uses and Zoning

The site is bound by a multi-family residential development to the east, the Highlands Ranch Water and Sanitation District's water treatment facility to the south, Highway C-470 to the north, and vacant tracts located to the west, owned by the Highlands Ranch Metropolitan District and the Regional Transportation District (RTD). Additionally, the Wind Crest by Erickson Senior Living, a 54.66-acre development, is located southwest of the subject property.

Zoning and Land Use

Direction	Zoning	Land Use
North	HRPD	CDOT Tract containing C-470 Right-of-way
South	HRPD	Highlands Ranch Metro District vacant tract; Highlands Ranch Water and Sanitation District water treatment plant tract
East	HRPD	CDOT vacant tract; Highlands Ranch Filing 157 Solana Lucent Station multi-family apartment complex
West	HRPD and Erickson PD	Highlands Ranch Metropolitan District Vacant Tract D, Erickson Filing 1; Regional Transportation District (RTD) vacant Tract G, Erickson Filing 1.

IV. PHYSICAL SITE CHARACTERISTICS

A. Site Characteristics and Constraints

The topography of the site consists of contour elevations that range from 5,540 feet to 5,560 feet in height. The applicant's supplemental exhibit shows existing site conditions containing slopes that range between 15% to 25%. The Phase III Drainage Report for the site notes that the project area slopes from east to west and drains to the High Line Canal via an existing swale between the rear property line of the site and C-470. Vegetation on the site contains native grasses and some shrubbery, along with a small, landscaped area located in the northeastern corner of the site, near the C-470 right-of-way.

The site is impacted by noise from C-470 traffic. The applicant will address noise mitigation during the Site Improvement Plan (SIP) design process.

B. Access

The applicant has obtained an off-site private access easement from Denver Water located on Tract D, Erickson Filing No. 1 for access to the new lot. This access easement connects to Plaza Drive. With the future SIP submittal, the applicant will be

proposing a future parking lot easement for the public to access the High Line Canal trail system. Additionally, the future SIP may include another access drive from Plaza Drive.

C. Soils and Geology

Based on a review of the 2040 Douglas County Comprehensive Master Plan (CMP) Class 3 Hazards and Environmental Constraints Map, the project area does not include any hazardous geologic or soil conditions. The applicant's geotechnical study for the subject property was reviewed by the Colorado Geological Survey and was found to be valid.

D. Drainage and Erosion

The applicant will be required to meet all engineering requirements for drainage, grading, and erosion control during future development of the site. Douglas County Engineering did not require a Subdivision Improvements Agreement (SIA) with the Minor Development Final Plat. Improvements will be identified and secured with the future Site Improvement Plan (SIP).

E. Floodplain

No portion of the site is within the 100-year flood plain.

F. Wildlife

The CMP Wildlife Resources Map shows the site as a low habitat value for wildlife. The site is not located within an overland connection, wildlife movement corridor, or wildlife crossing area. Colorado Parks and Wildlife (CPW) noted that the site may contain some small ground-dwelling mammals, small birds, raptors, and other common urban species. CPW further acknowledged that there may be burrowing owls on the site, which is a state protected species. CPW recommended a burrowing owl survey be conducted between March 15th and August 31st during the year prior to construction activities (condition of approval #1). Additionally, CPW recommended that the applicant complete a weed management plan. The applicant has agreed to implement CPWs recommendations. A weed management plan was completed and approved by Douglas County Public Works Engineering.

H. Historic Preservation

Douglas County Historic Preservation provided referral comments on the application. The County Curator reviewed the applicant's Limited-Results Cultural Resource Survey and had no further comments and stated that there were no impacts to cultural resources in the area.

V. PROVISION OF SERVICES

A. Schools

The Douglas County School District (DCSD) reviewed the request, and it was determined that the required school land dedication has been accounted for within

the Highlands Ranch PD. DCSD stated that the proposed development is within the overall unit count of Highlands Ranch as outlined in the HRPD. DSCD had no objection to the approval of the Minor Development Final Plat.

B. Fire Protection

South Metro Fire Rescue (SMFR) provides fire protection services to the site and reviewed the request. SMFR provided a “conditional non-objection” to the request. SMFR referral comments noted that a fire hydrant plan indicating hydrant location will be required for future development. The applicant will provide a fire hydrant plan with the future SIP.

C. Sheriff Services

The Douglas County Sheriff’s Office (DCSO) provides police protection services to the site. No response was received from DCSO and DCSO 911.

D. Water and Sanitation

The water and sanitation services for the proposed lot will be provided by the Highlands Ranch Water and Sanitation District.

E. Utilities

Utility Service providers are AT&T, Black Hills Energy, and Xcel Energy. Phone and data services are provided by CenturyLink and Comcast. AT&T and CenturyLink had no objections to the proposal; and Black Hills Energy did not respond to the request. Xcel Energy reviewed the request and stated that the agency owns and operates existing underground electric facilities along the east and north property lines and required that these facilities be shown on the plat exhibit. Additionally, Xcel Energy requested a plat note for the general-purpose utility easement and stated that additional utility easements may be needed by separate instrument with future development. The applicant has provided a 10-foot general utility easement to meet these needs along the southerly, westerly and northerly lines of the Minor Development Final Plat.

F. Dedications

The applicant will dedicate a 10-foot general purpose utility easement to the County for public utility purposes, and a 10-foot sidewalk easement to close a gap in the existing sidewalk segment on Plaza Drive.

G. Parks and Trails

Douglas County Parks and Trails reviewed the request and determined that Parks commitments have been met through previous dedications within the HRPD and stated that no dedications or fees are required. With the future SIP submittal, the applicant may propose a parking easement for public access to the High Line Canal trail system.

H. Subdivision Improvements

Engineering did not require a Subdivision Improvements Agreement (SIA) with the Minor Development Final Plat. Improvements will be identified and secured with the future SIP.

VI. PUBLIC NOTICE AND INPUT

Courtesy notices were mailed to abutting property owners. No comments were received regarding the Minor Development Final Plat request.

Referrals were sent to the Highlands Ranch Community Association (HRCA), the Highlands Ranch Golf Club HOA, and the Highlands Ranch Metropolitan District. The HRCA commented that the proposed development should be in compliance with HRCA development standards. HRCA provided further comments relating to architectural design for future development. The applicant has coordinated with HRCA on the proposed Minor Development Final Plat and stated that they will consider incorporating HRCA recommendations into their future design. No referral agency comments were received from the Highlands Ranch Golf Club HOA. The Highlands Ranch Metropolitan District (HRMD) provided informational comments pertaining to future development of the site. The applicant stated that they will work directly with HRMD to address the agency's comments.

The applicant has provided responses to all referral comments within a separate letter included in the staff report attachments.

VII. PLANNING COMMISSION

The Planning Commission will hear the minor development request at its March 2, 2026, public hearing. Staff will provide an update to the Board at its March 10, 2026, Board hearing.

VIII. STAFF ANALYSIS

Per Article 603A of the DCSR, a Minor Development Final Plat may be approved upon the finding by the Board that the Minor Development Final Plat:

603A.01: Conforms with the goals, objectives, and policies of the Master Plan.

Staff Comment: The CMP establishes goals and objectives applicable to development in the County. The application is generally consistent with the CMP policies in Objective 2-1B and 2-1C of the Urban Land Use, and the goals, policies and objectives of the Primary Urban Area. The subdivision is near the High Line Canal trail system creating recreational opportunities for future residents. Fire protection and police services are provided to the site and provision for access and utilities have been verified.

603A.02: Addresses the design elements established in Section 404 – Preliminary Plan, herein.

Staff Comment: The minor development is in conformance with the design elements as established in the DCSR Section 404 Preliminary Plan. The proposed lot will be accessible from Plaza Drive, providing opportunities for vehicular and pedestrian access. The proposed lot meets the minimum lot size and setbacks of the Highlands Ranch PD zone district. Off-street parking requirements can be met. Geotechnical and building analysis will occur at building permit for the proposed senior apartment development. The applicant will ensure that archaeological or historic resources are identified during construction. Drainage and grading plans have been accepted by Douglas County Engineering.

603A.03: Conforms with Section 18A, Water Supply Overlay District, of the Zoning Resolution.

Staff Comment: DCZR Section 1803A establishes approval standards to be used in the evaluation of land use applications reviewed under Section 18A, Water Supply. The proposed subdivision will receive central water and sewer service from Highlands Ranch Water. Highlands Ranch Water has committed to serve the future development of the proposed subdivision. According to the will serve letter provided by Highlands Ranch Water, the water supply resources are adequate to serve the proposed lot and meets all other approval standards of Section 18A. The applicant has indicated that this will serve letter will be applicable to the proposed senior apartment development, as the development will contain 165 units in a single building, versus the proposed 240-unit multi-family two-building development previously proposed.

The Colorado Division of Water Resources (CWR) and the County's water consultant have reviewed the request and the required water documentation and have determined that the supply is adequate to serve the subdivision.

Below are the water supply approval standards used for evaluating land use applications.

1803A.01: The applicant has demonstrated that the water rights can be used for the proposed use(s).

Staff Comment: The CWR and the County water consultant have reviewed the Minor Development Final Plat request and the required water documentation and have determined that the supply is adequate to serve the subdivision without injuring water rights. The proposed subdivision will be served by central water and sewer services from Highlands Ranch Water (formally known as Centennial Water & Sanitation District).

1803A.02: The reliability of a renewable water right has been analyzed and is deemed sufficient by the County based on its priority date within the Colorado System of Water Rights Administration.

Staff Comment: No new renewable water rights are proposed to serve the development.

1803A.03: The Water Plan is deemed adequate and feasible by the County to ensure that water supply shortages will not occur due to variations in the hydrologic cycle.

Staff Comment: No water plan is required when service is provided by a district.

1803A.04: The Water Plan is sufficient to meet the demand applicable to the project based on the minimum water demand standards in Section 1805A herein.

Staff Comment: No water plan is required when service is provided by a district.

603A.05: Identifies all areas of the proposed subdivision which may involve soil or topographical conditions presenting hazards or requiring special precautions and that the proposed uses of these areas are compatible with such conditions.

Staff Comment: Standard geotechnical exploration of the individual building site is required as part of the building permit process. The applicant's geotechnical study for the subject property was reviewed by the Colorado Geological Survey and was found to be valid.

603A.06: Provides adequate drainage improvements.

Staff Comment: A Phase III Drainage Report, and a GESC plan and report have been accepted by Douglas County Engineering Services.

603A.07: Provides adequate transportation improvements.

Staff Comment: The applicant's traffic analysis has been reviewed by Douglas County Engineering and found to be acceptable.

603A.08: Protects significant cultural, archaeological, natural, and historical resources, and unique landforms.

Staff Comment: No unique site features or artifacts were identified within the applicant's Limited Results Cultural Resource Survey. During construction activity within the development, the applicant, its successors and assigns shall take all reasonable care to watch for historic resources, paleontological resources, and other cultural history resources and shall immediately notify Douglas County in the event of such discovery.

603A.09: Demonstrates the extraction of any known commercial mining deposit shall not be impeded.

Staff Comment: There are no known commercial mining deposits or significant mineral deposits on site per the Douglas County Mineral Extraction Plan.

603A.10: Has available all necessary services, including fire and police protection, recreation facilities, utility service facilities, streets, and open space to serve the proposed subdivision.

Staff Comment: The subdivision will be served by SMFR, the Douglas County Sheriff's Office, the Douglas County School District, Black Hills Energy, CORE Electric Cooperative, Comcast, CenturyLink, and Xcel Energy. The required school land dedication and Parks commitments have been met through previous dedications within the Highlands Ranch PD.

IX. STAFF ASSESSMENT

Staff has evaluated the Minor Development Final Plat request in accordance with Article 6A of the DCSR. Should the Board of County Commissioners find that the approval standards have been met, the following proposed conditions should be considered for inclusion in the motion.

1. During construction activity within the development, the applicant, its successors and assigns shall conduct a burrowing owl study if any earth moving will take place between March 15 and October 31.
2. During construction activity within the development, the owner, its successors and assigns shall take all reasonable care to watch for historic resources, paleontological resources, and other cultural history resources and shall immediately notify Douglas County in the event of such discovery.
3. Prior to recordation of the Minor Development Final Plat, technical corrections to the plat exhibit shall be made to the satisfaction of Douglas County.
4. All commitments and promises made by the applicant or the applicant's representative during the public hearing and/or agreed to in writing and included in the public record have been relied upon by the Board of County Commissioners in approving the application; therefore, such approval is conditioned upon the applicant's full satisfaction of all such commitments and promises.

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LAND USE APPLICATION

Please fill in this application form completely. An incomplete application will not be processed.

Note: Neither the Planning Commission nor the Board of County Commissioners should be contacted regarding an open application.

OFFICE USE ONLYPROJECT NAME: Highlands Ranch Filing 159, A Portion of PA79 - Minor Development Plat

PROJECT FILE #:

SB2023-022PROJECT TYPE: Minor Development Plat

PLANNING FEES:

\$2,600.00MARKETING NAME: Kaos Apartments

ENGINEERING FEES:

SITE ADDRESS: Highlands Ranch - Filing No. 159 - A portion of Planning Area 79Shea Properties

OWNER(S):

TOTAL FEES:

Name(s): _____

Address: _____

Phone: _____

Email: _____

RELATED PROJECTS:

PS2022-244SP2023-035

AUTHORIZED REPRESENTATIVE (requires notarized letter of authorization if other than owner)

Name: Dave Witte / Rob Oglesby

Address: _____

Phone: _____

Email: _____

LEGAL DESCRIPTION:

Subdivision Name: Highlands Ranch PA 79Filing #: 157 Lot #: _____ Block #: _____ Section #: NE 5 Township: 6 S Range: 68 WSTATE PARCEL NUMBER(S): 2229-051-00-009

ZONING:

Present Zoning: PD - Planned Development Proposed Zoning: PD - Planned Development Gross Acreage: 9.69 ACGross Site Density (DU per AC): _____ # of Lots or Units Proposed: 240 units

SERVICE PROVIDERS:

Fire District: South Metro Fire RescueMetro District: Highlands RanchGas: Xcel EnergyWater: Centennial Water & SewerSewer: Centennial Water & SewerElectric: Xcel EnergyRoads: ☐ Public ☒ Private (please explain): Private access drive lanes and parking

To the best of my knowledge, the information contained on this application is true and correct. ***I have received the County's information sheet regarding the Preble's Meadow Jumping Mouse.***



Applicant Signature

04/03/2023

Date

100 Third Street, Castle Rock, Colorado 80104 • 303.660.7460

January 6, 2026

Carolyn Freeland
Douglas County Community Development Department
Planning Services Division
100 Third St., Castle Rock, CO 80104

**Re: Lot 1, Highlands Ranch Filing No. 159
SB2023-022**

Dear Matt,

Please accept this letter on behalf of Central Park at Highlands Ranch, LLC, a Colorado limited liability company, by Shea Properties Management Company, Inc., a Delaware corporation, the applicant for Lot 1, Highlands Ranch Filing No. 159. Shea Properties is proposing to combine three separate tracts into one lot of 9.86 acres north of Plaza Drive and east of the Highline Canal.

Based on the 2040 Comprehensive Master Plan (CMP), this Minor Development Plat (MDP) will aid the County in achieving goals outlined within the CMP. The single lot proposed with this MDP will encourage development in this area and support a healthy community with its proximity to the Highline Canal Trail. The single lot will conform to the adjacent multi-family use to the east.

The applicant has reviewed the site's development and is proposing to revise the project from market rate multi-family to affordable senior apartments, proposing approximately 165 units in a single building (roughly 17 dwelling units per acre). Since this plan has a lower density compared to the previous SIP for the site, it's expected that the existing Water and Sewer Will Serve Letter will remain valid. Other engineering reports will be updated as needed to reflect changes to the site plan and unit count during the SIP process with Douglas County.

The following is a narrative per Section 605A.02 of the Douglas County Zoning Resolution.

605A.02.1:

The total area to be subdivided will be 9.686 acres.

605A.02.2:

There will be 1 lot with a proposed use of multi-family.

605A.02.3:

The total number of units and density will be determined by the SIP.

605A.02.4:

The total land area to be preserved as open space will be evaluated at future development reviews.

605A.02.5:

There are no public roads or tracts proposed with this Minor Development Plat. All existing and proposed utilities within easements shall be maintained by the entity responsible for the utility.

605A.02.6:

Land dedication for parks and schools has been accounted for within the Highlands Ranch PD.

605A.02.7:

Water and sewer for the site shall be provided by Centennial Water and Sanitation District as outlined in the attached letter.

Please let me know if you need any clarifications. We look forward to working with you on the success of the project.

Sincerely,



Rob Oglesby, PE
Sr. Project Engineer

Comprehensive Master Plan Land Use Reference Map

Comprehensive Master Plan Areas

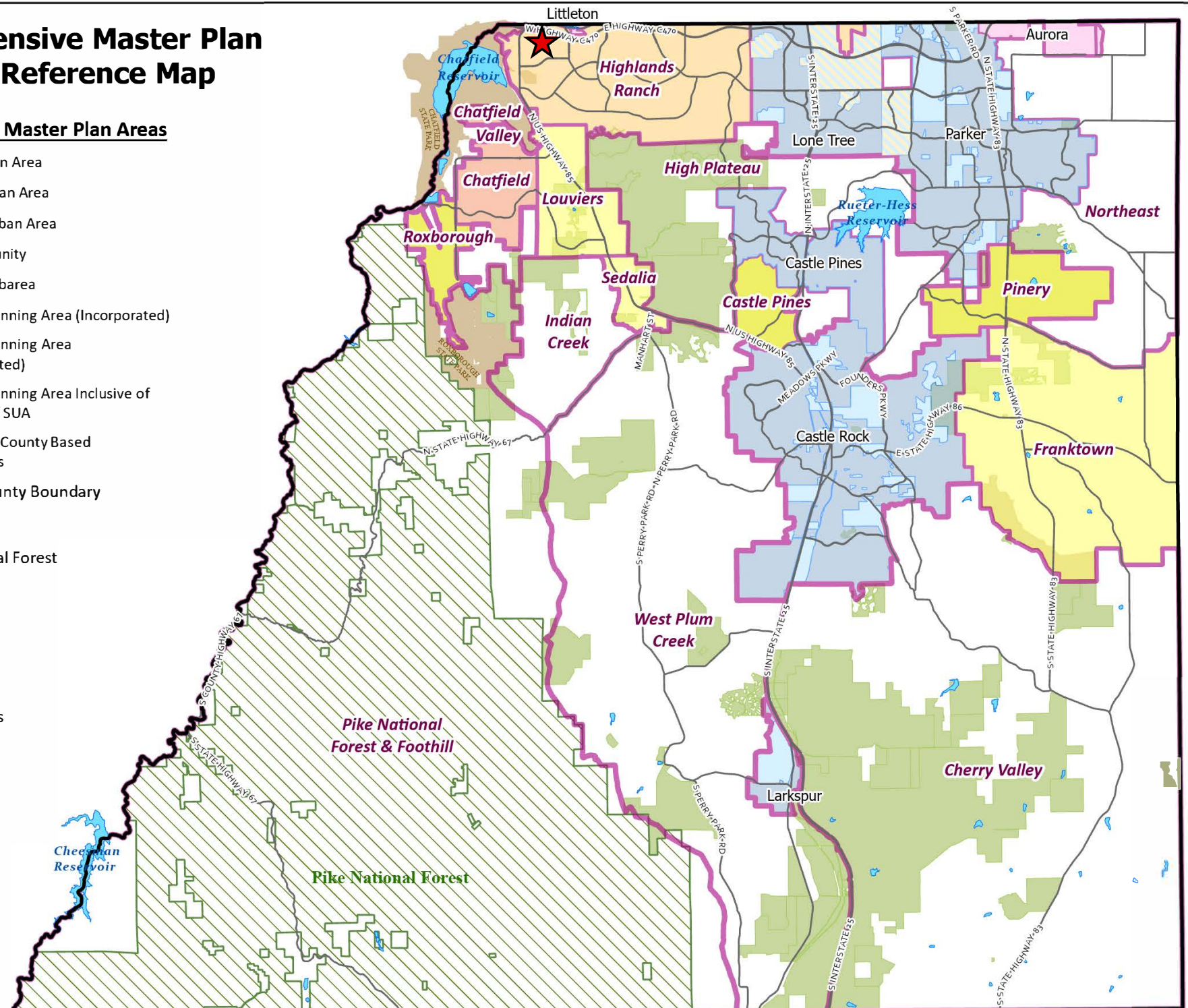
- Primary Urban Area
- Chatfield Urban Area
- Separated Urban Area
- Rural Community
- Nonurban Subarea
- Municipal Planning Area (Incorporated)
- Municipal Planning Area (Unincorporated)
- Municipal Planning Area Inclusive of County PUA / SUA
- Non-Douglas County Based Municipalities
- Douglas County Boundary

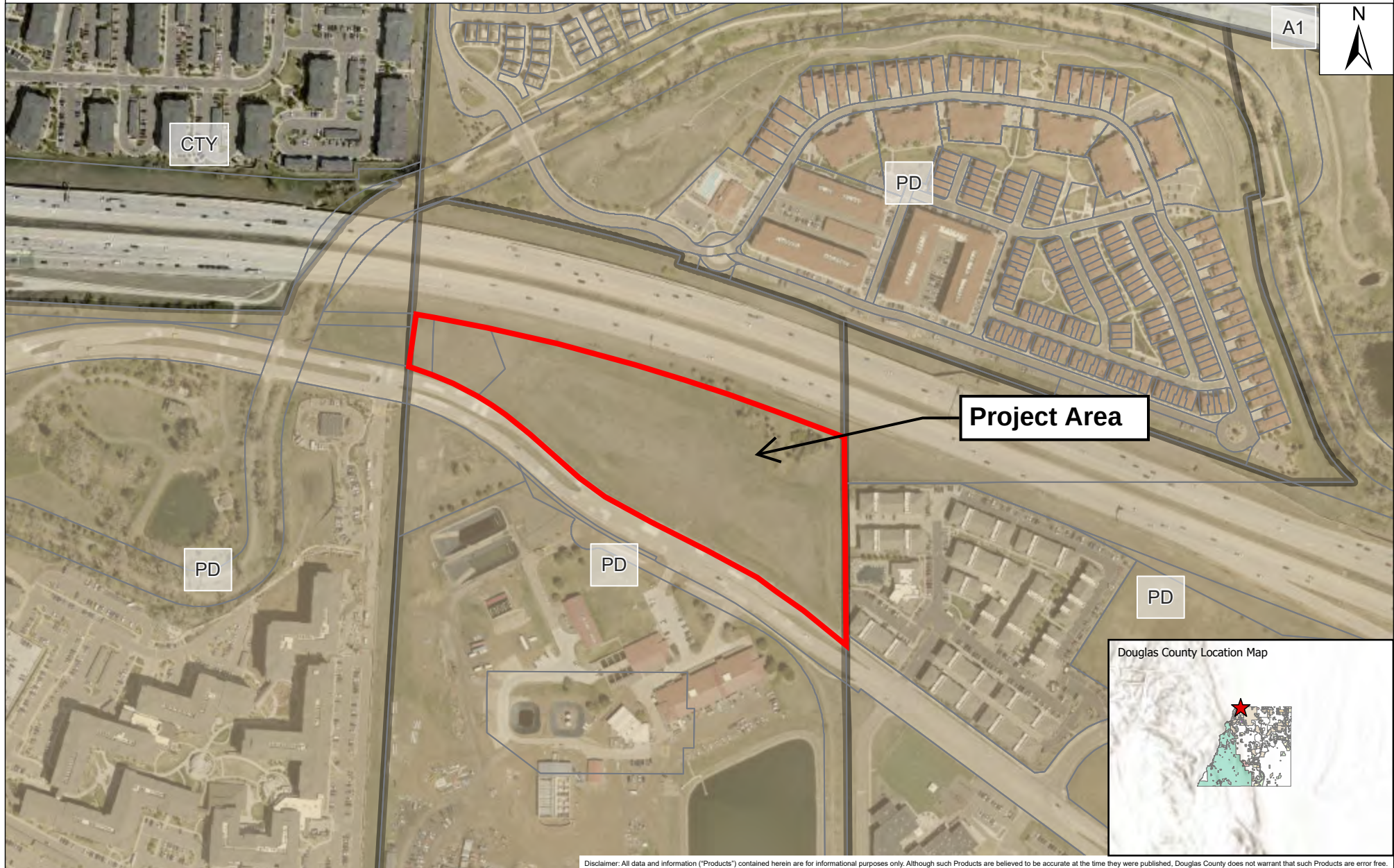
Parks

- Pike National Forest
- State Parks
- Open Space
- Lakes

Roadways

- Major Roads





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-  A1 - AGRICULTURAL ONE
-  PD - PLANNED DEVELOPMENT



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 PD - PLANNED DEVELOPMENT

Referral Agency Response Report**Page 1 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
Addressing Analyst	06/16/2023	No Comment	Addressing of the proposed lot will occur during the SIP process.
Arapahoe County Engineering Services Division	06/20/2023	Verbatim response: Engineering Services Division of Arapahoe County Public Works and Development (Staff) thanks you for the opportunity to review the outside referral for the proposed project located in Douglas County. The Engineering Division has no comments regarding the referral at this time based on the information submitted. Please know that other Divisions in the Public Works Department may submit comments as well. Thank you, Sue Liu, PE, CFM Arapahoe County Public Works & Development, Engineering Services Division	No further action necessary
Arapahoe County PWD/ Planning	06/20/2023	Verbatim response: Thank you for the opportunity to review and comment on this project. The Arapahoe County Planning Division has no comments; however, other departments and/or divisions may submit comments. TERRI MAULIK, Planning Technician Public Works and Development - Planning Division	No further action necessary
Assessor	06/29/2023	Verbatim response: Please be aware of the following comments and concerns: - Acreage on plat is showing 9.686, the deeded area of parcels before plat is 10.335 acres. Please verify acreage on plat is correct. Regards, Mark Rankin	Applicant has addressed Assessor comments and verified the correct acreage of the proposed lot as noted it on the plat exhibit.

Referral Agency Response Report**Page 2 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
AT&T Long Distance - ROW	06/30/2023	Verbatim response: The Earth map shows the project area in red and based on the address and/or map you provided, there should be NO conflicts with the AT&T Long Lines, as we do not have facilities in that area. Please feel free to contact us with any questions or concerns. Ann Barnowski, Clearwater Consulting Group Inc, 120 9th Avenue South, Suite 140, Nampa, ID 83651 Annbn@cwc64.com	No further action necessary
Building Services	06/22/2023	Verbatim response: Permit is required, please visit Douglas County's web site for requirements and contact 303-660-7497 with questions.	Applicant has acknowledged Building Services comment. Building permits will be submitted following approval of an SIP.
Centennial Water and Sanitation District	07/13/2023	No Comment	No further action necessary
CenturyLink		No Response Received	The plat establishes a general purpose utility easement. No encroachments are anticipated.

Referral Agency Response Report**Page 3 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
Colorado Department of Transportation CDOT-Region # 1	07/07/2023	Summary: For ANY ground disturbance/work within CDOT ROW--- Required: Since this is a permit, a file search for Arch, Paleo and History is required. If the file search identifies anything, a more extensive report will be required. If nothing is identified, then the file search should be sufficient. Clear Zone: Ensure that any new landscaping/trees are outside of the clear zones for any State Highway/ CDOT ROW and that the new landscaping/trees do not interfere with site lines from any State Highway/CDOT ROW. Landscape: Any new or changes to existing landscaping within CDOT ROW must be reviewed and approved by CDOT. Landscaping plans should be submitted and should include details of all proposed plant species and seed mixes/ratios. WQ: Will This development be taking any drainage from CDOT ROW? Has the Highline Canal company been contacted in regards to the proposed water quality measures being installed? Right of Way Comments: All work appears to be to the south of existing ROW- there is a 10' setback from the C-470 property line and only a little minor grading work was proposed in this 10' strip on the east end of the project. No A-Lines, No Dedications to CDOT, no real concerns that I can see from a ROW or Survey Perspective. Permits Comments: It appears that CDOT ROW runs along the north side of this development (470). Please keep in mind that any work in the CDOT ROW unrelated to access will require a permit from our office.	Applicant has acknowledged CDOT referral comments. In response to CDOT comments, the applicant has indicated that no work is anticipated within the State Highway CDOT ROW. The applicant is working with the High Line Canal and other entities on the drainage plan and stormwater management for the future senior apartment development.

Referral Agency Response Report**Page 4 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
Colorado Division of Water Resources	07/06/2023	Verbatim response: We have received the proposal for a minor development plat under Case No. SB2023-022. The Applicant is requesting to construct 240 multifamily units known as the "Kaos Apartments". This referral for Shea Properties, Case No. SB2023-022, on 9.69 acres in Sec. 5, T6S, R68W, 6th P.M., does not appear to qualify as a "subdivision" as defined in section 30-28-101(10)(a), C.R.S. Therefore, pursuant to the State Engineer's March 4, 2005 and March 11, 2011 memorandums to county planning directors, this office only performed a cursory review of the referral information. Upon review, it appears that the proposed water supply source for the property is service provided by the Centennial Water and Sanitation District. There are no permitted wells on the subject property. Therefore, our office has no comments on this referral. Thank you for the opportunity to review Case No. SB2023-022. Please let us know if you have any questions or concerns. Mike Matz, Water Resource Engineer P 303.866.3581 x 8241 1313 Sherman Street, Room 818, Denver, CO 80203 michael.matz@state.co.us www.colorado.gov/water	No further action required. The property is served by a district and no groundwater wells exist on the property.
Colorado Geological Survey	07/26/2023	Verbatim response: No comment. The recommendations in Cesare's 10/6/2022 geotechnical investigation are valid.	No further action required

Referral Agency Response Report**Page 5 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Colorado Parks and Wildlife	07/05/2023	Summary: District Wildlife Manager Justin Olson recently analyzed the project site. CPW would expect to find occasional use of the proposed site by small ground-dwelling mammals, small birds, raptors, and other common urban species. Prairie dogs may occur within or near the proposed development site, and as a result, the potential may also exist for the presence of burrowing owls. These raptors are classified as a state threatened species and are protected by both state and federal laws, including the Migratory Bird Treaty Act. These laws prohibit the killing of burrowing owls or disturbance of their nest. Therefore, if any earth-moving will begin between March 15th and August 31st, a burrowing owl survey should be performed. Guidelines for performing a burrowing owl survey can be obtained from your local District Wildlife Manager. If prairie dogs are present and any earth-moving is to be done on site, CPW recommends euthanasia or relocation (with the appropriate permit) prior to any work being done. If relocation is chosen, please consult with the local district wildlife manager for the required permit. Care should also be taken to make sure no raptor nests will be impacted during this project. Raptors are protected from take, harassment, and nest disruption at both the state and federal levels. CPW recommends that buffer zones be implemented around any nest discovered within the project vicinity during any period of activity that may interfere with nesting season. This will prevent the intentional or unintentional destruction of an active nest. For further information on this topic, a copy of the document "Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors" and CPW High Priority Habitat designations are available from your local District Wildlife Manager. Following the recommendations outlined in these documents will decrease the likelihood of unintentional	Applicant acknowledged CPW referral comments and will follow the CPW recommended guidelines if any wildlife is encountered on the site.
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Referral Agency Response Report**Page 6 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
		take through disturbance. Noxious weeds should be monitored very closely. CPW would recommend implementation of a weed management plan that may already exist within Douglas County and re-vegetation of any disturbed sites with native seed mixes. In addition, if any aspects of this project will require fencing, CPW would recommend the use of wildlife-friendly fencing designs that allow for ease of movement and reduced likelihood of entanglement. Information about wildlife friendly fencing can be obtained from your local CPW Office. Current CPW policy directs our efforts towards proposals that will potentially have high impacts to wildlife and wildlife habitat. The emphasis of CPW's concerns is on large acreages, critical habitats, wildlife diversity, and impacts to species of special concern, or those that are state or federally endangered. Due to the small acreage of the proposed project and limited disturbance to nearby habitat areas, impacts of the development can be characterized as minimal. This may not mean that the landscape has no value to wildlife or value to the community. It is important to remember that incremental and cumulative loss of natural areas and open spaces will, over time, significantly degrade the overall quality of wildlife habitat in the area. Therefore, in this case, we want to focus our recommendations on planning and implementing your proposal to minimize negative impacts and maximize potential enhancements to support living with wildlife in our community. If you have any further questions, please contact District Wildlife Manager Justin Olson at (303) 291-7131. Sincerely, Matt Martinez, Area Wildlife Manager Cc: M. Leslie, S. Schaller, J. Olson	
Comcast		No Response Received	No further action required

Referral Agency Response Report**Page 7 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
Denver Water Board	07/12/2023	Summary: In summary, Denver Water’s main concerns related to grading and drainage on their easement and commented on the following: Label 50’ wide Denver Water easement on the plans. Also show the 24” Denver Water Conduit 100. Per our easement terms, no utility crossings are allowed, but storm sewer may be permitted by special provision and a Denver Water license. Drainage plans need to be reviewed to look at flows, connections to pond and if there are any impacts to High Line Canal. No trees, fencing or structures are allowed in the easement. Denver Water stated that they may not approve grading changes over the waterline, but will discuss this after reviewing plans. The agency asked who would be maintaining the access drive on their easement. Gina Begly Property Management Real Estate Sr Specialist Denver Water t: 303-628-6219 1600 West 12th Avenue Denver, CO 80204 denverwater.org	The applicant acknowledged Denver Water Board referral comments and has been coordinating with the agency to address all concerns related to grading, drainage, stormwater management, and potential impacts to the High Line Canal. The applicant has revised the MDP exhibit to show all Denver Water easements. Additionally, the applicant has indicated that Mile High Flood District’s consultant RESPEC has reviewed the potential impacts on the High Line Canal, and found that there would be no impact from the proposed future development. Shea Properties will maintain the access drive.
Douglas County Conservation District	07/14/2023	Summary: The Douglas County Conservation District provided comments relating to soil conditions and recommended alternatives to mitigate the limitations of the soil in the final engineering design of the future development. All disturbed areas should be seeded and mulched with weed free hay mulch at 4,000 lbs./acre. Disturbed land should be mulched or revegetated within 45 days of disturbance. An Integrated Noxious Weed Control plan was recommended to be completed. Low Impact Development (LID) techniques were recommended to be implemented for economic and conservation benefits.	The applicant has completed a weed management plan and has coordinated with Douglas County Engineering to address construction plan comments.

Referral Agency Response Report**Page 8 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
Douglas County Health Department	06/26/2023	Verbatim response: Thank you for the opportunity to review and comment on the request to plat one multi-family residential lot. Douglas County Health Department (DCHD) staff have reviewed the application for compliance with pertinent environmental and public health regulations. After reviewing the application, DCHD has no comments. Please feel free to contact me at 720-907-4888 or bfreder@douglas.co.us if you have any questions about our comments. Sincerely, Brent Freyer, Environmental Health Specialist I	No further action necessary
Douglas County Historic Preservation	07/18/2023	Summary: Upon reading the Limited-Results Cultural Resource Survey of the subject site written by ERO Resources Corporation in 2023, the Douglas County Curator has no further comments. There are no impacts to cultural resources in the area. Thank you in advance for your attention to the preservation and protection of Douglas County's cultural resources for future generations. Sincerely, Brittany Cassell, Curator	No further action necessary
Douglas County Parks and Trails	06/21/2023	Verbatim response: Parks commitments have been met through previous dedications within the PD. Thus, no dedications or fees are required.	No further action necessary

Referral Agency Response Report**Page 9 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
Douglas County School District RE 1	06/26/2023	Received: Summary - DCSD has calculated the amount of school site land dedication required for students generated by the proposal. A total of 18 students are expected from the development requiring a total land dedication requirement of 0.396 acres. The required school land dedication has been accounted for within the Highlands Ranch PD. The proposed development is within the overall unit count of Highlands Ranch as outlined in the Highlands Ranch PD. Since the overall unit count within Highlands Ranch is not increasing, all land dedication for parks and schools has been accounted for. DCSD has no objection to approval of this application. The proposed subdivision is currently located in the school attendance areas of Northridge, Mountain Ridge Middle School and Mountain Vista High School. Shavon Caldwell, Planning Manager, DCSD Planning & Construction, shavon.caldwell@dcsdk12.org office: 303.387.0417 mobile: 720.428.1170	No further action necessary

Referral Agency Response Report**Page 10 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
Engineering Services	07/06/2023	Verbatim response: Engineering has reviewed the above referenced submittal and have the following comments: <u>Final Plat Comments</u> Comment #1-On sheet 1, please remove general note #8. The only secondary drainage easement that will be dedicated to Douglas County will be for the detention/water quality pond which will be handled through a separate easement dedication. Comment #2-On sheet 2, please provide us with an executed copy of the access easement with the Highlands Ranch Metropolitan District for the westerly access. Comment #3-On sheet 2, please designate which entity the proposed drainage easement along the north side of lot 1 will be dedicated. Comment #4-A Public Improvements Agreement (PIA) for the median island improvements in Plaza Drive will be required. I will provide you with a copy of this agreement. A separate set of construction plans will need to be submitted with the final plat that incorporates these widening/median island improvements. We cannot recommend approval of this minor development plat until our comments have been addressed. If you have any questions, please give me a call. Sincerely, Chuck Smith Development Review Engineer See attachments	Comments have been forwarded to the applicant. The applicant has addressed all Douglas County Engineering comments. After further evaluation of this MDP, engineering will not require a PIA for this proposed subdivision for one lot.
High Line Canal Conservancy		No Response Received	No further action necessary

Referral Agency Response Report**Page 11 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
Highlands Ranch Community Association (HRCA)	07/12/2023	Summary: The HRCA development and design team commented on the architecture, landscaping, and site improvements and indicated that these would be complimentary to the surrounding developments. Additional discussions related to the applicant's traffic study, and stormwater management. The HRCA further noted that the project will finish portions of the public sidewalk along Plaza Drive and a trail connection to the High Line Canal providing pedestrian connectivity.	The applicant has met with the HRCA, and has indicated that they will look to incorporate some of the HRCA comments on future development of the site.
Highlands Ranch Golf Club HOA		No Response Received	No further action necessary
Highlands Ranch Metro District	07/05/2023	Verbatim response: Informational response: site civil plans must be submitted to the District for review and approval. Thanks, Jon Klassen Project Manager Centennial Water & Sanitation District	The applicant is working directly with HRMD to resolve referral comments.
Jefferson County Planning and Zoning		No Response Received	No further action necessary
City of Littleton		No Response Received	No further action necessary
Mile High Flood District	07/06/2023	Verbatim response: Since the outfall discharges into the High Line Canal (HLC), we are referring the design report to RESPEC, who maintains a living SWMM model for the HLC. RESPEC will coordinate with Redland on running the proposed conditions in the SWMM model, in order to confirm there are no adverse impacts. As a note, outfalls into the HLC are not considered maintenance eligible.	The applicant has coordinated with Douglas County Engineering, MHFD and RESPEC to address any adverse impacts.

Referral Agency Response Report**Page 12 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
Office of Emergency Management		No Response Received	No further action necessary
Open Space and Natural Resources	06/20/2023	No Comment	No further action necessary
RTD - Planning & Development Dept		No Response Received	No further action necessary
Sheriff's Office		No Response Received	No further action necessary
Sheriff's Office E911		No Response Received	No further action necessary
South Metro Fire Rescue	06/28/2023	Verbatim response: South Metro Fire Rescue (SMFR) has reviewed the provided documents and has conditional non-objection to the proposed Minor Development Plat. Comments must be resolved as required by planner for Plat approval. Applicants and Contractors are encouraged to contact SMFR regarding the applicable permit requirements for the proposed project. COMMENTS: 1. Fire Hydrant locations will not be approved as shown on Water and Sanitary Plans resulting in required revisions to utility easements. Once required fire flow requirements for the buildings have been determined and hydrant requirements verified, a plan indicating revised hydrant locations will be required to be reviewed by SMFR for approval.	The applicant continues to work with SMFR to address fire hydrant locations and utility easements needs. These will be finalized with future development of the Senior Apartment facility site design.

Referral Agency Response Report**Page 13 of 13****Project Name:** Highlands Ranch Filing 159**Project File #:** SB2023-022**Date Sent:** 06/16/2023**Date Due:** 07/14/2023

Agency	Date Received	Agency Response	Response Resolution
South Suburban Park & Recreation District	07/13/2023	Verbatim response: South Suburban staff reviewed the referral for SB2023-022 - Highlands Ranch Filing 159, Minor Development Plat and have the following comments. This development is outside of South Suburban Park and Recreation District. Any comments should be provided by Highlands Ranch Metro District. Thank you for the opportunity to comment on SB2023-022 - Highlands Ranch Filing 159, Minor Development Plat. Sincerely, Melissa Reese-Thacker Planning Manager	No further action necessary
Xcel Energy- Right of Way & Permits	06/27/2023	Summary: Public Service Company requests that all existing and proposed utility easements be depicted graphically on the MDP plat. While these easements may accommodate certain utilities to be installed in the subdivision, some additional easements may be required as planning and building progresses. PSCo owns and operates existing underground electric facilities along east and north property lines and requires all facilities are shown on the plan. The property owner/developer/ contractor must complete the application process for any new natural gas or electric service, or modification to existing facilities via xcelenergy.com/ InstallAndConnect . It is then the responsibility of the developer to contact the Designer assigned to the project for approval of design details. Additional easements may need to be acquired by separate document. The Designer must contact the appropriate Right-of-Way Agent. Violeta Ciocanu (Chokanu), Right of Way and Permits Public Service Company of Colorado dba Xcel Energy Office: 303-285-6612 – Email: violeta.ciocanu@xcelenergy.com	The applicant has dedicate a 10-foot utility easement along the southerly, westerly, and northerly property lines of the MDP plat exhibit.

July 6, 2023

Rob Oglesby, P.E.
Authorized Representative
Redland Consulting Group, Inc.
1500 West Canal Court B
Littleton, CO 80120

DV 2023-168

Subject: Highlands Ranch Filing 159 – Minor Development Plat

Dear Rob,

Plan Review Summary:

Submitted to Engineering	-	6/16/23
Comments Sent Out	-	7/6/23

Engineering has reviewed the above referenced submittal and have the following comments:

Final Plat Comments

Comment #1-On sheet 1, please remove general note #8. The only secondary drainage easement that will be dedicated to Douglas County will be for the detention/water quality pond which will be handled through a separate easement dedication.

Comment #2-On sheet 2, please provide us with an executed copy of the access easement with the Highlands Ranch Metropolitan District for the westerly access.

Comment #3-On sheet 2, please designate which entity the proposed drainage easement along the north side of lot 1 will be dedicated.

Comment #4-A Public Improvements Agreement (PIA) for the median island improvements in Plaza Drive will be required. I will provide you with a copy of this agreement. A separate set of construction plans will need to be submitted with the final plat that incorporates these widening/median island improvements.

We cannot recommend approval of this minor development plat until our comments have been addressed. If you have any questions, please give me a call.

Sincerely,

A handwritten signature in blue ink, appearing to read "Chuck Smith".

Chuck Smith

Development Review Engineer

cc: Matt Williams, P.E.; Assistant Director of Public Works Engineering
Carolyn Washee-Freeland, AICP; Senior Planner

DV23168



HIGHLANDS RANCH

COMMUNITY ASSOCIATION

Enhancing property values and creating quality of life through recreation, community events and leadership

Wednesday - July 12, 2023

To: **HRCA DEVELOPMENT REVIEW COMMITTEE**

Cc: Mr. Mike Bailey via: Mike.Bailey@hrcaonline.org
Ms. Diana Sklenar via: Diana.Sklenar@hrcaonline.org

From: Weylan A. "Woody" Bryant, PE for the HRCA Staff

Subject: **KAOS APARTMENTS (SHEA PROPERTIES)**
Highlands Ranch Filing 159, Lot 1 (Plaza Drive – west of Solana Lucent Station Apartments)
HRCA STAFF REVIEW FINDINGS AND RECOMMENDATIONS

Staff has completed our review of the above noted application and offers the following findings and recommendations:

RECOMMENDATION: ☐ Approve ☐ Approve w/Conditions ☐ Deny ☐ Continue ☒ Other: **COMMENT**

BACKGROUND AND APPLICATION INFORMATION:

This project is proposed by and located on property owned by the Declarant, Shea Properties. For Declarant projects on Declarant owned property, the DRC's review and approval authority is limited by Article VII: Declarant's Rights & Reservations of the Community Declaration, specifically §7.4 that notes, in part, "Nothing contained in this Community Declaration shall...require the Declarant to seek or obtain the approval of the Architectural Committee or of the Community Association...." Accordingly, **the DRC is only a referral entity to Douglas County, tasked to offer comments, concerns, suggestions, etc. to Douglas County for their (and the Declarant's) consideration.**

The proposed project is located on Lot 1 of Highlands Ranch Filing 159 and totals 9.69 acres (note: The development team has submitted for a concurrent review of a Minor Development Plat to combine the existing three separate tracts into the one lot of 9.69 acres).

The Site Improvement Plan reflects two multi-family buildings and a clubhouse. Each multi-family building is proposed to have 72 one-bedroom units, 44 two-bedroom units and 4 three-bedroom units, for a total of 240 units. Additionally, the development will include such amenities as a pool, exercise facility, dog park, grill stations and fire pits.

The development and design team believe the architecture, landscaping and site improvements (e.g. retaining walls, fencing, hand rails, etc) will be complimentary to the surrounding developments. Finally, they note that the project will finish portions of the public sidewalk along Plaza Drive and a trail connection to the Highline Canal providing pedestrian connectivity.

FINDINGS AND RECOMMENDATIONS:

The project is located within Planning Area 79, "Plaza Center" on the north side of Plaza Drive, south of C-470 and west of the existing Solana at Lucent Station apartment complex. Multi-family dwellings (for sale or lease, with a minimum of 10 units per building) are a Use Permitted by Right per §X-C: Plaza Center (PA 77-A, 77-B, and 79) of the Highlands Ranch Planned Development Guide (hereinafter, HRPDG). First floor retail is allowed, but not required and private leasing and sales offices are allowed. The accessory buildings (club house and fitness center) are generally allowed per §XIV: Accessory Uses of the HRPDG.

Development Standards per the HRPDG:

Per §X-C: Plaza Center (PA 77-A, 77-B, and 79).

1. Minimum Lot Area: 5,000 square feet.
 - a. **COMPLIANT.** The project site, as previously noted, is 9.69 acres (421,904 square feet).
2. Maximum Building Height: 70 feet.
 - a. **COMPLIANT.** The building height, including the necessary parapet to screen the roof top equipment, is approximately 60 feet.
3. Minimum Setbacks: 20 feet abutting property boundary lines; however, no setback is required adjacent to property lines which merely separate uses.
 - a. **COMPLIANT.** The least dimension proposed is 20.27' from the corner of the eastern building to the property line.
4. Lighting: Comply with Douglas County regulations.
5. Loading Areas & Trash/Storage Areas: Screened from view by placement within building or enclosure with opaque walls at least five feet in height (wall to compliment exterior building materials).
 - a. **COMPLIANT.** The trash/storage areas are internal to the buildings, accessed by small drive lanes.

HRCAonline.org

6. Screening of mechanical equipment placed on roof: Must be screened from view from any street.
 - a. **COMPLIANT.** The design includes an approximately seven-foot-tall parapet wall providing full screening of the roof top equipment.
7. Landscaping:
 - a. Installed on at least 15% of the acreage of the lot.
 - i. **COMPLIANT.** The “planted area” and “existing vegetation” account for approximately 40% of the gross site area.
 - b. Installed along all property lines abutting perimeter public streets to a width of at least 10 feet.
 - i. **COMPLIANT.** Landscaping is proposed within 10 feet of the northern and eastern property lines. Additional landscape area is provided along Plaza Drive and within the planned stormwater management pond at the west end of the development.

Per §XVI: Off-Street Parking.

1. ¶C.4.b discusses multiple-family dwellings.
 - a. One-bedroom unit: 1.3 spaces per unit x 144 units = 188 spaces required
 - b. Two-bedroom unit: 1.6 spaces per unit x 88 units = 141 spaces required
 - c. Three-bedroom unit: 2.0 spaces per unit x 8 units = 16 spaces required
 - d. Visitor parking: 0.5 spaces for each unit x 240 units = 120 spaces required
 - e. 465 spaces required | 470 spaces provided (mix between garage and surface)
 - i. **COMPLIANT.** Note: Additional ADA and “Highline” spaces provided (+23 spaces)

Discussion:

1. Regarding Architecture. In reviewing the architectural design, it appears there is some similarity to the design used with Windcrest (same scale buildings, building elevation materials, etcetera); however, the abutting Solana Lucent Station Apartments have “tower elements” to break up the monotony of the building roofline that is not planned with this project. The design does add some vertical material elements to break up the elevation view of the building; however, **Staff recommends that the bottom band of brick proposed on the two residential structures be replaced with the “Manufactured Stone Veneer: Lyons Sandstone College Rose with mortar” to tie the two residential buildings in with the Clubhouse’s and Fitness Center’s design.**
2. Regarding Building Height. As noted above, the design is compliant with the Development Standards for this Planning Area; however, Solana’s maximum building height is three-stories while this project proposes five-stories (plus), so there isn’t consistency to the abutting development. In comparing the building height to other developments in the general vicinity, the Golf Course Community Homes are at (roughly) elevation 5616’ and the ground level in the center of KAOS is 5553’, so roughly 63’ lower. Add back into that a conservative 60 feet for the KAOS buildings (because that’s the maximum height of their buildings, and the ground slopes from east→west) and the top of the proposed buildings will be roughly 10-feet below the ground grade at the Golf Course Community Homes.



3. Regarding Landscaping: The designers are presenting a varied palate of materials, which will be aesthetically pleasing. Staff is concerned with the quantity of irrigated “Turf-Sod-RTF” that is planned; however, it is acknowledged that the

majority of the area is along the frontage of Plaza Drive with smaller “pocket parks” internal to the site, which may be appropriate. The larger areas (e.g. Dog Park in northeast corner and stormwater management pond in the northwest corner) are planned as native grass.

4. Regarding Traffic: A Traffic Impact Study was prepared for this development. The purpose of the Study was to identify project traffic generation characteristics to determine potential project traffic related impacts on the local street system and to develop the necessary mitigation measures required for the identified traffic impacts. The following intersections were incorporated into the Study in accordance with Douglas County standards and requirements:
 - a. County Line Road and Erickson Boulevard (#1)
 - b. Plaza Drive and Erickson Boulevard (#2)
 - c. Plaza Drive and Lucent Boulevard (#3)

In addition, two (2) full movement accesses and one (1) proposed right-in/right-out access along Plaza Drive were evaluated.

The Study found that the development is expected to generate approximately 1,100 weekday daily trips, with 94 of these trips occurring during each of the morning and afternoon peak hours.

The Study provided the following recommended improvements:

- a. R1-1 “STOP” signs are recommended to be installed on the southbound approaches of all three (3) accesses, exiting the development.
- b. A R3-2 “NO LEFT TURN” sign should be placed underneath the R1-1 “STOP” sign at the right-in/right-out (RIRO) access that is proposed approximately 450 east of the full movement access that is aligned with the Centennial Water & Sanitation driveway.
- c. A R6-1R “ONE WAY” sign could be placed within the existing raised median of Plaza Drive.
- d. The eastbound left turn lanes at the full movement accesses provide a length of 250 feet.

Staff recommends that the DRC encourage the applicant to address the recommendations of their Traffic Engineer in their Site Improvement Plan and Construction Drawings for this project. It appears that some, but not all, of these recommendations are captured on the current Site Improvement Plans.

5. Regarding Stormwater Management: A Phase III Drainage Report was prepared for this development. Runoff from the site will be collected by a private drainage system and storm sewer which will outfall into a proposed “Full-Spectrum Detention Pond”. The pond is sized per Douglas County requirements to accommodate the Water Quality Capture Volume (WQCV), Excess Urban Runoff Volume (EURV), and the 100-year Recurrent Storm Interval Runoff Volume. The pond includes a controlled release to the Highline Canal at or below historic rates, as required. It is expected that downstream infrastructure will not be adversely impacted with the development since the discharge will be controlled.

The stormwater management pond will be enclosed with a fence and the plans note “reference to Landscape Plans for Fence Details”; however, the Landscape Plans do not include details for this fencing. **Staff recommends this fencing be the same as what is proposed for the “Dog Park Perimeter Fence”, as shown on Drawing 10 of 25, for consistency in look.**

June 26, 2023

Matt Jakubowski, Chief Planner
Douglas County Department of Community Development
Planning Services Division
100 Third St., Castle Rock, CO 80104
303-660-7460
mjakubow@douglas.co.us

Carolyn Washee-Freeland, Senior Planner
Douglas County Department of Community Development
100 Third St., Castle Rock, CO 80104
303-814-4361
cfreeland@douglas.co.us

RE: Highlands Ranch Filing 159-Minor Development Plat and Site Plan (SB2023-022, SP2023-035)

Dear Mr. Jakubowski and Ms. Washee-Freeland,

Thank you for the opportunity to respond to the above referenced application. It is our understanding that the applicant is requesting approval for the construction of two multifamily buildings and a clubhouse (240 multifamily residential units) on 9.86 acres. The property is located at the southeast intersection of Colorado State Highway 470 and the High Line Canal and Trail.

**CASH-IN-LIEU CALCULATION
STUDENT GENERATION**

PROJECT NAME: HIGHLANDS RANCH FILING 159-MINOR DEVELOPMENT PLAT AND SITE PLAN					
DU/	ACRES		DENSITY		
240	9.86		24.34		
			Generation	Number	
<u>STUDENT GENERATION RATES</u>	<u>No. of DU's</u>		<u>Rate</u>	<u>of Students</u>	
ELEMENTARY	240	X	0.05	12	
MIDDLE SCHOOL	240	X	0.008	2	
HIGH SCHOOL	240	X	0.017	4	
				18	
				Required	
			School	Land	
	Number		Acreage	Dedication	
<u>SCHOOL LAND DEDICATION</u>	<u>of Students</u>		<u>Per Student</u>	<u>Acreage</u>	
ELEMENTARY	12	X	0.018	0.216	
MIDDLE SCHOOL	2	X	0.030	0.058	
HIGH SCHOOL	4	X	0.030	0.122	
			TOTAL	0.396	

On behalf of Douglas County School District, we have a couple comments regarding this application. DCSD has calculated the amount of school site land dedication required for students generated by the proposal. A total of 18 students are expected from the development requiring a total land dedication requirement of 0.396 acres.

The required school land dedication has been accounted for within the Highlands Ranch PD. The proposed development is within the overall unit count of Highlands Ranch as outlined in the Highlands Ranch PD. Since the overall unit count within Highlands Ranch is not increasing, all land dedication for parks and schools has been accounted for. DCSD has no objection to approval of this application.

The proposed subdivision is currently located in the school attendance areas of Northridge, Mountain Ridge Middle School and Mountain Vista High School.

Shavon Caldwell, Planning Manager
DCSD Planning & Construction
shavon.caldwell@dcsdk12.org
office: 303.387.0417
mobile: 720.428.1170

REFERRAL RESPONSE REQUEST

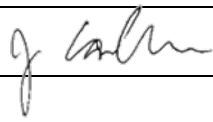
Date sent June 16, 2023
Comments due by July 14, 2023
Project Name: Highlands Ranch Filing 159 – Minor Development Plat

Project File #: SB2023-022

Project Summary:

The applicant requests approval of a Minor Development Plat (MDP) for one lot within the Highlands Ranch Planned Development (PD), Filing 159. The property consists of 9.2 acres and is located within Planning Area 79. The subject property is located between C-470 and Plaza Drive, and east of Erickson Blvd. and west of Lucent Blvd. State Parcel Number: 2229-051-00-009. This MDP request will be processed concurrently with the associated Site Improvement Plan (SP2023-035) to construct 240 multi-family residential units known as the Kaos Apartments.

Information on the identified development proposal located in Douglas County is enclosed. Please review and comment in the space provided.

☒	No Comment	The recommendations in Cesare's 10/6/2022 geotechnical investigation are valid
☐	Please be advised of the following concerns:	
☐	See letter attached for detail.	
Agency: Colorado Geological Survey		Phone #: 303-384-2643
Your Name: Jill Carlson		Your Signature: 
(please print)		Date: 7/25/2023

Agencies should be advised that failure to submit written comments prior to the due date, or to obtain the applicant's written approval of an extension, will result in written comments being accepted for informational purposes only.

Sincerely,

Carolyn Washee-Freeland

Carolyn Washee-Freeland, AICP
 Senior Planner, Planning Services
 303-660-7460
cfreeland@douglas.co.us

STATE OF COLORADO

Traffic & Safety

Region 1

2829 W. Howard Place

Denver, Colorado 80204



COLORADO
Department of Transportation

Project Name: **Kaos Residential**

Print Date: 7/7/2023

Highway:

C-470

Mile Marker:

18.142

Environmental Comments:

No Planning concerns

For ANY ground disturbance/work within CDOT ROW---

Required:

Arch/History/Paleo:

Since this is a permit, a file search for Arch, Paleo and History is required. If the file search identifies anything, a more extensive report will be required. If nothing is identified, then the file search should be sufficient. For the file search contact:

Cultural/History File Search: <https://www.historycolorado.org/file-access> Email: hc_filesearch@state.co.us

Paleo File Search: Colorado University Museum of Natural History - Email: jacob.vanveldhuizen@colorado.edu and <https://www.dmns.org/science/earth-sciences/earth-sciences-collections/> and/or Denver Museum of Nature and Science – Email: kristen.mackenzie@dmns.org <https://www.dmns.org/science/earth-sciences/earth-sciences-collections/>

Clear Zone: It is the responsibility of the engineer/architect who stamps the plans to ensure that: any new landscaping/trees are outside of the clear zones for any State Highway/CDOT ROW and that the new landscaping/trees do not interfere with site lines from any State Highway/CDOT ROW.

Landscape: Any new or changes to existing landscaping within CDOT ROW must be reviewed and approved by CDOT. Landscaping plans should be submitted and should include details of all proposed plant species and seed mixes/ratios.

WQ: Will This development be taking any drainage from CDOT ROW? **Has the Highline Canal company been contacted in regards to the proposed water quality measures being installed?**

The Landscaping and trees cannot have any visual effect on C-470.

Right of Way Comments:

MJO 6/22/2023 - All work appears to be to the south of existing ROW- there is a 10' setback from the C-470 property line and only a little minor grading work was proposed in this 10' strip on the east end of the project. No A-Lines, No Dedications to CDOT, no real concerns that I can see from a ROW or Survey Perspective.

SDH 6/22/2023 - Agree with John there are no concerns from the ROW or Survey perspective.

Permits Comments:

7-5-23 It appears that CDOT ROW runs along the north side of this development (470). Please keep in mind that any work in the CDOT ROW unrelated to access will require a permit from our office. This includes, but is not limited to survey, landscaping, or utility work. Application is made online at the following link: <https://cdotpermits.force.com/portal/s/login/?ec=302&startURL=%2Fportal%2Fs%2F> **AE 7-5-23**

REFERRAL RESPONSE REQUEST – SITE IMPROVEMENT PLAN

 Date sent: June 16, 2023

 Comments due by: **July 7, 2023**

Fax: 303.660.9550

Project Name: Highlands Ranch Filing 159, Lot 1

Project File #: SP2023-035

Project Summary:

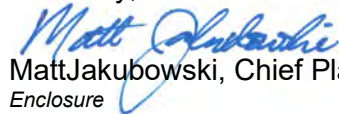
Site Improvement Plan (SIP) request for construction of a 240-unit multi-family residential development consisting of 2 buildings and a clubhouse. The parcel is located on Plaza Drive, approximately ¼ mile west of the intersection of Plaza Drive and Greensborough Drive within Planning Area 79 of the Highlands Ranch Planned Development. *Note: this proposal is being processed concurrently with, and is related to, the Highlands Ranch Filing No. 159 Minor Development Plat (SB2023-022).*

Information on the identified development proposal located in Douglas County is enclosed. Please review and comment in the space provided.

☐ No Comment	
☒ Please be advised of the following concerns:	
Since the outfall discharges into the High Line Canal (HLC), we are referring the design report to RESPEC, who maintains a living SWMM model for the HLC. RESPEC will coordinate with Redland on running the proposed conditions in the SWMM model, in order to confirm there are no adverse impacts. As a note, outfalls into the HLC are not considered maintenance eligible.	
☐ See letter attached for detail.	
Agency: Mile High Flood District	Phone #: 303-455-6277
Your Name: Jeff Battiste	Your Signature:
(please print)	Date: 7/6/23

Agencies should be advised that failure to submit written comments prior to the due date, or to obtain the applicant's written approval of an extension, will result in written comments being accepted for informational purposes only.

Sincerely,



Matt Jakubowski, Chief Planner

Enclosure

Carolyn Freeland

From: annb cwc64.com <annb@cwc64.com>
Sent: Friday, June 30, 2023 11:58 AM
To: Carolyn Freeland
Cc: Pam Choy (pc2914@att.com); duanew cwc64.com; jt cwc64.com
Subject: Plaza Dr Littleton, Colorado Douglas County eReferral #SB2023-022
Attachments: Plaza Dr Littleton, Colorado.jpg

Hi Carolyn,

This is in response to your eReferral with a utility map showing any buried AT&T Long Line Fiber Optics near Plaza Dr Littleton, Colorado. The Earth map shows the project area in red and based on the address and/or map you provided, there should be NO conflicts with the AT&T Long Lines, as we do not have facilities in that area.

Please feel free to contact us with any questions or concerns.

Ann Barnowski
Clearwater Consulting Group Inc
120 9th Avenue South
Suite 140
Nampa, ID 83651
Annb@cwc64.com

The attached google earth maps are intended to show approximate locations of the buried AT&T long line fiber optic cable. The maps are provided for informational purposes only. In no way should the maps be used for anything other than general guidelines as to where the fiber is or is not and any other use of these maps is strictly prohibited.

-----Original Message-----

From: duanew cwc64.com <duanew@cwc64.com>
Sent: Monday, June 19, 2023 11:42 AM
To: annb cwc64.com <annb@cwc64.com>
Subject: FW: Douglas County eReferral (SB2023-022) Is Ready For Review

Please do not hesitate to contact me with any questions or concerns!

Thank you!!

Duane Ward
Clearwater Consulting Group Inc
120 9th Ave South
STE 140
Nampa Id 83687
Duanew@cwc64.com
208-866-2956



Carolyn Freeland

From: Matz - DNR, Michael <michael.matz@state.co.us>
Sent: Thursday, July 6, 2023 2:42 PM
To: Carolyn Freeland
Cc: dave.witte@sheaproperties.com
Subject: Case No. SB2023-022 Highlands Ranch Filing 159, Minor Development Plat

Good Afternoon Carolyn,

We have received the proposal for a minor development plat under Case No. SB2023-022.

The Applicant is requesting to construct 240 multi-family units known as the "Kaos Apartments".

This referral for Shea Properties, Case No. SB2023-022, on 9.69 acres in Sec. 5, T6S, R68W, 6th P.M., does not appear to qualify as a "subdivision" as defined in section 30-28-101(10)(a), C.R.S. Therefore, pursuant to the State Engineer's March 4, 2005 and March 11, 2011 memorandums to county planning directors, this office only performed a cursory review of the referral information. Upon review, it appears that the proposed water supply source for the property is service provided by the Centennial Water and Sanitation District. There are no permitted wells on the subject property. Therefore, our office has no comments on this referral.

Thank you for the opportunity to review Case No. SB2023-022.

Please let us know if you have any questions or concerns.

Best Regards,

Mike Matz
Water Resource Engineer



P 303.866.3581 x 8241
1313 Sherman Street, Room 818, Denver, CO 80203
michael.matz@state.co.us | www.colorado.gov/water



COLORADO **Parks and Wildlife**

Department of Natural Resources

Northeast Regional Office
6060 Broadway
Denver, CO 80216
P 303.291.7227

July 5, 2023

Carolyn Washee-Freeland, AICP/Senior Planner
Douglas County Planning Services
100 Third Street
Castle Rock, CO 80104

RE: Highlands Ranch Filing 159, Minor Development Plat

Dear Ms. Washee-Freeland:

Thank you for the opportunity to comment on the Highlands Ranch Preliminary Filing 159 MDP Project in Douglas County, Colorado. The mission of Colorado Parks and Wildlife (CPW) is to perpetuate the wildlife resources of the state, to provide a quality state parks system, and to provide enjoyable and sustainable outdoor recreation opportunities that educate and inspire current and future generations to serve as active stewards of Colorado's natural resources. Our goal in responding to land use proposals such as this is to provide complete, consistent, and timely information to all entities who request comment on matters within our statutory authority.

District Wildlife Manager Justin Olson recently analyzed the project site. The project is located within the Highlands Ranch Planned Development (Planning Area 79) and is located between C-470 and Plaza Drive, east of Erickson Boulevard, west of Lucent Boulevard, and the parcel size is 9.2 acres. The project is proposing 240 multi-family residential units and associated amenities. CPW would expect to find occasional use of the proposed site by small ground-dwelling mammals, small birds, raptors, and other common urban species.

Prairie dogs may occur within or near the proposed development site, and as a result, the potential may also exist for the presence of burrowing owls. Burrowing owls live on flat, treeless land with short vegetation, and nest underground in burrows dug by prairie dogs, badgers, and foxes. These raptors are classified as a state threatened species and are protected by both state and federal laws, including the Migratory Bird Treaty Act. These laws prohibit the killing of burrowing owls or disturbance of their nest. Therefore, if any earth-moving will begin between March 15th and August 31st, a burrowing owl survey should be performed. Guidelines for performing a burrowing owl survey can be obtained from your local District Wildlife Manager. If prairie dogs are present and any earth-moving is to be done on site, CPW recommends euthanasia or relocation (with the appropriate permit) prior to any work being done. If relocation is chosen, please consult with the local district wildlife manager for the required permit.

Care should also be taken to make sure no raptor nests will be impacted during this project. Raptors are protected from take, harassment, and nest disruption at both the state and

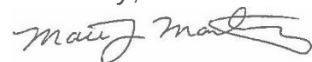


federal levels. CPW recommends that buffer zones be implemented around any nest discovered within the project vicinity during any period of activity that may interfere with nesting season. This will prevent the intentional or unintentional destruction of an active nest. For further information on this topic, a copy of the document "Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors" and CPW High Priority Habitat designations are available from your local District Wildlife Manager. Following the recommendations outlined in these documents will decrease the likelihood of unintentional take through disturbance.

Noxious weeds should be monitored very closely. The spread and control of noxious weeds on and around this Douglas County site is a concern for wildlife. Invasive plants endanger the ecosystem by disturbing natural processes and jeopardizing the survival of native plants and the wildlife that depend on them. CPW would recommend implementation of a weed management plan that may already exist within Douglas County and re-vegetation of any disturbed sites with native seed mixes. In addition, if any aspects of this project will require fencing, CPW would recommend the use of wildlife-friendly fencing designs that allow for ease of movement and reduced likelihood of entanglement. Information about wildlife-friendly fencing can be obtained from your local CPW Office.

Current CPW policy directs our efforts towards proposals that will potentially have high impacts to wildlife and wildlife habitat. The emphasis of CPW's concerns is on large acreages, critical habitats, wildlife diversity, and impacts to species of special concern, or those that are state or federally endangered. Due to the small acreage of the proposed project and limited disturbance to nearby habitat areas, impacts of the development can be characterized as minimal. This may not mean that the landscape has no value to wildlife or value to the community. It is important to remember that incremental and cumulative loss of natural areas and open spaces will, over time, significantly degrade the overall quality of wildlife habitat in the area. Therefore, in this case, we want to focus our recommendations on planning and implementing your proposal to minimize negative impacts and maximize potential enhancements to support living with wildlife in our community. If you have any further questions, please contact District Wildlife Manager Justin Olson at (303) 291-7131.

Sincerely,



Matt Martinez
Area Wildlife Manager

Cc: M. Leslie, S. Schaller, J. Olson

From: Begly, Gina <Gina.Begly@denverwater.org>
Sent: Wednesday, July 12, 2023 11:59 AM
To: mjakubow@douglas.co.us; Carolyn Freeland
Cc: Boothe, Gary W.
Subject: Highlands Ranch 159 SB2023-022 / SP2023-035
Attachments: 1983 Exclusive Esmt.pdf

Hi Matt and Carolyn,

Thank you for sending us a referral and giving up the opportunity to comment.

Denver Water has an exclusive 50' wide easement on the west edge of this project, see attached. Although our easement appears to be off site, this project will still have improvements over us.

Our biggest concerns are the grading and drainage. Denver Water has the following comments:

- Please show/label 50' wide Denver Water easement on the plans. Also show the 24" Denver Water Conduit 100. We recommend you add a plat note to page 1 stating this is an exclusive easement for water purposes, any and all future crossings/improvements need to be approved in writing by Denver Water. (we can discuss language of note)
- Per our easement terms, no utility crossings are allowed, but storm sewer may be permitted by special provision and a Denver Water license. Please send plan and profile for storm sewer crossing at this location.
- The plat shows several easements crossing us, to be dedicated by separate document. Overlapping easements are subject to our approval. Please send for our review.
- Drainage plans need to be reviewed to look at flows, connections to pond and if there are any impacts to High Line Canal.
- Review #2-prohibited obstructions of our easement. No trees, fencing, structures are allowed in the easement.
- We need to review a complete set of grading plans. Our pipe has to maintain a certain depth, we need to see cut/fill over the pipe. We may not approve grading changes over the waterline but we can discuss after reviewing plans.
- Who is maintaining the access drive on our easement? Please show our easement in relationship to easement drive on the plans.

Matt, I apologize I missed your deadline. I hope there's still a way my comments can get incorporated and sent to the applicant.

We are happy to get on a call if you have any questions,

Gina Begly | Property Management | Real Estate Sr Specialist
Denver Water t: 303-628-6219
1600 West 12th Avenue Denver, CO 80204
denverwater.org



2023-01-19
BOOK 467 PAGE 335
RECEIVED
#15.00 pd
MAR 2 3 35 PM '83

RIGHT OF WAY AGREEMENT

THIS AGREEMENT, made and entered into as of the 19th day of January 19 83
by and between Bowen Farms, Inc. FILE NO. 427 DOC. NO. 241

hereinafter called "Grantor", (whether grammatically singular or plural) and the CITY AND COUNTY OF DENVER, acting by and through its BOARD OF WATER COMMISSIONERS, hereinafter called "Board",

WITNESSETH:

For and in consideration of the sum of
Forty Thousand and no/100-----DOLLARS (\$ 40,000.00)
to the Grantor in hand paid by the Board, the receipt whereof is hereby acknowledged, the Grantor hereby grants to the Board, its successors and assigns, the sole, exclusive and permanent right to enter, re-enter, occupy and use the hereinafter described property to construct, maintain, repair, replace, remove, enlarge and operate one or more water pipelines and all underground and surface appurtenances thereto, including electric or other control systems related thereto including underground cables, wires and connections and surface appurtenances thereto. By way of example and not by way of limitation, the parties intend to include within the terms pipelines and appurtenances, the following: mains and conduits, valves, vaults, manholes, control systems, ventilators and the like in, through, over and across the following described parcel of land situate, lying and being in the County of Douglas and State of Colorado, to-wit:

A parcel of land situated in the east half of the north-east quarter (E¹/₂ NE¹/₄) of Section 5, Township 6 South, Range 68 West of the Sixth Principal Meridian, more particularly described and bounded as follows:

Beginning at a point, at the intersection of the Grantor's east property line with the north boundary of the Board's Conduit Number 96 right-of-way, said point being sixty (60) feet north of the east-west centerline of said Section 5, whence the east quarter corner of said Section 5 bears South 87°35'05" East a distance of 1313.6 feet more or less; thence South 89°47'51" West along the north boundary of the Board's Conduit Number 96 right-of-way a distance of 50.10 feet to a point; thence North 03°22'39" East, fifty (50) feet west of and parallel with the Grantor's east property line a distance of 2062.65 feet to a point on the southerly boundary of the Board's High Line Canal property; thence North 71°38'14" East along the said southerly boundary of the Board's High Line Canal property a distance of 53.83 feet to a point on the Grantor's east property line; thence South 03°22'39" West, along the Grantor's east property line, a distance of 2079.5 feet more or less to the point of beginning as shown on D.W.D. drawing Dr. 68 No. 2021 a copy of which is attached hereto and made a part hereof.

The above described parcel of land contains 103,553 square feet (2.38 acres) more or less.

IT IS HEREBY MUTUALLY covenanted and agreed by and between the parties hereto as follows:

1. The Board shall have and exercise the right of ingress and egress in, to, over, through and across the above described property for any purpose needful for the full enjoyment of any other right of occupancy or use provided for herein.
2. The Grantor shall not construct or place any structure or building, street light, power pole, yard light, mail box or sign, temporary or permanent, or plant any shrub, tree, woody plant or nursery stock, on any part of the above described right-of-way. Any structure or building, street light, power pole, yard light, mail box or sign, temporary or permanent, or shrub, tree, woody plant or nursery stock, of any kind situated on the above described right-of-way as of the date of this Agreement, may be removed by the Board without liability for damages arising therefrom.

3. The Grantor shall not construct new fencing across or within the right-of-way herein described without the written approval of the Board.

4. The Grantor grants to the Board the right to occupy the right-of-way in order to protect its interests in and right of occupancy of the right-of-way at all times and particularly during times of construction, repair, removal, replacement or enlargement of water facilities.

5. All water pipelines installed within the above described right-of-way shall be laid not less than two and one-half feet below the natural surface of the adjacent ground

6. The Board shall have and exercise the right of subjacent and lateral support to whatever extent is necessary or desirable for the full, complete and unmolested enjoyment of the rights hereinabove described. It is specifically agreed between the parties that the Grantor shall take no action which would impair the earth cover over, or the lateral or subjacent support for any water pipeline or lines and appurtenances within the right-of-way, provided, however, that upon obtaining the specific written permission of the Board, the earth cover over any water pipeline or lines may be modified, but normally permission will not be granted for a modification involving a cover of less than two and one-half feet nor greater than ten feet measured vertically from the top of any water pipeline or lines, and any modification undertaken by the Grantor would be upon terms which would provide for reimbursement to the Board of the cost of any alterations to any pipeline facility made necessary by the change.

7. After construction of any water pipeline or lines as hereinabove referred to, the general surface of the ground, except as necessarily modified to accommodate appurtenances, shall be restored, as nearly as may reasonably be, to the grade and condition it was in immediately prior to construction. Topsoil shall be replaced in cultivated and agricultural areas, and any excess earth resulting from installations by the Board shall be removed from the right-of-way at the sole expense of the Board. The Board agrees that for a period of one year following construction which involved disturbance of the surface of the ground, the Board will maintain the surface elevation and quality of the soil by correcting any settling or subsiding that may occur as a result of the work done by the Board.

8. The Grantor has retained the right to the undisturbed use and occupancy of the subject property insofar as such use and occupancy is consistent with and does not impair any grant herein contained and except as herein otherwise provided.

9. It is mutually agreed by and between the parties hereto that the Board may commence the exercise of its rights hereunder forthwith or it may postpone the exercise of all or some part of its rights hereunder to some indeterminate future time. The Board may properly acquire, own, and exercise the rights in the subject property as herein provided for in order to insure to the Board a dominant right-of-way for the exercise of the Board's functions and that the exercise of any rights in the subject property other than those retained by the Grantor should be within the sound discretion of the Board. The Board agrees to permit and authorize such other uses of the subject property, not reserved in the Grantor, as will not impair the Board's dominant rights, upon the payment of reasonable compensation to the Board and upon such reasonable terms, limitations, and conditions as the Board shall find reasonably necessary to protect its dominant right of occupancy of the subject property for the purpose of the Board without undue or unnecessary injury to or impairment of the estate retained by the Grantor.

10. In case the Board shall abandon its rights herein granted and cease to use the same, all right, title and interest hereunder of the Board shall cease and terminate, and the Grantor shall hold said premises, as the same may then be, free from the rights so abandoned and shall own all material and structures of the Board so abandoned, but nothing herein shall be construed as working a forfeiture or abandonment of any interest derived hereunder and not owned by the Board at the time of the abandonment of Board rights.

11. The Grantor warrants that he has full right and lawful authority to make the grant hereinabove contained, and promises and agrees to defend the Board in the exercise of its rights hereunder against any defect in his title to the land involved or his right to make the grant hereinabove contained.

12. Each and every one of the benefits and burdens of this Agreement shall inure to and be binding upon the respective legal representatives, heirs, executors, administrators, successors and assigns of the parties hereto.

13. Unless special provisions are attached hereto, the above and foregoing constitute the whole agreement between the parties and no additional or different oral representation, promise or agreement shall be binding on any of the parties hereto with respect to the subject matter of this instrument. To the extent that any special provisions attached hereto are in conflict with any other provisions hereof, such special provisions shall control and supersede any other term or provisions hereof.

SPECIAL PROVISIONS:

FILE NO. 2427 DOC. NO. 241

The Board agrees that public and private roadways and utilities such as sanitary sewer, storm sewer and gas lines may be installed across the herein-described right-of-way, provided they do not interfere with the rights herein granted to the Board; however, plans for the construction/ installation of any and all of said roadways and utilities must first be approved in writing by the Board. Approval will be by license from the Board in accordance with its licensing procedure, which shall set forth the limitations and conditions necessary to protect the Board's existing and future facilities. Installation by "open cut" method will be authorized provided the Board's facilities are adequately protected.

IN WITNESS WHEREOF, the parties hereto have executed the within Agreement as of the day and year first above written.

Bowen Farms, Inc.

By: John G. Bowen
President

ATTEST

John A. Bowen Sec.
Secretary (TITLE)

(D) (U) (S) (X) (A) (M) (D) (V) (N) (G) (E) (H) (E) (N) (N) (X) (X) (X)

STATE OF COLORADO XXXX

_____) X16X
COUNTX OFXX)

~~The writer and/or recipient's name was not changed to xxxxxx~~

01X1015XXX 0121015XXX XXX1015XXX

~~XXXXXXXXXXXXXXXXXXXX~~

~~Witness your hand and seal of fiscal year~~

X X M A T H S P U B L I C X

(Corporate Acknowledgment)

STATE OF COLORADO)
) ss.
_____) COUNTY OF Douglas

The foregoing instrument was acknowledged before me by John G. Bowen

as _____ President and **John A. Bowen** _____ as

Secretary of Bowen Farms, Inc.

a Colorado corporation

on this 19th day of January, 1983

My commission expires: My Commission Expires Oct. 4, 1985
1600 West 12th Ave.
Denver, Colorado 80254

Witness my hand and official seal.

Forrest R. Christ
Notary Public

Address:

CITY AND COUNTY OF DENVER,
acting by and through its
BOARD OF WATER COMMISSIONERS

By: William R. Jell

APPROVED:


Director of Engineering

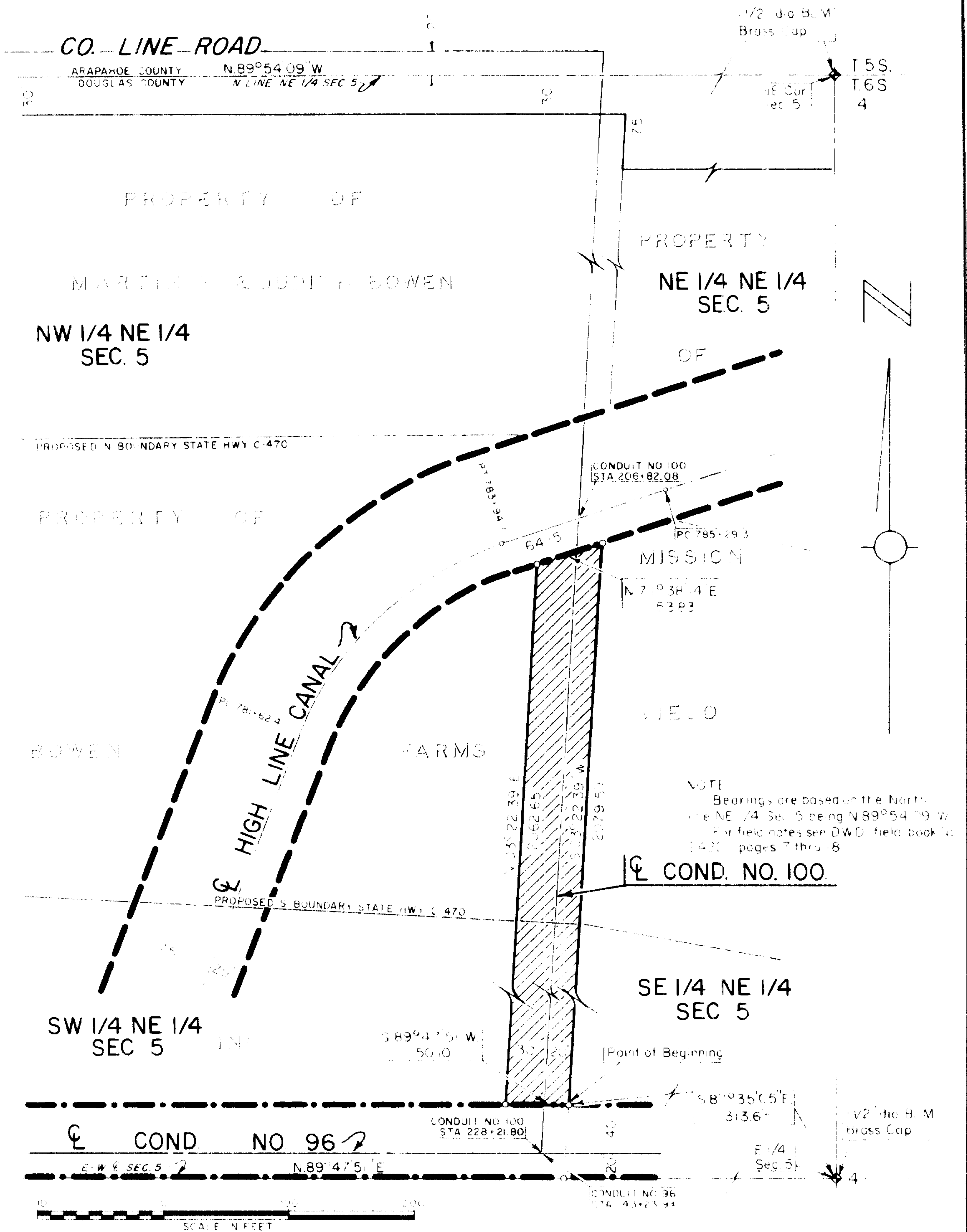
APPROVED AS TO FORM:


Legal Division

REGISTERED AND COUNTERSIGNED
Auditor, City and County of Denver

By: Charles Byrne
D-3 2/8/83

NE 1/4 SECTION 5, TOWNSHIP 6 SOUTH, RANGE 68 WEST 6th P.M.
DOUGLAS COUNTY



PARCEL CONTAINS 103,553 SQ. FT. (2.38 ACRES±)

LEGEND

-  BOUNDARY D.W.D. PROPERTY
 RIGHT-OF-WAY ACQUIRED
 BOUNDARY D.W.D. RIGHT-OF-WAY

DOCUMENT DATED
SEP 14 1974

DENVER WATER DEPARTMENT

CONDUIT NO. 100
RIGHT-OF-WAY ACQUIRED FROM
BOWEN FARMS, INC.

SCALE: 1" = 100'

DATE: JULY 28, 1982

DRN. JAY

TR.

CK 3

APP

DR 68 NO 202!

Please be aware that PSCo owns and operates existing underground electric facilities along east and north property lines and requires all facilities are shown on the plan.

The property owner/developer/contractor must complete the application process for any new natural gas or electric service, or modification to existing facilities via xcelenergy.com/InstallAndConnect. It is then the responsibility of the developer to contact the Designer assigned to the project for approval of design details.

Additional easements may need to be acquired by separate document. The Designer must contact the appropriate Right-of-Way Agent.

As a safety precaution, PSCo would like to remind the developer to contact Colorado 811 for utility locates prior to construction.

Violeta Ciocanu (Chokanu)
Right of Way and Permits
Public Service Company of Colorado dba Xcel Energy
Office: 303-285-6612 – Email: violeta.ciocanu@xcelenergy.com

SOUTH METRO FIRE RESCUE

FIRE MARSHAL'S OFFICE



Matthew Jakubowski, Chief Planner
Douglas County Department of Community Development, Planning Services
100 Third St
Castle Rock Co 80104
303.660.7460
303.660.9550 Fax

Project Name: Highlands Ranch Filing 159, Minor Development Plat
Project File #: **SB2023-022**
S Metro Review #: REFFP23-00131

Review date: June 28, 2023

Plan reviewer: Aaron Miller
720.989.2246
aaron.miller@southmetro.org

Project Summary: The applicant requests approval of a Minor Development Plat (MDP) for one lot within the Highlands Ranch Planned Development (PD), Filing 159. The property consists of 9.2 acres and is located within Planning Area 79. The subject property is located between C-470 and Plaza Drive, and east of Erickson Blvd. and west of Lucent Blvd. State Parcel Number: 2229-051-00-009. This MDP request will be processed concurrently with the associated Site Improvement Plan (SP2023-035) to construct 240 multi-family residential units known as the Kaos Apartments.

Code Reference: Douglas County Fire Code, 2018 International Fire Code, and 2018 International Building Code with amendments as adopted by Douglas County.

South Metro Fire Rescue (SMFR) has reviewed the provided documents and has conditional non-objection to the proposed Minor Development Plat. Comments must be resolved as required by planner for Plat approval. Applicants and Contractors are encouraged to contact SMFR regarding the applicable permit requirements for the proposed project.

COMMENTS:

1. Fire Hydrant locations will not be approved as shown on Water and Sanitary Plans resulting in required revisions to utility easements. Once required fire flow requirements for the buildings have been determined and hydrant requirements verified, a plan indicating revised hydrant locations will be required to be reviewed by SMFR for approval.

Carolyn Freeland

From: Terri Maulik <TMaulik@arapahoegov.com>
Sent: Tuesday, June 20, 2023 11:57 AM
To: Carolyn Freeland
Cc: Ava Pecherzewski; Cathleen Valencia; Michelle Lengyel; Referrals; Robert Victor; Roger Harvey
Subject: RE: Douglas County eReferral (SB2023-022) Is Ready For Review

Carolyn,

Thank you for the opportunity to review and comment on this project. The Arapahoe County Planning Division has no comments; however, other departments and/or divisions may submit comments.



TERRI MAULIK

Planning Technician | Public Works and Development - Planning Division

6924 S Lima St., Centennial Co 80112

O: 720-874-6840 | M: 720-874-6650

arapahoegov.com | [Facebook](#) | [Twitter](#) | [Instagram](#) | [Nextdoor](#)

Many County services can be accessed online. You are encouraged to visit our website at <https://www.arapahoegov.com/519/Public-Works-and-Development>. Please consider emailing us at planning@arapahoegov.com as this email inbox is monitored by several staff members. You may also call (720) 874-6650 to leave a message.

-----Original Message-----

From: cfreeland@douglas.co.us <cfreeland@douglas.co.us>
Sent: Friday, June 16, 2023 2:02 PM
To: Referrals <Referrals@arapahoegov.com>
Subject: Douglas County eReferral (SB2023-022) Is Ready For Review

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

There is an eReferral for your review. Please use the following link to log on to your account:

<https://apps.douglas.co.us/planning/projects/Login.aspx>

SB2023-022 - Highlands Ranch Filing 159, Minor Development Plat

The applicant requests approval of a Minor Development Plat (MDP) for one lot within the Highlands Ranch Planned Development (PD), Filing 159. The property consists of 9.2 acres and is located within Planning Area 79. The subject property is located between C-470 and Plaza Drive, and east of Erickson Blvd. and west of Lucent Blvd. State Parcel Number: 2229-051-00-009. This MDP request will be processed concurrently with

June 26, 2023

Carolyn Washee-Freeland
100 Third St.
Castle Rock, CO 80104

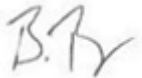
RE: SB2023-022

Dear Mr. Washee-Freeland,

Thank you for the opportunity to review and comment on the request to plat one multi-family residential lot. Douglas County Health Department (DCHD) staff have reviewed the application for compliance with pertinent environmental and public health regulations. After reviewing the application, DCHD has no comments.

Please feel free to contact me at 720-907-4888 or bfreyer@douglas.co.us if you have any questions about our comments.

Sincerely,



Brent Freyer
Environmental Health Specialist I
Douglas County Health Department

July 18, 2023

Carolyn Washee-Freeland, AICP, Senior Planner
Douglas County Department of Community Development
Planning Services Division
100 Third St., Castle Rock, CO 80104

Re: SB2023-022 - Highlands Ranch Filing 159

Dear Mrs. Washee-Freeland:

This letter provides comments regarding the request for approval of a Minor Development Plat (MDP) for one lot within the Highlands Ranch Planned Development (PD), Filing 159. The property consists of 9.2 acres and is located within Planning Area 79. The subject property is located between C-470 and Plaza Drive, and east of Erickson Blvd. and west of Lucent Blvd. State Parcel Number: 2229-051-00-009. This MDP request will be processed concurrently with the associated Site Improvement Plan (SP2023-035) to construct 240 multi-family residential units known as the Kaos Apartments.

Upon reading the Limited-Results Cultural Resource Survey of the subject site written by ERO Resources Corporation in 2023, the Douglas County Curator has no further comments. There are no impacts to cultural resources in the area.

Thank you in advance for your attention to the preservation and protection of Douglas County's cultural resources for future generations.

Sincerely,

Brittany Cassell

Brittany Cassell, Curator



Engineering Services Division Referral Comments

June 20, 2023

Douglas County – Planning Services Division
100 Third St
Castle Rock, CO 80104
Attn: Planning Case Manager

Re: SB2023-022 - Highlands Ranch Filing 159
Minor Development Plat

Engineering Services Division of Arapahoe County Public Works and Development (Staff) thanks you for the opportunity to review the outside referral for the proposed project located in the Douglas County. The Engineering Division has no comments regarding the referral at this time based on the information submitted.

Please know that other Divisions in the Public Works Department may submit comments as well.

Thank you,
Sue Liu, PE, CFM
Arapahoe County Public Works & Development
Engineering Services Division
cc Arapahoe County Case No. O23-170

REFERRAL RESPONSE REQUEST

 Date sent June 16, 2023

 Comments due by July 14, 2023
Project Name: Highlands Ranch Filing 159 – Minor Development Plat

Project File #: SB2023-022

Project Summary:

The applicant requests approval of a Minor Development Plat (MDP) for one lot within the Highlands Ranch Planned Development (PD), Filing 159. The property consists of 9.2 acres and is located within Planning Area 79. The subject property is located between C-470 and Plaza Drive, and east of Erickson Blvd. and west of Lucent Blvd. State Parcel Number: 2229-051-00-009. This MDP request will be processed concurrently with the associated Site Improvement Plan (SP2023-035) to construct 240 multi-family residential units known as the Kaos Apartments.

Information on the identified development proposal located in Douglas County is enclosed. Please review and comment in the space provided.

☐	No Comment
☐	Please be advised of the following concerns:
☒	See letter attached for detail.
Agency: Douglas Co. Cons. Dist	Phone #: 303-218-2622
Your Name: David Shohet	Your Signature: <i>Daniel Shohet</i>
(please print) President	Date: June 26, 2023

Agencies should be advised that failure to submit written comments prior to the due date, or to obtain the applicant's written approval of an extension, will result in written comments being accepted for informational purposes only.

Sincerely,

Carolyn Washee-Freeland

Carolyn Washee-Freeland, AICP
 Senior Planner, Planning Services
 303-660-7460
cfreeland@douglas.co.us



DOUGLAS COUNTY CONSERVATION DISTRICT

PO Box 688 / 7519A E. Hwy 86 Franktown, CO 80116 / Phone 303-218-2622

June 26, 2023

RE: SB2023-022, Highlands Ranch Filing 159, Minor Development Plat

According to the Natural Resources Conservation Service (NRCS) soils survey, the Fondis loam, 0 to 3 percent slopes is somewhat limited for dwellings with basements. The Blakeland loamy sand, 0 to 9 percent slopes is not limited for dwellings with basements.

According to the NRCS soils survey, the Fondis loam, 0 to 3 percent slopes, is “very limited” for **streets, roads, and shallow excavations** due to frost action, slope, shrink-well properties, and low strength. The Blakeland loamy sand, 0 to 9 percent slopes is not limited for streets and shallow excavations. Due to the limitations on the above soils on the site, alternatives to mitigate the limitations of the soil will be required in your engineering design or construction techniques.

Topsoil should be stripped to a depth of 6 inches and all stockpiles should have side slopes no steeper than 3:1 and seeded. All disturbed areas should be seeded and mulched with weed free hay mulch at 4,000 lbs. /acre. All disturbed areas should be reseeded between the planting dates of Nov. 1-April 30th. Grass seed should be drilled at a depth of ¼ to ½ inch deep and if broadcasted, double the rate.

The Douglas County Conservation District recommends disturbed land be mulched or revegetated within 45 days of disturbance.

The Conservation District recommends using a phased grading approach. By limiting the area being graded to 15 acres or less and seeding with native grasses the land area disturbed is minimized. The development site is 9.2 acres.

There is no Integrated Noxious Weed Control plan, and it is recommended that an integrated weed management program be reviewed and approved by the Douglas

August 31, 2023

Carolyn Washee-Freeland, AICP
Senior Planner
Douglas County Department of Community Development
100 Third Street
Castle Rock, CO 80104

Re: Highlands Ranch Filing 159 – Lot 1 – Minor Development Plat

Dear Ms. Washee-Freeland:

Please accept this letter on behalf of Redland. We received your comment letter dated July 28, 2023, and we offer the following response:

MINOR DEVELOPMENT PLAT EXHIBIT COMMENTS

1. Dedication Statement – add information about the access easements that will be dedicated by plat – see redlines.
Response: Information added.
2. General Notes - plat notes will be updated as the project progresses. Please update the plat notes accordingly per engineering's referral comments; and per Article 606A.17.
Response: Noted.
3. Vicinity Map - Please change the scale of the vicinity map to be 1-inch equals 1,000-ft.
Response: Revised.
4. Planning Commission Certificate – address redlines to the certificate.
Response: Revised.
5. Sheet 2 - Address all redlines and comments regarding easements shown on the sheet.
Response: Revised.

6. Sheet 3 -
 - a. Provide draft easements that will be dedicated by plat with the next submittal for County Review.
 - b. Address all redlines and comments regarding easements shown on this sheet. Add dimensions where indicated.

Response: Revised.

COUNTY WATER CONSULTANT REVIEW

1. The County's water consultant provided a review of the MDP request. Please see the attached review letter.

Response: Thank you for your review. We understand your office has no comments on this referral.

PUBLIC COMMENTS/COMMUNITY OUTREACH

1. Douglas County encourages community outreach to abutting property owners, neighbors, and nearby HOAs that may have interest in the project. The applicant is encouraged to communicate with property owners abutting the site. Please submit neighborhood feedback or other information generated from any community meetings that are held.

Response: The HRCA has submitted feedback from our DRC meeting. Our team will continue to forward any other neighborhood feedback or other information generated from other community meetings held.

MINERAL RIGHTS OWNERS

1. The title commitment submitted with the application materials indicates that there may be mineral rights owners of the property. A completed mineral rights certificate of compliance must be completed during the review process certifying that all mineral rights holders have been notified of the proposal. Notices must be sent a minimum of 30 days prior to the public hearing date. If the applicant owns all mineral rights underlying the land, this notice is not required. In that case, please provide verification of the applicant's mineral rights ownership. Please see the attached forms for reference.

Response: A completed mineral rights certificate of compliance will be completed. It is noted that mineral rights holders will be notified a minimum of 30 days prior to the public hearing date.

REFERRAL COMMENTS

ASSESSOR COMMENTS

1. Please be aware of the following comments and concerns:
 - Acreage on plat is showing 9.686, the deeded area of parcels before plat is 10.335 acres. Please verify acreage on plat is correct.

Response: Area has been verified. 9.686 acres is correct.

CDOT COMMENTS

1. Clear Zone: It is the responsibility of the engineer/architect who stamps the plans to ensure that: any new landscaping/trees are outside of the clear zones for any State Highway/ CDOT ROW and that the new landscaping/trees do not interfere with site lines from any State Highway/CDOT ROW.

Response: No work is proposed within State Highway / CDOT ROW.

2. Landscape: Any new or changes to existing landscaping within CDOT ROW must be reviewed and approved by CDOT. Landscaping plans should be submitted and should include details of all proposed plant species and seed mixes/ratios.

Response: No work is proposed within State Highway / CDOT ROW.

3. WQ: Will This development be taking any drainage from CDOT ROW? Has the Highline Canal company been contacted in regards to the proposed water quality measures being installed?

Response: Our project team is working with the Highline Canal and other entities with respect of discharging the proposed full-spectrum pond into the canal.

4. The Landscaping and trees cannot have any visual effect on C-470.

Response: Noted, thank you.

5. Right of Way Comments:

MJO 6/22/2023 - All work appears to be to the south of existing ROW- there is a 10' setback from the C-470 property line and only a little minor grading work was proposed in this 10' strip on the east end of the project. No A-Lines, No Dedications to CDOT, no real concerns that I can see from a ROW or Survey Perspective.

SDH 6/22/2023 - Agree with John there are no concerns from the ROW or Survey perspective.

Response: Noted, thank you.

6. Permits Comments:

7-5-23 It appears that CDOT ROW runs along the north side of this development (470). Please keep in mind that any work in the CDOT ROW unrelated to access will require a permit from our office. This includes, but is not limited to survey, landscaping, or utility work.

Response: No work is proposed within State Highway / CDOT ROW.

COLORADO PARKS AND WILDLIFE COMMENTS

Response: Thank you for your comments. Our team will follow the recommended guidelines if any wildlife is encountered on site

DENVER WATER COMMENTS

1. Please show/label 50' wide Denver Water easement on the plans. Also show the 24" Denver Water Conduit 100. We recommend you add a plat note to page 1 stating this is an exclusive easement for water purposes, any and all future crossings/improvements need to be approved in writing by Denver Water. (we can discuss language of note).

Response: The 50ft wide Denver Water easement will be shown on future submittals of the SIP & Civil CD's, it is shown on the Minor Development Plat.

2. Per our easement terms, no utility crossings are allowed, but storm sewer may be permitted by special provision and a Denver Water license. Please send plan and profile for storm sewer crossing at this location.

Response: Plan and Profile of the storm sewer crossing will be sent to Denver Water with the next submittal of the SIP & Civil CD's.

3. The plat shows several easements crossing us, to be dedicated by separate document. Overlapping easements are subject to our approval. Please send for our review.

Response: Overlapping easements will be sent to Denver Water for review.

4. Drainage plans need to be reviewed to look at flows, connections to pond and if there are any impacts to High Line Canal.

Response: Mile High Flood District has reviewed the plans and coordinated with RESPEC for the hydraulic analysis of the proposed flows. According to RESPEC's letter, the additional flow will have no impact to the High Line Canal.

5. Review #2-prohibited obstructions of our easement. No trees, fencing, structures are allowed in the easement

Response: Noted, our plans will not show any obstructions within the easement.

6. We need to review a complete set of grading plans. Our pipe has to maintain a certain depth, we need to see cut/fill over the pipe. We may not approve grading changes over the waterline but we can discuss after reviewing plans.

Response: Grading Plans will be sent to Denver Water with the next submittal of the SIP & Civil CD's.

7. Who is maintaining the access drive on our easement? Please show our easement in relationship to easement drive on the plans.

Response: Shea Properties will maintain the access drive. The relationship to the existing Denver Water easement is shown on the Plat.

DOUGLAS COUNTY CONSERVATION DISTRICT COMMENTS

Response: All Erosion Control BMP's will follow Douglas County standards. Low Impact Development (LID) techniques have been utilized within the project including detached impervious areas.

ENGINEERING SERVICES COMMENTS

1. On sheet 1, please remove general note #8. The only secondary drainage easement that will be dedicated to Douglas County will be for the detention/water quality pond which will be handled through a separate easement dedication.

Response: Note #8 has been removed.

2. On sheet 2, please provide us with an executed copy of the access easement with the Highlands Ranch Metropolitan District for the westerly access.

Response: Access Easement document to be provided.

3. On sheet 2, please designate which entity the proposed drainage easement along the north side of lot 1 will be dedicated.

Response: Note #8 has been removed.

4. A Public Improvements Agreement (PIA) for the median island improvements in Plaza Drive will be required. I will provide you with a copy of this agreement. A separate set of construction plans will need to be submitted with the final plat that incorporates these widening/median island improvements.

Response: A Public Improvements Agreement (PIA) will be submitted with the next submittal of the SIP & Civil CD's.

HIGHLANDS RANCH COMMUNITY ASSOCIATION COMMENTS

Response: Thank you for your comments and time to meet on the project. We will look to incorporate some of your suggestions into our design.

HIGHLANDS RANCH METRO DISTRICT COMMENTS

1. Informational response: site civil plans must be submitted to the District for review and approval.

Response: We are working directly with HRMD on their comments.

MILE HIGH FLOOD DISTRICT COMMENTS

1. Since the outfall discharges into the High Line Canal (HLC), we are referring the design report to RESPEC, who maintains a living SWMM model for the HLC. RESPEC will coordinate with Redland on running the proposed conditions in the SWMM model, in order to confirm there are no adverse impacts. As a note, outfalls into the HLC are not considered maintenance eligible.

Response: Based on the review memo from RESPEC dated July 31, 2023, the proposed conditions resulted in insignificant decreases in freeboard, at or less than 0.01 ft.

SOUTH METRO FIRE RESCUE COMMENTS

1. Fire Hydrant locations will not be approved as shown on Water and Sanitary Plans resulting in required revisions to utility easements. Once required fire flow requirements for the buildings have been determined and hydrant requirements verified, a plan indicating revised hydrant locations will be required to be reviewed by SMFR for approval.

Response: Fire hydrant locations and utility easements have been updated and shown on this Minor Development Plat. Our team will continue to work with SMFR through the approval process.

XCEL ENERGY – RIGHT OF WAY AND PERMITS COMMENTS

Response: 10' PSCo easement has been added along the southerly, westerly and northerly lines of the plat.

On behalf of Shea Properties and our project team, thank you for your time and consideration reviewing the Highlands Ranch Filing 159 – Lot 1 – Minor Development Plat Submittal. If you have any questions, please contact me at roglesby@redland.com or 720-283-6783 ext. 133.

Sincerely,



Rob Oglesby, P.E.

Phase III Drainage Report Highlands Ranch – Filing No. 159

Prepared for:

Shea Properties

8351 E Bellevue Ave.
Denver, CO 80237
Office 303.486.1371 voice
Contact: Mr. David Witte

Prepared by:



720.283.6783 Office
1500 West Canal Court
Littleton, Colorado 80120
REDLAND.COM

Contact: Rob Oglesby, PE

March 2023
Project No. 22029

ENGINEER'S CERTIFICATION

"This report and plan for the Phase III drainage design of Highlands Ranch Filing No. 159 was prepared by me (or under my direct supervision) in accordance with the provisions of Douglas County Drainage Design and Technical Criteria for the owners thereof. I understand that Douglas County does not and will not assume liability for drainage facilities designed by others.

Rob Oglesby, P.E.
Registered Professional Engineer
State of Colorado No. 54400

OWNERS STATEMENT

Shea Properties hereby certifies that the drainage facilities for Highlands Ranch Filing No, 159 shall be constructed according to the design presented in this report. I understand that Douglas County does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that Douglas County reviews drainage plans pursuant to Colorado Revised Statutes, Title 30, Article 28, but cannot, on behalf of Highlands Ranch Filing No. 159 guarantee that final drainage design review will absolve Shea Properties and/or their successors and/or assigns future liability for improper design. I further understand that approval of the Final Plat does not imply approval of my engineer's drainage design.

Name of Developer

Authorized Signature

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Introduction

INTRODUCTION

This Phase III drainage report presents an analysis for the proposed drainage patterns and requirements for the proposed Highlands Ranch Filing No. 159, hereafter referred to as the Site.

Site Location

The Highlands Ranch – Filing No. 159 project (“Site”) is located in the northeast quarter of Section 5, Township 6 South, Range 68 west of the sixth principal meridian. The Site is generally located to the south of State Highway C-470 and north of Plaza Drive. The site is to the west of Solana Lucent Station, an apartment complex, north of the Centennial Water Plant, and east of the High Line Canal.

Site Description

Highlands Ranch – Filing No. 159 is an approximately 9.69 acres and is currently undeveloped with the exception of the Highlands Ranch monument at the northeast corner of the site. Native grasses and weeds currently cover the site. The site slopes from east to west at approximately 3% and ultimately drains to Highline Canal to the west of the site and to the C-470 right-of-way to the north. It is important to note that there is a swale between the back property line of the site and C-470, but this swale drains to the Highline Canal.

Proposed Project Description

The property is proposed to be a multifamily development, which will include 2 five-story apartment buildings, the bottom level will serve as parking, and a clubhouse with a pool. Infrastructure improvements include wet and dry utilities, parking lots, drive aisles, retaining walls, walks, and a trail connection to the Highline Canal to the northwest of the site. A full-spectrum detention pond will be located at the west end of the site. This pond will treat runoff from the site and provide 100-year detention. The pond will outfall to the Highline Canal.

Flood Hazard and Drainage Studies Relevant to the Site

The site is contained within FIRM panels 08035C009F and 08035C0017F. According to Panel # 08035C009F and 08035C0017F, the site is Zone X and no part of the site lies within the 100- year flood plain (see Appendix A).

Soil Type

The NRCS soil survey indicates that the soil on site is primarily Fondis Loam (66.6%) whose hydrologic soil group is Type C. Approximately 33.4% of the site in the northwest and southwest corners is Blackland Loamy San whose hydrologic soil group is Type A. A soil map has been included in the Appendix A for reference.

Historic Drainage System

Major Basins

The site is currently undeveloped and existing runoff generally flows from the southeast to the northwest at a 3% slope. The runoff sheet flows to the swale north of the site and eventually outfalls into the Highline Canal. The site has been previously described in the Phase III drainage report for The West Plaza Drive Extension prepared by Felsburg Holt & Ullevig, Inc. dated August 4, 2006. This report indicates that the Site is included in parts of existing major basins OS-2 and PD-N; minor basins OS-2C, PD-N3, and PD-N4. The report reaffirms the current drainage patterns outlined in previous sections. It is important to note that the proposed sidewalk for the Site was anticipated to flow and collect at inlets along Plaza.

Proposed Drainage System and Basins

Criteria

This report has been prepared in accordance with the Douglas County Storm Drainage Design and Technical Criteria and the Urban Drainage and Flood Control District Criteria Manual. This Drainage Plan also references the Phase III Drainage report for the *West Plaza Drive Extension* prepared by *Felsburg Holt & Ullevig, Inc.* dated August 4, 2006, herein referred to the Master Report.

The hydrologic design was computed using the Rational Method as defined by Mile High Flood District. The 5-year storm was used as the minor storm event, while the 100-year storm was used as the major event. The one-hour point rainfall depth used for the 5-year storm was 1.43 inches and 2.60 inches for the 100-year event. The Rational Method was used to analyze fully developed conditions. Cumulative flow calculations and storm sewer sizing were performed using StormCAD. Runoff was also computed using a spreadsheet to ensure that the values obtained from StormCAD are reasonable. The proposed inlets were sized to accommodate their respective flows for both the major and minor storm. The proposed inlet sizes were calculated using Mile High Flood District spreadsheet MHFD-Inlet v5.02. The proposed full-spectrum detention pond was sized to accommodate the flows from the site under fully developed conditions. The pond

configuration was calculated using Mile High Flood District Pond Sizing spreadsheet MHFD-Detention v4 06.

Runoff / Proposed Basin Description

Major Basins

The Site will be split into two proposed major basins Basin A, consisting of the on-site drainage, and Basins OS, consisting of the off-site drainage. The on-site basins will collect into the proposed storm system and be treated at the proposed full-spectrum pond to the northwest of the site which will release at historic rates. The on-site basins have an overall imperviousness of 58% and the off-site basins have an overall imperviousness of 23%.

Sub-basins

Basin A1 (0.37 Acres)

Basin A1 consists of the proposed full-spectrum detention pond, and subsequent walls. All of these flows will collect at the bottom of the pond where they will be routed through a drainage pan to an Outlet Structure at Design Point A1. This basin has an overall imperviousness of 2%.

$$C_5 = 0.05 \quad C_{100} = 0.49$$

$$Q_5 = 0.1 \text{ CFS} \quad Q_{100} = 1.6 \text{ CFS}$$

Basin A2 (0.41 Acres)

Basin A2 consists of parking area, sidewalk, and landscape islands. Flows will sheet flow into curb and gutter and be collected at the 10' Type R Inlet at Design Point A2. The calculations for street and inlet capacity are collected in Appendix C for reference. This basin has an overall imperviousness of 54%.

$$C_5 = 0.47 \quad C_{100} = 0.70$$

$$Q_5 = 0.8 \text{ CFS} \quad Q_{100} = 2.3 \text{ CFS}$$

Basin A3 (1.09 Acres)

Basin A3 consists of parking areas, sidewalks, and landscape. Flows will sheet flow into curb and gutter and be collected at the 10' Type R Inlet at Design Point A3. The calculations for street and inlet capacity are collected in Appendix C for reference. This basin has an overall imperviousness of 76%.

$$C_5 = 0.66 \quad C_{100} = 0.79$$

$$Q_5 = 3.0 \text{ CFS} \quad Q_{100} = 6.5 \text{ CFS}$$

Basin A4 (0.62 Acres)

Basin A4 consists of parking areas, sidewalks, concrete drive lanes and landscape. Flows will sheet flow into area drains around the basin and combine at the 12" PVC SD pipe which will be routed into the storm system near the area drain at Design Point A4. This basin has an overall imperviousness of 12%.

$$C_5 = 0.13 \quad C_{100} = 0.53$$

$$Q_5 = 0.3 \text{ CFS} \quad Q_{100} = 2.3 \text{ CFS}$$

Basin A5 (0.50 Acres)

Basin A5 consists of 2/3 of the western apartment building roof area. Flows will collect at roof drains which will outfall into the area drain system in Basin A4. This basin has an overall imperviousness of 90%.

$$C_5 = 0.77 \quad C_{100} = 0.85$$

$$Q_5 = 1.9 \text{ CFS} \quad Q_{100} = 3.8 \text{ CFS}$$

Basin A6 (1.10 Acres)

Basin A6 consists of parking areas, sidewalks, and landscape. Runoff will sheet flow through chases, into curb and gutter and will be collected by the 10' Type R inlet at Design Point A6. The calculations for street and inlet capacity can be found in Appendix C. This basin has an overall imperviousness of 63%.

$$C_5 = 0.55 \quad C_{100} = 0.74$$

$$Q_5 = 2.4 \text{ CFS} \quad Q_{100} = 6.0 \text{ CFS}$$

Basin A7 (1.32 Acres)

Basin A7 consists of parking areas, sidewalks, and landscape. Runoff will sheet flow into curb and gutter and area inlets that collect at the 10' Type R inlet at Design Point A7. The area inlets in this basin were sized to carry the minor storm with the additional storm collection in the major gathering at Design Point A7. The calculations for street and inlet capacity can be found in Appendix C. This basin has an overall imperviousness of 28%.

$$C_5 = 0.27 \quad C_{100} = 0.60$$

$$Q_5 = 1.3 \text{ CFS} \quad Q_{100} = 5.4 \text{ CFS}$$

Basin A8 (0.22 Acres)

Basin A8 consists of the clubhouse roof area. Runoff will collect in roof drains which will outfall into the private drainage system near Design Point A8. The private drainage system around basin A8 was designed to carry the major flows of the clubhouse. The private drainage system ultimately outfalls to 10' Type R Inlet at design point A7. This basin has an overall imperviousness of 90%.

$$C_5 = 0.77 \quad C_{100} = 0.85$$

$$Q_5 = 0.8 \text{ CFS} \quad Q_{100} = 1.7 \text{ CFS}$$

Basin A9 (0.51 Acres)

Basin A9 consists of the pool area, landscape, and sidewalk. Runoff will collect at the area inlets and outfall into the private drainage system at Design Point A9. The private drain system ultimately outfalls to the 10' Type R Inlet at Design Point A7. This basin has an overall imperviousness of 44%.

$$C_5 = 0.40 \quad C_{100} = 0.67$$

$$Q_5 = 0.9 \text{ CFS} \quad Q_{100} = 2.7 \text{ CFS}$$

Basin A10 (0.31 Acres)

Basin A10 comprises of 1/3 of the western apartment building roof area. Flows will collect at roof drains which will outfall into the area drain system in Basin A6. These flows will ultimately outfall into the storm system at Design Point A7. This basin has an overall imperviousness of 90%.

$$C_5 = 0.77 \quad C_{100} = 0.85$$

$$Q_5 = 1.1 \text{ CFS} \quad Q_{100} = 2.3 \text{ CFS}$$

Basin A11 (1.50 Acres)

Basin A11 consists of parking areas, sidewalks, concrete drive lanes and landscape. Runoff will collect into area inlets, curb and gutter, drainage pans and be captured at the 10' Type R Inlet at Design Point A11. This basin has an overall imperviousness of 68%.

$$C_5 = 0.59 \quad C_{100} = 0.76$$

$$Q_5 = 3.7 \text{ CFS} \quad Q_{100} = 8.8 \text{ CFS}$$

Basin A12 (0.86 Acres)

Basin A12 entails the eastern apartment building roof area. Flows will collect at roof drains which will ultimately outfall to the 10' Type R Inlet at Design Point A11. This basin has an overall imperviousness of 90%.

$$C_5 = 0.77 \quad C_{100} = 0.85$$

$$Q_5 = 3.0 \text{ CFS} \quad Q_{100} = 6.1 \text{ CFS}$$

Basin OS-1 (0.85 Acres)

Basin OS-1 consists of the landscape buffer on the northern side of the site and includes the existing Highlands Ranch monument sign. Flows will sheet flow and collect into the swale behind the property line that eventually runs to the Highline canal. Due to the low imperviousness and the general nature of the swale no changes are made to the historical drainage condition of the Highline Canal.

$$C_5 = 0.05 \quad C_{100} = 0.49$$

$$Q_5 = 0.2 \text{ CFS} \quad Q_{100} = 3.7 \text{ CFS}$$

Basin OS-2 (0.28 Acres)

Basin OS-2 comprises of the eastern landscape buffer of the site. Flows will concentrate into the swale along the eastern property line and outfalls to the north. Due to the low imperviousness and the general nature of the basin no changes are made to the historical drainage condition of the Highline Canal.

$$C_5 = 0.05 \quad C_{100} = 0.49$$

$$Q_5 = 0.1 \text{ CFS} \quad Q_{100} = 1.2 \text{ CFS}$$

Basin OS-3 (0.09 Acres)

Basin OS-3 consists of sidewalk, pavement and landscape. Flows will sheet flow onto Plaza Drive and collect at the existing 10' Type R Inlet at Design Point OS-3. In Master report, it was assumed that flows along Plaza would sheet flow and collect into the subsequent inlets along Plaza. This basin has an overall imperviousness of 67%.

$$C_5 = 0.58 \quad C_{100} = 0.76$$

$$Q_5 = 0.3 \text{ CFS} \quad Q_{100} = 0.6 \text{ CFS}$$

Basin OS-4 (0.32 Acres)

Basin OS-4 consists of sidewalk and associated landscape. Flows will sheet flow onto Plaza Drive and collect at the existing 10' Type R Inlet at Design Point OS-4. In the Master Report, it was assumed that flows along Plaza Drive would sheet flow and collect into its subsequent inlets along Plaza. This basin has an overall imperviousness of 64%.

$$C_5 = 0.56 \quad C_{100} = 0.75$$

$$Q_5 = 0.8 \text{ CFS} \quad Q_{100} = 1.9 \text{ CFS}$$

Basin OS-5 (0.34 Acres)

Basin OS-5 consists of sidewalk and associated landscape. Flows will concentrate along the curb of Plaza drive and collect at an existing 10' Type R Inlet further downstream. In the Master Report, it was assumed that flows along Plaza Drive would sheet flow and collect into its subsequent inlets along Plaza Drive. This basin has an overall imperviousness of 41%.

$$C_5 = 0.37 \quad C_{100} = 0.65$$

$$Q_5 = 0.4 \text{ CFS} \quad Q_{100} = 1.4 \text{ CFS}$$

Basin OS-6 (0.04 Acres)

Basin OS-6 consists of sidewalk. Flows will sheet flow into a 12" FES near the Highline Canal Trail. It was anticipated by Douglas County that a trail would be built in the future. The design of the proposed trail mimics the design trail that the county approved (see Appendix D). This basin has an overall imperviousness of 90%.

$$C_5 = 0.77 \quad C_{100} = 0.85$$

$$Q_5 = 0.1 \text{ CFS} \quad Q_{100} = 0.3 \text{ CFS}$$

Proposed Full-Spectrum Extended Detention Basin

The Site will utilize a full-spectrum extended detention basin (EDB) for on-site water quality and detention requirements. The proposed storm infrastructure will capture the runoff from Basin A and route flows to the pond. Tributary basins make up approximately 8.8 acres with an imperviousness of 58%.

The proposed EDB is designed to have a total volume of approximately 0.808 acre-feet, that includes forebay, micropool, access road and emergency overflow. It was sized using the Mile-High Flood District spreadsheet MHFD-Detention_v4.04. There will be a 4' concrete channel at the bottom of the pond for low flows. The pond has been sized for Water Quality Capture Volume, Excess Urban Runoff Volume and 100-year detention. Excess Urban Runoff Volume is defined as the difference between the developed condition runoff volume and the pre-development volume. Orifice plates will keep the 100-year release rate below historical runoff for the site. See Appendix B for detention calculations.

POND TABLE			
	ELEV.	V_REQUIRED (AC-FT)	Q RELEASE (CFS)
WQCV	5625.03	0.169	0.1
EURV	5627.43	0.363	0.2
100-YEAR	5628.83	0.276	6.7
OVERFLOW	5628.92	N/A	N/A

The pond and the outlet structure shall be owned and maintained by the Highlands Ranch Metropolitan District. The pond and outlet structures shall have maintenance access via the path from the southwest corn of the pond.

Water Quality Enhancement Best Management Practices

The pond discussed in the previous section has been designed in accordance with the *Douglas County Storm Drainage Design and Stormwater Quality Control Criteria, July 8, 2008* and the *MHFD Urban Storm Drainage Criteria Manual Volumes 1, 2 and 3*. The pond was designed to detain the Excess Urban Runoff Volume and the 100-year Detention Volume for the entire site.

Conclusion

Highlands Ranch Filing No. 159 is proposed to be a multi-family project with a proposed on-site Full-Spectrum Detention Pond. Runoff from the site will be collected by a private drainage system and storm sewer which will outfall into the proposed pond. The pond has been sized for WQCV, EURV and 100-year detention which will outfall to the Highline Canal at or below historic rates. Since the site will reduce the total runoff of the site to the historic drainage location, downstream infrastructure will not be negatively affected.

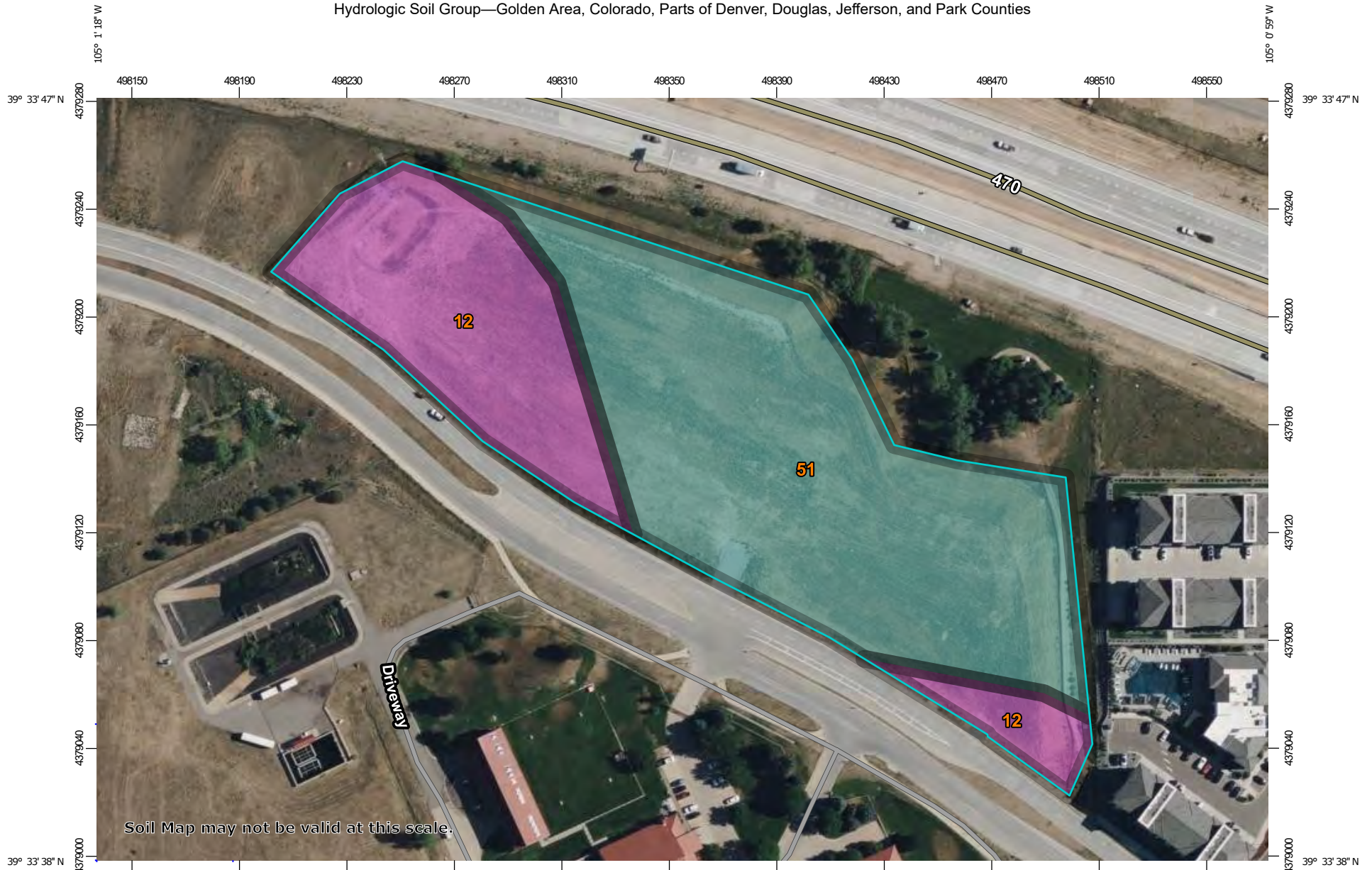
References

REFERENCES

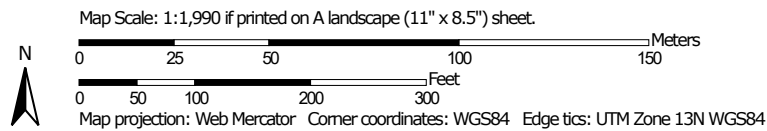
1. *Douglas County Storm Drainage Design and Stormwater Quality Control Criteria, July 8, 2008*
2. *Mile High Flood District Urban Storm Drainage Criteria Manual, Volume 1-3, latest online addition.*
3. *Douglas County GESC Manual, January 2013.*

Appendix A - Vicinity Map, FIRM Map, Soils Map

Hydrologic Soil Group—Golden Area, Colorado, Parts of Denver, Douglas, Jefferson, and Park Counties



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Golden Area, Colorado, Parts of Denver, Douglas, Jefferson, and Park Counties
 Survey Area Data: Version 17, Sep 7, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 1, 2020—Jul 2, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12	Blakeland loamy sand, 0 to 9 percent slopes	A	2.3	33.4%
51	Fondis loam, 0 to 3 percent slopes	C	4.7	66.6%
Totals for Area of Interest			7.0	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition



Component Percent Cutoff: None Specified

Tie-break Rule: Higher



National Flood Hazard Layer FIRMette



105°1'27"W 39°33'56"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **1/24/2023 at 4:52 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

0 250 500 1,000 1,500 2,000 Feet

1:6,000

105°0'50"W 39°33'28"N

Highlands Ranch Filing 150 Minor Development Final Plat

Project File: SB2023-022

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Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Appendix B - Hydrologic Calculation



Redland

**STANDARD FORM SF-1 - DEVELOPED
RUNOFF COEFFICIENTS**

PROJECT NAME: Kaos Apartments
PROJECT NUMBER: 22029
CALCULATED BY: RO
CHECKED BY: RO

DATE: 3/24/2023
JURISDICTION: Douglas - Zone 1

LAND USE:	Paved Road	Drive/Walk	Roof	Lawn			
IMPERVIOUSNESS	100%	90%	90%	2%			

NRCS SOIL TYPE: TYPE C

OVERALL SITE STUDY AREA

DESIGN BASIN	DESIGN POINT	Paved Road (AC)	Drive/Walk (AC)	Roof (AC)	Lawn (AC)	(AC)	(AC)	(AC)	TOTAL AREA (AC)	C _d (2)	C _d (5)	C _d (10)	C _d (100)	Imp (%)
A1	A1				0.37				0.37	0.01	0.05	0.15	0.49	2%
A2	A2	0.21	0.01		0.19				0.41	0.41	0.47	0.53	0.70	54%
A3	A3	0.76	0.07		0.26				1.09	0.61	0.66	0.69	0.79	76%
A4	A4		0.07		0.55				0.62	0.07	0.13	0.22	0.53	12%
A5	A5			0.50					0.50	0.74	0.77	0.80	0.85	90%
A6	A6	0.63	0.05		0.41				1.10	0.49	0.55	0.60	0.74	63%
A7	A7	0.28	0.08		0.96				1.32	0.20	0.27	0.34	0.60	28%
A8	A8			0.22					0.22	0.74	0.77	0.80	0.85	90%
A9	A9		0.25		0.26				0.51	0.33	0.40	0.46	0.67	44%
A10	A10			0.31					0.31	0.74	0.77	0.80	0.85	90%
A11	A11	0.94	0.08		0.49				1.50	0.54	0.59	0.63	0.76	68%
A12	A12			0.86					0.86	0.74	0.77	0.80	0.85	90%
									0.00					
									0.00					
									0.00					
BASIN A		2.82	0.61	1.90	3.50				8.82	0.45	0.51	0.56	0.72	58%
		31.9%	6.9%	21.5%	39.7%				100.0%					
									0.00					
									0.00					
ON SITE STUDY AREA		2.82	0.61	1.90	3.50				8.82	0.45	0.51	0.56	0.70	58%
		31.9%	6.9%	21.5%	39.7%				100.0%					
OS-1	OS-1				0.85				0.85	0.01	0.05	0.15	0.49	2%
OS-2	OS-2				0.28				0.28	0.01	0.05	0.15	0.49	2%
OS-3	OS-3	0.02	0.04		0.03				0.09	0.53	0.58	0.62	0.76	67%
OS-4	OS-4	0.02	0.20		0.10				0.32	0.51	0.56	0.61	0.75	64%
OS-5	OS-5	0.01	0.13		0.19				0.34	0.30	0.37	0.43	0.65	41%
OS-6	OS-6		0.04						0.04	0.74	0.77	0.80	0.85	90%
OFF SITE BASINS		0.06	0.41		1.44				1.92	0.17	0.23	0.31	0.58	24%
		3.2%	21.7%		75.2%				100.0%					
OVERALL STUDY AREA		2.88	1.02	1.90	4.94				10.74	0.40	0.46	0.52	0.67	52%
		26.8%	9.5%	17.7%	46.0%				100.0%					



STANDARD FORM SF-2 - DEVELOPED TIME OF CONCENTRATION

PROJECT NAME: Kaos Apartments
PROJECT NUMBER: 22029
CALCULATED BY: RO
CHECKED BY: RO

DATE: 3/24/2023
JURISDICTION: Douglas - Zone 1

SUB-BASIN DATA			INITIAL TIME (T _i)			TRAVEL TIME (T _t)						t _c CHECK (URBANIZED BASINS)			FINAL T _c	RUNOFF COEFFICIENT	
DESIGN BASIN (1)	AREA (AC) (2)	C _s (3)	LENGTH* (FT) (4)	SLOPE (%) (5)	T _i (MINUTES) (6)	LENGTH (FT) (7)	SLOPE (%) (8)	C _s (9)	Land Surface (10)	VEL (FPS) (11)	T _t (MINUTES) (12)	COMP. t _c (13)	TOTAL LENGTH (14)	REGIONAL t _c (15)	Min. t _c	C _s	C ₁₀₀
A1	0.37	0.05	35	25.0%	4	130	0.5%	20.0	Paved Areas	1.4	1.5	5.4	165	25.9	5.4	0.05	0.49
A2	0.41	0.47	75	3.5%	6.5	190	1.8%	20.0	Paved Areas	2.7	1.2	7.7	265	17.1	7.7	0.47	0.70
A3	1.09	0.66	120	3.5%	5.9	420	2.0%	20.0	Paved Areas	2.8	2.5	8.3	540	13.5	8.3	0.66	0.79
A4	0.62	0.13	160	20.0%	8.3	270	2.0%	20.0	Paved Areas	2.8	1.6	9.9	430	24.3	9.9	0.13	0.53
A5	0.50	0.77	65	2.0%	3.8	210	2.0%	20.0	Paved Areas	2.8	1.2	5.1	275	10.9	5.1	0.77	0.85
A6	1.10	0.55	105	3.5%	6.8	355	2.0%	20.0	Paved Areas	2.8	2.1	8.9	460	15.7	8.9	0.55	0.74
A7	1.32	0.27	85	9.5%	6.6	670	2.0%	20.0	Paved Areas	2.8	3.9	10.6	755	21.8	10.6	0.27	0.60
A8	0.22	0.77	70	2.0%	4.0	100	2.0%	20.0	Paved Areas	2.8	0.6	4.6	170	10.8	5.0	0.77	0.85
A9	0.51	0.40	65	5.0%	6.1	205	4.0%	20.0	Paved Areas	4.0	0.9	6.9	270	18.6	6.9	0.40	0.67
A10	0.31	0.77	30	2.0%	2.6	520	2.3%	20.0	Paved Areas	3.0	2.9	5.5	550	11.1	5.5	0.77	0.85
A11	1.50	0.59	70	5.0%	4.6	650	2.6%	20.0	Paved Areas	3.2	3.4	7.9	720	15.0	7.9	0.59	0.76
A12	0.86	0.77	70	2.0%	4.0	350	2.0%	20.0	Paved Areas	2.8	2.1	6.0	420	11.0	6.0	0.77	0.85
OS-1	0.85	0.05				120	5.9%	7.0	Short Pasture/Lawn	1.7	1.2	1.2	120	25.7	5.0	0.05	0.49
OS-2	0.28	0.05				110	5.9%	20.0	Paved Areas	4.9	0.4	0.4	110	25.7	5.0	0.05	0.49
OS-3	0.09	0.58	14	2.0%	2.8	245	2.6%	20.0	Paved Areas	3.2	1.3	4.1	259	14.9	5.0	0.58	0.76
OS-4	0.32	0.56	14	2.0%	2.9	949	3.1%	20.0	Paved Areas	3.5	4.5	7.4	963	15.7	7.4	0.56	0.75
OS-5	0.34	0.37	14	2.0%	4.0	635	3.0%	7.0	Short Pasture/Lawn	1.2	8.7	12.7	649	19.5	12.7	0.37	0.65
OS-6	0.04	0.77				115	8.4%	20.0	Paved Areas	5.8	0.3	0.3	115	10.7	5.0	0.77	0.85

* L = 500' max for non-urban land uses and 300' max for urban land uses

$$T_i = \frac{0.395(1.1 - C)L^{1/2}}{S^{1/3}}$$

$$T_t = \frac{L}{60V}$$

$$V = C_s S_w^{0.5}$$

$$t_c = \frac{L}{180} + 10$$

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Table RO-2—Conveyance Coefficient, C_v

Type of Land Surface	Conveyance Coefficient, C _v
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20



STANDARD FORM SF-3 - DEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 5 YEAR EVENT

PROJECT NAME: Kaos Apartments
PROJECT NUMBER: 22029
CALCULATED BY: RO
CHECKED BY: RO

P₁ (1-Hour Rainfall) = 1.43

DATE: 3/24/2023
JURISDICTION: Douglas - Zone 1

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF C _s	t _c (minutes)	C*A(AC)	I (in/hr)	Q (cfs)	t _c (minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t _t (Minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	A1	A1	0.4	0.05	5.4	0.0	4.75	0.1													
	A2	A2	0.4	0.47	7.7	0.2	4.26	0.8													
	A3	A3	1.1	0.66	8.3	0.7	4.14	3.0	9.88	0.80	3.89	3.09									Sum of A3 and A4
	A4	A4	0.6	0.13	9.9	0.1	3.89	0.3													
	A5	A5	0.5	0.77	5.1	0.4	4.83	1.9													
	A6	A6	1.1	0.55	8.9	0.6	4.04	2.4													
	A7	A7	1.3	0.27	10.6	0.4	3.78	1.3	10.59	0.56	3.78	2.10									Sum of A7 and A9
	A8	A8	0.2	0.77	5.0	0.2	4.85	0.8													
	A9	A9	0.5	0.40	6.9	0.2	4.41	0.9													
	A10	A10	0.3	0.77	5.5	0.2	4.74	1.1													
	A11	A11	1.5	0.59	7.9	0.9	4.22	3.7													
	A12	A12	0.9	0.77	6.0	0.7	4.60	3.0													
	OS-1	OS-1	0.8	0.05	5.0	0.0	4.85	0.2													
	OS-2	OS-2	0.3	0.05	5.0	0.0	4.85	0.1													
	OS-3	OS-3	0.1	0.58	5.0	0.1	4.85	0.3													
	OS-4	OS-4	0.3	0.56	7.4	0.2	4.31	0.8													
	OS-5	OS-5	0.3	0.37	12.7	0.1	3.50	0.4													
	OS-6	OS-6	0.0	0.77	5.0	0.0	4.85	0.1													



STANDARD FORM SF-3 - DEVELOPED

STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: Kaos Apartments
 PROJECT NUMBER: 22029
 CALCULATED BY: RO
 CHECKED BY: RO

P₁ (1-Hour Rainfall) = 2.6

DATE: 3/24/2023
 JURISDICTION: Douglas - Zone 1

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF C ₁₀₀	t _c (minutes)	C*A(ac)	I (in/hr)	Q (cfs)	t _c (minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t _t (minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	A1	A1	0.4	0.49	5.4	0.2	8.63	1.6													
	A2	A2	0.4	0.70	7.7	0.3	7.74	2.3													
	A3	A3	1.1	0.79	8.3	0.9	7.53	6.5	9.88	1.20	7.07	8.45									Sum of A3 and A4
	A4	A4	0.6	0.53	9.9	0.3	7.07	2.3													
	A5	A5	0.5	0.85	5.1	0.4	8.78	3.8													
	A6	A6	1.1	0.74	8.9	0.8	7.35	6.0													
	A7	A7	1.3	0.60	10.6	0.8	6.87	5.4	10.59	1.13	6.87	7.78									Sum of A7 and A9
	A8	A8	0.2	0.85	5.0	0.2	8.82	1.7													
	A9	A9	0.5	0.67	6.9	0.3	8.03	2.7													
	A10	A10	0.3	0.85	5.5	0.3	8.61	2.3													
	A11	A11	1.5	0.76	7.9	1.1	7.67	8.8													
	A12	A12	0.9	0.85	6.0	0.7	8.36	6.1													
		OS-1	0.8	0.49	5.0	0.4	8.82	3.7	0.00	0.00	12.13	0.00									
		OS-2	0.3	0.49	5.0	0.1	8.82	1.2	0.00	0.00	12.13	0.00									
		OS-3	0.1	0.76	5.0	0.1	8.82	0.6	0.00	0.00	12.13	0.00									
		OS-4	0.3	0.75	7.4	0.2	7.84	1.9	0.00	0.00	12.13	0.00									
		OS-5	0.3	0.65	12.7	0.2	6.37	1.4	0.00	0.00	12.13	0.00									
		OS-6	0.0	0.85	5.0	0.0	8.82	0.3	0.00	0.00	12.13	0.00									



PROJECT NAME: Kaos Apartments DATE: 3/24/2023
 PROJECT NUMBER: 22029.000 JURISDICTION: Douglas - Zone 1
 CALCULATED BY: RO
 CHECKED BY: RO

Basin Summary Table						
Basin	Area (AC)	Runoff Coefficients		I (%)	Peak Flows (cfs)	
		C ₅	C ₁₀₀		Q ₅	Q ₁₀₀
A1	0.37	0.05	0.49	2%	0.1	1.6
A2	0.41	0.47	0.70	54%	0.8	2.3
A3	1.09	0.66	0.79	76%	3.0	6.5
A4	0.62	0.13	0.53	12%	0.3	2.3
A5	0.50	0.77	0.85	90%	1.9	3.8
A6	1.10	0.55	0.74	63%	2.4	6.0
A7	1.32	0.27	0.60	28%	1.3	5.4
A8	0.22	0.77	0.85	90%	0.8	1.7
A9	0.51	0.40	0.67	44%	0.9	2.7
A10	0.31	0.77	0.85	90%	1.1	2.3
A11	1.50	0.59	0.76	68%	3.7	8.8
A12	0.86	0.77	0.85	90%	3.0	6.1
Basin Summary Table						
Basin	Area (AC)	Runoff Coefficients		I (%)	Peak Flows (cfs)	
		C ₅	C ₁₀₀		Q ₅	Q ₁₀₀
OS-1	0.85	0.05	0.49	2%	0.2	3.7
OS-2	0.28	0.05	0.49	2%	0.1	1.2
OS-3	0.09	0.58	0.76	67%	0.3	0.6
OS-4	0.32	0.56	0.75	64%	0.8	1.9
OS-5	0.34	0.37	0.65	41%	0.4	1.4
OS-6	0.04	0.77	0.85	90%	0.1	0.3

Appendix C - Hydraulic Calculations

MHFD-Detention, Version 4.06 (July 2022)

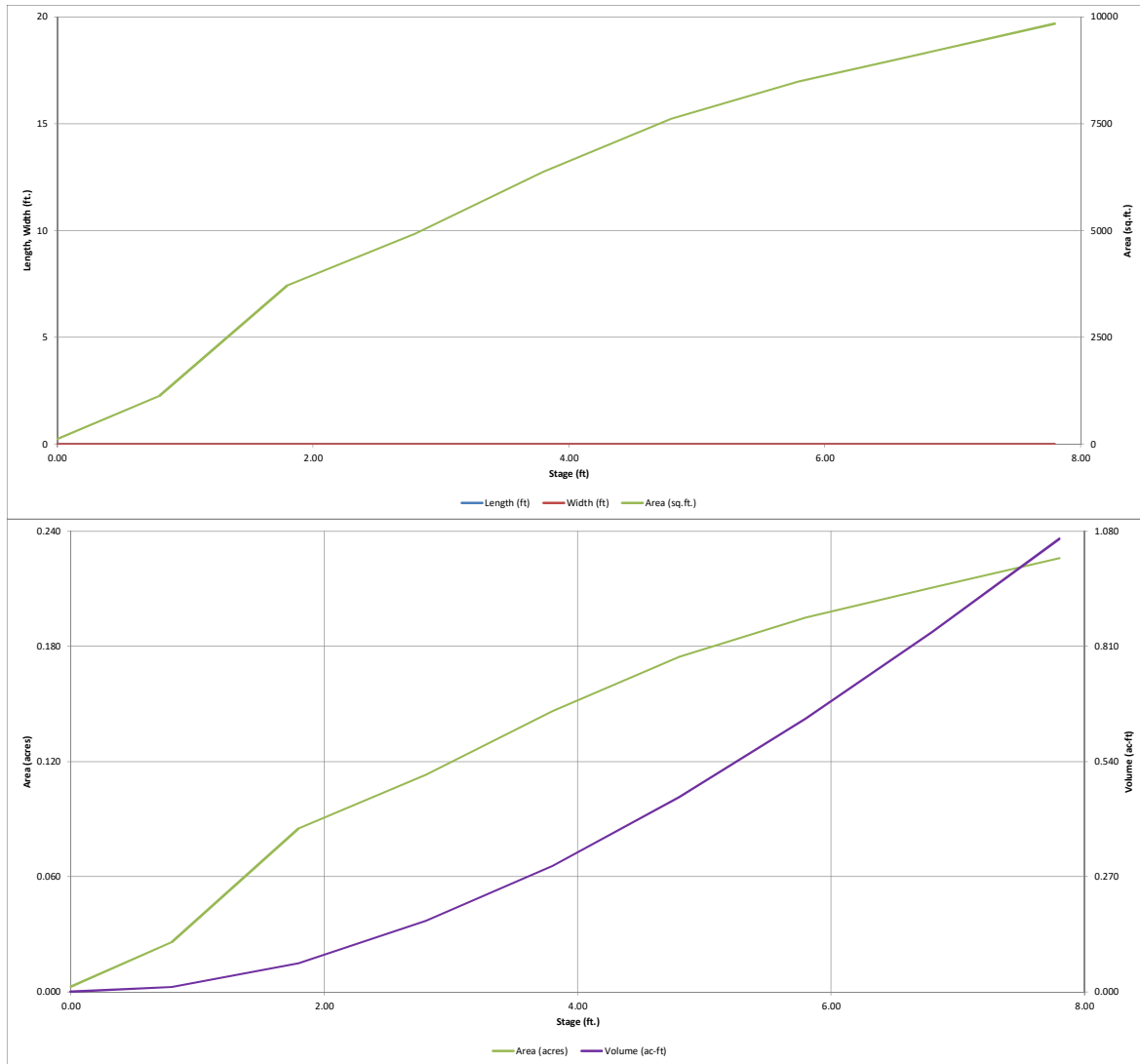
Basin ID: Basin A

[illegible]

Highlands Ranch Filing 159 Minor Development Final Plat
Project File: SB2023-022
Determination of Net Lot Sizing: 600m
Board of County Commissioners Staff Report - Page 90 of 283

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-DETENTION, Version 4.06 (July 2022)

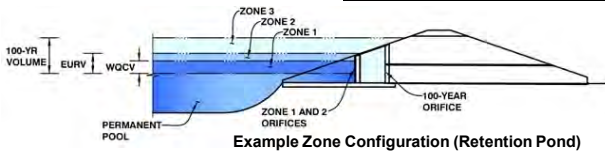


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Kaos Apartments

Basin ID: Basin A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.83	0.169	Orifice Plate
Zone 2 (EURV)	5.23	0.363	Orifice Plate
Zone 3 (100-year)	6.63	0.276	Weir&Pipe (Restrict)
Total (all zones)		0.808	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-1/8 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.80	3.60					
Orifice Area (sq. inches)	0.98	0.98	0.98					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

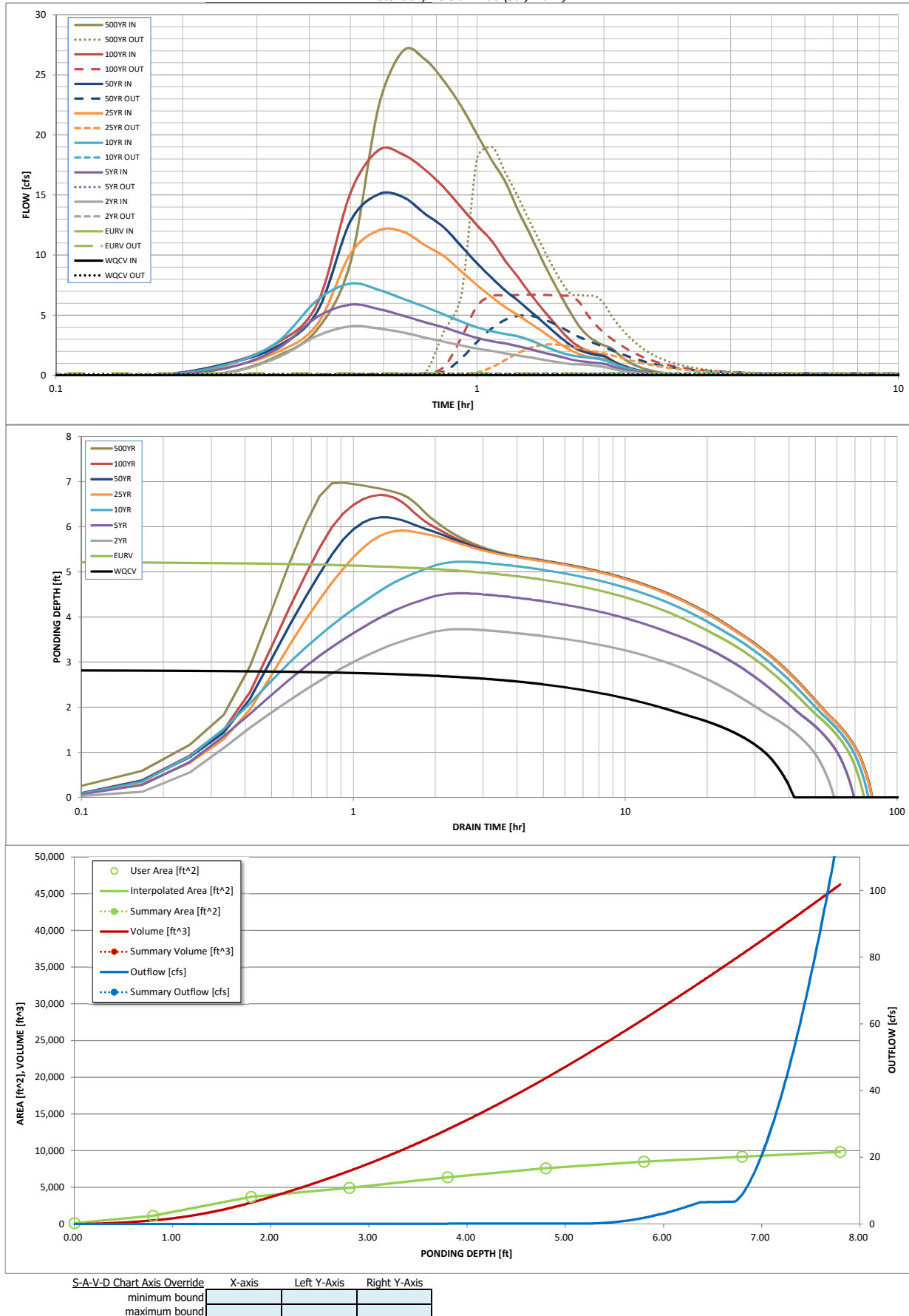
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.82	1.09	1.32	1.67	1.95	2.25	3.01
One-Hour Rainfall Depth (in) =	N/A	N/A	0.305	0.435	0.563	0.836	1.034	1.284	1.848
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.305	0.435	0.563	0.836	1.034	1.284	1.848
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.1	0.6	3.4	5.1	7.3	12.0
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.01	0.07	0.38	0.58	0.83	1.36
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.01	0.07	0.38	0.58	0.83	1.36
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	4.1	5.9	7.6	12.1	15.1	18.7	27.0
Peak Inflow Q (cfs) =	N/A	N/A	0.1	0.2	0.2	2.6	5.0	6.7	19.0
Peak Outflow Q (cfs) =	N/A	N/A	N/A	1.6	0.3	0.8	1.0	0.9	1.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.6	0.3	0.8	1.0	0.9	1.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.4	0.8	1.0	1.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	53	62	70	69	67	65	60
Time to Drain 99% of Inflow Volume (hours) =	40	72	56	66	74	75	75	74	72
Maximum Ponding Depth (ft) =	2.83	5.23	3.73	4.52	5.22	5.92	6.21	6.71	6.98
Area at Maximum Ponding Depth (acres) =	0.11	0.18	0.14	0.17	0.18	0.20	0.20	0.21	0.21
Maximum Volume Stored (acre-ft) =	0.170	0.533	0.284	0.409	0.532	0.663	0.723	0.823	0.880

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.06 (July 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
	0:15:00	0.00	0.00	0.17	0.56	0.83	0.63	0.91	0.94	1.58
	0:20:00	0.00	0.00	1.44	2.16	2.72	1.91	2.38	2.65	3.82
	0:25:00	0.00	0.00	3.29	4.87	6.25	4.24	5.30	5.94	9.41
	0:30:00	0.00	0.00	4.09	5.89	7.64	10.12	12.83	15.18	22.39
	0:35:00	0.00	0.00	3.90	5.53	7.13	12.07	15.08	18.75	27.01
	0:40:00	0.00	0.00	3.57	4.97	6.38	11.96	14.84	18.38	26.32
	0:45:00	0.00	0.00	3.16	4.44	5.72	10.85	13.47	17.14	24.51
	0:50:00	0.00	0.00	2.81	3.99	5.07	9.92	12.32	15.64	22.37
	0:55:00	0.00	0.00	2.50	3.52	4.49	8.65	10.74	13.97	20.02
	1:00:00	0.00	0.00	2.23	3.12	3.99	7.50	9.31	12.47	17.89
	1:05:00	0.00	0.00	2.04	2.85	3.67	6.52	8.10	11.18	16.08
	1:10:00	0.00	0.00	1.84	2.66	3.45	5.67	7.05	9.52	13.72
	1:15:00	0.00	0.00	1.66	2.44	3.25	5.02	6.22	8.17	11.79
	1:20:00	0.00	0.00	1.50	2.19	2.94	4.35	5.37	6.84	9.83
	1:25:00	0.00	0.00	1.34	1.95	2.55	3.74	4.59	5.67	8.10
	1:30:00	0.00	0.00	1.19	1.73	2.19	3.13	3.82	4.63	6.57
	1:35:00	0.00	0.00	1.06	1.54	1.89	2.57	3.11	3.70	5.20
	1:40:00	0.00	0.00	0.96	1.34	1.68	2.09	2.51	2.90	4.05
	1:45:00	0.00	0.00	0.91	1.20	1.56	1.76	2.10	2.36	3.29
	1:50:00	0.00	0.00	0.89	1.11	1.48	1.56	1.86	2.03	2.81
	1:55:00	0.00	0.00	0.79	1.05	1.41	1.44	1.70	1.81	2.50
	2:00:00	0.00	0.00	0.71	0.97	1.29	1.36	1.60	1.66	2.27
	2:05:00	0.00	0.00	0.56	0.77	1.03	1.07	1.26	1.28	1.74
	2:10:00	0.00	0.00	0.44	0.60	0.80	0.82	0.96	0.95	1.29
	2:15:00	0.00	0.00	0.34	0.46	0.61	0.63	0.74	0.72	0.96
	2:20:00	0.00	0.00	0.26	0.36	0.47	0.48	0.56	0.54	0.73
	2:25:00	0.00	0.00	0.20	0.27	0.35	0.37	0.43	0.41	0.55
	2:30:00	0.00	0.00	0.15	0.20	0.26	0.27	0.32	0.31	0.41
	2:35:00	0.00	0.00	0.12	0.15	0.20	0.20	0.24	0.23	0.31
	2:40:00	0.00	0.00	0.09	0.11	0.15	0.15	0.18	0.18	0.23
	2:45:00	0.00	0.00	0.06	0.08	0.11	0.11	0.13	0.13	0.17
	2:50:00	0.00	0.00	0.04	0.05	0.07	0.08	0.09	0.09	0.12
	2:55:00	0.00	0.00	0.02	0.03	0.05	0.05	0.06	0.06	0.07
	3:00:00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.04
	3:05:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

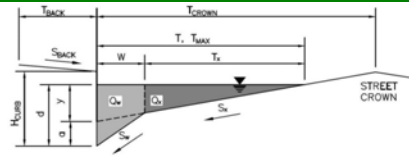
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ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Inlet ID: Inlet A2

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	0.5	ft
S_{BACK}	=	0.000	ft/ft
n_{BACK}	=	0.013	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	26.0	ft
W	=	1.00	ft
S_X	=	0.006	ft/ft
S_W	=	0.083	ft/ft
S_O	=	0.000	ft/ft
n_{STREET}	=	0.015	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	13.0	13.0	ft
d_{MAX}	6.0	6.0	inches

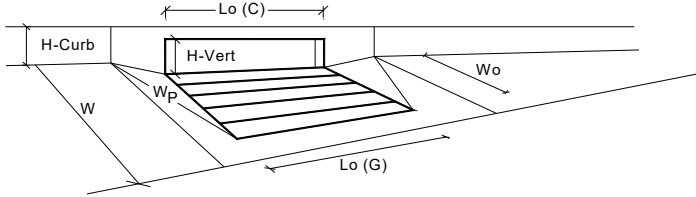
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



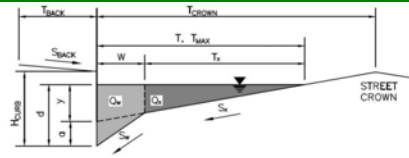
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening				
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	2.8	6.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.15	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.91	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	1.2	5.9	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _{PEAK REQUIRED} =	0.8	2.3	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Inlet ID: Inlet A3

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	0.5	ft
S_{BACK}	=	0.000	ft/ft
n_{BACK}	=	0.013	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	19.0	ft
W	=	1.00	ft
S_X	=	0.035	ft/ft
S_W	=	0.083	ft/ft
S_O	=	0.000	ft/ft
n_{STREET}	=	0.013	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	19.0	19.0	ft
d_{MAX}	6.0	6.0	inches

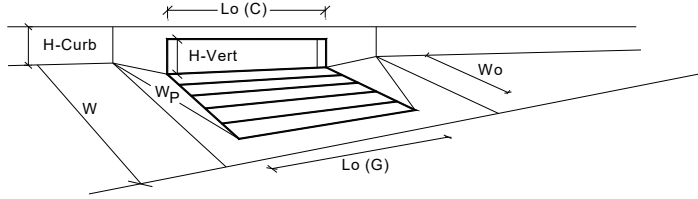
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



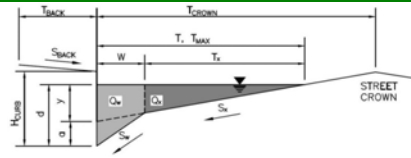
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.42	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.93	0.93	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	10.0	10.0	cfs
		Q _{PEAK REQUIRED} =	3.1	8.5	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Inlet ID: Inlet A6

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	0.5	ft
S_{BACK}	=	0.000	ft/ft
n_{BACK}	=	0.013	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	19.0	ft
W	=	1.00	ft
S_X	=	0.033	ft/ft
S_W	=	0.083	ft/ft
S_O	=	0.000	ft/ft
n_{STREET}	=	0.015	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	19.0	19.0	ft
d_{MAX}	6.0	6.0	inches

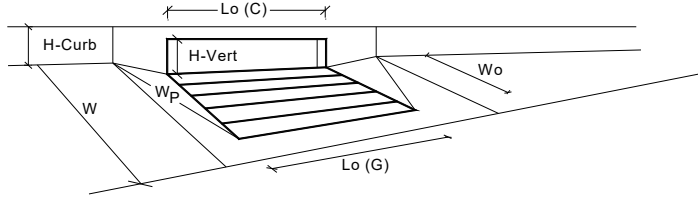
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



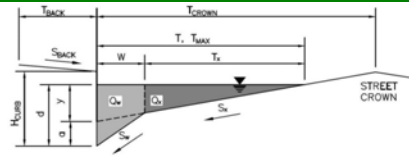
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.42	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.93	0.93	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	10.0	10.0	cfs
		Q _{PEAK REQUIRED} =	2.4	6.0	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Inlet ID: Inlet A7

**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	5.0	ft
S_{BACK}	=	0.020	ft/ft
n_{BACK}	=	0.013	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	19.0	ft
W	=	1.00	ft
S_X	=	0.040	ft/ft
S_W	=	0.083	ft/ft
S_O	=	0.000	ft/ft
n_{STREET}	=	0.015	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	19.0	19.0	ft
d_{MAX}	6.0	6.0	inches

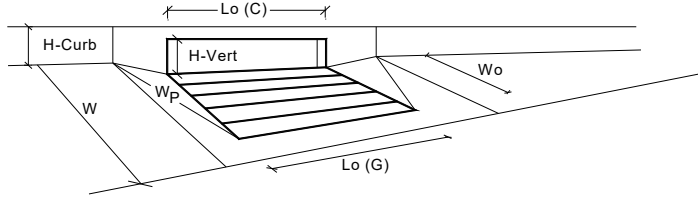
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)

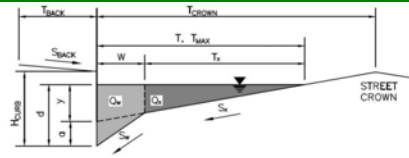


Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.42	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.93	0.93	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	10.0	10.0	cfs
		Q _{PEAK REQUIRED} =	2.1	7.8	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

Inlet ID: **A11****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

T_{BACK}	=	0.5	ft
S_{BACK}	=	0.000	ft/ft
n_{BACK}	=	0.013	

H_{CURB}	=	6.00	inches
T_{CROWN}	=	19.0	ft
W	=	1.00	ft
S_X	=	0.028	ft/ft
S_W	=	0.083	ft/ft
S_O	=	0.000	ft/ft
n_{STREET}	=	0.015	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	19.0	19.0	ft
d_{MAX}	6.0	6.0	inches

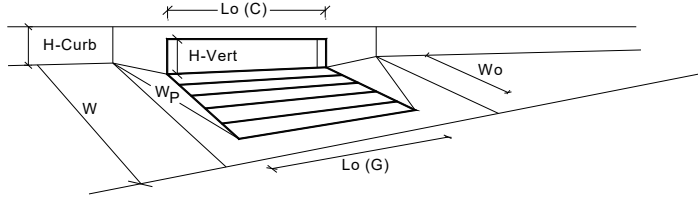
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR		MAJOR	
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W _p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C _f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C _o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR		MAJOR	
Depth for Grate Midwidth		d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d _{Curb} =	0.42	0.42	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.93	0.93	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	10.0	10.0	cfs
		Q _{PEAK REQUIRED} =	3.7	8.8	cfs

Appendix D - Reference Documents

DV06-155
DOUGLAS COUNTY
AUG 11 2006
DEPARTMENT OF
PUBLIC WORKS

May 3, 2006
Revised August 4, 2006

Phase III Drainage Report for the West Plaza Drive Extension Douglas County, Colorado

Prepared for:
Highlands Ranch Metro District

Prepared by:



Basin PD-N1

This basin includes 1.83 acres of new Plaza Drive pavement and half of the seeded median. The historic flow pattern in this basin flows from south to north and discharges into the existing roadside ditch along C-470. The flows from the new roadway will be collected via inlets and storm sewer that will discharge into the detention/water quality pond west of the CWSD.

Basin OS-3A

Historical drainage patterns in basin OS-3A flow from south to north in front of the CWSD access and are discharged into an existing system that parallels Plaza Drive. The basin is 0.43 acres of paved parking for the CWSD and sodded area. No changes will be made to historic drainage patterns and the proposed improvements include minor grading enhancements and construction of a new area inlet in the southwest corner of the CWSD access and Plaza Drive. This system drains to the detention/water quality pond west of CWSD.

Basin PD-S3

This basin includes 1.69 acres of east bound Plaza Drive pavement and half of the median that will be seeded. Historically much of the drainage in this basin is collected through a series of inlets, storm sewer and swales from the existing CWSD access and discharges into the existing pond located west of the CWSD. Proposed improvements include adding an on-grade inlet and storm sewer to discharge flows into the detention/water quality pond located in the western part of the basin.

The existing pond has an approximate detention/water quality volume of 2.0 acre feet. The pond will be impacted by the new roadway alignment. The proposed improvements include re-grading the pond to the south of Plaza Drive and providing additional volume for the new portions of Plaza Drive pavement that will drain into this pond per direction of Highlands Ranch Metro Districts (HRMD). Contributing to the pond are basins PD-S1, PD-N1, PD-S3, PD-N3, OS-2B and OS-3A (Appendix A and B for additional information and details).

Basin PD-N3

The contributing area for basin PD-N3 includes 1.10 acres of east bound Plaza Drive pavement and half of the seeded median area. As mentioned in Basin PD-S3, much of the historic runoff was intercepted by the existing CWSD access roadside ditch and storm drainage system. The new on-grade inlet and storm sewer will discharge into the CWSD detention/water quality pond.

Basin OS-2B

Contributing to basin OS-2B is predominately the CWSD property and a small portion of single family homes south of the CWSD. Historic drainage patterns flow from south to north and are intercepted by the existing CWSD roadside ditch, area inlets, storm sewer and existing swales through out the property. The majority of flows concentrate at the existing detention pond located west of the CWSD. The existing emergency overflow is located in the northern portion of the

Basin OS-2C

Historical drainage patterns in basin OS-2C flow from southeast in front of the CWSD to the northwest towards C-470 and discharge into the High Line Canal. No historical drainage patterns will be changed with this project. No portions of the Plaza Drive pavement will drain to the High Line Canal. All paved portions of Plaza Drive will drain either to the CWSD detention/water quality pond or the proposed water quality pond located in the northeast corner of Plaza Drive and Erickson Boulevard intersection.

Basin PD-S4

This basin includes 0.99 acres of east bound Plaza Drive pavement and half of the seeded median. Historic conditions in this basin are primarily sheet flows that concentrate at the High Line Canal. These flows will be intercepted by the new roadway alignment and collected in an on-grade inlet and storm sewer and discharged west of the High Line Canal.

Basin PD-N4

The contributing area for basin PD-N4 includes 1.07 acres of west bound Plaza Drive pavement and half of the seeded median area. As mentioned in Basin PD-S4, much of the historic runoff was intercepted by the High Line Canal. The new on-grade inlet and storm sewer will collect flows and discharge west of the High Line Canal into a roadside ditch that concentrates at a water quality pond near the intersection of Plaza Drive and Erickson Boulevard.

Basin OS-2E & OS-2F

Contributing to these two basins are approximately 2.18 acres of undisturbed C-470 side slopes and existing High Line Canal bike paths. These basins historically flow west towards Erickson Boulevard and will continue to do so as a part of this project.

During the summer of 2006, a new pedestrian box culvert was constructed to allow pedestrian movement under the future Plaza Drive Extension. Inlets and storm sewer were also constructed to drain the pedestrian box culvert. This system will be connected to the Plaza Drive drainage system and storm drainage flows from basins OS-2E & OS-2F will be conveyed to the water quality pond near the intersection of Plaza Drive and Erickson Boulevard.

Basin PD-S5

Basin PD-S5 consists of a 0.71 acres of east bound Plaza Drive pavement and half of the median that will be un-landscaped. Historic flows for this basin concentrate at an existing energy dissipator located south of C-470. The dissipator is connected to an existing 60" RCP that drains the majority of basin OS-2D. Proposed improvements include providing an inlet and storm drainage system to drain to the proposed water quality pond.

DOUGLAS COUNTY
DEPARTMENT OF PUBLIC WORKS ENGINEERING
PLAN AND PROFILE OF PROPOSED

SUBMITTAL
SEPTEMBER 10, 2013

APPROVED BY: DOUGLAS COUNTY

AMY BRANSTETTER PROJECT MANAGER	DATE
LEONARD CHELOCK, PE TRAFFIC ENGINEERING/ TRAFFIC OPERATIONS MANAGER	DATE
ROBERT KENNY, PE, PTOE PRINCIPAL TRAFFIC ENGINEER	DATE
JANET HERMAN, PE ASST. DIRECTOR OF DEVELOPMENT REVIEW	DATE
FRED KOCH, PE ENGINEERING SERVICES DIRECTOR	DATE

PLAZA DRIVE SIDEWALK IMPROVEMENTS
PROJECT NO. TF 2013-026
DOUGLAS COUNTY, COLORADO

SCALE OF ORIGINAL DRAWINGS
PLAN: 1" = 20'
PROFILE: 1" = 20' HORIZONTAL
1" = 5' VERTICAL

INDEX OF SHEETS

- 1 TITLE SHEET
2 STANDARD PLAN LIST
3 GENERAL NOTES
4 SUMMARY OF APPROXIMATE QUANTITIES
5 TABULATION OF QUANTITIES
6 TYPICAL SECTIONS
7 ROADWAY DETAIL
8-10 GEOMETRIC PLAN
11 PROJECT KEY MAP
12-20 STORM WATER MANAGEMENT PLANS
21-29 PLAZA DRIVE SIDEWALK PLAN AND PROFILE
30 CONSTRUCTION TRAFFIC CONTROL PLANS
100-107 PLAZA DRIVE SIDEWALK CROSS SECTIONS
(FOR INFORMATION ONLY)

AS CONSTRUCTED INFORMATION

CONTRACTOR _____
ENGINEER _____
PROJECT STARTED _____
PROJECT COMPLETED _____
AS CONSTRUCTED PLANS APPROVED BY: _____
TITLE: _____ DATE _____

TABULATION OF LENGTH

STATION	SIDEWALK	
	LIN. FEET	MILES
PLAZA DRIVE SIDEWALK IMPROVEMENTS : BEGIN PROJECT 4+84.01 END PROJECT 46+77.38	4193.37	0.794
TOTALS	4193.37	0.794



VICINITY MAP

DOUGLAS COUNTY STANDARDS

GESC PLAN STANDARD NOTES AND DETAILS (3 SHEETS)
CONCRETE JOINTS (STANDARD DRAWING NO. SP.31)

CDOT M&S-STANDARDS ATTACHED

- M-608-1 CURB RAMPS (6 SHEETS)
M-609-1 CURB, GUTTERS, AND SIDEWALKS (4 SHEETS)
S-614-1 GROUND SIGN PLACEMENT (2 SHEETS)
S-630-1 TRAFFIC CONTROLS FOR HIGHWAY CONSTRUCTION
(20 SHEETS)

INDEX OF REVISIONS	
Rev	Date

DOUGLAS COUNTY
COLORADO
Engineering Division - Traffic
100 Third Street
Castle Rock, Colorado 80104
(303) 667-7490

TITLE SHEET

PLAZA DRIVE SIDEWALK IMPROVEMENTS

Design: D. DIER	D. DIER
Drawn: M. HARTWIG	M. HARTWIG
Checked: M. HARTWIG	M. HARTWIG
Date Created: 7/10/13	Date Modified: N/A
Scale: N/A	Job No.: TF 2013-026

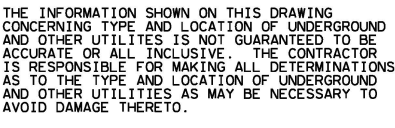
SHEET

1

OF - 30



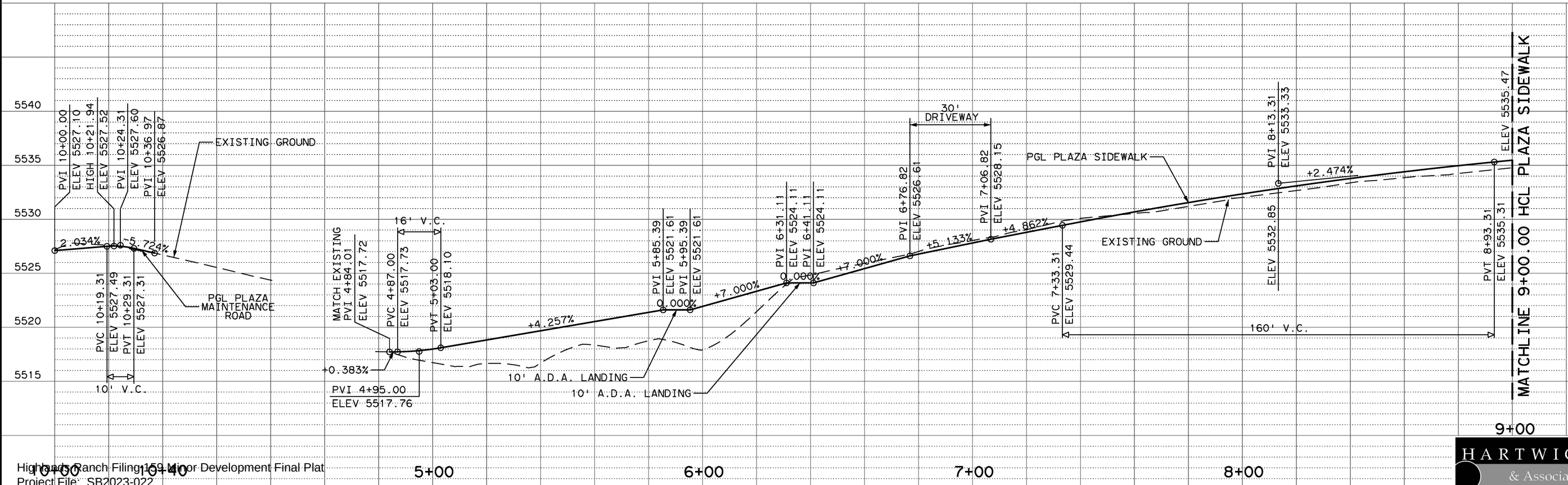
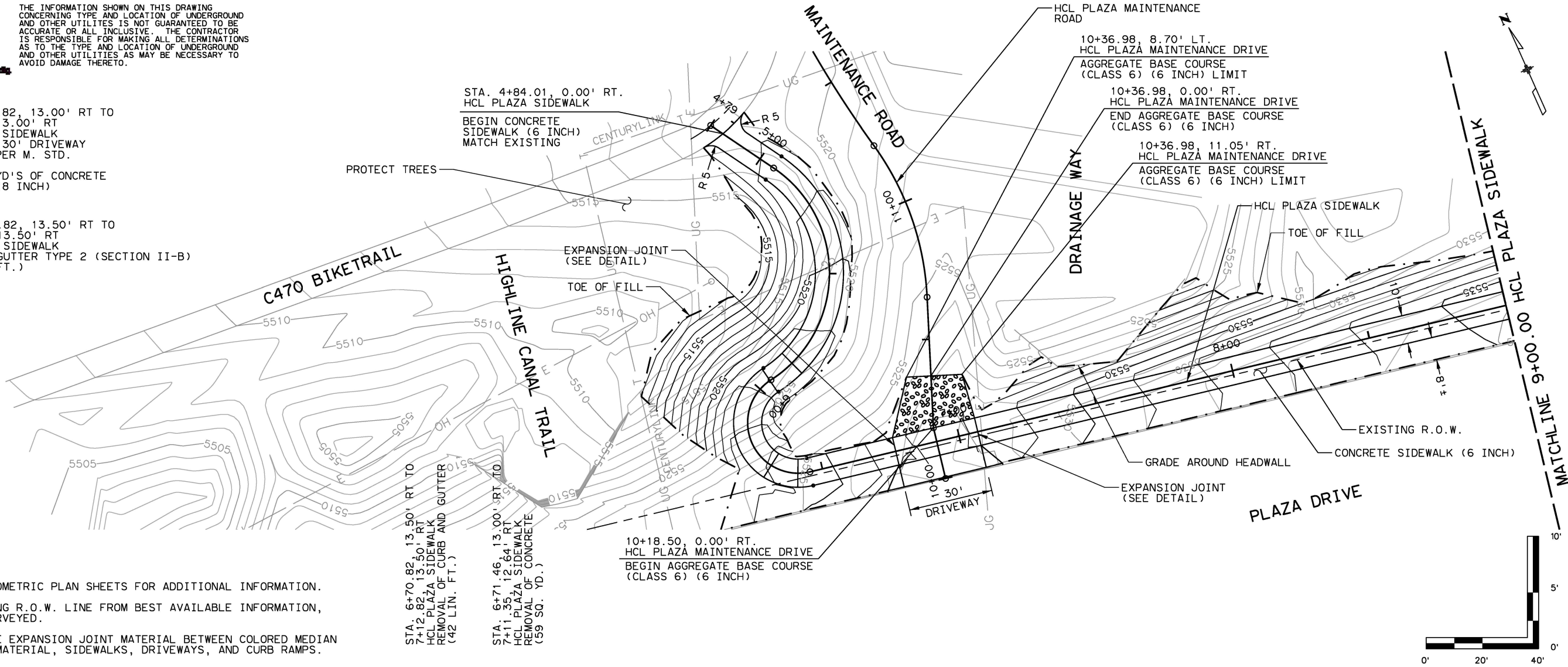
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REQUIRED:
STA. 6+70.82, 13.50' RT TO
7+12.82, 13.50' RT
HCL PLAZA SIDEWALK
CURB AND GUTTER TYPE 2 (SECTION II-B)
(42 LIN. FT.)

NOTES:

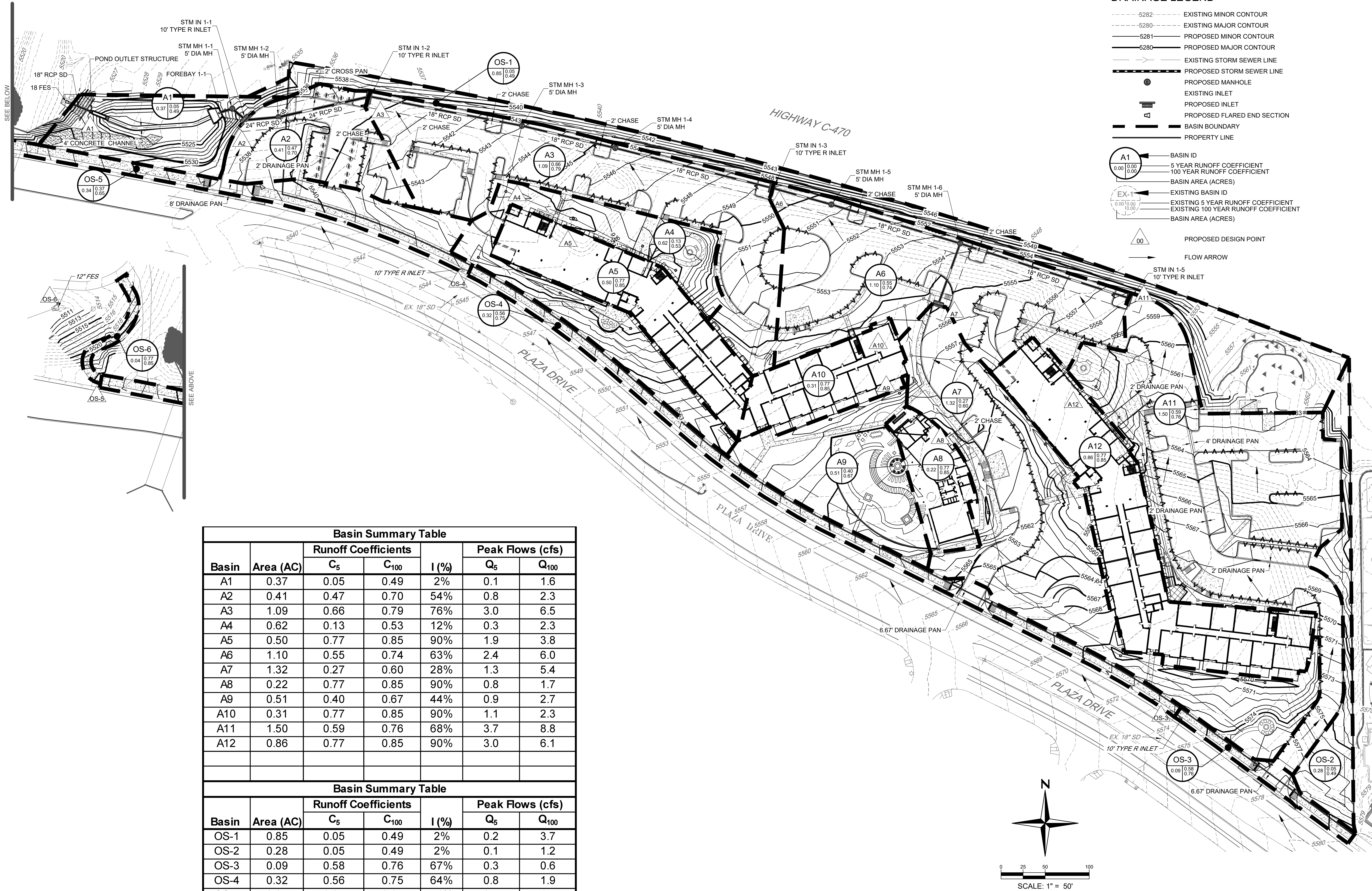
1. SEE GEOMETRIC PLAN SHEETS FOR ADDITIONAL INFORMATION.
2. EXISTING R.O.W. LINE FROM BEST AVAILABLE INFORMATION, NOT SURVEYED.
3. INCLUDE EXPANSION JOINT MATERIAL BETWEEN COLORED MEDIAN COVER MATERIAL, SIDEWALKS, DRIVEWAYS, AND CURB RAMPS.

[illegible]

 **DOUGLAS COUNTY**
COLORADO
Engineering Division - Traffic
100 Third Street
Castle Rock, Colorado 80104
(303) 660-7490

Design: K. BRUBAKER	PLAN AND PROFILE 4+84.01 TO 9+00 SHEET 21
Drawn: D. DYER	
Checked: M. HARTMIG	
Date Created: 7/24/13	
Date Modified:	
Scale: 20:1	PLAZA DRIVE SIDEWALK IMPROVEMENTS
Job No.: TP 2013-026	

Appendix E - Drainage Maps



DRAINAGE LEGEND

- 5282 --- EXISTING MINOR CONTOUR
- 5280 --- EXISTING MAJOR CONTOUR
- 5281 --- PROPOSED MINOR CONTOUR
- 5280 --- PROPOSED MAJOR CONTOUR
- - - - - EXISTING STORM SEWER LINE
- - - - - PROPOSED STORM SEWER LINE
- PROPOSED MANHOLE
- EXISTING INLET
- PROPOSED INLET
- PROPOSED FLARED END SECTION
- - - - - BASIN BOUNDARY
- - - - - PROPERTY LINE
- A1 BASIN ID
- 0.00 0.00 5 YEAR RUNOFF COEFFICIENT
- 0.00 0.00 100 YEAR RUNOFF COEFFICIENT
- 0.00 0.00 BASIN AREA (ACRES)
- EX-1 EXISTING BASIN ID
- 0.00 0.00 EXISTING 5 YEAR RUNOFF COEFFICIENT
- 0.00 0.00 EXISTING 100 YEAR RUNOFF COEFFICIENT
- 0.00 0.00 BASIN AREA (ACRES)

- △ 00 PROPOSED DESIGN POINT
- FLOW ARROW

Basin Summary Table

Basin	Area (AC)	Runoff Coefficients		I (%)	Peak Flows (cfs)	
		C ₅	C ₁₀₀		Q ₅	Q ₁₀₀
A1	0.37	0.05	0.49	2%	0.1	1.6
A2	0.41	0.47	0.70	54%	0.8	2.3
A3	1.09	0.66	0.79	76%	3.0	6.5
A4	0.62	0.13	0.53	12%	0.3	2.3
A5	0.50	0.77	0.85	90%	1.9	3.8
A6	1.10	0.55	0.74	63%	2.4	6.0
A7	1.32	0.27	0.60	28%	1.3	5.4
A8	0.22	0.77	0.85	90%	0.8	1.7
A9	0.51	0.40	0.67	44%	0.9	2.7
A10	0.31	0.77	0.85	90%	1.1	2.3
A11	1.50	0.59	0.76	68%	3.7	8.8
A12	0.86	0.77	0.85	90%	3.0	6.1

Basin Summary Table

Basin	Area (AC)	Runoff Coefficients		I (%)	Peak Flows (cfs)	
		C ₅	C ₁₀₀		Q ₅	Q ₁₀₀
OS-1	0.85	0.05	0.49	2%	0.2	3.7
OS-2	0.28	0.05	0.49	2%	0.1	1.2
OS-3	0.09	0.58	0.76	67%	0.3	0.6
OS-4	0.32	0.56	0.75	64%	0.8	1.9
OS-5	0.34	0.37	0.65	41%	0.4	1.4
OS-6	0.04	0.77	0.85	90%	0.1	0.3

NOT FOR
CONSTRUCTION

PROJECT NO. 22029		DATE	NO.	NOTES
DATE	NO.			
03/28/2023	1			ISSUED FOR REVIEW

KAOS APARTMENTS
DRAINAGE PLAN



Consultants in Natural Resources and the Environment

Noxious Weed Management Plan Highlands Ranch Planning Area 79 Douglas County, Colorado

Prepared for—

Shea Properties Colorado
8351 East Belleview Avenue
Denver, Colorado 80237

Prepared by—

ERO Resources Corporation
1626 Cole Boulevard, Suite 100
Lakewood, Colorado 80401
(303) 830-1188
ERO Project #25-059

April 8, 2025

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Project Area Description	3
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Appendix A Photo Log

Appendix B CDA Noxious Weed Fact Sheets

Noxious Weed Management Plan Highlands Ranch Planning Area 79 Douglas County, Colorado

April 8, 2025

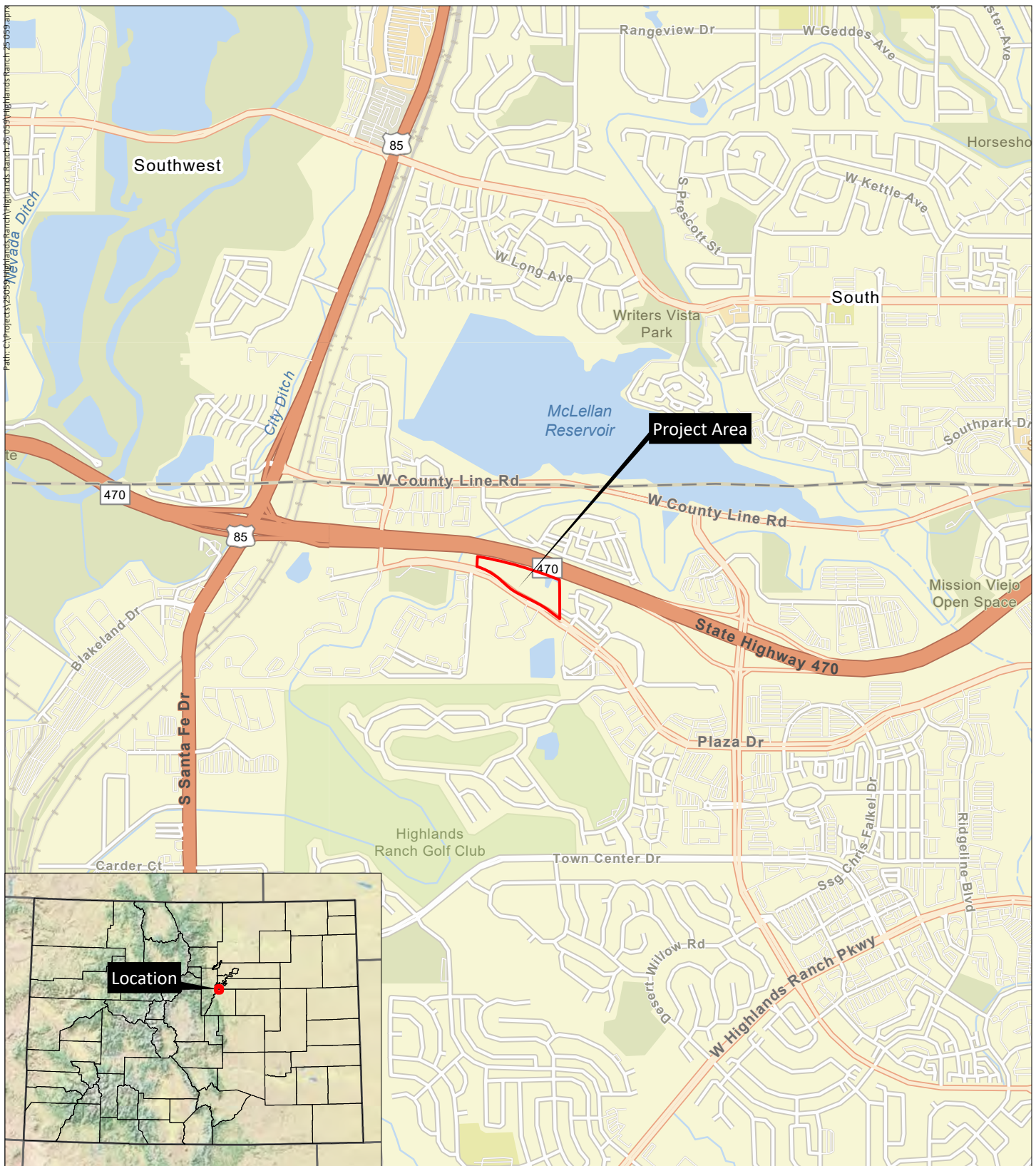
Introduction

Shea Properties Colorado (SPC) is proposing to construct the Highlands Ranch Planning Area 79 development project (project) in Douglas County, Colorado (project area; Figure 1). SPC contracted ERO Resources Corporation (ERO) to prepare this Noxious Weed Management Plan for the project. This Noxious Weed Management Plan has been developed to follow an integrated weed management approach of mechanical, chemical, and biological control strategies.

As defined by the Colorado Department of Agriculture (CDA), noxious weeds are nonnative aggressive invaders that replace native vegetation, reduce agricultural productivity, cause wind and water erosion, and pose an increased threat to communities from wildfire (CDA 2025). Noxious weeds are ranked by the CDA into one of the following lists based on the severity of potential impacts and other factors:

- List A – Contains noxious weed species designated in Colorado for eradication upon detection.
- List B – Contains noxious weed species common enough in parts of Colorado that eradication is not feasible, though these species are still recommended for eradication, suppression, or containment depending on distribution and densities around the state. Noxious weed management plans for these species are designed to stop the continued spread of these species.
- List C – Contains noxious weed species widespread in Colorado. Noxious weed management plans for these species are designed to provide additional education, research, and biological resources to reduce the harm associated with these species.
- Watch List Species – Contains weed species that are rare or unknown in the state but display noxious characteristics in plant communities similar to those in Colorado. Watch list species are not designated as noxious but are included in the list to educate and encourage identification and reporting.

The noxious weeds identified in the project area are discussed in further detail in the *Results* section of this report.



Highlands Ranch Planning Area 79

Section 5, T6S, R68W; 6th PM

UTM NAD 83: Zone 13N; 498362mE, 4379165mN

Longitude 105.019077W, Latitude 39.562185N

USGS Littleton, CO Quadrangle

Douglas County, Colorado

Figure 1 Vicinity Map

Prepared for: Shea Properties
Colorado
File: 25059 Figure 1 (MT)
April 2, 2025

ERO
ERO Resources Corp.

0 1,000 2,000
Feet



Project Location

The project area is in Section 5, Township 6 South, Range 68 West of the 6th Principal Meridian in Douglas County, Colorado (Figure 1). The UTM coordinates of the approximate center of the project area are NAD 83: 498362mE, 4379165mN, Zone 13 North. The longitude/latitude of the project area is 105.019077°W/39.562185°N. The elevation of the project area is approximately 5,550 feet above sea level. Representative photos of the project area are included in Appendix A, and the photo points are shown on Figure 2.

Project Area Description

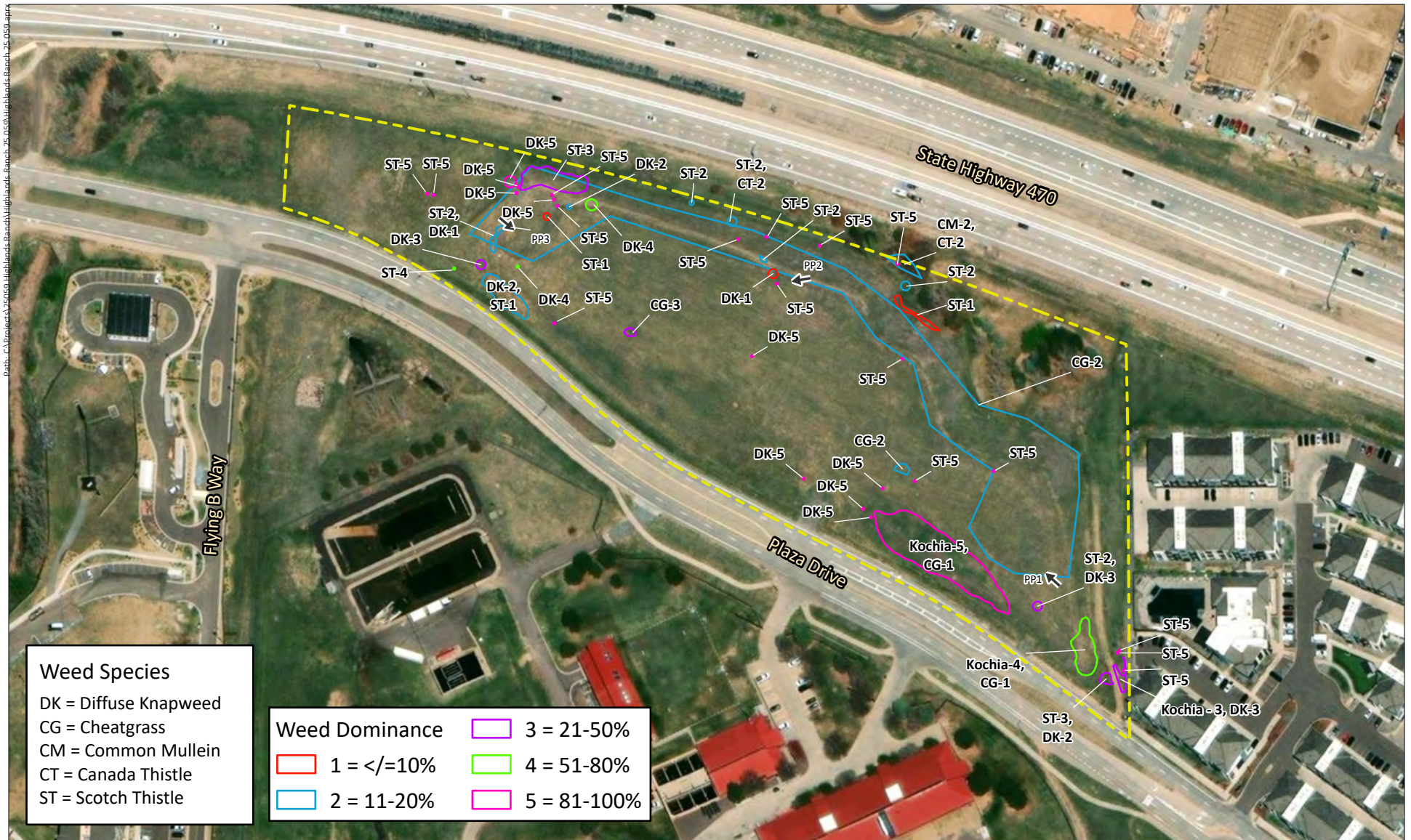
The project area is surrounded primarily by existing infrastructure including Colorado State Highway 470 to the north, an existing residential development to the east, Plaza Drive to the south, and undeveloped land to the west (Figure 2). Vegetation in the project area is dominated by a mix of nonnative and native upland species including smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), and rubber rabbitbrush (*Ericameria nauseosa*) with curly dock (*Rumex crispus*) and Japanese brome (*Bromus arvensis*) prevalent throughout (Photo 1 through Photo 3).

Results

On March 20, 2025, Anna Wistrom and Joshua Dresen, biologists with ERO, assessed the project area for noxious weeds (2025 site visit). No List A or Watch List species were documented in the project area during the 2025 site visit. During the 2025 site visit, ERO documented three List B noxious weed species and two List C noxious weed species in the project area, as described below (Table 1). Additionally, during the 2025 site visit, ERO identified three high-density populations of kochia (*Bassia scoparia*) (Figure 2). While kochia is not classified as a noxious weed by the CDA, it is an undesirable, nonnative species known to outcompete native vegetation. The observed weed populations in the project area consisted of small and large populations and scattered individual weeds. Noxious weed data are shown on Figure 2.

List B Species

- **Canada thistle (*Cirsium arvense*)** – Low-density Canada thistle populations were observed in two locations along the northern boundary of the project area.
- **Diffuse knapweed (*Centaurea diffusa*)** – Diffuse knapweed was present throughout much of the project area as low-density populations with one high-density population in the northwestern portion of the project area and scattered individuals.
- **Scotch thistle (*Onopordum acanthium*)** – Scotch thistle occurred throughout the project area, mainly as scattered individuals, with a few low-density populations.



Highlands Ranch Planning Area 79

- ➔ Photo Point
- Project Area

Image Source: Maxar Technologies© May 5th, 2023

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Highlands Ranch Planning Area 79 Minor Development Final Plat

Project File: SB2023-022

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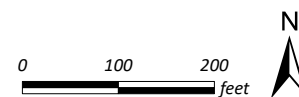


Figure 2
Existing Conditions

Prepared for: Shea Properties Colorado
File: 25059 Figure 2 (MT)
April 4, 2025

ERO
ERO Resources Corp.

List C Species

- **Cheatgrass (*Bromus tectorum*)** – Low-density cheatgrass populations were observed sporadically in the project area with the largest and most significant infestation occurring on a gentle hillslope along the perimeter of the project area.
- **Common mullein (*Verbascum thapsus*)** – A low-density population of common mullein was observed in a single location along the northern boundary of the project area.

Table 1. Noxious weeds found in the project area.

Common Name	Scientific Name	CDA Noxious Weed List
Canada thistle	<i>Cirsium arvense</i>	B
Diffuse knapweed	<i>Centaurea diffusa</i>	B
Scotch thistle	<i>Onopordum acanthium</i>	B
Cheatgrass	<i>Bromus tectorum</i>	C
Common mullein	<i>Verbascum thapsus</i>	C

Management Recommendations

The management recommendations are divided into (1) targeted methods focused on individual species and (2) best management practices (BMPs) to prevent the spread of noxious weeds during and after construction of the residential development.

Targeted Methods

Below are the targeted control methods for the noxious weeds found in the project area during the 2025 site visit. For herbicide recommendations, the Environmental Protection Agency regulates pesticide residue in waterways as a discharge of a pollutant regulated under the Clean Water Act. A general National Pollutant Discharge Elimination System Permit has been issued that covers the application of pesticides in or near water. In general, only herbicides rated as safe near water must be used, and Douglas County and the applicator must keep records of the herbicide operations. Additionally, when using herbicides, the directions on the labels must be strictly followed.

List B Species: Canada Thistle, Diffuse Knapweed, and Scotch Thistle

Canada Thistle

Mechanical methods, like hand pulling and tilling, are not recommended for controlling Canada thistle, as root fragments can stimulate new growth. Chemical spot-spray treatment with approved herbicides applied in the rosette and pre-flower (i.e., bolting) growth stages is recommended (CDA 2015). During flowering or seed production, cut off the flower heads, place them in a bag, and dispose of the bag in an area where the flower heads or seeds will not grow. If chemical methods are used, see the noxious weed factsheets (Appendix B) for herbicide recommendations.

Diffuse Knapweed

The populations of diffuse knapweed found in the project area can be best controlled by mechanical means in combination with approved herbicide applied in the rosette and bolting growth stages (CDA 2015). Diffuse knapweed can be controlled by any physical or mechanical method that severs the root below the soil surface and is best controlled in the rosette stage. Preventing seed production is crucial,

so it is important to stop the plant from flowering. If flowers are present, they should be collected, bagged, and properly disposed of in an area where the flower heads or seeds will not grow, as recommended by the CDA (CDA 2015). If chemical methods are used, see the noxious weed factsheets (Appendix B) for herbicide recommendations.

Scotch Thistle

Mechanical methods, such as mowing, chopping, and deadheading, are not recommended for controlling Scotch thistle, as seeds will mature and germinate if left on the ground. Mechanical methods, including tilling (small infestations), hoeing, and digging, along with chemical spot treatment with approved herbicides in the rosette and early bolting growth stages is recommended (CDA 2016). During flowering or seed production, flower heads must be collected, bagged, and disposed of or destroyed, as recommended by the CDA (CDA 2016). Fire gives Scotch thistle a competitive advantage; therefore, this method is not recommended. If chemical methods are used, see the noxious weed factsheets (Appendix B) for herbicide recommendations.

List C Species: Cheatgrass and Common Mullein

Cheatgrass

Mechanical methods, such as mowing and chopping, are not recommended as they leave roots behind, stimulate flower production, disperse seeds, and expand the size of the infested area. To control cheatgrass, mechanical control methods, including tilling, in combination with approved chemical herbicide are recommended (CDA 2019). Any tilling must be deeper than 6 inches to be successful at inhibiting cheatgrass regeneration. If chemical methods are used, see the noxious weed factsheets (Appendix B) for herbicide recommendations.

Common Mullein

To control common mullein, hand pulling or digging up the plants when the soil is moist in combination with approved chemical herbicide are recommended (CDA 2009). Removed plants should also be bagged to prevent the spread of seeds. If chemical methods are used, see the noxious weed factsheets (Appendix B) for herbicide recommendations.

Best Management Practices

In areas where construction is proposed, the BMPs described below should be used to prevent the spread of these species:

- Major equipment (track equipment, rubber tire loaders, and backhoes) should be cleaned with high-pressure air or water spray before being delivered to the project area to avoid introducing undesirable plants and noxious weeds.
- Disturbed areas should be reclaimed as soon as practicable after completion of construction and seeded with an appropriate native seed mix (certified as noxious-weed-free). In areas where construction is complete, but seeding cannot immediately occur due to the time of year, mulch and mulch tackifier should be used for temporary erosion control until seeding can occur.
- Certified weed-free seed, mulch, and borrow material should be used for revegetation. Weed-free straw bales should be used for sediment barriers.
- Locally or regionally available seed and mulch should be used when practicable.

- Fertilizers in seeded areas should be kept to a minimum because fertilizers tend to promote the growth of many noxious weeds and other undesirable species.
- Large bare patches should be reseeded as soon as practicable to prevent the establishment of noxious weeds.
- The project area should be monitored for one year after construction in the residential development areas and for three years in open space areas. If noxious weeds are present, weed control plans should be formulated and completed. Control of noxious weeds should be implemented as soon as practicable to prevent establishment because noxious weeds are more difficult to control after they have been established.

References

- Colorado Department of Agriculture (CDOA). 2009. "Common Mullein Identification and Management." <https://ag.colorado.gov/conservation/noxious-weeds/noxious-weed-species-id/common-mullein>.
- Colorado Department of Agriculture (CDOA). 2015a. "Canada Thistle Identification and Management." <https://ag.colorado.gov/conservation/noxious-weeds/noxious-weed-species-id/canada-thistle>.
- Colorado Department of Agriculture (CDOA). 2015b. "Diffuse Knapweed Identification and Management." <https://ag.colorado.gov/conservation/noxious-weeds/noxious-weed-species-id/diffuse-knapweed>.
- Colorado Department of Agriculture (CDOA). 2016. "Scotch Thistle Identification and Management." <https://ag.colorado.gov/conservation/noxious-weeds/noxious-weed-species-id/scotch-thistle>.
- Colorado Department of Agriculture (CDOA). 2019. "Cheatgrass Identification and Management." <https://drive.google.com/file/d/1rzVSgQmhdYerHekDpfAvUs4x34BaPoog/view>.
- Colorado Department of Agriculture (CDOA). 2025. "Colorado Noxious Weed List (Including Watch List)." <https://ag.colorado.gov/conservation/noxious-weeds/species-id>.

Appendix A Photo Log

Photo Log
Noxious Weed Management Plan
Highlands Ranch Planning Area 79
Douglas County, Colorado
March 20, 2025



Photo 1 - Overview of site conditions in the eastern portion of the project area. View is northwest.



Photo 2 - Overview of site conditions in the central portion of the project area. View is west.



Photo 3 - Overview of site conditions in the western portion of the project area. View is southeast.

Appendix B CDA Noxious Weed Fact Sheets



its root system, and quickly form dense stands. Each fragmented piece of root, 0.25 inch or larger, is capable of forming new plants. The key to controlling Canada thistle is to eliminate seed production and to reduce the plant's nutrient reserves in its root system through persistent, long-term management.

Canada thistle is one of the most troublesome noxious weeds in the U.S. It can infest diverse land types, ranging from roadsides, ditch banks, riparian zones, meadows, pastures, irrigated cropland, to the most productive dryland cropland. Large infestations significantly reduce crop and cattle forage production and native plant species. It is a host plant to several agricultural pests and diseases. Canada thistle prefers moist soils, but it can be found in a variety of soil types. It has been found at elevations up to 12,000 feet.

Effective Canada thistle control requires a combination of methods. Prevention is the most important strategy. Maintain healthy pastures and rangelands, and continually monitor your property for new infestations. Established plants need to be continually stressed. Management options become limited once plants begin to produce seeds. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Canada thistle (*Cirsium arvense*) is a non-native, deep-rooted perennial that spreads by seeds and aggressive creeping, horizontal roots called rhizomes. Canada thistle can grow 2 to 4 feet in height. The leaves are oblong, spiny, bright green, and slightly hairy on the undersurface. Unlike other noxious biennial thistles which have a solitary flower at the end of each stem, Canada thistle flowers occur in small clusters of 1 to 5 flowers. They are about 1 cm in diameter, tubular shaped, and vary from white to purple in color.

Canada thistle emerges from its root system from late April through May. It flowers in late spring and throughout the summer. It produces about 1,000 to 1,500 seeds per plant that can be wind dispersed. Seeds survive in the soil for up to 20 years. Additionally, Canada thistle reproduces vegetatively through



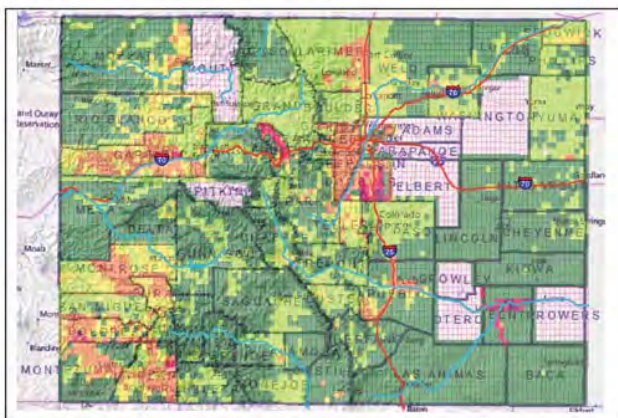
Canada thistle *Cirsium arvense*

2013 Quarter Quad Survey

Canada Thistle
Cirsium arvense

2013 Quarterquad Survey
Distribution and Abundance
in Colorado

129,572+ Infested Acres



Canada thistle is designated as a "List B" species as described in the Colorado Noxious Weed Act. It is required to be either eliminated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/weeds and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, (303) 869-9030.

Key ID Points

1. Cluster of 1-5 white to purple flowers on a stem.
2. Floral bracts are spineless.
3. Small flowers that are 1 cm in diameter.
4. Perennial, rhizomatous plant with spiny, oblong, green leaves.

Integrated Weed Management Recommendations

Integrated weed management is imperative for effective Canada thistle control. This weed needs to be continually stressed, forcing it to exhaust root nutrient stores, and eventually die. Mowing or grazing can be followed up with herbicide application. Avoid hand-pulling and tilling which can stimulate the growth of new plants.



CULTURAL

Prevention is the best control strategy. Maintain healthy pastures, riparian areas, and rangelands. Prevent bare ground caused by overgrazing, and continually monitor your property for new infestations. Establishment of select grasses can be an effective control.

BIOLOGICAL

Cattle, goats, and sheep will graze on Canada thistle when plants are young and succulent in the spring. Follow up grazing with a fall herbicide application. Insects are available, and provide limited control. Currently, collection and distribution methods for Canada thistle rust (*Puccinia punctiformis*) are being refined. For more information on Canada thistle biocontrol, contact the Colorado Department of Agriculture - Palisade Insectary at (970) 464-7916.



MECHANICAL

Due to Canada thistle's extensive root system, hand-pulling and tilling create root fragments and stimulate the growth of new plants. Mowing can be effective if done every 10 to 21 days throughout the growing season. Combining mowing with herbicides will further enhance Canada thistle control.



CHEMICAL

The table below includes recommendations for herbicides that can be applied to rangeland and some pastures. Treatments may be necessary for an additional 1 to 3 years because of root nutrient stores. Always read, understand, and follow the label directions.



Herbicide	Rate	Application Timing
Aminopyralid* (Miles tone)	5-7 oz. product/acre + 0.25% v/v non-ionic surfactant OR 1 teaspoon product/gal water + 0.32 oz./gal water	Apply in spring at the pre-bud growth stage until flowering and/or to fall regrowth. Can also add chlorsulfuron (Telar) at 1 oz./acre to the mix.
Clopyralid + Triclopyr (Prescott, Redeem; others)	3 pints product/acre + 0.25% v/v non-ionic surfactant OR 1.25 oz. product/gal water + 0.32 oz./gal water	Apply until flowering and/or fall regrowth.
Aminocyclopyrachlor + chlorsulfuron (Perspective)*	5.5 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply to spring rosette to flower bud growth stage; or fall. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.
Note: *Product not permitted for use in the San Luis Valley. Additional herbicide recommendations for this and other species can be found at: goo.gl/TWwlv9		

t

Canada thistle

Cirsium arvense

Updated:
07/2015



Colorado Department of Agriculture - Conservation Services

305 Interlocken Parkway
Broomfield, CO 80021
(303) 869-9030
www.colorado.gov/ag/weeds



Highland:

Project File: SB2023-022

Board of County Commissioners Staff Report - Page 129 of 283

Diffuse knapweed

Colorado Department of
Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us



Key ID Points

1. Floral bracts have yellow spines with teeth appearing as a comb and a distinct terminal spine.
2. Flowers are white or lavender.
3. Seedlings have finely divided leaves

Diffuse knapweed Identification and Management



Identification and Impacts

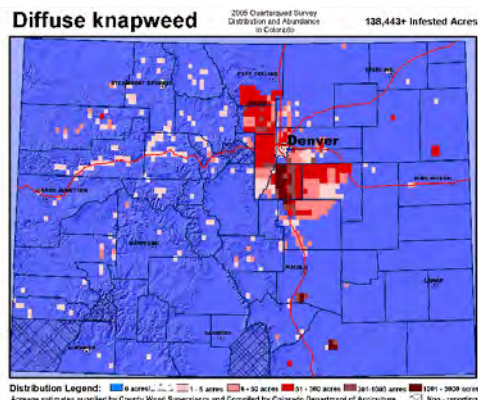
Diffuse knapweed (*Centaurea diffusa*) is a non-native biennial forb that reproduces solely by seed. A biennial is a plant that completes its lifecycle within two years. During the first year of growth, diffuse knapweed appears as a rosette in spring or fall. During the second year in mid to late spring – the stem bolts, flowers, sets seed, and the plant dies. Once the plant dries up, it breaks off at ground level and becomes a tumbleweed which disperses the still viable seeds over long distances. A prolific seed producer, diffuse knapweed can produce up to 18,000 seeds per plant. Therefore, the key to managing this plant is to prevent seed production. Diffuse knapweed can grow 1 to 3 feet tall, and is diffusely branched above ground. This gives the plant a ball-shaped appearance and tumble-weed mobility when broken off. Leaves are small, and are reduced in size near the flowering heads. Flowers are mostly white, sometimes purple, urn-shaped, and are located on each branch tip. Bracts that enclose the flowerheads are divided like the teeth of a comb, and are tipped with a distinct slender spine. Upon drying, the bracts become rough, rendering them injurious to the touch. Flowers bloom July through August. Seed set usually occurs by mid-August.

Diffuse knapweed tends to invade disturbed, overgrazed areas. Other habitats may also include rangeland, roadsides, riparian areas, and trails. It is a tough competitor

on dry sites and rapidly invades and dominates disturbed areas. Once established, diffuse knapweed outcompetes and reduces the quantity of desirable native species such as perennial grasses. As a result, biodiversity and land values are reduced, and soil erosion is increased.

The key to effective control of Diffuse knapweed is to prevent the plant from flowering and going to seed. An integrated weed management approach dealing with Diffuse knapweed is highly recommended. There are many options of mechanical, chemical, and biological controls, available. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Diffuse knapweed is designated as a "List B" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information, visit www.colorado.gov/ag/csd and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division at 303-239-4100.



Plant photo, top © Kelly Uhing. Infestation map above, Crystal Andrews. Flower photo © Cindy Roche. Rosette and leaf photos © Dale Swenarton.

Centaurea diffusa

**CULTURAL**

Establishment of selected grasses can be an effective cultural control of diffuse knapweed. Contact your local Natural Resources Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing. Bareground is prime habitat for weed invasions.

**BIOLOGICAL**

The seedhead weevil (*Larinus minutus*) and the root weevil fly (*Cyphocleonus achates*) provide fair to good control when used in combination with each other. Expect to wait at least 3 to 5 years for the insects to establish and achieve optimum results. This is an option for large infestations. To obtain the insects, contact the Colorado Department of Agriculture, 970-464-7916.

**MECHANICAL**

Any mechanical or physical method that severs the root below the soil surface will kill diffuse knapweed. Mowing or chopping is most effective when diffuse knapweed plants are at full-bloom. Be sure to properly dispose of the flowering cut plants, since seeds can mature and become viable after the plant has been cut down.

Integrated Weed Management:

Diffuse knapweed is best controlled in the rosette stage. It is imperative to prevent seed production. Do not allow diffuse knapweed flowers to appear. Management must be persistent in order to deplete the seed bank in the soil.

HERBICIDES : The following are recommendations for herbicides that can be applied to range and pasturelands. Always read, understand, and follow the label directions. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Aminocyclopyrachlor + chlorsulfuron (Perspective)*	4.75-8 oz. product/acre + 0.25% non-ionic surfactant	Pre-emergence or from seedling to mid-rosette stage. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.
Aminopyralid* (Milestone)	5-7 oz./acre + 0.25% non-ionic surfactant	Spring at rosette to early bolt stage and/or in the fall to rosettes. Add 1 qt./acre 2,4-D or 3 oz. Perspective when treating in the bolting to flowering growth stages.
Clopyralid (Transline)	0.67-1.33 pints/acre + 0.25% non-ionic surfactant	Apply to spring/fall rosettes before flowering stalk lengthens. Add 1 qt./acre 2,4-D when treating in the bolting to flowering growth stages.
Note: *Not permitted for use in the San Luis Valley.		
Additional herbicide recommendations for this and other species can be found at: goo.gl/TvWnv9		

Weevil photo © J. Johnson, Univ. Idaho, bugwood.org. All other photos © Kelly Uhing.

Highlands Ranch Filing 159 Minor Development Final Plat

Project File: SB2023-022

Board of County Commissioners Staff Report - Page 131 of 283

Diffuse knapweed



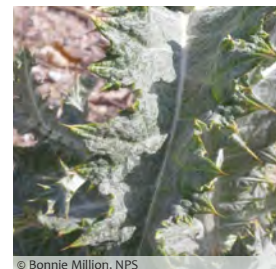


spine-tipped bracts curve away from the flowering head. The flower receptacle is fleshy and has pits to hold seeds. The plants flower from mid-June to September. Scotch thistle seeds have the ability to mature in flower buds and heads that have been removed from the stalk. Both species can produce up to 14,000 seeds per plant. Seeds remain viable for up to 30 years but germinate readily with moisture in spring and fall.

Scotch thistle invades rangeland, overgrazed pastures, roadsides, and irrigation ditches. Both species prefer moist soil, such as areas adjacent to creeks and rivers. Roadsides appear to be especially vulnerable to invasion likely due to the water runoff from the shoulders. Maintaining healthy pastures and native plants, minimizing soil disturbance, changing land use practices to prevent overuse, and using seed-free equipment are critical measures to preventing infestations. As with most biennials, once established, limiting seed production is critical to effective control. Due to the robust, spiny nature of Scotch thistle, this plant can act as a living barbed wire fence, making areas impassible for wildlife, livestock, and people and unpalatable to cattle.

To control seed production, plants with buds or flowers should be collected, bagged and immediately disposed of or destroyed. Chemical control is most effective when plants are in rosette stage, spring or early fall. Mechanical controls can be used to eliminate small patches or plants in a later growth stage.

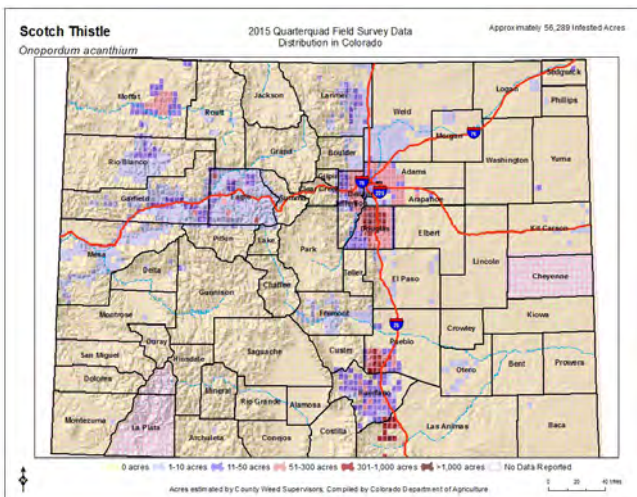
Scotch thistle includes two species, *Onopordum acanthium* L. and *O. tauricum* Willd. Both are non-native biennial forbs. During the first year of growth, both species appear as a rosette in spring or fall. During the second year in mid to late spring the stems bolt, the plants flower, set seed, and the plants die. Both Scotch thistle species can grow up to 12 feet tall and basal rosettes can be up to 2 feet in diameter. Stems are numerous and branched. Characteristically, the entire length of stems from both species have broad wings with spiny tips. *O. acanthium* leaves have an overall gray color from dense woolly hairs. *O. tauricum* leaves are glandular and not as hairy as *O. acanthium*. For both, leaves are spiny. Both species have a distinct mid-rib. Flower heads are terminal, violet to reddish in color, 1 to 3 inches in diameter, and arranged in a raceme. One plant can produce up to 100 flower heads. The



Scotch thistle

Onopordum acanthium L. and *O. tauricum* Willd.

2015 Quarter Quad Survey



Scotch thistle is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be eradicated; some populations may be contained or suppressed depending on state regulations. For state regulations described for each county, refer to the most recent Rule, or visit www.colorado.gov/ag/weedcontacts for details.

Key ID Points

1. Pitted fleshy flower receptacle.
2. Prominent mid-rib.
3. Wide lobed leaves with distinct mid-rib.
4. Wide spiny wings extend the length of the stem.

Integrated Weed Management Recommendations

Scotch thistle

Onopordum acanthium L. and *O. tauricum* Willd.

Effective integrated management means using a variety of eradication methods along with restoration, prevention of seed production and dispersal, and monitoring. Maintain robust healthy native landscapes. Restore degraded sites. Avoid soil disturbance. As with most biennials, prevent seed production in the first and second year of growth. Prevent seed from dispersing, such as on contaminated equipment. Rest sites until they are effectively restored. Change land use practices. Use methods appropriate for the site.



CULTURAL CONTROL METHODS

Effectiveness begins with maintaining or restoring a competitive native forb and forb assemblage. Continue restoration efforts until native plants are robust and abundant. Use locally adapted native seeds whenever possible to improve competitiveness. Include cool season and warm season, as well as perennial and annual grasses in revegetation efforts. Soil may need to be restored by adding soil amendments, soil microbes, mycorrhizal fungi and nitrogen fixing plants such as legumes. Manage land uses so they do not create bare mineral soil or compact soil. Annual crop cultivation appears to be an effective control measure.



© Jacqui Turner, The Timaru Herald

BIOLOGICAL CONTROL METHODS

Domestic livestock are likely to avoid this plant due the large number of spines all over the plant. Goats and sheep may eat flower heads if plants are small. Since most livestock and herbivores avoid the leaves and stems, Scotch thistle can become an "increaser" in over-grazed systems. Properly managed grazing systems can increase desirable plant vigor and indirectly reduce Scotch thistle. There are no known biological control agents effective against scotch thistle or authorized in Colorado. For more information about biological control agents, visit the Colorado Department of Agriculture's Palisade Insectary website at www.colorado.gov/ag/biocontrol.



© Bugwood

MECHANICAL CONTROL METHODS

Methods, such as tilling, hoeing and digging, are best for infestations smaller than 0.5 acres; weigh this against other plants present, ecology and site condition. Sever roots below the soil surface during the first year before the plant stores energy and in the second year before seed production. Mowing, chopping and deadheading stimulates more flower production; these methods require consecutive years of season-long treatments. Flower heads must be collected, bagged, and disposed of or destroyed; seeds will mature and germinate if left on the ground. Fire gives Scotch thistle a competitive advantage. Large fleshy stems and leaves would not be consumed in a low severity fire and seeds would remain unaffected. High severity fires would likely damage native plants, which favors Scotch thistle if seeds are not killed and this is not recommended.

CHEMICAL

NOTE: The following are recommendations for herbicides that can be applied to pastures and rangeland. Rates are approximate and based on equipment with an output of 30 gal/acre. Follow the label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid* (Milestone)	7 oz. product/acre + 0.25-0.5% v/v non-ionic surfactant	Apply in spring rosette to early bolting growth stages or in fall to rosettes. *Product not permitted for use in the San Luis Valley.
Chlorsulfuron** (Telar)	1-2.6 oz. product/acre (0.75 oz. active ingredient/acre) + 0.25% v/v non-ionic surfactant	Spring from bolting to flower bud stages. **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.
Metsulfuron + Chlorsulfuron (Cimarron X-tra)	2 oz. product/acre + 0.25-0.5% v/v non-ionic surfactant	Apply during rosette to flower bud stages.
Clopyralid (Transline)	0.67-1.33 pints product/acre + 0.25% v/v non-ionic surfactant	Apply to rosettes in spring or fall.
Aminocyclopyrachlor + chlorsulfuron (Perspective)* *Product not permitted for use in the San Luis Valley.	4.75-8 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply from the seedling to the bolting stage. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.

Colorado Department of Agriculture - Conservation Services

305 Interlocken Parkway

Broomfield, CO 80021

(303) 869-9030

www.colorado.gov/ag/weeds

Colorado
State
University



©James Bailey, iNaturalist

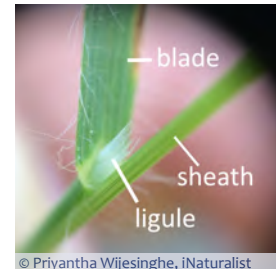
Cheatgrass (*Bromus tectorum* L.) is a winter annual grass in the Poaceae family, also known as downy brome.

Mature plants reach up to 24 inches tall. The stems are smooth but the leaf blades and sheath are hairy (downy). The ligules are fringed, short and membranous. The culms range from five to 90 cm long, can be prostrate or vertical, and have fine short hairs. Its fibrous roots can be up to 60 inches long, but the majority of root biomass is within first 12 inches of the soil surface. Roots are efficient at absorbing soil moisture, allowing cheatgrass to grow quickly early in season, while other plants are still dormant. Green up can occur twice per season. Cheatgrass has an unique spectral signature during seed set and senescence when it turns reddish purple. During these shoulder growing season events, it is easily detectable from other vegetation with satellite imagery.

The flower is a simple one-sided panicle that characteristically flops over and hangs, branches and is open. Spikelets are usually terminal. Usually there are five to many florets; it has perfect flowers. The upper and lower glumes are usually unequal in length and shorter than florets; the lower glume ranges from 4 to 14 mm in length and is one veined. The upper glume is three-veined. The plant disarticulates above the glumes. The lemmas are usually downy, narrowly lanceolate with sharp tips and about 9 to 12 mm long. Usually there are five to many lemmas. Awns are usually present and range from 10 to 18 mm long. It is a prolific seed producer, capable of two seed crops per season. Seeds need to be buried in soil or litter and have fall moisture to germinate. The fall seed crop has greater reproductive success than spring. Seeds lack dispersal anatomy so fall close to parent plants but transport readily with animals, people and equipment. Seed longevity is about three years. Both inbreeding and cross breeding occur.

Cheatgrass is one of the most competitive non-natives in the Western US. It thrives in arid, semi arid, and cold environments. Colorado's high elevation range is not an issue for cheatgrass; plants were recently detected as high as 9,500 feet. It exhibits phenotypic plasticity and genetic diversity, making it highly adaptable to a variety of conditions, likely due to multiple introductions. Its presence has significant negative impacts throughout the West. Most notably, it alters fire regimes and thus engineers a positive fire feedback loop that favors its growth over other plants. This feedback loop is why cheatgrass forms monocultures throughout the West.

It is often confused with Japanese brome (*Bromus japonicus*), which has denser more compact spikelets, shorter awns, and changes from green to gold through the growing season.



© Priyantha Wijesinghe, iNaturalist



© Veronika Johansson, iNaturalist

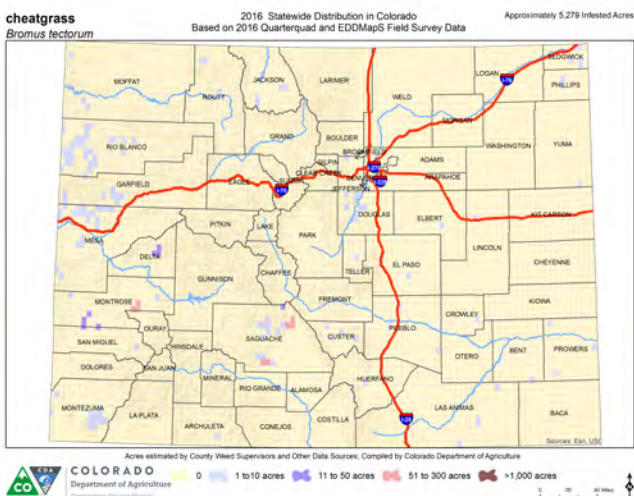


© Leslie J. Mehrhoff, University of CT

Cheatgrass *Bromus tectorum* L.

Key ID Points

1. Downy leaf blades, sheaths, ligules
2. Glumes are unequal size, lemmas are downy
3. One-sided panicle that droops, red-purple during seed set & senescence
4. Fibrous roots



Integrated Weed Management Recommendations

Effective integrated management means using a variety of eradication methods in the same site along with restoration, prevention of seed production and dispersal, and monitoring. Maintain robust healthy native landscapes. Restore degraded sites. Avoid soil disturbance. Prevent seed production and seed dispersal, e.g. on contaminated equipment. Rest sites until restored. Modify land use practices. Use methods appropriate for the site, including land use practices.



© Martin Bernetti, Associated Press



© Bureau of Land Management

CULTURAL

Biological soil crust is a soil health indicator of arid and semi arid sites; crusts inhibit cheatgrass seed germination. Aerial spread and cultivate soil crust where it is absent. Aerial and drill seeding bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*) with vesicular-arbuscular mycorrhizae; these are drought tolerant natives that are highly competitive against cheatgrass but require mycorrhizae. As these grasses establish and cheatgrass wanes slowly introduce additional species such as thickspike wheatgrass (*Elymus lanceolatus*), winterfat (*Krascheninnikovia lanata*), yarrow (*Achillea millefolium*) in the plant interspaces in subsequent years. Be cautious when purchasing seed as cheatgrass is often a contaminate, especially in mixes. Use seed pillows to disperse seeds.



© Stacy Litz, Associated Press

BIOLOGICAL

Sheep and cattle will select green cheatgrass which also affects desired cool-season grasses. Properly managed grazing can improve vigor of desired species and directly reduce cheatgrass. Post-fire grazing management varies depending on site potential and objectives. Currently there are no biological control agents for cheatgrass authorized in Colorado. For more biocontrol information, visit the Colorado Department of Agriculture's Palisade Insectary website at: www.colorado.gov/ag/biocontrol

MECHANICAL

Mechanical methods are best for residential areas and small infestations. Mowing and chopping are not recommended; they leave roots behind, stimulate flower production, disperse seeds, and expand the size of the infested area. Collect, bag, and dispose of or destroy flowers; seeds can mature and germinate if left. Tilling must be deeper than 6 inches to work. Prescribed fire applied before seed maturity, (late spring or early summer), may kill seeds; the trick is to get green cheatgrass and litter to carry fire and at a hot enough temperature to destroy seeds and seedlings. Always combine prescribed fire with cultural methods, timed appropriately, and base it on site conditions and other plants present. Monitoring and adaptive management are critical if prescribed fire is used as a tool for control.



© Helena Weed Control, Rocky Mountain Elk Foundation

CHEMICAL

Pseudomonas fluorescens D7 inhibits cheatgrass and is currently approved by EPA and Colorado. NOTE: Herbicide recommendations to control cheatgrass in pastures and rangeland are found at: <https://goo.gl/TvWnv9>. Rates are approximate and based on equipment with an output of 30 gal/acre. Follow the label for exact rates. Consult local turf and ornamental experts for residential settings. Always read, understand, and follow the label directions. The herbicide label is the LAW!

Cheatgrass

Bromus tectorum L.



Colorado Department of Agriculture - Conservation Services

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www.colorado.gov/ag/weeds

Colorado
State
University

Common mullein

Colorado Department of
Agriculture

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Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us



Key ID Points

Identification and Management



Identification and Impacts

Common mullein (*Verbascum thapsus*) is a biennial forb native to Europe and Asia. The first year of the plant it produces a basal rosette. Basal rosettes can grow to 30 inches in diameter. The leaves are light-green in color and are covered in fine soft hairs. The woolly leaves are alternate and overlapping each other and can grow over a foot long. In spring of the second year the plant bolts an erect stem, that grows 2 to 6 feet tall. The flowers of the plant are borne in terminal spikes. These terminal spikes may reach up to 20 inches in length. The flowers are sulfur-yellow in color and have five petals. The flowers range from 3/4 of an inch to 1 1/2 inches in diameter. Numerous two chambered fruits produce 100,000 to 250,000 seeds per plant. Flowering and seed production typical occur from June to August. The plant has a deep taproot along with a fibrous root system.

Habitats for Common mullein are roadsides, waste places, right-of-ways, pastures, hay fields, and abandoned lands. It prefers gravelly soil types, but can grow in other soil types. Livestock will avoid eating

Common mullein, due to the hairy leaves of the plants. The plants were originally introduced as a medicinal plant. The Europeans used the flowers for tea, and the leaves for many remedies like burns and rashes. Both the Europeans and the Indians smoked the dried leaves to treat bronchitis.

The key to effective control of Common mullein is preventing the production of seeds. This plant is difficult to control due to the large amount of seed produced and seed bank left in the soil. Mechanical, cultural, biological and chemical treatments can be successful if utilized together in an integrated weed management plan. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Common mullein is designated as a "List C" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local jurisdictions managing this species. For more information, visit www.colorado.gov/ag/weeds or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Photos © All Photos from Kelly Uhing, Department of Agriculture; Except Bottom left Mary Ellen (Mel) Harte, United States

Verbascum thapsus

**CULTURAL**

Cultural control can be effective in assistance with other treatment options. Once the parent plants have been removed, cultivating the area with desirable grasses and forbs may outcompete Common mullein seedlings. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

**BIOLOGICAL**

Gymnetron tetrum, a seed eating weevil, biological control has been found in eastern Washington State and is currently working on populations there. The weevil has not yet been approved for use in Colorado. Contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916 for more information.

**MECHANICAL**

Hand pull or dig when soil is moist, prior to flowering and seed production can be effective. If flowers are present, bag specimens carefully so as not to scatter any potential seeds. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Preventing the establishment and the seed production of Common mullein is key to controlling populations. If the population is established, using a combination of cultural, chemical, biological and mechanical treatments can aid in suppressing population size. Since plants produce thousands of seed treatments need to occur over an extended period of time.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Chlorsulfuron (Telar XP)	1-3 oz/acre	Apply to rosette stages in spring or fall prior to bolting. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.
2,4-D Picloram (Grazon P+D *this is a Restricted Use Pesticide*)	4 pts/acre	Apply to rosette stages in spring or fall prior to bolting. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water. DO NOT apply near trees/shrubs/high water table.
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	1-2 qts/acre	Apply to rosette stages to early growth stages in spring or fall. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water. DO NOT Apply near trees/shrubs/high water table.
Metsulfuron (Cimmaron)	1.0 oz/acre	Apply to rosette stages in spring or fall. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.

Photos © Top to Bottom; Kelly Uhing, Colorado Department of Agriculture; Whitney Cranshaw, Colorado State University, Bugwood.org; Kelly Uhing, Colorado Department of Agriculture

Common mullein



CENTENNIAL

WATER AND SANITATION DISTRICT

June 6, 2023

Douglas County Planning Services
100 Third Street
Castle Rock, CO 80104

Re: Water and Sewer for Filing 159, Kaos Apartments

To Whom It May Concern:

Pursuant to Section 1805A of the Douglas County Zoning Resolution, Centennial Water and Sanitation District (the "District") acknowledges its willingness and ability to serve all future Kaos Apartment proposed developments in its Highlands Ranch service area, including parcels in Filing 159, Tract IN NE1/4 5-6-68 9.276 AM/L Lying S of C470.

Verification of District Status:

The District hereby verifies that the statements made in the letters and reports submitted by the District for the State Engineer and the County, and in the current materials are true and accurate, with the exception of any updates to the District's available water supply in accordance with the attached information.

Commitment to Serve:

The District is committed to providing service to all future developments within its service area based upon the water supply sources so identified. The connection to and use of such lines, mains and facilities is conditioned upon compliance with all of the Rules and Regulations of the Districts, including the payment of the appropriate fees. Any applicant, owner or customer desiring water and/or sewer service from the District shall pay a Tap Fee prior to the installation of a water meter. Such fee shall be paid in addition to all other charges relating to water and/or sewer service as established from time to time by the Board of Directors.

Water Demand:

Based on the demands at buildout of Highlands Ranch, all existing and future developments within our service area will require 19,600 to 22,600 AF/year. At this time, with the existing development at approximately 95% of buildout, demand has not exceeded 17,000 AF/year.

The representative for the developer has stated that the development will include a mix of multi-family residential uses that will include 240 multi-family units, swimming pool, and associated irrigation for landscaping and common areas equating to 143 Single Family Equivalents (SFE). Based on Centennial's standard water demand requirements, this project will therefore require 72 acre-feet (AF) of water per year.



62 West Plaza Drive
Highlands Ranch, Colorado 80129
www.highlandsranch.org

303-791-0430 Telephone
303-791-0437 Engineering Fax
303-791-3290 Financial Services Fax

CENTENNIAL

WATER AND SANITATION DISTRICT

Page 2
Douglas County Planning Services

Water Supply:

The District's existing water supply (in accordance with the attached report on sources, storage and decrees) of over 30,000 AF/year is adequate to deliver water to all future development within its service area. Centennial's water supply includes an amount sufficient to meet the water demands for this property.

Water Quality:

The District is in compliance with the Colorado Department of Public Health and Environment testing and quality requirements, and provides a high-quality water supply to all of its customers.

Sanitary Sewer Service:

The District shall provide sanitary sewer service for all water taps requested for this development. Treatment is provided by Centennial's Marcy Gulch Wastewater Treatment Plant.

Feasibility of Service:

Since its inception, Centennial has developed and funded an infrastructure plan to provide service to all properties within its service area. It is physically and economically feasible for the District to extend service to the proposed development.

Documentation:

Information describing Centennial's water supply including decrees is contained in the attached letter from Samuel L. Calkins, General Manager of CWSD.

Sincerely,



Jeffrey B. Case, P.E.
Director of Public Works Engineering
Centennial Water and Sanitation District

Enclosures



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Highlands Ranch, Colorado 80129
www.highlandsranch.org

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303-791-3290 Financial Services Fax

Centennial Water Court Case Numbers								7/1/22
Water Right Description	Original Decree	Change Case Decree	Diligence/ Absolute Decrees			Fourth	Fifth/Sixth	When next diligence due
			First	Second	Third			
Surface Water Rights								
Plum Creek	W - 6072	85CW415 93CW177	NA					
Augmentation Plan/ Exchange	85CW415 19CW3257	93CW178	94CW286	02CW037	11CW244	19CW3140		1/31/2027 7/31/2028
So. Platte Direct	88CW222	93CW179	96CW219	04CW033	12CW184	19CW3222		11/30/2026
Chatfield Storage	84CW411	93CW082 83CW184*	93CW081 95CW111	01CW101 02CW041	14CW3155 09CW076	21CW3183 17CW3176		TBD 10/31/2024
So. Platte Reservoir	95CW239	93CW082	03CW295	12CW199	20CW3078			2/28/2028
Highlands Ranch Reservoirs	79CW316 to 330		85CW288 to 294	89CW168	96CW124	03CW266	12CW291 19CW3139	2/28/2026
Highlands Ranch Gulches	86CW332 to 336	95CW160 (Big Dry)	95CW159 to 164	02CW311 to 315	BD-11CW171 DC-11CW024 SPG-11CW129 MG-11CW130			Dropped Dropped Dropped Dropped
Cline	99CW199(A)		08CW20	15CW3133				11/30/2022
Fairview Senior Junior	84CW058 85CW314		01CW276	12CW119	18CW3222			8/31/2026
Hock Hocking	W-1318		83CW214	87CW161	97CW222	04CW271		Completed
Randall Ditch/ Tingle Res Junior Application	05CW111 09CW180		13CW3029 17CW3207	19CW3223				10/31/2026 6/30/2024
CD Catholic Schools United Development	07CW62 18CW3188							
Groundwater Rights								
Dawson	82CW480							
Denver Trib	85CW415							
Denver Non-Trib	80CW445	97CW145 (locations)			88CV335 D-3 Settlemt			
Arapahoe	W-9192-78	84CW483 (locations)	84CW482 (diligence)	06CW202 (A-1 reloca.)				
Laramie-Foxhills	W-9192-78	83CW237 (locations)	83CW237					
Chatfield LFH	82CW479							
Willows Arap.(PA -5,7)	W-9310-78	90CW109	also	85CW163, 85CW170, 88CW079, and 99CW163				10CW171 PA-7
Plum Creek Non-Trib	W-6072							

CENTENNIAL

WATER AND SANITATION DISTRICT

December 16, 2022

Douglas County Planning Services
100 Third Street
Castle Rock, CO 80104

Re: Statement of Water Availability

This letter serves as a general summary addressing the water supply for customers seeking water service within the Centennial Water and Sanitation District's (CWSD) service area through the Northern Douglas County Water and Sanitation District (NDCWSD), the Highlands Ranch Metropolitan District and Mirabelle Metropolitan District.

For planning purposes, the water demand projected for all existing and future customers in the CWSD service area is estimated to be from 19,600 to 22,600 acre-feet per year (AF/yr.). The actual annual demand for the last few years has averaged about 17,000 AF/yr. and the CWSD's service area is approximately 95% developed. Approximately 90% of CWSD's reusable water is recycled for municipal purposes in the CWSD water service area.

Water demands in the CWSD service area are met through a robust conjunctive use system that includes both renewable surface water and reusable Denver Basin ground water. Captured surface-water supplies are stored in four reservoirs and in three of the four Denver Basin aquifers through an aquifer storage and recovery (ASR) program. CWSD's surface-water supplies are from several sources on the South Platte River and its tributaries, which are summarized in Table 1.

Table 1

Surface-Water Sources	Average Year Yield (AF/yr.)
Augmentation / Exchange Plan	3,000
Plum Creek	550
Cline Ranch	400
South Platte River / Reservoir	700
Hock Hocking Mine	100
Tingle Reservoir	100
Englewood Agreements	6,120
Denver Water ("Patti water")	1,000
Bargas Ranch	900
Castle Pines North	50
WISE	1,000
Chatfield Reservoir	2,500
Total Surface Water Supply (current)	16,420



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CENTENNIAL

WATER AND SANITATION DISTRICT

CWSD's decreed annual yield of Denver Basin ground-water rights total 17,717 AF/yr., which are defined in Table 2. Ground water can be pumped from the Denver Basin aquifers through a well field array comprised of more than 50 wells.

Table 2

Bedrock Aquifer	Decree Yield (af/yr.)
Arapahoe	4,915
Denver	5,111
Laramie-Fox Hills	4,500
Laramie-Fox Hills West	340
Dawson	390
Not-Nontributary Denver	1,876
Phipps Arapahoe	585
TOTAL	17,717

In an average year, the total volume of water currently available for use by CWSD customers is more than 30,000 AF. In addition to these water rights, CWSD has the use of 3,885 AF of storage space in McLellan Reservoir, 6,400 AF of storage space in South Platte Reservoir, 205 AF of storage space in James Tingle Reservoir, and 6,922 AF of storage space in the Chatfield Reservoir Reallocation Project. The total storage space is 17,412 AF.

CWSD operates a successful ASR program that stores treated surface water in three of the four Denver Basin aquifers, and makes that water available for use at any time. The ASR program has been operated for over 20 years. To date, nearly 15,300 AF of treated potable water has been stored in the Denver Basin aquifers beneath Highlands Ranch and is available when needed to supplement the annual decreed quantities defined above.

The attached sheet lists the water right decrees for the various water sources available for service to CWSD customers.

Sincerely,



Samuel L. Calkins
General Manager

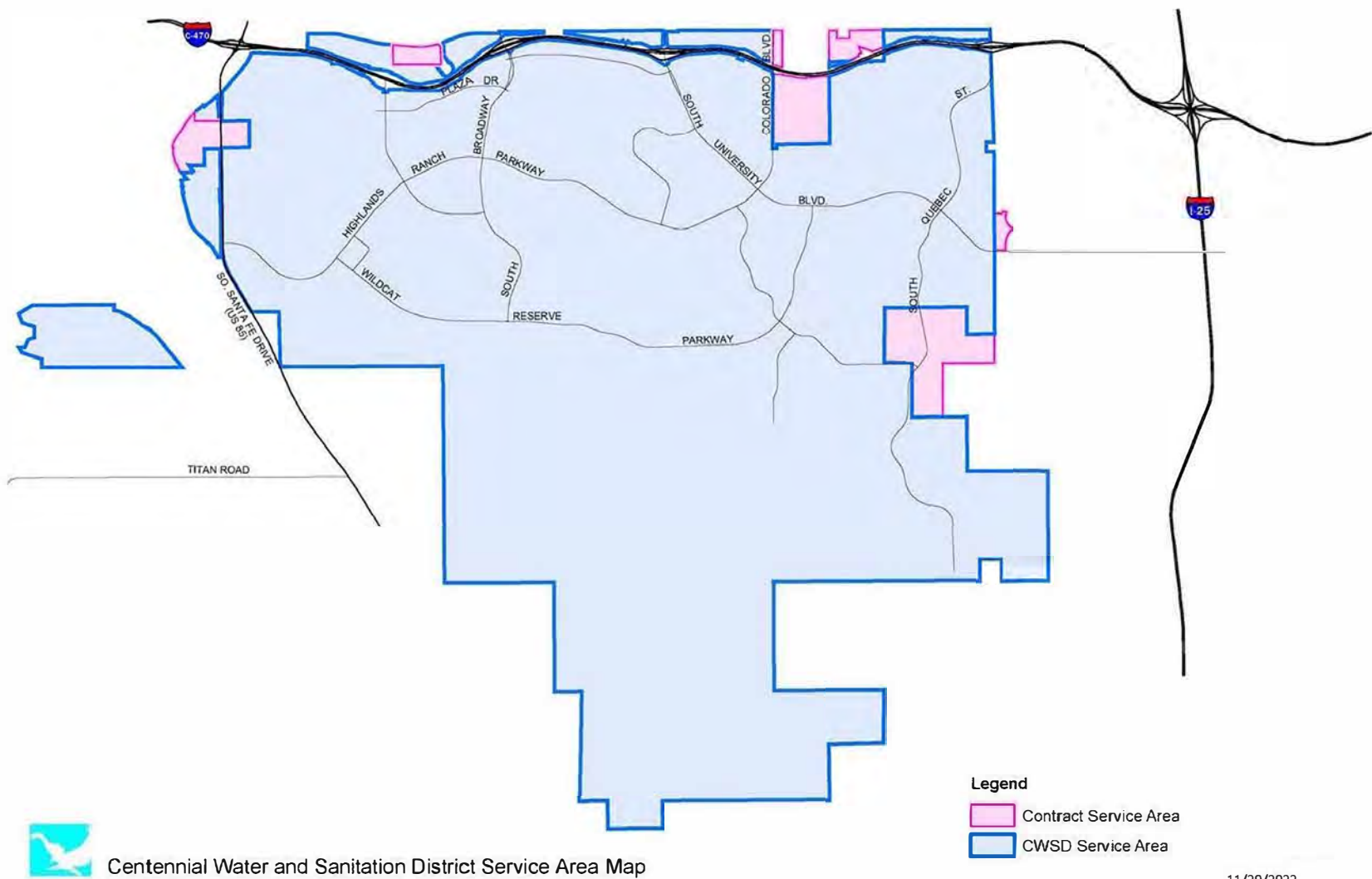
Cc: Jeffrey Case

Attachment: Water Right Decree List



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11/29/2022

Traffic Impact Study

Kaos

Highlands Ranch/Douglas County, Colorado

Prepared for:

Shea Properties

Kimley»Horn

T R A F F I C I M P A C T S T U D Y

Kaos

Highlands Ranch/Douglas County, Colorado

**Prepared for
Shea Properties**

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August 2022

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1.0 EXECUTIVE SUMMARY

Kaos is proposed to be located along the north side of Plaza Drive, between Erickson Boulevard and Lucent Boulevard in Highlands Ranch within unincorporated Douglas County, Colorado. The project is proposed to include 240 multifamily homes. It is expected that Kaos will be completed in the next couple of years. Therefore, analysis was conducted for the 2024 short-term buildout horizon as well as the 2045 long-term twenty-year planning horizon.

The purpose of this traffic study is to identify project traffic generation characteristics to determine potential project traffic related impacts on the local street system and to develop the necessary mitigation measures required for the identified traffic impacts. The following intersections were incorporated into this traffic study in accordance with Douglas County standards and requirements:

- County Line Road and Erickson Boulevard (#1)
- Plaza Drive and Erickson Boulevard (#2)
- Plaza Drive and Lucent Boulevard (#3)

In addition, two (2) full movement accesses and one (1) proposed right-in/right-out access along Plaza Drive were evaluated.

Regional access to Kaos will be provided by C-470 and Santa Fe Drive (US-85). Primary access will be provided by County Line Road, Plaza Drive, Erickson Boulevard, and Lucent Boulevard. Direct access will be provided by two full movement accesses along Plaza Drive with the western one aligning with Flying B Way (#4) and the other aligning with the Centennial Water & Sanitation full movement access (#5). In addition, one (1) right-in/right-out access (#6) is proposed approximately 450 feet east of the full movement access aligned with the Centennial Water & Sanitation driveway location.

Kaos is expected to generate approximately 1,100 weekday daily trips, with 94 of these trips occurring during each of the morning and afternoon peak hours.

Based on the analysis presented in this report, Kimley-Horn believes Kaos will be successfully incorporated into the existing and future roadway network. Analysis of the existing street network, the proposed project development, and expected traffic volumes resulted in the following recommendations:

- With completion of the Kaos project, a full movement access that aligns with Flying B Way and a full movement access that aligns with the Centennial Water & Sanitation full movement access along Plaza Drive will be provided. In addition, one (1) right-in/right-out access is proposed approximately 450 feet east of the full movement access aligned with the Centennial Water & Sanitation driveway location. “STOP” (R1-1) signs are recommended to be installed on the southbound approaches of all three (3) accesses, exiting the development. In addition, a R3-2 No Left Turn sign should be placed underneath the R1-1 “STOP” sign at the right-in/right-out (RIRO) access. Furthermore, a R6-1R “ONE WAY” sign could be placed within the existing raised median of Plaza Drive. The eastbound left turn lanes at the full movement accesses are recommended to provide a length of 250 feet. The western access to align with Flying B Way will require median construction whereas the middle access to align with Centennial Water will just require restriping for the eastbound left turn lanes.
- Any on-site or offsite improvements should be incorporated into the Civil Drawings and conform to standards of the Douglas County and the Manual on Uniform Traffic Control Devices (MUTCD) – 2009 Edition.

2.0 INTRODUCTION

Kimley-Horn and Associates, Inc. has prepared this report to document the results of a Traffic Impact Study for Kaos proposed to be located along the north side of Plaza Drive, between Erickson Boulevard and Lucent Boulevard in Highlands Ranch within unincorporated Douglas County, Colorado. A vicinity map illustrating the Kaos development location is shown in **Figure 1**. Kaos is proposed to include 240 multifamily homes. A conceptual site plan is attached in **Appendix F**. It is expected that Kaos will be completed in the next couple of years; therefore, analysis was conducted for the 2024 short-term buildout horizon as well as the 2045 long-term twenty-year planning horizon.

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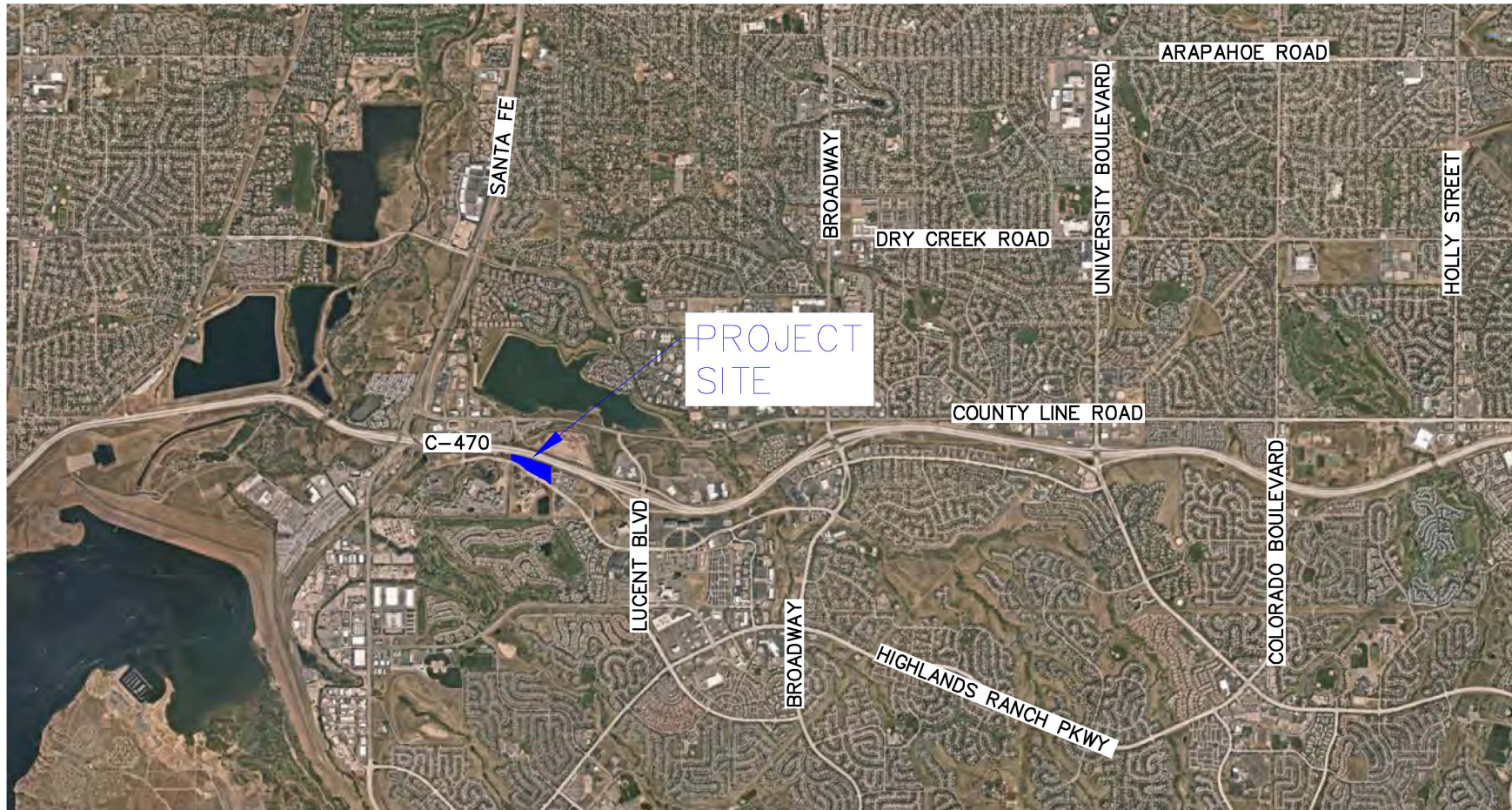


FIGURE 1
KAOS
HIGHLANDS RANCH, COLORADO
VICINITY MAP

3.0 EXISTING AND FUTURE CONDITIONS

3.1 Existing Study Area

The existing site is vacant land. Directly to the south is the Centennial Water & Sanitation building and directly to the north is C-470. Surrounding the site are a mix of multifamily housing and other undeveloped parcels.

3.2 Existing Roadway Network

County Line Road extends east-west with two through lanes in each direction and a raised median in the study area. Left turn lanes are provided along the roadway at major intersections. The posted speed limit along County Line Road in the study area is 40 miles per hour.

Erickson Boulevard extends north-south with two through lanes in each direction with the north limit being County Line Road and the south limit being Plaza Drive. The posted speed limit is 30 miles per hour.

Plaza Drive extends east-west with two through lanes in each direction with a raised median. The posted speed limit is 40 miles per hour.

Lucent Boulevard extends north-south with three through lanes in each direction with a raised median. The posted speed limit is 40 miles per hour in the study area. Lucent Boulevard provides a C-470 interchange and extends from County Line Road to the north to Broadway to the south.

The signalized intersection of County Line Road and Erickson Boulevard operates with protected-permitted left turn phasing on all four approaches. The northbound Erickson Boulevard and southbound Southpark Circle approaches provide a left turn lane and a shared through/right turn lane. The eastbound and westbound approaches of County Line Road provide a left turn lane and two through lanes with the outside lane being a shared through/right turn lane. An aerial photo of the existing intersection configuration is below (north is up - typical).



County Line Road and Erickson Boulevard

The unsignalized intersection of Plaza Drive and Erickson Boulevard operates with all-way stop control on all four approaches. The westbound Plaza Drive and southbound Erickson Boulevard approaches provide a left turn lane, a through lane, and a right turn lane. The eastbound Plaza Drive approach provides a left turn lane and a shared through/right turn lane. The northbound Mill Vista Road approach provide a single lane shared for all movements. An aerial photo of the existing intersection configuration is below.



Plaza Drive and Erickson Boulevard

The signalized intersection of Plaza Drive and Lucent Boulevard operates with protected-only left turn phasing on all four approaches. The northbound and southbound approaches of Lucent Boulevard provide dual left turn lanes and three through lanes with the outside lane being a shared through/right turn. The eastbound approach on Plaza Drive provides dual left turn lanes and two through lanes with the outside lane being a shared through/right turn lane. The westbound approach of Plaza Drive provides dual left turn lanes, two through lanes, and a right turn lane. An aerial photo of the existing intersection configuration is below.



Plaza Drive and Lucent Boulevard

The intersection lane configuration and control for the study area intersections are shown in **Figure 2**.

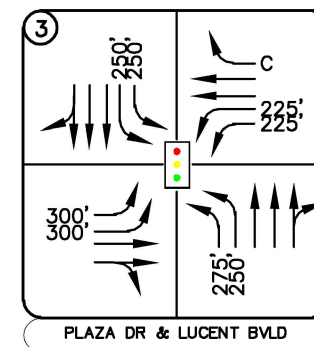
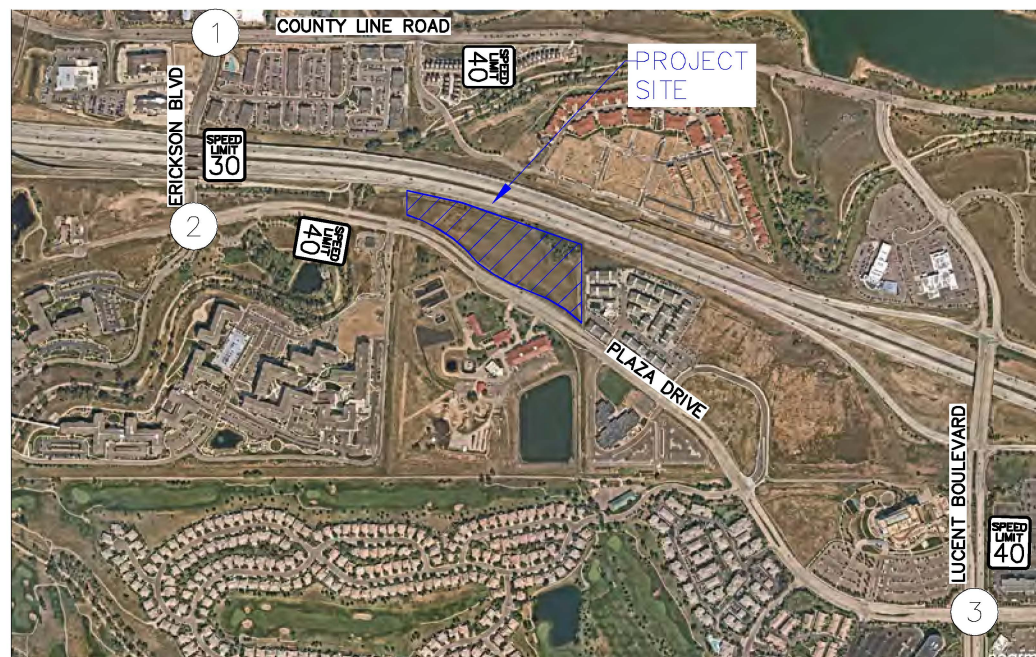
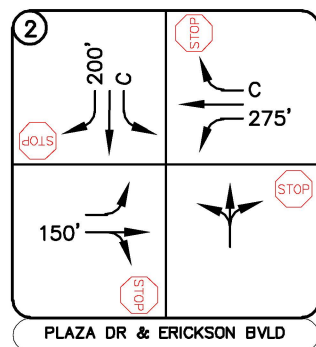
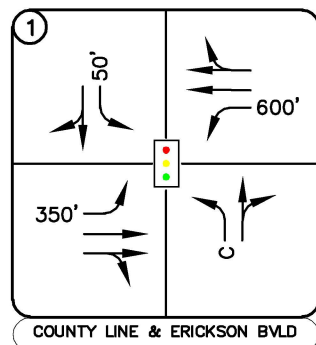
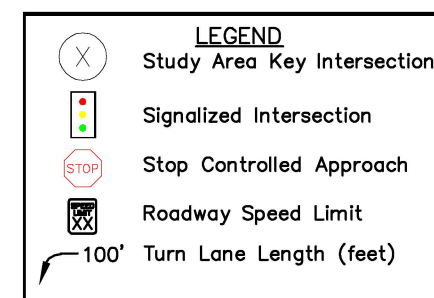


FIGURE 2
KAOS
HIGHLANDS RANCH, COLORADO
EXISTING GEOMETRY AND CONTROL



3.3 Existing Traffic Volumes

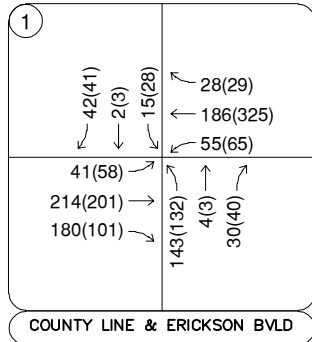
Existing turning movement counts were conducted at the study intersections on Wednesday, March 2, 2022 during the morning and afternoon peak hours. The counts were conducted during the morning and afternoon peak hours of adjacent street traffic in 15-minute intervals from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM on this count date. The existing intersection traffic volumes are shown in **Figure 3** with count sheets provided in **Appendix A**.

3.4 Unspecified Development Traffic Growth

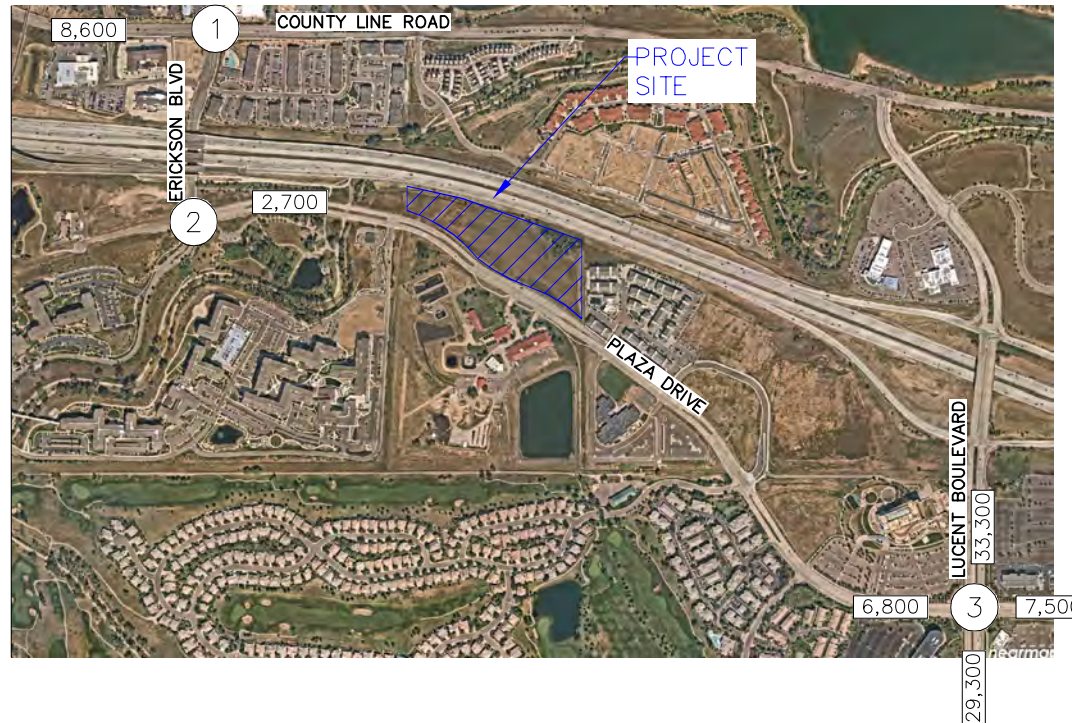
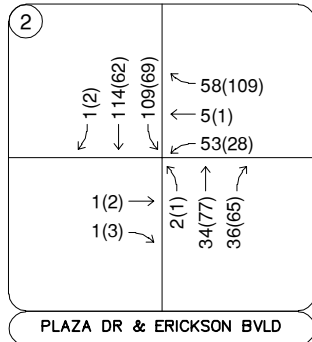
The Douglas County Transportation Plan does not provide existing and future traffic volumes that can be used to calculate an annual growth rate. The surrounding area is mostly developed and DRCOG provided a 0.36 annual growth rate calculation for this area. To provide a conservative analysis, a one (1) percent annual growth rate was used to estimate short-term 2024 and long-term 2045 traffic volume projections at the key intersections.

In addition, the west full movement access is proposed to align with Flying B Way. Flying B Way at Plaza Drive is currently not open to the senior living through traffic and is blocked by a temporary gate located approximately 300 feet from Plaza Drive along Flying B Way. The access currently allows through traffic from the Brinkmann Constructors site. However, because the gate is temporary, it is assumed that the senior living traffic will be able to use Flying B Way in the future. Therefore, traffic associated with the Wind Crest Retirement Community was assigned to the Flying B Way access in the future to provide a conservative analysis. Future traffic volume projections and growth rate calculations from DRCOG are provided in **Appendix B**. The calculated background traffic volumes for 2024 and 2045 are shown in **Figure 4** and **Figure 5**, respectively.

Wednesday, March 2, 2022
7:45 to 8:45AM (5:00 to 6:00PM)



Wednesday, March 2, 2022
7:45 to 8:45AM (4:00 to 5:00PM)



Wednesday, March 2, 2022
7:15 to 8:15AM (4:45 to 5:45PM)

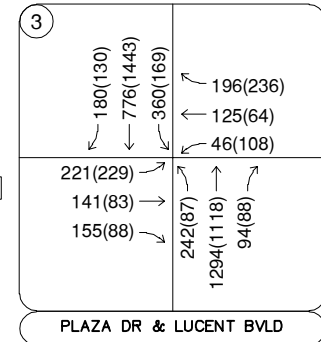
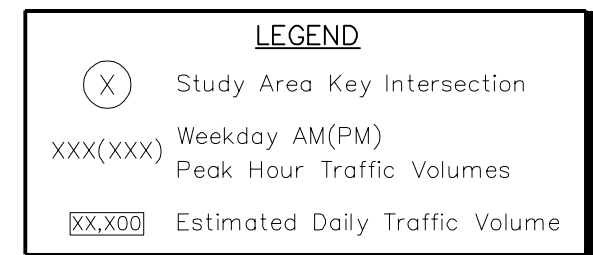
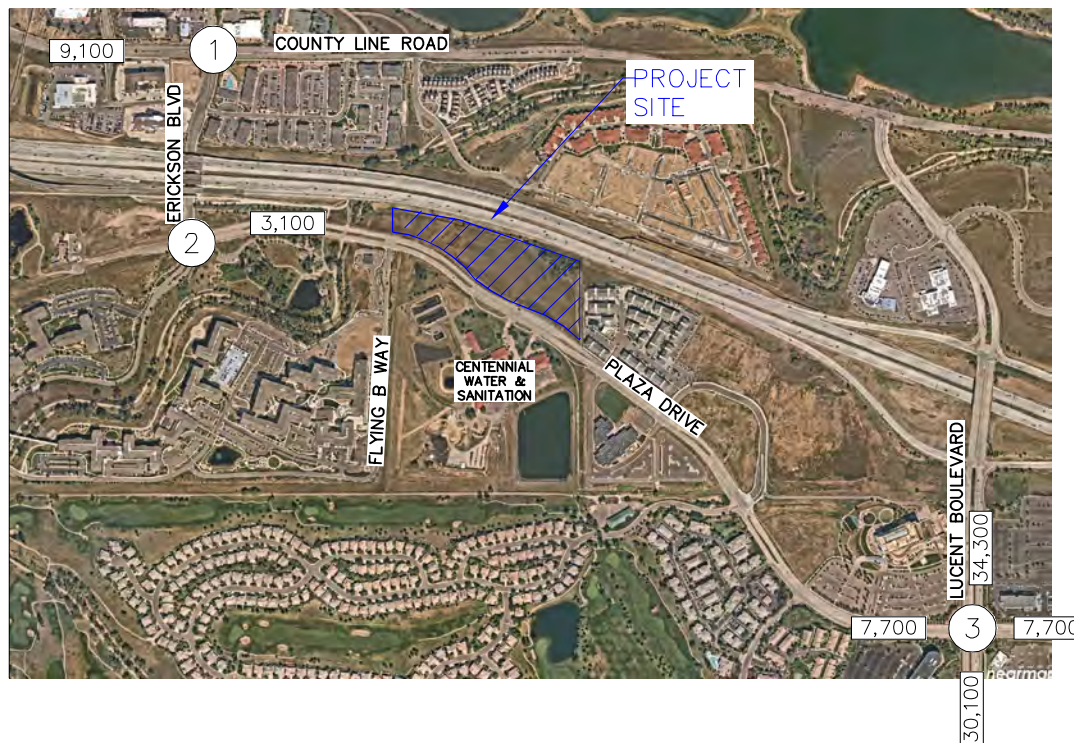


FIGURE 3
KAOS
HIGHLANDS RANCH, COLORADO
2022 EXISTING TRAFFIC VOLUMES



1	
43(42) 2(3) 15(29) 29(30) 190(332) 56(66)	
42(59) 218(205) 194(124) 166(151) 4(3) 31(41)	
COUNTY LINE & ERICKSON BLVD	

2	
1(2) 116(63) 121(91) 79(127) 5(1) 54(29)	
1(2) 1(3) 2(1) 35(79) 37(66)	
PLAZA DR & ERICKSON BLVD	



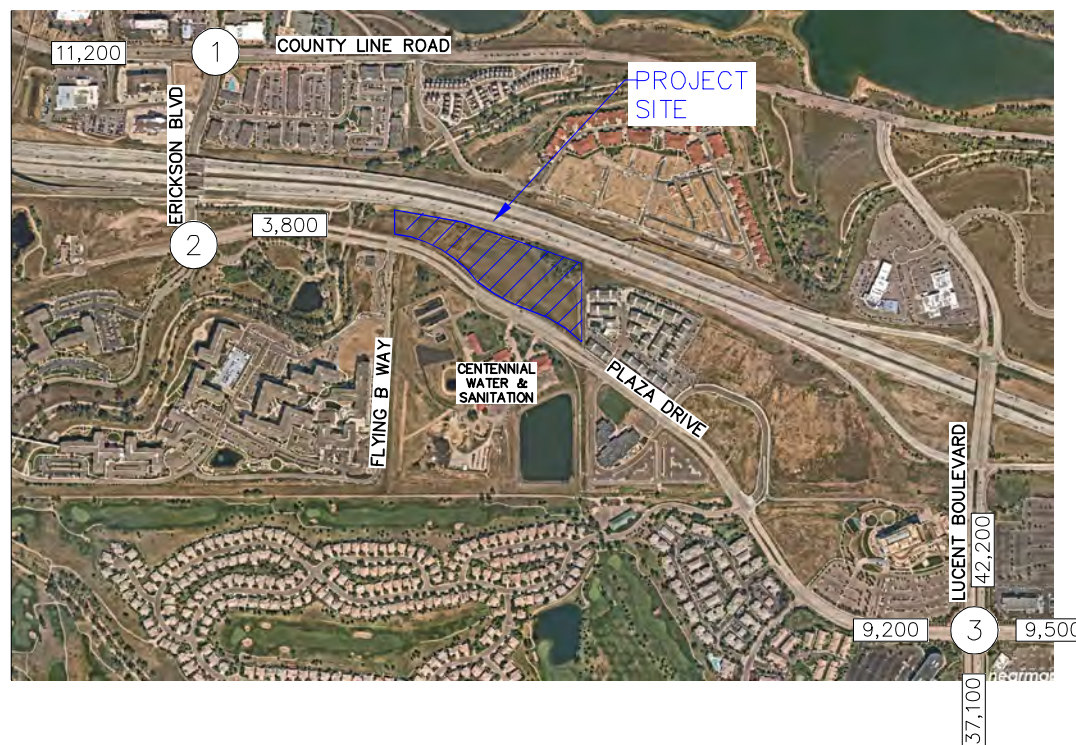
3	
194(154) 792(1472) 367(172) 200(241) 131(71) 47(110)	
245(250) 150(90) 169(99) 253(101) 1320(1140) 96(90)	
PLAZA DR & LUCENT BLVD	

FIGURE 4
KAOS
HIGHLANDS RANCH, COLORADO
2024 BACKGROUND TRAFFIC VOLUMES

LEGEND	
(X)	Study Area Key Intersection
xxx(xxx)	Weekday AM(PM) Peak Hour Traffic Volumes
xx,x00	Estimated Daily Traffic Volume

1	
53(52) 3(4) 19(35) 35(36) 234(409) 69(82)	
52(73) 269(253) 236(148) 200(182) 5(4) 38(50)	
COUNTY LINE & ERICKSON BLVD	

2	
1(3) 143(78) 147(108) 93(153) 6(1) 67(35)	
1(3) 1(4) 3(1) 43(97) 45(82)	
PLAZA DR & ERICKSON BLVD	



3	
236(184) 976(1814) 453(212) 246(297) 160(86) 58(136)	
298(304) 183(109) 206(120) 310(121) 1627(1406) 118(111)	
PLAZA DR & LUCENT BLVD	

FIGURE 5
KAOS
HIGHLANDS RANCH, COLORADO
2045 BACKGROUND TRAFFIC VOLUMES

LEGEND	
(X)	Study Area Key Intersection
xxx(xxx)	Weekday AM(PM) Peak Hour Traffic Volumes
xx,x00	Estimated Daily Traffic Volume

4.0 PROJECT TRAFFIC CHARACTERISTICS

4.1 Trip Generation

Site-generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. The acknowledged source for trip generation rates is the *Trip Generation Manual*¹ published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses. For this study, Kimley-Horn used the ITE Trip Generation Report fitted curve equations that applies to Multifamily Mid-Rise Housing (ITE Land Use Code 221), for traffic associated with the development.

Kaos is expected to generate approximately 1,100 weekday daily trips, with 94 of these trips occurring during each of the morning and afternoon peak hours. Calculations were based on the procedure and information provided in the ITE *Trip Generation Manual, 11th Edition – Volume 1: User's Guide and Handbook*, 2022. **Table 1** summarizes the estimated trip generation for the Kaos. The trip generation worksheets are included in **Appendix C**.

Table 1 – Kaos Traffic Generation

Land Use and Size	Weekday Vehicle Trips						
	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Multifamily Housing (Mid-Rise) (221) – 240 Dwelling Units	1,100	22	72	94	57	37	94

4.2 Trip Distribution

Distribution of site traffic on the street system was based on the area street system characteristics, existing traffic patterns, existing and anticipated surrounding demographic information, and the proposed access system for the project. The directional distribution of traffic is a means to quantify the percentage of site-generated traffic that approaches the site from a given direction and departs the site back to the original source. The project trip distribution for the proposed development is illustrated in **Figure 6**.

¹ Institute of Transportation Engineers, *Trip Generation Manual*, Eleventh Edition, Washington DC, 2022.

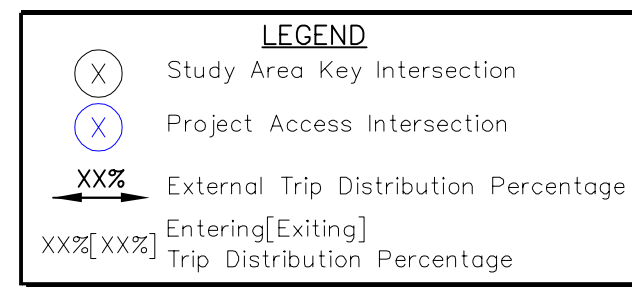
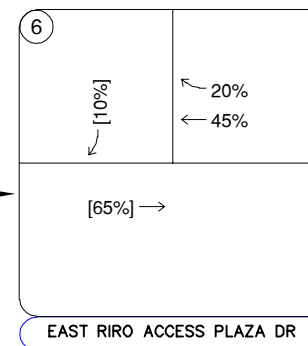
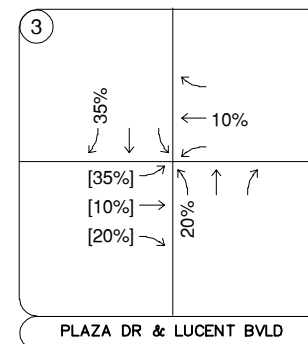
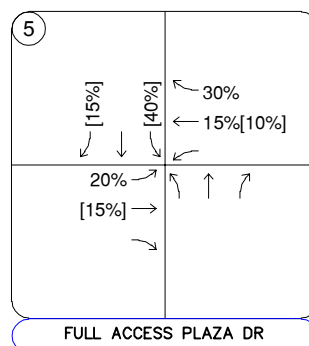
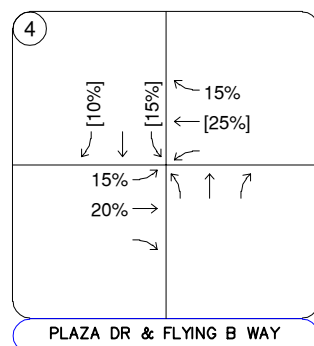
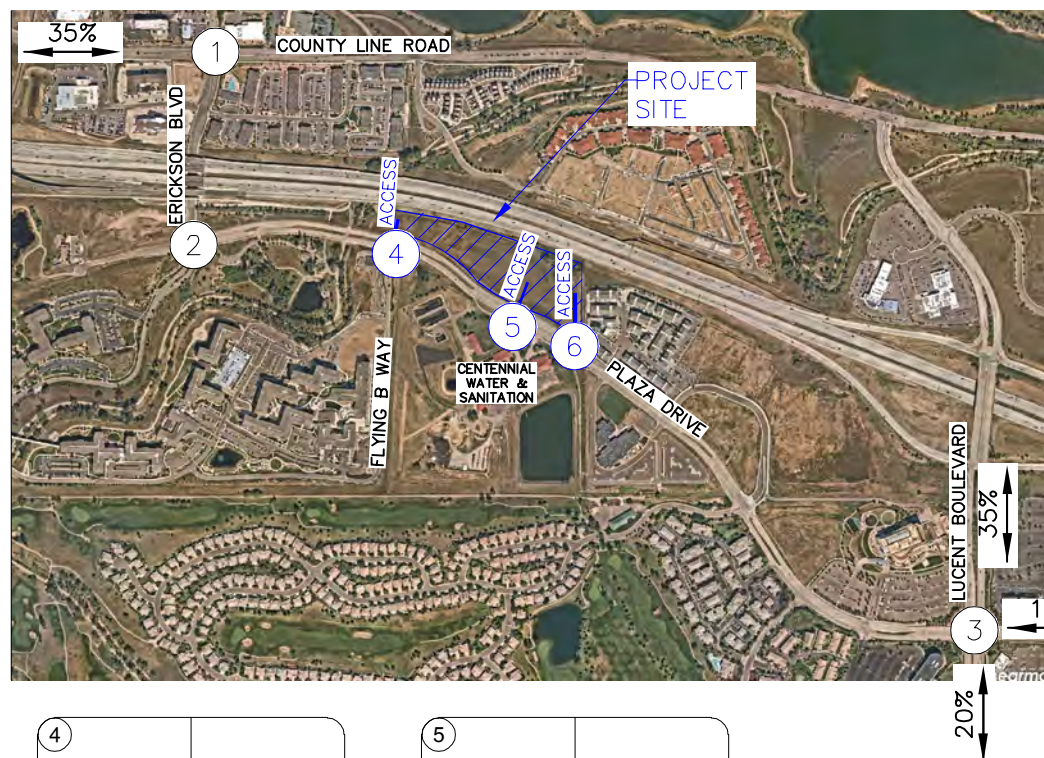
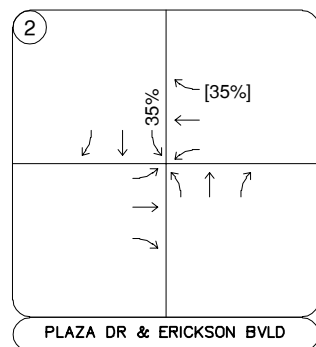
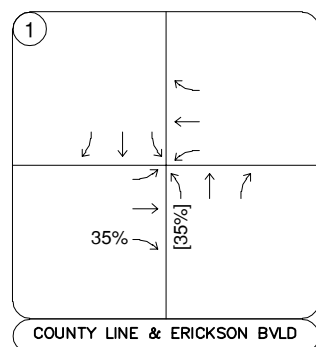


FIGURE 6
KAOS
HIGHLANDS RANCH, COLORADO
PROJECT TRIP DISTRIBUTION

4.3 Traffic Assignment

Kaos traffic assignment was obtained by applying the project trip distribution to the estimated traffic generation of the development shown in **Table 1**. Traffic assignment is shown in **Figure 7**.

4.4 Total (Background Plus Project) Traffic

Site traffic volumes were added to the background volumes to represent estimated traffic conditions for the short-term 2024 buildout horizon and long-term 2045 twenty-year planning horizon. These total traffic volumes for the study area are illustrated for the 2024 and 2045 horizon years in **Figures 8 and 9**, respectively.

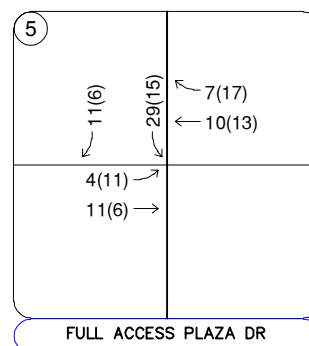
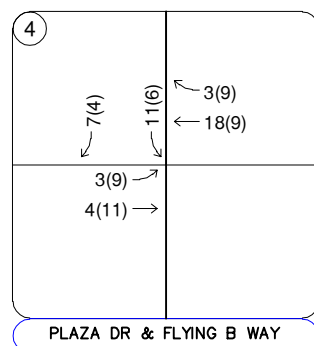
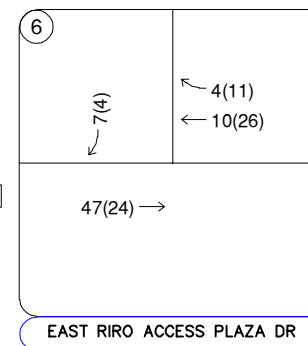
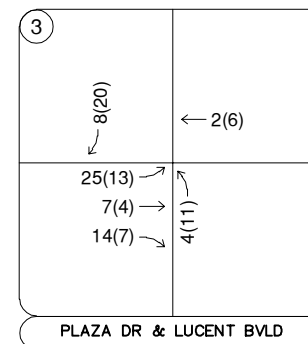
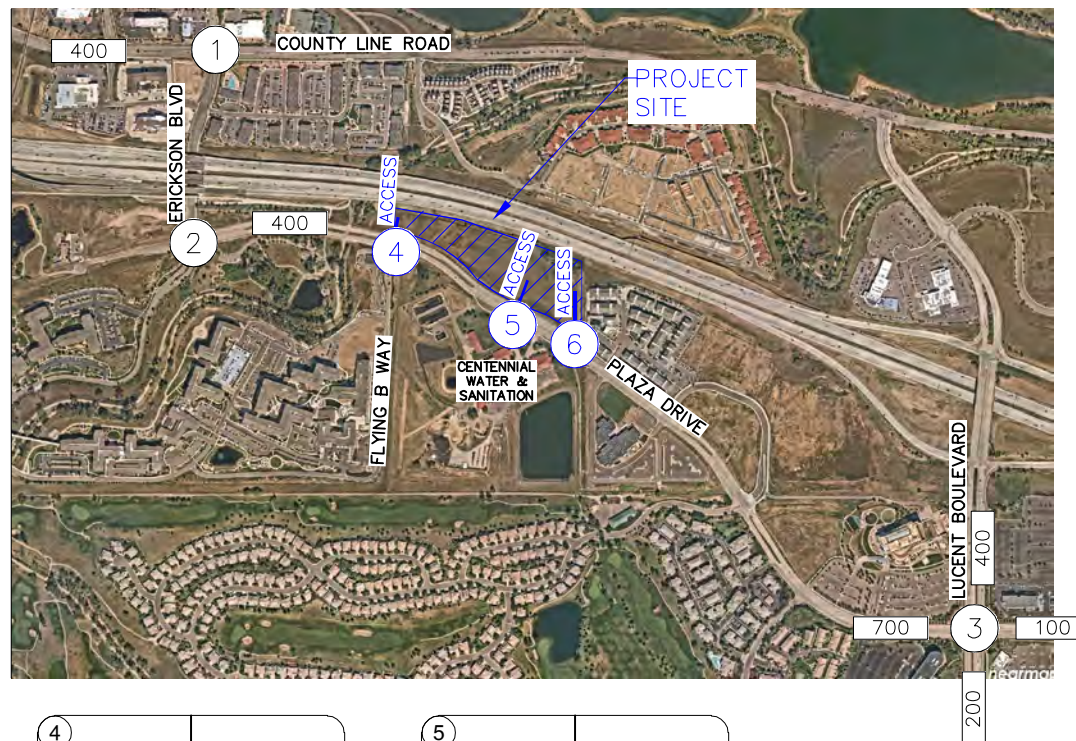
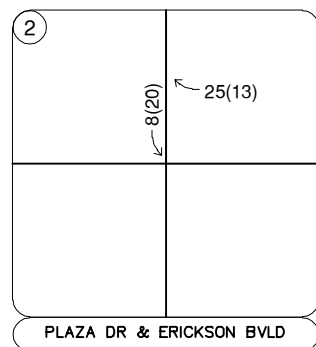
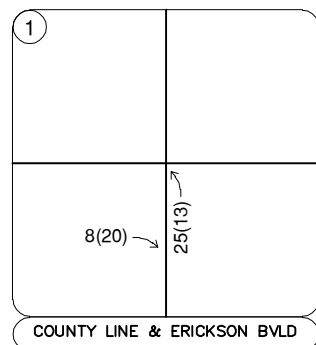


FIGURE 7
KAOS
HIGHLANDS RANCH, COLORADO
PROJECT TRAFFIC ASSIGNMENT

LEGEND

(X) Study Area Key Intersection
(X) Project Access Intersection
xxx(xxx) Weekday AM(PM)
Peak Hour Traffic Volumes
xx,x00 Estimated Daily Traffic Volume

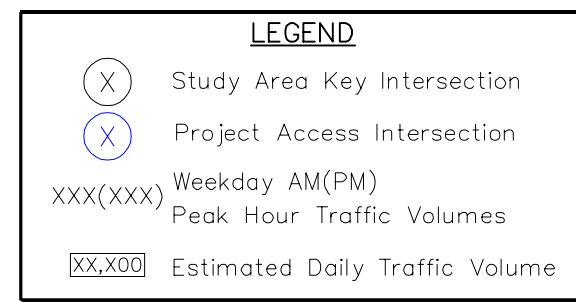
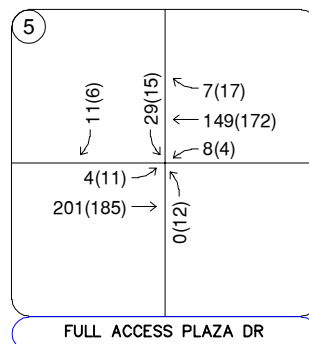
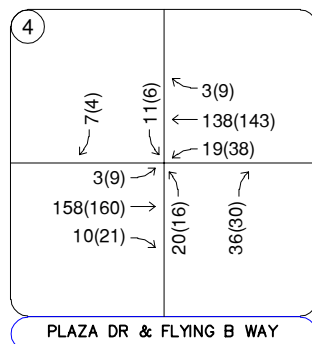
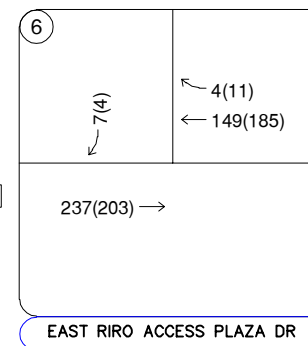
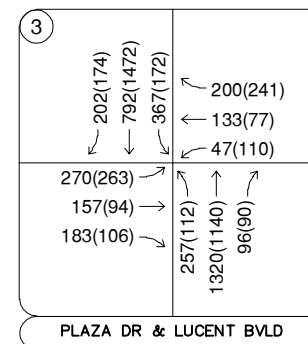
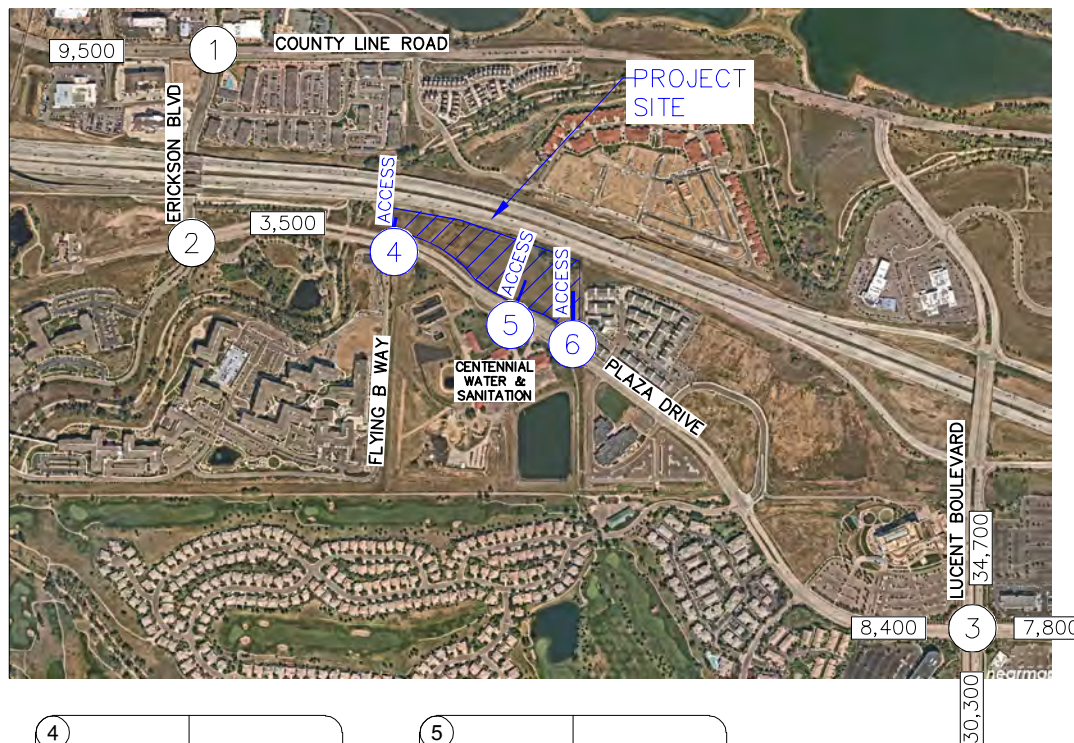
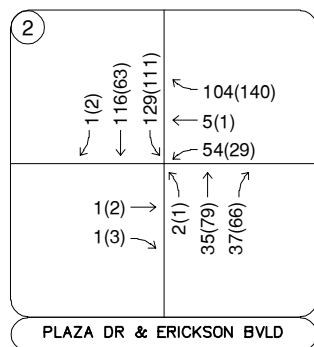
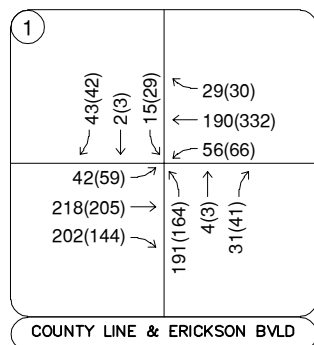


FIGURE 8
KAOS
HIGHLANDS RANCH, COLORADO
2024 TOTAL TRAFFIC VOLUMES

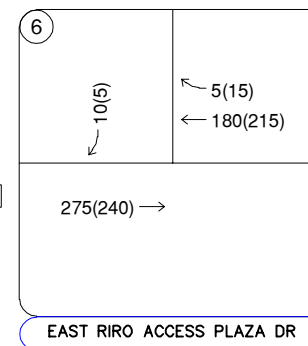
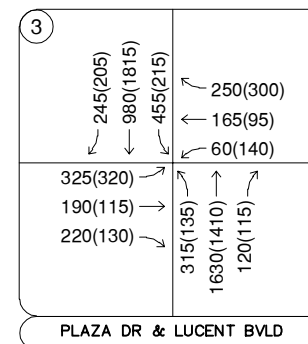
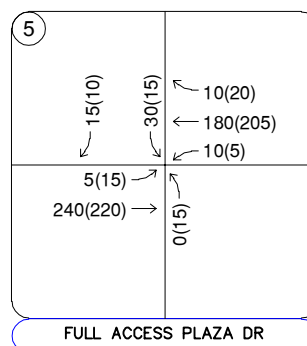
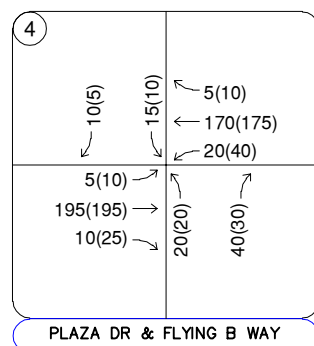
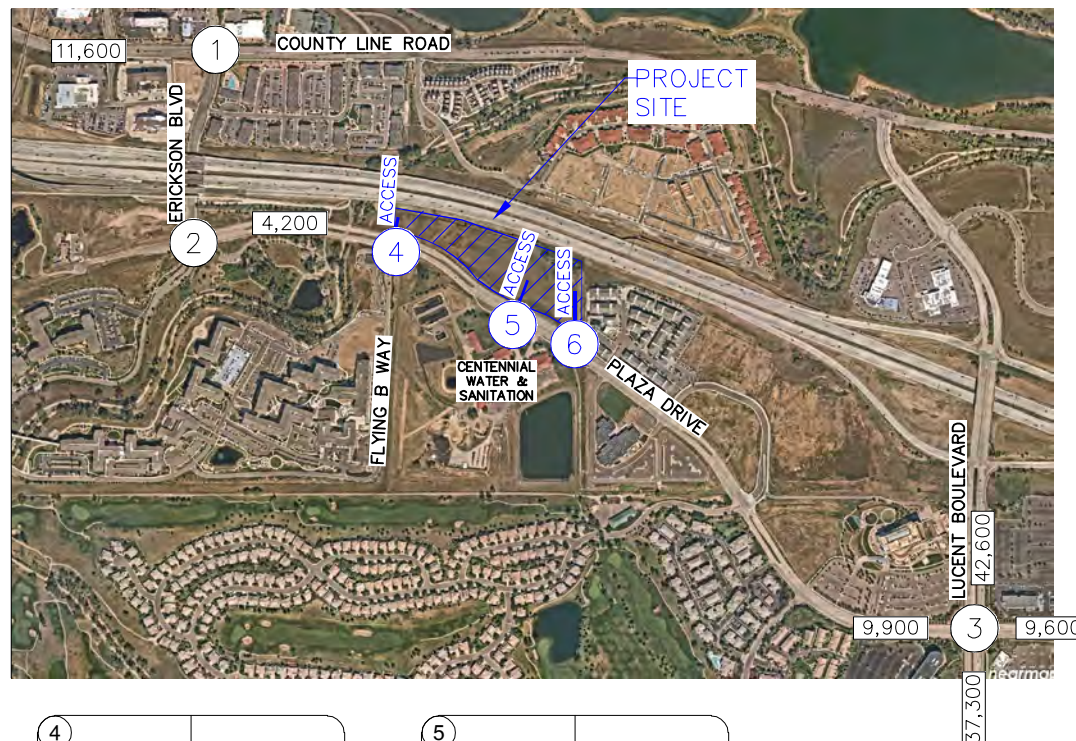
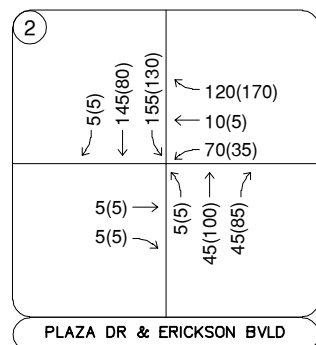
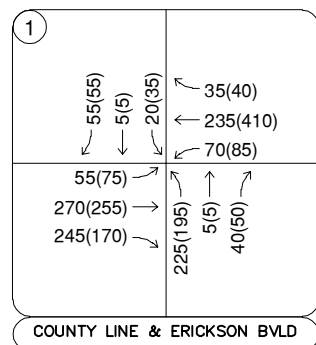
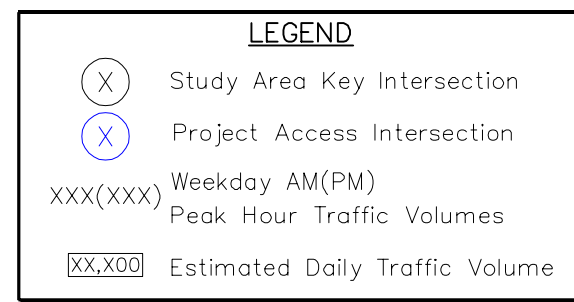


FIGURE 9
KAOS
HIGHLANDS RANCH, COLORADO
2045 TOTAL TRAFFIC VOLUMES



5.0 TRAFFIC OPERATIONS ANALYSIS

Kimley-Horn's analysis of traffic operations in the site vicinity was conducted to determine potential capacity deficiencies in the 2024 and 2045 development horizons at the identified key intersections. The acknowledged source for determining overall capacity is the current edition of the *Highway Capacity Manual (HCM)*².

5.1 Analysis Methodology

Capacity analysis results are listed in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). For intersections and roadways in this study area, standard traffic engineering practice recommends overall intersection LOS D and movement/approach LOS E as the minimum desirable thresholds for acceptable operations. **Table 2** shows the definition of level of service for signalized and unsignalized intersections.

Table 2 – Level of Service Definitions

Level of Service	Signalized Intersection Average Total Delay (sec/veh)	Unsignalized Intersection Average Total Delay (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Definitions provided from the Highway Capacity Manual, Sixth Edition, Transportation Research Board, 2016.

Study area intersections were analyzed based on average total delay analysis for signalized and unsignalized intersections. Under the unsignalized analysis, the LOS for a two-way stop-controlled intersection is determined by the computed or measured control delay and is defined for each minor movement. LOS for a two-way stop-controlled intersection is not defined for the intersection as a whole. LOS for signalized, roundabout, and all-way stop controlled intersections are defined for each approach and for the overall intersection.

² Transportation Research Board, *Highway Capacity Manual*, Sixth Edition, Washington DC, 2016.

5.2 Key Intersection Operational Analysis

Calculations for the operational level of service at the key intersections for the study area are provided in **Appendix D**. The existing year analysis is based on the lane geometry and intersection control shown in **Figure 2**. Existing peak hour factors were utilized in the existing and 2024 horizon analysis years while the HCM urban standard of 0.92 was used for the long-term 2045 horizon analysis. The signalized intersection analysis utilizes the observed cycle lengths with optimized phasing and timing. Based on increased national attention given to establishing appropriate yellow and all-red clearance intervals to improve intersection safety, these have been calculated and are applied for approaches at the signalized intersections. The increase in yellow and all red time sacrifices intersection capacity for improved safety. Synchro traffic analysis software was used to analyze the signalized, and unsignalized key intersections for HCM level of service.

County Line Road and Erickson Boulevard

The signalized intersection of County Line Road and Erickson Boulevard operates with protected-permitted left turn phasing on all four approaches. The intersection operates acceptably at LOS C during the morning peak hour and LOS D during the afternoon peak hour under existing conditions. With project traffic, the intersection is anticipated to continue operating at an acceptable LOS C during the morning peak hour and LOS D during the afternoon peak hour throughout the 2045 horizon. Therefore, no improvements or modifications are anticipated to be needed at this intersection based on the addition of project traffic and the operational level of service analysis. **Table 3** provides the results of the LOS analysis conducted at this intersection.

Table 3 – County Line Road & Erickson Boulevard LOS Results

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2022 Existing	32.9	C	35.9	D
2024 Background	33.0	C	36.2	D
2024 Background Plus Project	33.6	C	36.5	D
2045 Background	34.1	C	36.5	D
2045 Background Plus Project	34.5	C	36.8	D

Plaza Drive and Erickson Boulevard

The unsignalized intersection of Plaza Drive and Erickson Boulevard operates with all-way stop control on all four approaches. The intersection operates acceptably at LOS A during both peak hours under existing conditions. With project traffic, the intersection is anticipated to continue operating at an acceptable level of service A during both studied weekday peak hours throughout the 2045 horizon. Therefore, no improvements or modifications are anticipated to be needed at this intersection based on the addition of project traffic and this operational analysis. **Table 4** provides the results of the LOS analysis conducted at this intersection.

Table 4 – Plaza Drive & Erickson Boulevard LOS Results

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2022 Existing	8.9	A	9.2	A
Eastbound Approach	8.2	A	8.3	A
Westbound Approach	7.6	A	8.9	A
Northbound Approach	8.5	A	9.7	A
Southbound Approach	9.1	A	9.0	A
2024 Background	9.1	A	9.5	A
Eastbound Approach	8.3	A	8.5	A
Westbound Approach	8.7	A	9.2	A
Northbound Approach	8.7	A	10.0	A
Southbound Approach	9.4	A	9.4	A
2024 Background Plus Project	9.2	A	9.9	A
Eastbound Approach	8.4	A	8.6	A
Westbound Approach	8.8	A	9.6	A
Northbound Approach	8.8	A	10.3	B
Southbound Approach	9.5	A	9.8	A
2045 Background	9.4	A	9.5	A
Eastbound Approach	8.5	A	8.5	A
Westbound Approach	9.0	A	9.2	A
Northbound Approach	9.1	A	10.1	B
Southbound Approach	9.7	A	9.4	A
2045 Background Plus Project	9.5	A	10.0	A
Eastbound Approach	8.8	A	8.8	A
Westbound Approach	9.3	A	9.6	A
Northbound Approach	9.4	A	10.6	B
Southbound Approach	10.0	A	9.8	A

Plaza Drive and Lucent Boulevard

The signalized intersection of Plaza Drive and Lucent Boulevard operates with protected-only left turn phasing on all four approaches. The intersection operates acceptably at LOS D during the morning peak hour and LOS C during the afternoon peak hour under existing conditions. With project traffic, the intersection is anticipated to continue operating at an acceptable level of service of D during the morning peak hour and LOS C during the afternoon peak hour in 2024. In the 2045 horizon, the intersection is anticipated to operate acceptably with a LOS D during both studied weekday peak hours with the addition of project traffic. Therefore, no improvements or modifications are anticipated to be needed at this intersection based on the addition of project traffic and this operational level of service analysis. **Table 5** provides the results of the LOS analysis conducted at this intersection.

Table 5 – Plaza Drive & Lucent Boulevard LOS Results

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2022 Existing	38.2	D	33.6	C
2024 Background	39.6	D	34.9	C
2024 Background Plus Project	40.6	D	35.8	D
2045 Background	52.5	D	41.0	D
2045 Background Plus Project	54.4	D	42.4	D

Project Accesses

With completion of the Kaos project, a full movement access that aligns with Flying B Way and a full movement access that aligns with the Centennial Water & Sanitation full movement access along Plaza Drive will be provided. In addition, one (1) right-in/right-out access is proposed approximately 450 feet east of the full movement access aligned with the Centennial Water & Sanitation driveway location. "STOP" (R1-1) signs are recommended to be installed on the southbound approaches of all three (3) accesses, exiting the development. In addition, a R3-2 No Left Turn sign should be placed underneath the R1-1 "STOP" sign at the right-in/right-out (RIRO) access. Furthermore, a R6-1R "ONE WAY" sign could be placed within the existing raised median of Plaza Drive. Eastbound left turn lanes are recommended at the full movement access that aligns with Flying B Way and for the full movement access that aligns with the Centennial Water & Sanitation driveway. The western access to align with Flying B Way will require median construction whereas the middle access to align with Centennial Water will just require restriping for the eastbound left turn lanes. **Table 6** provides the results of the level of service analysis for these project accesses. As shown in the table, the project access intersections along Plaza Drive are anticipated to have all movements operating with acceptable LOS B or better during the peak hours in both the buildout year 2024 and the 2045 long term horizons.

Table 6 – Project Access Level of Service Results

Intersection	2024 Total				2045 Total			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Plaza Drive & Flying B Way								
Northbound Approach	9.8	A	9.9	A	10.0	B	10.8	B
Eastbound Left	7.5	A	7.6	A	7.6	A	7.7	A
Westbound Left	7.6	A	7.7	A	7.7	A	7.8	A
Southbound Approach	10.0	B	10.2	B	10.3	B	11.3	B
Plaza Drive Full Access								
Northbound Approach	0.0	A	10.8	B	0.0	A	11.3	B
Eastbound Left	7.6	A	7.7	A	7.7	A	7.8	A
Westbound Left	7.7	A	7.6	A	7.8	A	7.7	A
Southbound Approach	10.3	B	10.3	B	10.6	B	10.5	B
Plaza Drive East RIRO								
Southbound Right	8.8	A	8.9	A	8.9	A	9.0	A

5.3 Vehicle Queuing Analysis

A vehicle queuing analysis was conducted for the study area intersections. The queuing analysis was performed using Synchro presenting the results of the 95th percentile queue lengths. Results are shown in the following **Table 7** with calculations provided within the level of service operational sheets of **Appendix D** for unsignalized intersections and **Appendix E** for signalized intersections.

Table 7 – Turn Lane Queuing Analysis Results

Intersection Turn Lane	Existing Turn Lane Length (feet)	2024 Calculated Queue (feet)	2024 Recommended Length (feet)	2045 Calculated Queue (feet)	2045 Recommended Length (feet)
County Line & Erickson Blvd					
Eastbound Left	350'	54'	350'	61'	350'
Westbound Left	600'	60'	600'	67'	600'
Northbound Left	C	115'	C	142'	C
Southbound Left	50'	25'	50'	31'	50'
Plaza Dr & Erickson Blvd					
Eastbound Through/Right	150'	25'	150'	25'	150'
Westbound Left	275'	25'	275'	25'	275'
Westbound Right	C	25'	C	25'	C
Southbound Left	C	25'	C	25'	C
Southbound Right	200'	25'	200'	25'	200'
Plaza Dr & Lucent Blvd					
Eastbound Left	300' DL	189'	300' DL	241'	300' DL
Westbound Left	225' DL	85'	225' DL	104'	225' DL
Westbound Right	C	182'	C	241'	C
Northbound Left	250'/275'	149'	250'/275'	179'	250'/275'
Southbound Left	250' DL	200'	250' DL	250'	250' DL
Plaza Drive & Flying B Way					
Eastbound Left	DNE	25'	250'	25'	250'
Westbound Left	275'	25'	275'	25'	275'
Plaza Dr Full Access					
Eastbound Left	DNE	25'	250'	25'	250'
Westbound Left	275'	25'	275'	25'	275'

DNE = Does Not Exist; C = Continuous; **Red** Text = Storage Deficiency; **Blue** Text = Recommendation

All queues are anticipated to remain within the existing or recommended turn lane lengths through 2045. The eastbound left turn lanes at the full movement accesses are recommended to provide a length of 250 feet.

5.4 Improvement Summary

Based on the results of the intersection operational and vehicle queuing analysis, the key intersection recommended improvements and control are shown in **Figure 10**.

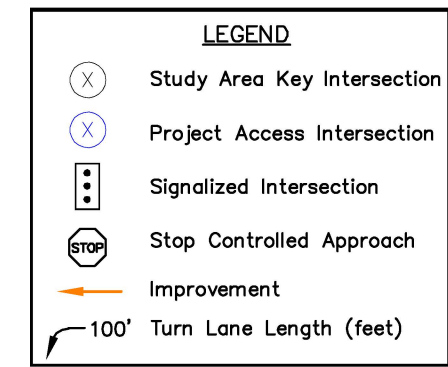
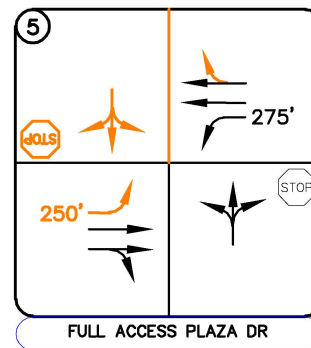
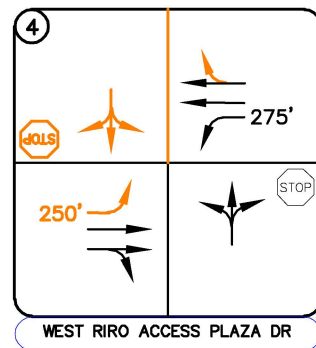
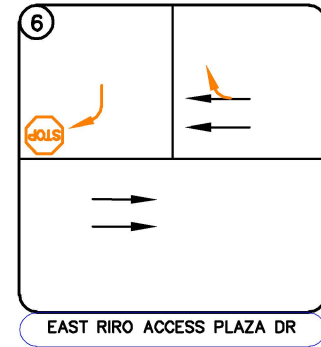
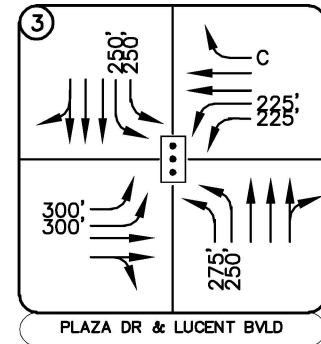
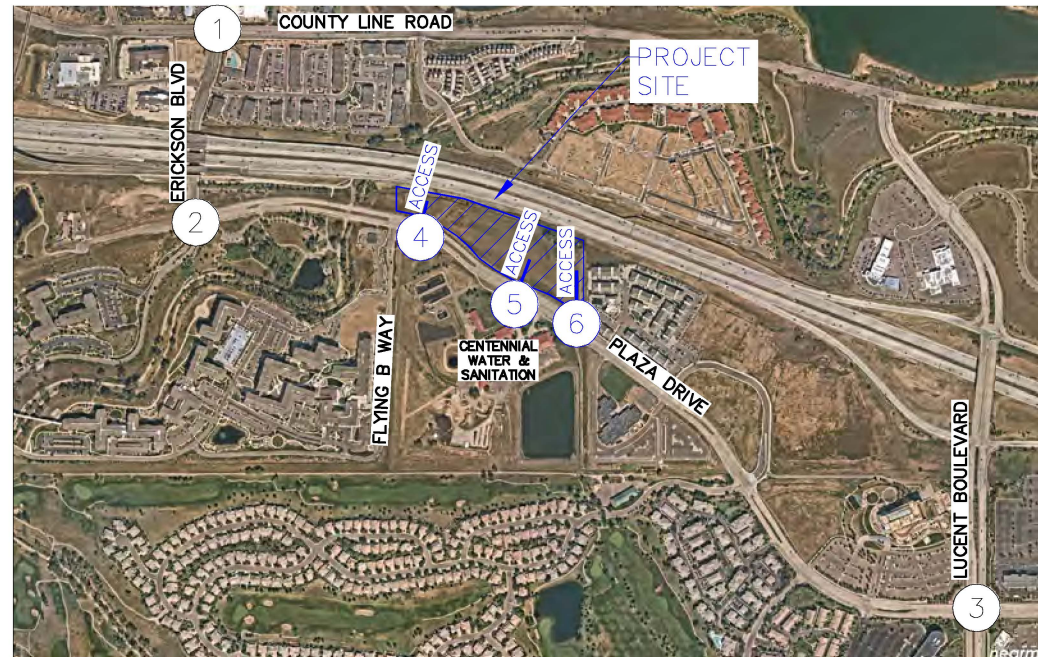
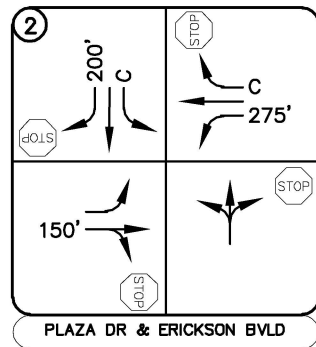
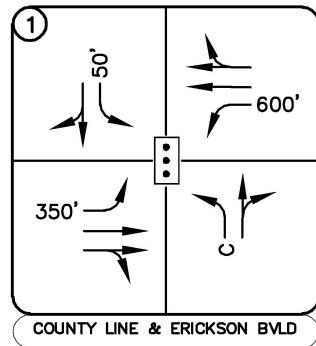


FIGURE 10
KAOS
HIGHLANDS RANCH, COLORADO
RECOMMENDED GEOMETRY AND CONTROL

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis presented in this report, Kimley-Horn believes Kaos will be successfully incorporated into the existing and future roadway network. Analysis of the existing street network, the proposed project development, and expected traffic volumes resulted in the following recommendations:

- With completion of the Kaos project, a full movement access that aligns with Flying B Way and a full movement access that aligns with the Centennial Water & Sanitation full movement access along Plaza Drive will be provided. In addition, one (1) right-in/right-out access is proposed approximately 450 feet east of the full movement access aligned with the Centennial Water & Sanitation driveway location. “STOP” (R1-1) signs are recommended to be installed on the southbound approaches of all three (3) accesses, exiting the development. In addition, a R3-2 No Left Turn sign should be placed underneath the R1-1 “STOP” sign at the right-in/right-out (RIRO) access. Furthermore, a R6-1R “ONE WAY” sign could be placed within the existing raised median of Plaza Drive. The eastbound left turn lanes at the full movement accesses are recommended to provide a length of 250 feet. The western access to align with Flying B Way will require median construction whereas the middle access to align with Centennial Water will just require restriping for the eastbound left turn lanes.
- Any on-site or offsite improvements should be incorporated into the Civil Drawings and conform to standards of the Douglas County and the Manual on Uniform Traffic Control Devices (MUTCD) – 2009 Edition.

APPENDICES

APPENDIX A

Intersection Count Sheets



Highlands Ranch, CO
 Kaos
 AM Peak
 County Line Rd & Erickson/Southpark

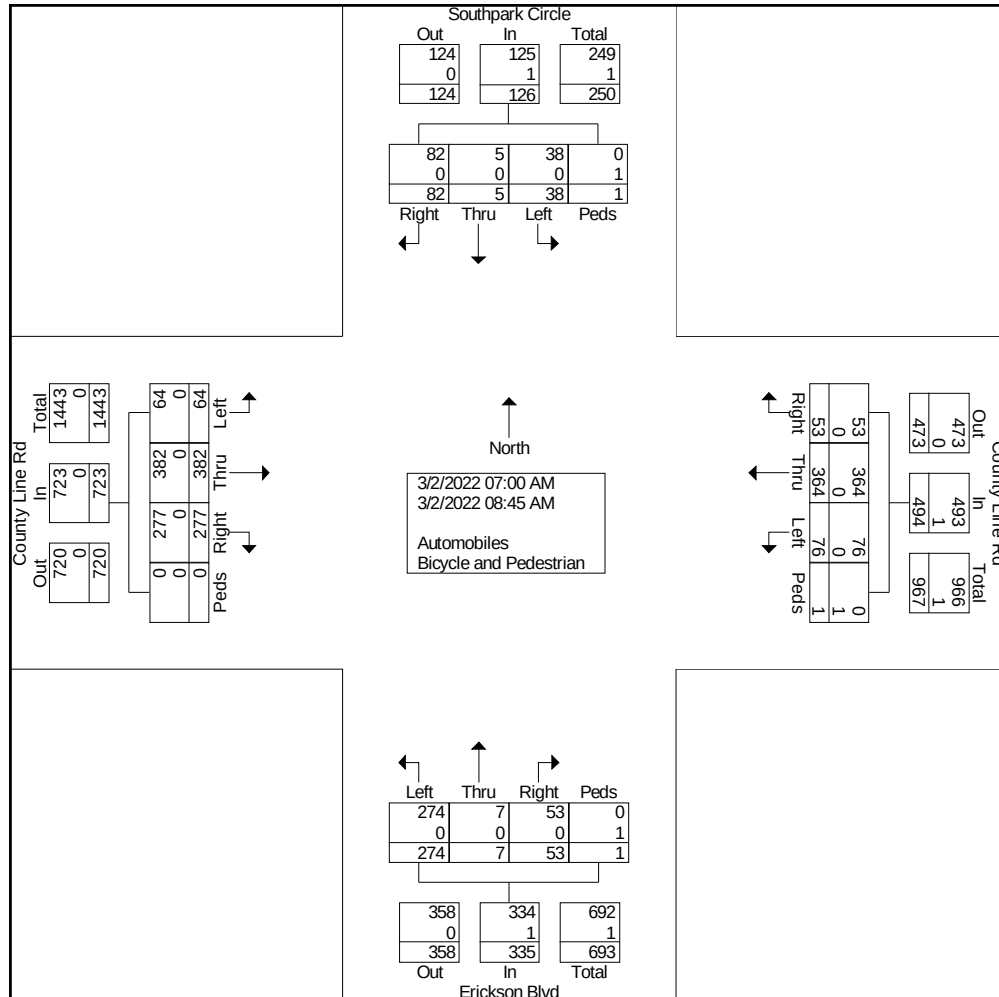
File Name : County Line and Erickson AM
 Site Code : IPO 596
 Start Date : 3/2/2022
 Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

	County Line Rd Eastbound					County Line Rd Westbound					Erickson Blvd Northbound					Southpark Circle Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	8	46	27	0	81	2	43	7	0	52	34	2	7	0	43	6	2	10	0	18	194
07:15 AM	3	29	24	0	56	4	54	2	1	61	41	1	6	1	49	5	0	12	1	18	184
07:30 AM	7	43	19	0	69	8	39	7	0	54	26	0	4	0	30	6	0	11	0	17	170
07:45 AM	11	67	60	0	138	16	51	10	0	77	39	2	7	0	48	7	1	8	0	16	279
Total	29	185	130	0	344	30	187	26	1	244	140	5	24	1	170	24	3	41	1	69	827
08:00 AM	4	50	57	0	111	16	42	9	0	67	34	2	5	0	41	5	1	14	0	20	239
08:15 AM	16	47	34	0	97	14	45	4	0	63	36	0	8	0	44	2	0	8	0	10	214
08:30 AM	10	50	29	0	89	9	48	5	0	62	34	0	10	0	44	1	0	12	0	13	208
08:45 AM	5	50	27	0	82	7	42	9	0	58	30	0	6	0	36	6	1	7	0	14	190
Total	35	197	147	0	379	46	177	27	0	250	134	2	29	0	165	14	2	41	0	57	851
Grand Total	64	382	277	0	723	76	364	53	1	494	274	7	53	1	335	38	5	82	1	126	1678
Apprch %	8.9	52.8	38.3	0		15.4	73.7	10.7	0.2		81.8	2.1	15.8	0.3		30.2	4	65.1	0.8		
Total %	3.8	22.8	16.5	0	43.1	4.5	21.7	3.2	0.1	29.4	16.3	0.4	3.2	0.1	20	2.3	0.3	4.9	0.1	7.5	
Automobiles	64	382	277	0	723	76	364	53	0	493	274	7	53	0	334	38	5	82	0	125	1675
% Automobiles	100	100	100	0	100	100	100	100	0	99.8	100	100	100	0	99.7	100	100	100	0	99.2	99.8
Bicycle and Pedestrian	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	1	1	3
% Bicycle and Pedestrian	0	0	0	0	0	0	0	0	100	0.2	0	0	0	100	0.3	0	0	0	100	0.8	0.2

Highlands Ranch, CO
Kaos
AM Peak
County Line Rd & Erickson/Southpark

File Name : County Line and Erickson AM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 2

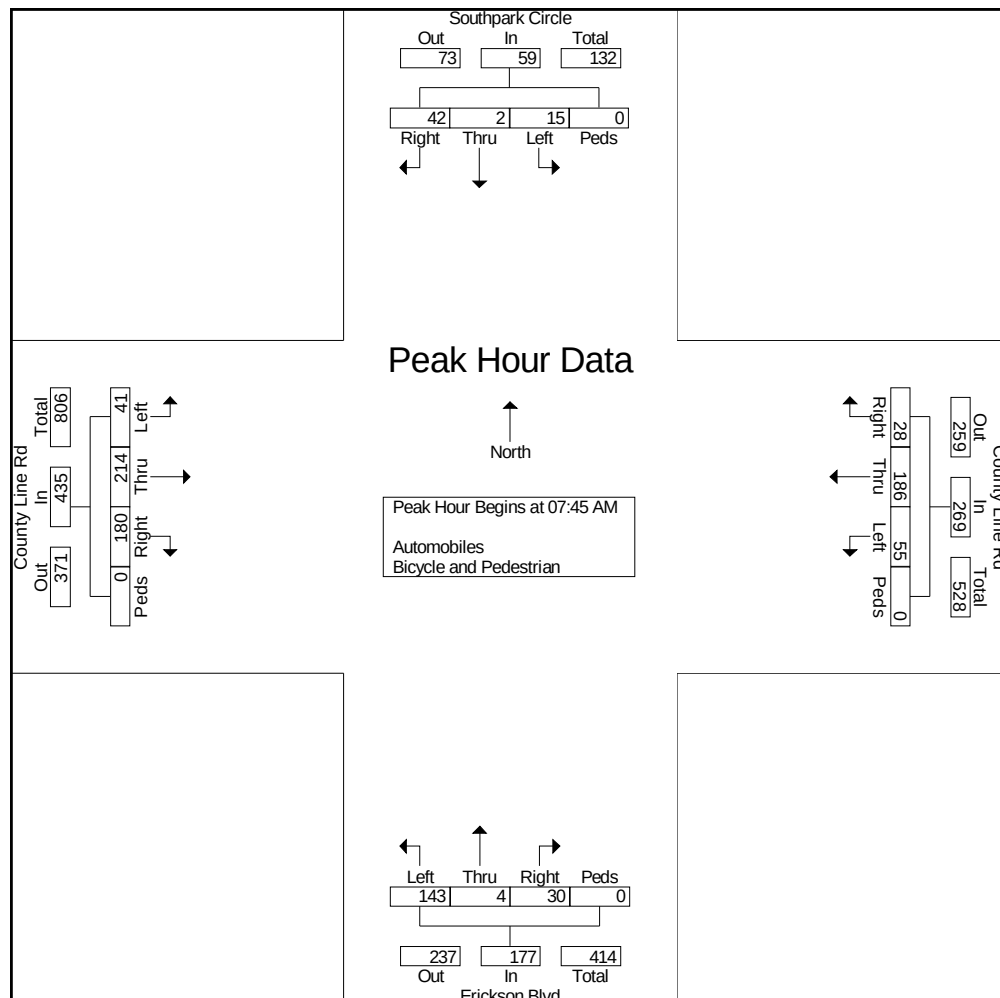




Highlands Ranch, CO
Kaos
AM Peak
County Line Rd & Erickson/Southpark

File Name : County Line and Erickson AM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 3

	County Line Rd Eastbound					County Line Rd Westbound					Erickson Blvd Northbound					Southpark Circle Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	11	67	60	0	138	16	51	10	0	77	39	2	7	0	48	7	1	8	0	16	279
08:00 AM	4	50	57	0	111	16	42	9	0	67	34	2	5	0	41	5	1	14	0	20	239
08:15 AM	16	47	34	0	97	14	45	4	0	63	36	0	8	0	44	2	0	8	0	10	214
08:30 AM	10	50	29	0	89	9	48	5	0	62	34	0	10	0	44	1	0	12	0	13	208
Total Volume	41	214	180	0	435	55	186	28	0	269	143	4	30	0	177	15	2	42	0	59	940
% App. Total	9.4	49.2	41.4	0		20.4	69.1	10.4	0		80.8	2.3	16.9	0		25.4	3.4	71.2	0		
PHF	.641	.799	.750	.000	.788	.859	.912	.700	.000	.873	.917	.500	.750	.000	.922	.536	.500	.750	.000	.738	.842





Highlands Ranch, CO
 Kaos
 PM Peak
 County Line Rd & Erickson/Southpark

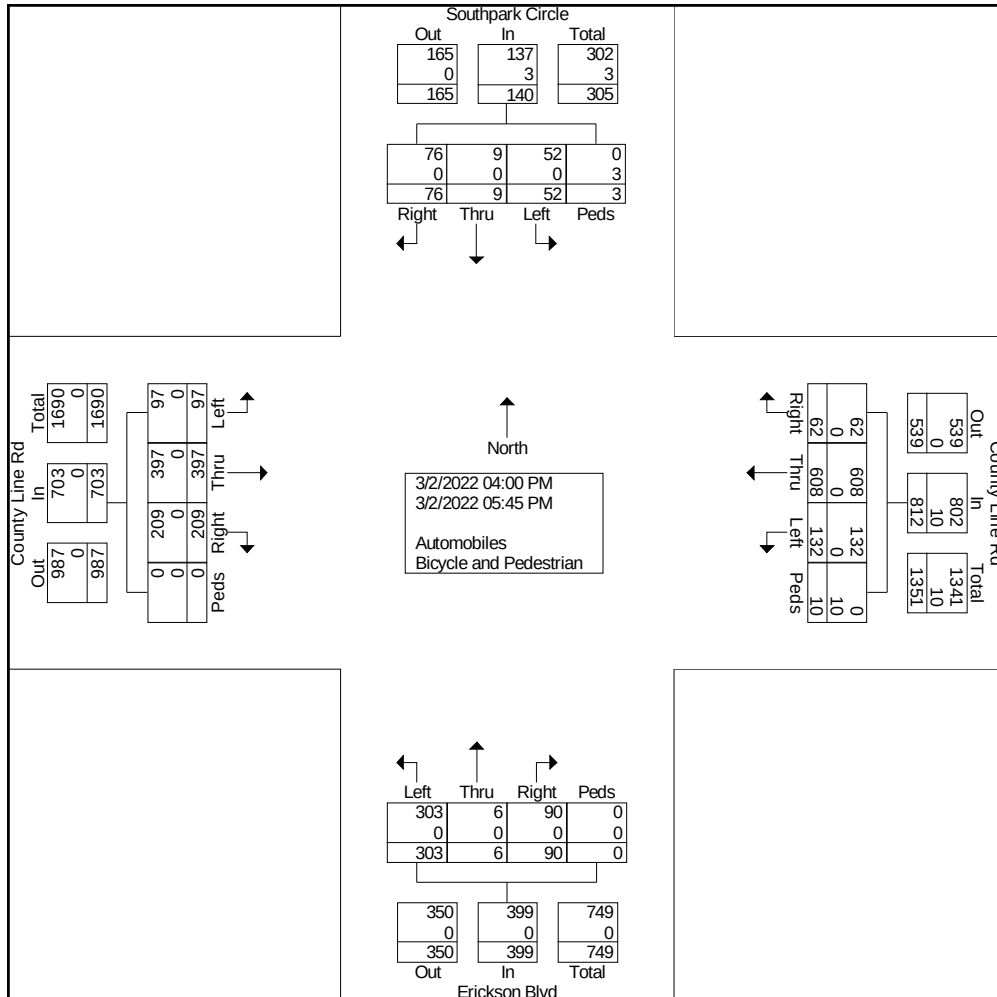
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 Start Date : 3/2/2022
 Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

	County Line Rd Eastbound					County Line Rd Westbound					Erickson Blvd Northbound					Southpark Circle Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	8	58	23	0	89	24	70	8	3	105	54	0	15	0	69	7	1	12	1	21	284
04:15 PM	11	48	38	0	97	19	75	8	1	103	39	0	13	0	52	7	2	6	0	15	267
04:30 PM	9	40	29	0	78	14	75	8	0	97	37	1	12	0	50	5	3	11	0	19	244
04:45 PM	11	50	18	0	79	10	63	9	0	82	41	2	10	0	53	5	0	6	0	11	225
Total	39	196	108	0	343	67	283	33	4	387	171	3	50	0	224	24	6	35	1	66	1020
05:00 PM	12	51	27	0	90	21	103	4	1	129	41	0	11	0	52	8	1	11	1	21	292
05:15 PM	13	53	28	0	94	18	75	7	1	101	32	3	9	0	44	12	1	11	0	24	263
05:30 PM	13	45	26	0	84	8	77	8	2	95	35	0	8	0	43	5	0	12	1	18	240
05:45 PM	20	52	20	0	92	18	70	10	2	100	24	0	12	0	36	3	1	7	0	11	239
Total	58	201	101	0	360	65	325	29	6	425	132	3	40	0	175	28	3	41	2	74	1034
Grand Total	97	397	209	0	703	132	608	62	10	812	303	6	90	0	399	52	9	76	3	140	2054
Apprch %	13.8	56.5	29.7	0		16.3	74.9	7.6	1.2		75.9	1.5	22.6	0		37.1	6.4	54.3	2.1		
Total %	4.7	19.3	10.2	0	34.2	6.4	29.6	3	0.5	39.5	14.8	0.3	4.4	0	19.4	2.5	0.4	3.7	0.1	6.8	
Automobiles	97	397	209	0	703	132	608	62	0	802	303	6	90	0	399	52	9	76	0	137	2041
% Automobiles	100	100	100	0	100	100	100	100	0	98.8	100	100	100	0	100	100	100	100	0	97.9	99.4
Bicycle and Pedestrian	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	3	3	13
% Bicycle and Pedestrian	0	0	0	0	0	0	0	0	100	1.2	0	0	0	0	0	0	0	0	100	2.1	0.6

Highlands Ranch, CO
Kaos
PM Peak
County Line Rd & Erickson/Southpark

File Name : County Line and Erickson PM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 2

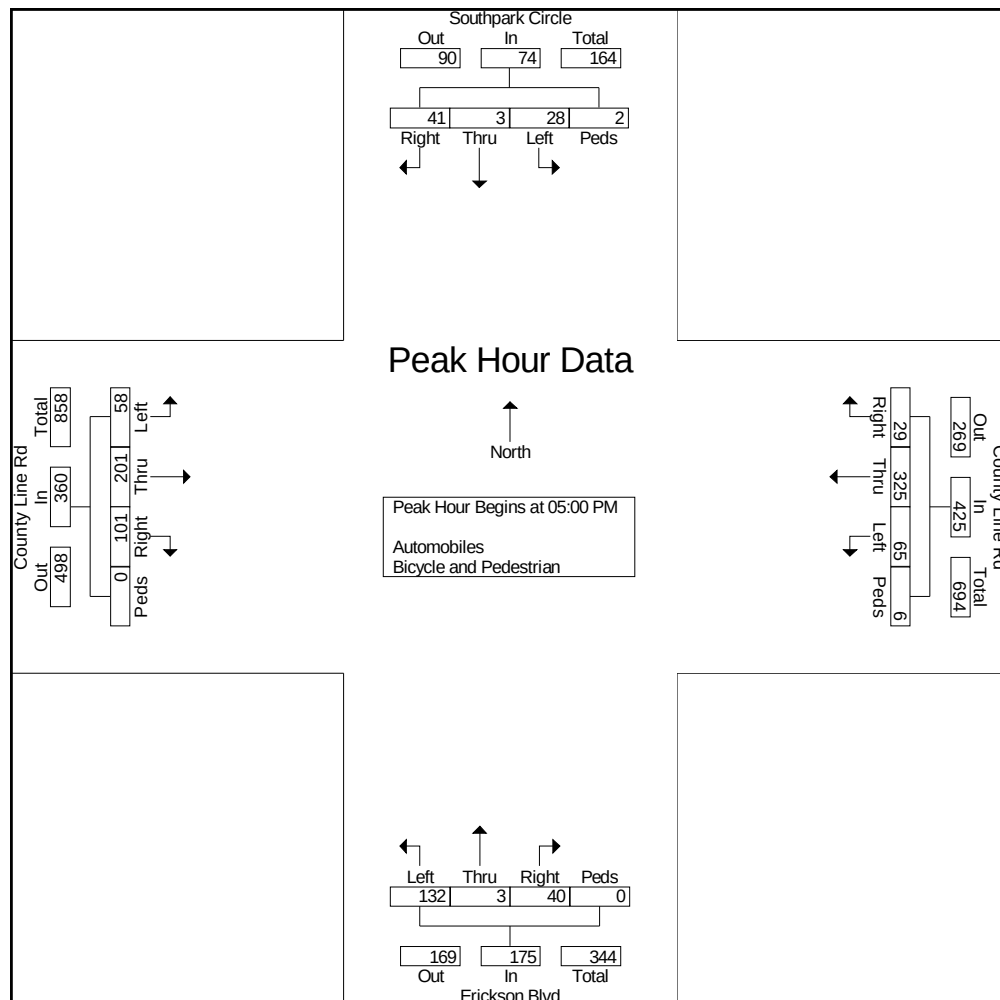




Highlands Ranch, CO
Kaos
PM Peak
County Line Rd & Erickson/Southpark

File Name : County Line and Erickson PM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 3

	County Line Rd Eastbound					County Line Rd Westbound					Erickson Blvd Northbound					Southpark Circle Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	12	51	27	0	90	21	103	4	1	129	41	0	11	0	52	8	1	11	1	21	292
05:15 PM	13	53	28	0	94	18	75	7	1	101	32	3	9	0	44	12	1	11	0	24	263
05:30 PM	13	45	26	0	84	8	77	8	2	95	35	0	8	0	43	5	0	12	1	18	240
05:45 PM	20	52	20	0	92	18	70	10	2	100	24	0	12	0	36	3	1	7	0	11	239
Total Volume	58	201	101	0	360	65	325	29	6	425	132	3	40	0	175	28	3	41	2	74	1034
% App. Total	16.1	55.8	28.1	0		15.3	76.5	6.8	1.4		75.4	1.7	22.9	0		37.8	4.1	55.4	2.7		
PHF	.725	.948	.902	.000	.957	.774	.789	.725	.750	.824	.805	.250	.833	.000	.841	.583	.750	.854	.500	.771	.885





Highlands Ranch, CO
Kaos
AM Peak
Plaza Dr & Erickson Blvd

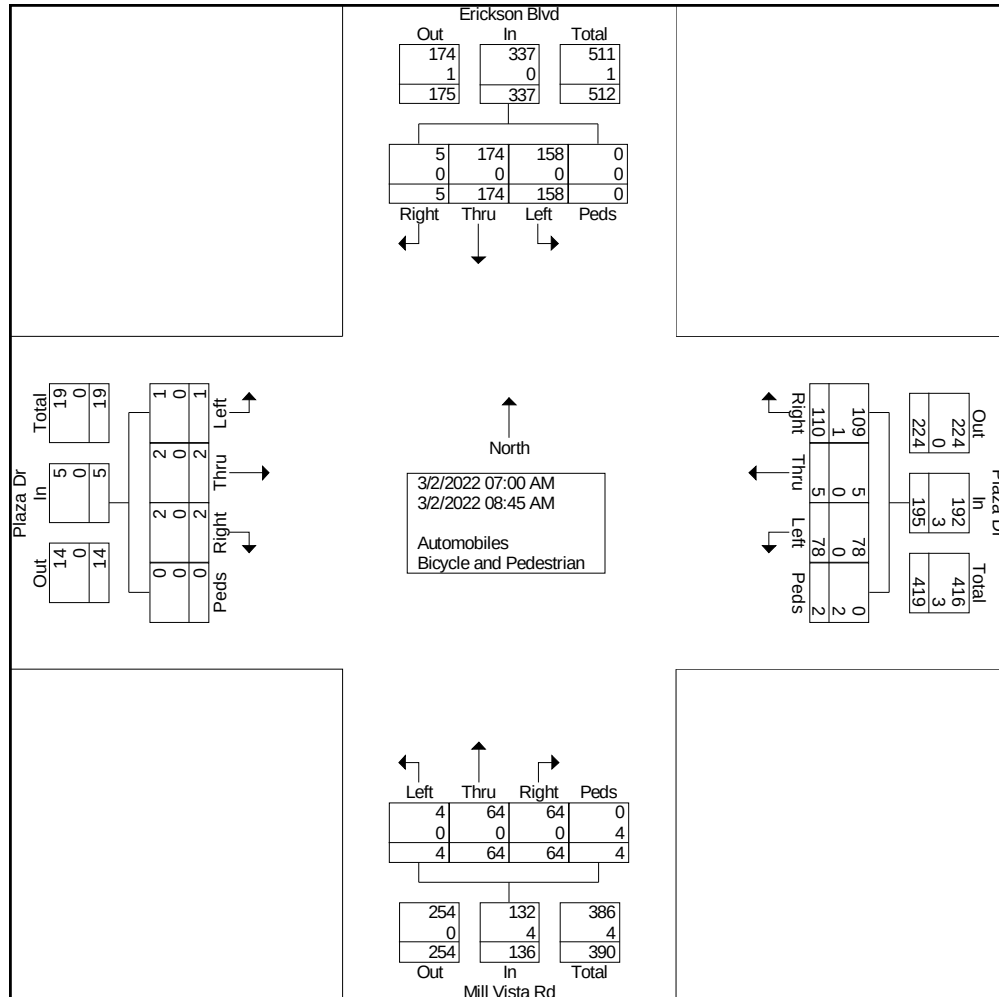
File Name : Plaza and Erickson AM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

	Plaza Dr Eastbound					Plaza Dr Westbound					Mill Vista Rd Northbound					Erickson Blvd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	5	0	14	0	19	1	7	5	1	14	18	15	0	0	33	66
07:15 AM	1	0	0	0	1	5	0	15	1	21	0	4	5	0	9	18	10	2	0	30	61
07:30 AM	0	0	0	0	0	10	0	15	0	25	1	3	7	0	11	12	10	0	0	22	58
07:45 AM	0	0	1	0	1	15	1	16	0	32	1	6	4	0	11	42	33	0	0	75	119
Total	1	0	1	0	2	35	1	60	1	97	3	20	21	1	45	90	68	2	0	160	304
08:00 AM	0	0	0	0	0	15	1	16	1	33	0	7	6	0	13	46	24	0	0	70	116
08:15 AM	0	0	0	0	0	10	0	12	0	22	1	8	16	0	25	10	36	1	0	47	94
08:30 AM	0	1	0	0	1	13	3	14	0	30	0	13	10	0	23	11	21	0	0	32	86
08:45 AM	0	1	1	0	2	5	0	8	0	13	0	16	11	3	30	1	25	2	0	28	73
Total	0	2	1	0	3	43	4	50	1	98	1	44	43	3	91	68	106	3	0	177	369
Grand Total	1	2	2	0	5	78	5	110	2	195	4	64	64	4	136	158	174	5	0	337	673
Apprch %	20	40	40	0		40	2.6	56.4	1		2.9	47.1	47.1	2.9		46.9	51.6	1.5	0		
Total %	0.1	0.3	0.3	0	0.7	11.6	0.7	16.3	0.3	29	0.6	9.5	9.5	0.6	20.2	23.5	25.9	0.7	0	50.1	
Automobiles	1	2	2	0	5	78	5	109	0	192	4	64	64	0	132	158	174	5	0	337	666
% Automobiles	100	100	100	0	100	100	100	99.1	0	98.5	100	100	100	0	97.1	100	100	100	0	100	99
Bicycle and Pedestrian	0	0	0	0	0	0	0	1	2	3	0	0	0	4	4	0	0	0	0	0	7
% Bicycle and Pedestrian	0	0	0	0	0	0	0	0.9	100	1.5	0	0	0	100	2.9	0	0	0	0	0	1

Highlands Ranch, CO
Kaos
AM Peak
Plaza Dr & Erickson Blvd

File Name : Plaza and Erickson AM
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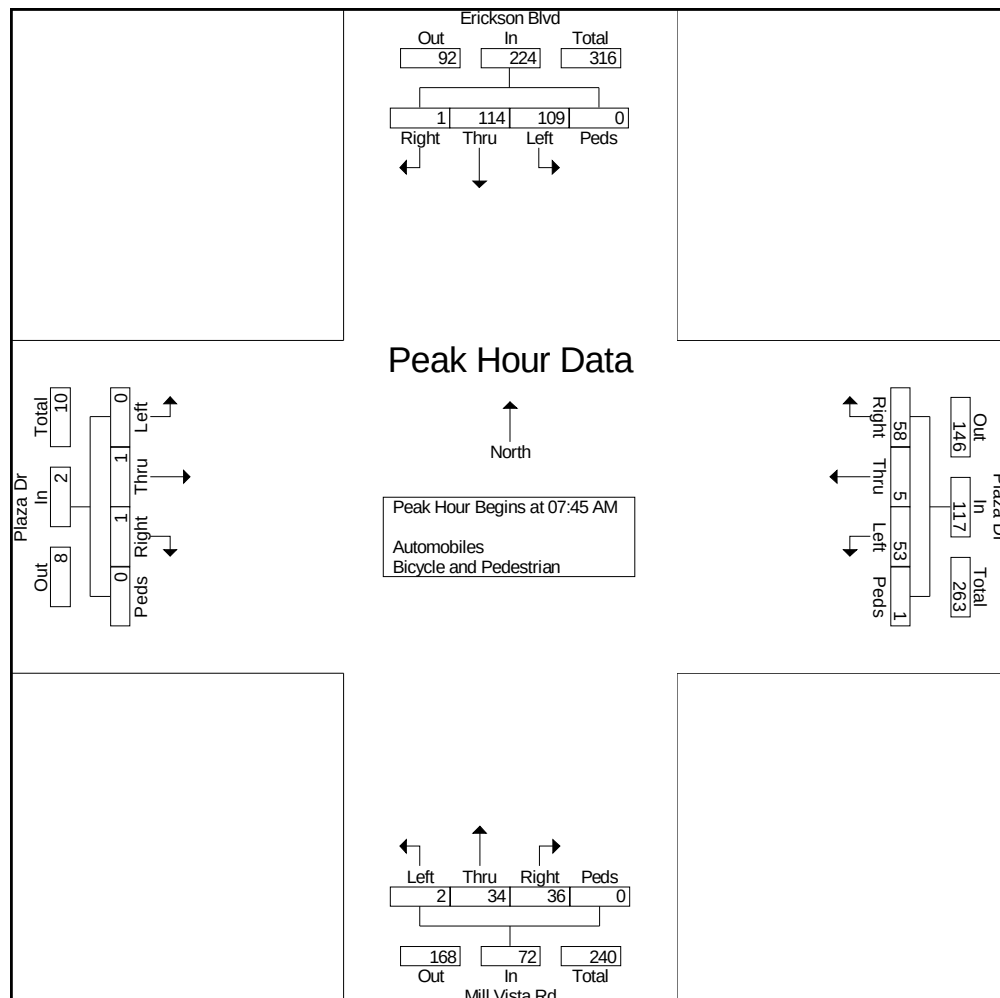




Highlands Ranch, CO
Kaos
AM Peak
Plaza Dr & Erickson Blvd

File Name : Plaza and Erickson AM
Site Code : IPO 596
Start Date : 3/2/2022
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	Plaza Dr Eastbound					Plaza Dr Westbound					Mill Vista Rd Northbound					Erickson Blvd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	1	0	1	15	1	16	0	32	1	6	4	0	11	42	33	0	0	75	119
08:00 AM	0	0	0	0	0	15	1	16	1	33	0	7	6	0	13	46	24	0	0	70	116
08:15 AM	0	0	0	0	0	10	0	12	0	22	1	8	16	0	25	10	36	1	0	47	94
08:30 AM	0	1	0	0	1	13	3	14	0	30	0	13	10	0	23	11	21	0	0	32	86
Total Volume	0	1	1	0	2	53	5	58	1	117	2	34	36	0	72	109	114	1	0	224	415
% App. Total	0	50	50	0		45.3	4.3	49.6	0.9		2.8	47.2	50	0		48.7	50.9	0.4	0		
PHF	.000	.250	.250	.000	.500	.883	.417	.906	.250	.886	.500	.654	.563	.000	.720	.592	.792	.250	.000	.747	.872





Highlands Ranch, CO
Kaos
PM Peak
Plaza Dr & Erickson Blvd

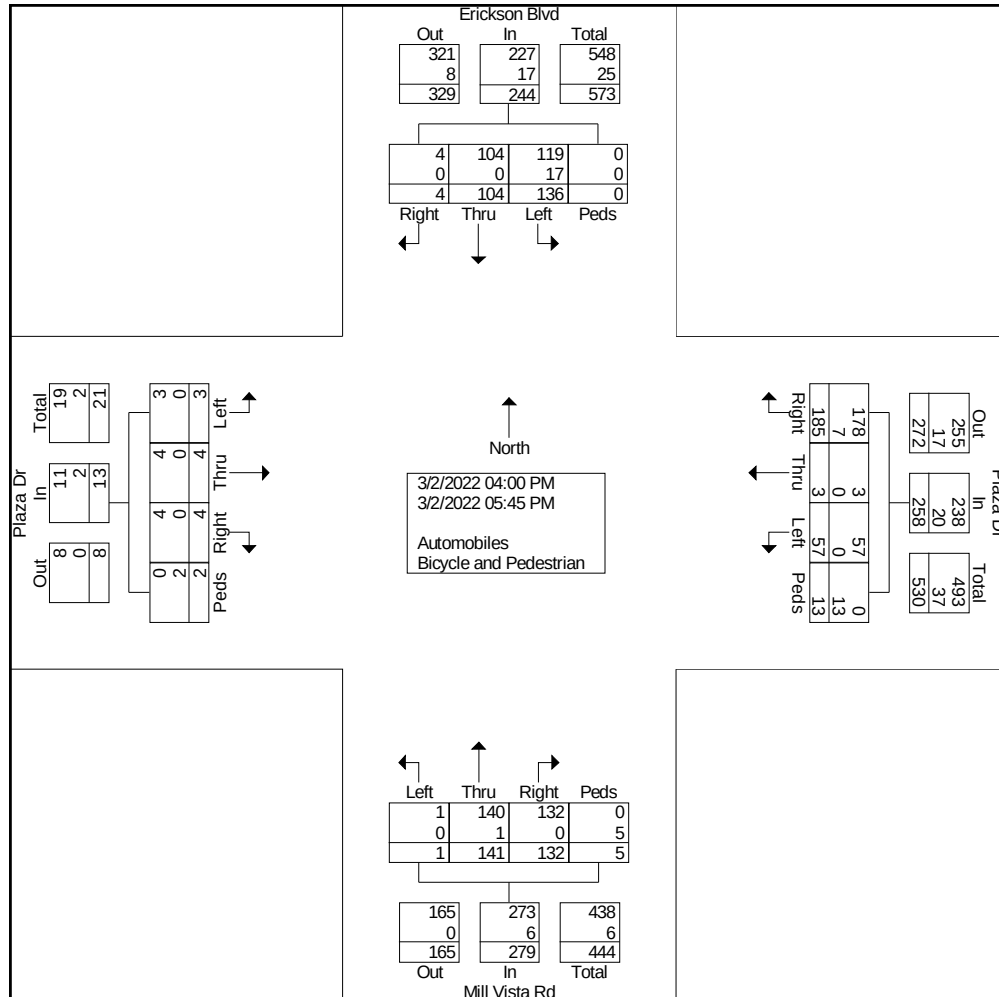
File Name : Plaza and Erickson PM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

	Plaza Dr Eastbound					Plaza Dr Westbound					Mill Vista Rd Northbound					Erickson Blvd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	0	0	2	2	9	1	29	1	40	0	31	28	0	59	19	20	0	0	39	140
04:15 PM	0	0	1	0	1	9	0	27	2	38	0	15	12	0	27	18	14	1	0	33	99
04:30 PM	0	1	1	0	2	6	0	31	0	37	1	11	13	0	25	19	18	1	0	38	102
04:45 PM	0	1	1	0	2	4	0	22	2	28	0	20	12	2	34	13	10	0	0	23	87
Total	0	2	3	2	7	28	1	109	5	143	1	77	65	2	145	69	62	2	0	133	428
05:00 PM	1	0	1	0	2	9	2	21	3	35	0	24	19	0	43	14	15	1	0	30	110
05:15 PM	1	1	0	0	2	8	0	16	1	25	0	14	20	1	35	20	7	0	0	27	89
05:30 PM	1	1	0	0	2	9	0	23	2	34	0	15	13	0	28	16	10	1	0	27	91
05:45 PM	0	0	0	0	0	3	0	16	2	21	0	11	15	2	28	17	10	0	0	27	76
Total	3	2	1	0	6	29	2	76	8	115	0	64	67	3	134	67	42	2	0	111	366
Grand Total	3	4	4	2	13	57	3	185	13	258	1	141	132	5	279	136	104	4	0	244	794
Apprch %	23.1	30.8	30.8	15.4		22.1	1.2	71.7	5		0.4	50.5	47.3	1.8		55.7	42.6	1.6	0		
Total %	0.4	0.5	0.5	0.3	1.6	7.2	0.4	23.3	1.6	32.5	0.1	17.8	16.6	0.6	35.1	17.1	13.1	0.5	0	30.7	
Automobiles	3	4	4	0	11	57	3	178	0	238	1	140	132	0	273	119	104	4	0	227	749
% Automobiles	100	100	100	0	84.6	100	100	96.2	0	92.2	100	99.3	100	0	97.8	87.5	100	100	0	93	94.3
Bicycle and Pedestrian	0	0	0	2	2	0	0	7	13	20	0	1	0	5	6	17	0	0	0	17	45
% Bicycle and Pedestrian	0	0	0	100	15.4	0	0	3.8	100	7.8	0	0.7	0	100	2.2	12.5	0	0	0	7	5.7

Highlands Ranch, CO
Kaos
PM Peak
Plaza Dr & Erickson Blvd

File Name : Plaza and Erickson PM
Site Code : IPO 596
Start Date : 3/2/2022
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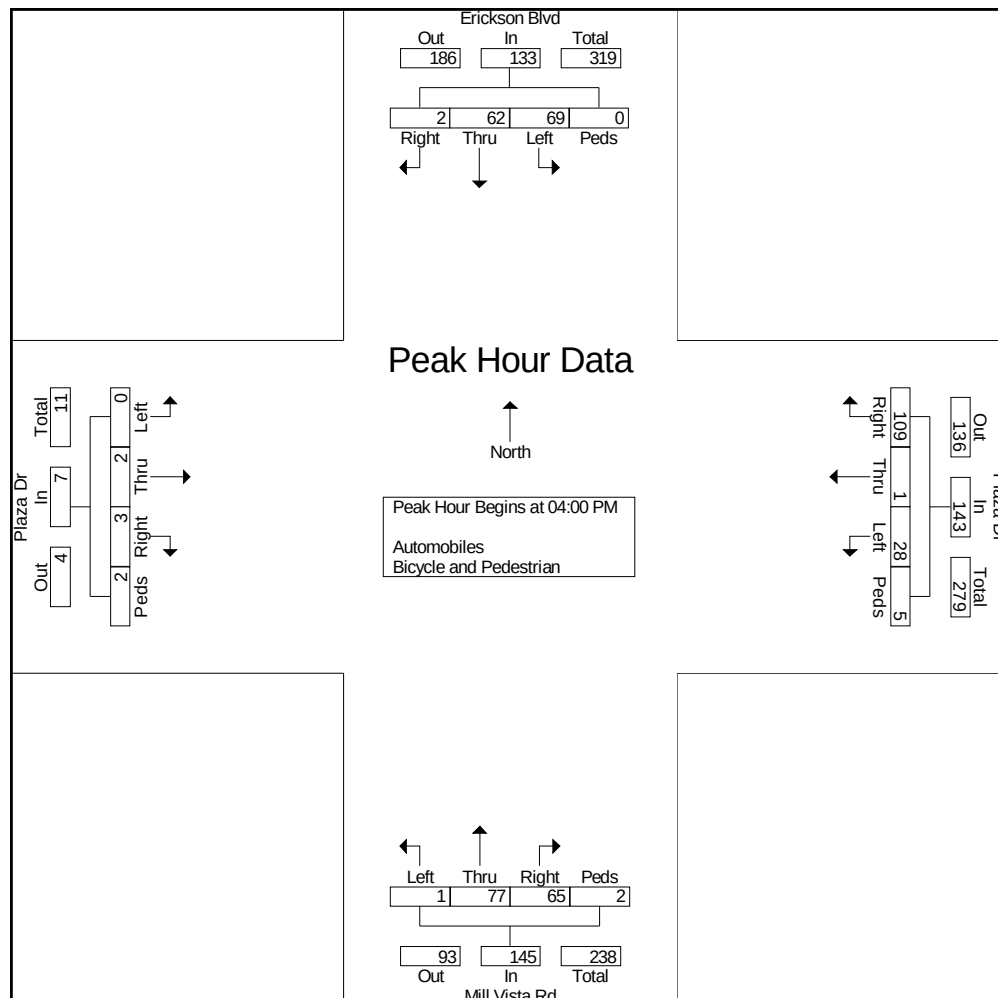




Highlands Ranch, CO
Kaos
PM Peak
Plaza Dr & Erickson Blvd

File Name : Plaza and Erickson PM
Site Code : IPO 596
Start Date : 3/2/2022
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	Plaza Dr Eastbound					Plaza Dr Westbound					Mill Vista Rd Northbound					Erickson Blvd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	2	2	9	1	29	1	40	0	31	28	0	59	19	20	0	0	39	140
04:15 PM	0	0	1	0	1	9	0	27	2	38	0	15	12	0	27	18	14	1	0	33	99
04:30 PM	0	1	1	0	2	6	0	31	0	37	1	11	13	0	25	19	18	1	0	38	102
04:45 PM	0	1	1	0	2	4	0	22	2	28	0	20	12	2	34	13	10	0	0	23	87
Total Volume	0	2	3	2	7	28	1	109	5	143	1	77	65	2	145	69	62	2	0	133	428
% App. Total	0	28.6	42.9	28.6		19.6	0.7	76.2	3.5		0.7	53.1	44.8	1.4		51.9	46.6	1.5	0		
PHF	.000	.500	.750	.250	.875	.778	.250	.879	.625	.894	.250	.621	.580	.250	.614	.908	.775	.500	.000	.853	.764





Highlands Ranch, CO
Kaos
AM Peak
Plaza Dr & Lucent Blvd

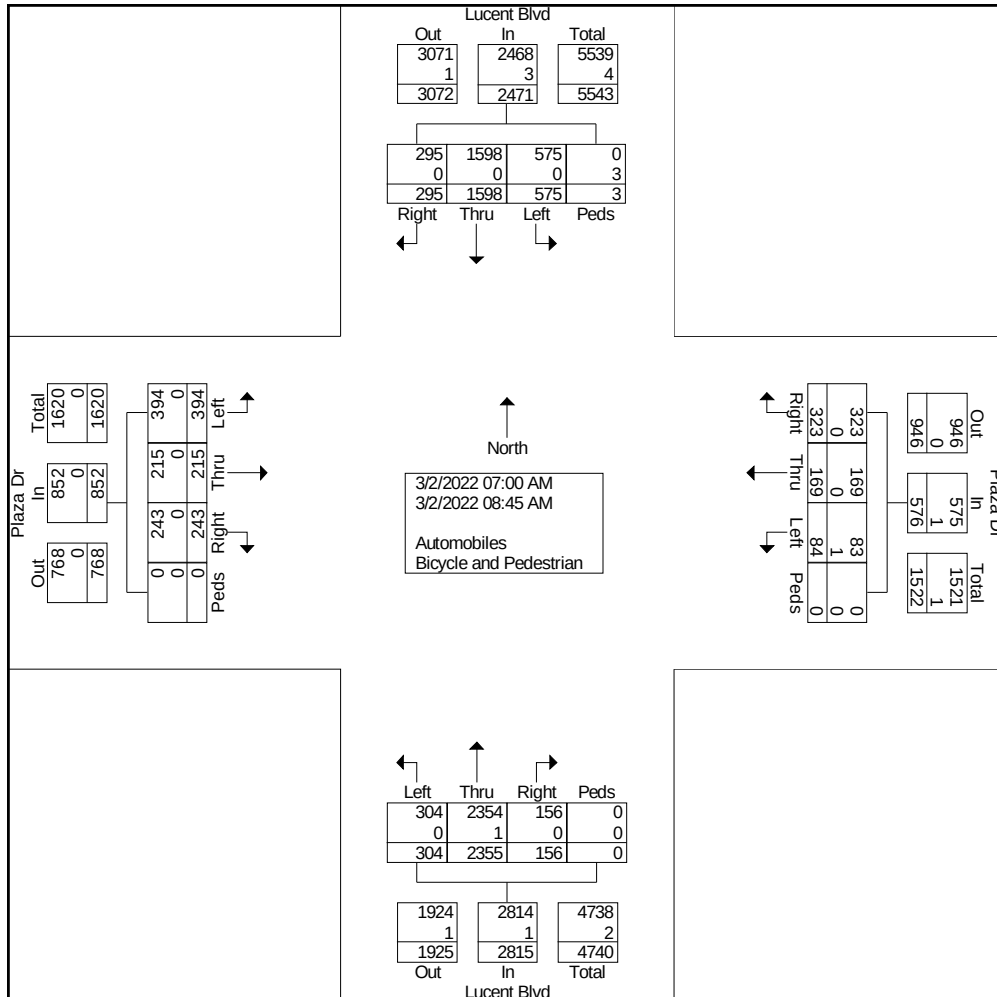
File Name : Plaza and Lucent AM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

	Plaza Dr Eastbound					Plaza Dr Westbound					Lucent Blvd Northbound					Lucent Blvd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00 AM	33	14	14	0	61	4	7	22	0	33	25	291	9	0	325	53	182	25	1	261	680
07:15 AM	38	16	12	0	66	11	7	67	0	85	17	304	24	0	345	96	193	23	0	312	808
07:30 AM	24	15	11	0	50	10	15	48	0	73	20	382	32	0	434	129	209	33	1	372	929
07:45 AM	69	42	49	0	160	17	57	54	0	128	114	333	16	0	463	78	168	57	1	304	1055
Total	164	87	86	0	337	42	86	191	0	319	176	1310	81	0	1567	356	752	138	3	1249	3472
08:00 AM	90	68	83	0	241	8	46	27	0	81	91	275	22	0	388	57	206	67	0	330	1040
08:15 AM	62	35	41	0	138	13	10	39	0	62	10	245	15	0	270	57	218	32	0	307	777
08:30 AM	35	11	15	0	61	9	17	37	0	63	16	304	15	0	335	66	223	34	0	323	782
08:45 AM	43	14	18	0	75	12	10	29	0	51	11	221	23	0	255	39	199	24	0	262	643
Total	230	128	157	0	515	42	83	132	0	257	128	1045	75	0	1248	219	846	157	0	1222	3242
Grand Total	394	215	243	0	852	84	169	323	0	576	304	2355	156	0	2815	575	1598	295	3	2471	6714
Apprch %	46.2	25.2	28.5	0		14.6	29.3	56.1	0		10.8	83.7	5.5	0		23.3	64.7	11.9	0.1		
Total %	5.9	3.2	3.6	0	12.7	1.3	2.5	4.8	0	8.6	4.5	35.1	2.3	0	41.9	8.6	23.8	4.4	0	36.8	
Automobiles	394	215	243	0	852	83	169	323	0	575	304	2354	156	0	2814	575	1598	295	0	2468	6709
% Automobiles	100	100	100	0	100	98.8	100	100	0	99.8	100	100	100	0	100	100	100	100	0	99.9	99.9
Bicycle and Pedestrian	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0	3	3	5
% Bicycle and Pedestrian	0	0	0	0	0	1.2	0	0	0	0.2	0	0	0	0	0	0	0	0	100	0.1	0.1

Highlands Ranch, CO
Kaos
AM Peak
Plaza Dr & Lucent Blvd

File Name : Plaza and Lucent AM
Site Code : IPO 596
Start Date : 3/2/2022
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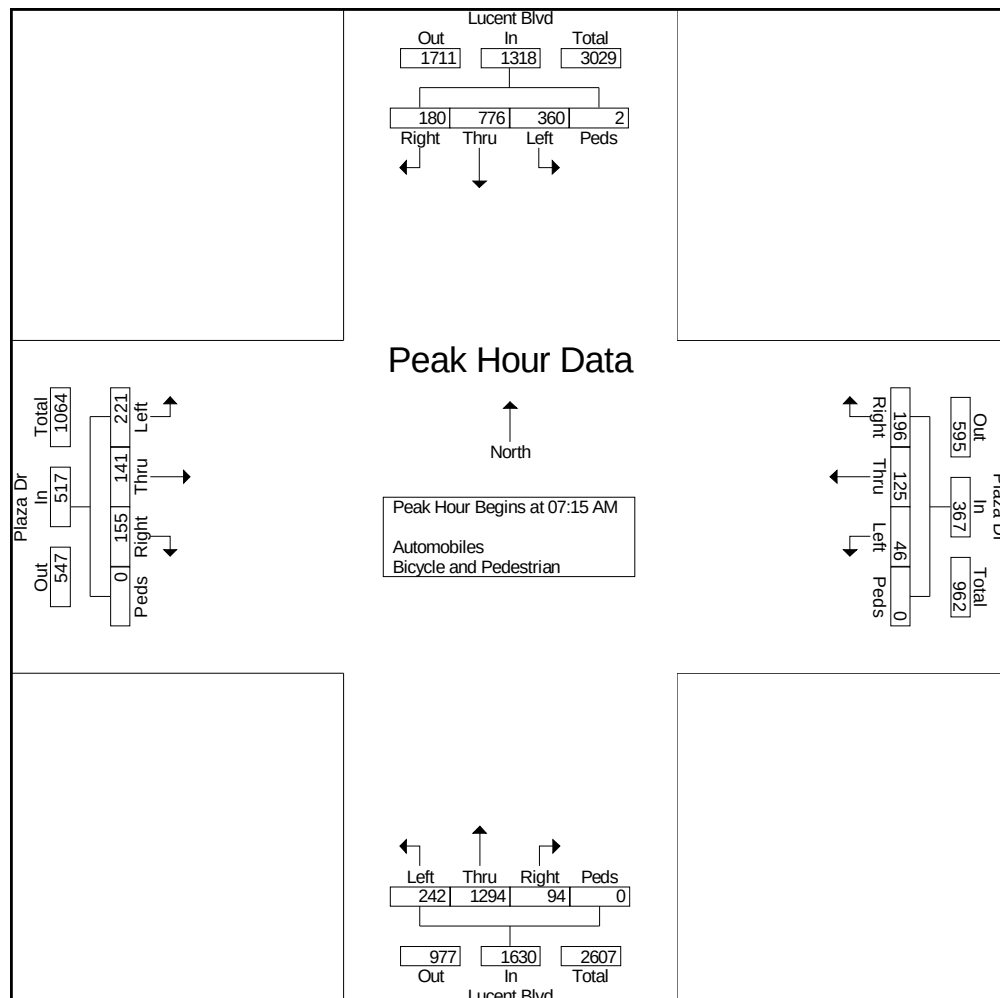




Highlands Ranch, CO
Kaos
AM Peak
Plaza Dr & Lucent Blvd

File Name : Plaza and Lucent AM
Site Code : IPO 596
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	Plaza Dr Eastbound					Plaza Dr Westbound					Lucent Blvd Northbound					Lucent Blvd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	38	16	12	0	66	11	7	67	0	85	17	304	24	0	345	96	193	23	0	312	808
07:30 AM	24	15	11	0	50	10	15	48	0	73	20	382	32	0	434	129	209	33	1	372	929
07:45 AM	69	42	49	0	160	17	57	54	0	128	114	333	16	0	463	78	168	57	1	304	1055
08:00 AM	90	68	83	0	241	8	46	27	0	81	91	275	22	0	388	57	206	67	0	330	1040
Total Volume	221	141	155	0	517	46	125	196	0	367	242	1294	94	0	1630	360	776	180	2	1318	3832
% App. Total	42.7	27.3	30	0		12.5	34.1	53.4	0		14.8	79.4	5.8	0		27.3	58.9	13.7	0.2		
PHF	.614	.518	.467	.000	.536	.676	.548	.731	.000	.717	.531	.847	.734	.000	.880	.698	.928	.672	.500	.886	.908





Highlands Ranch, CO
Kaos
PM Peak
Plaza Dr & Lucent Blvd

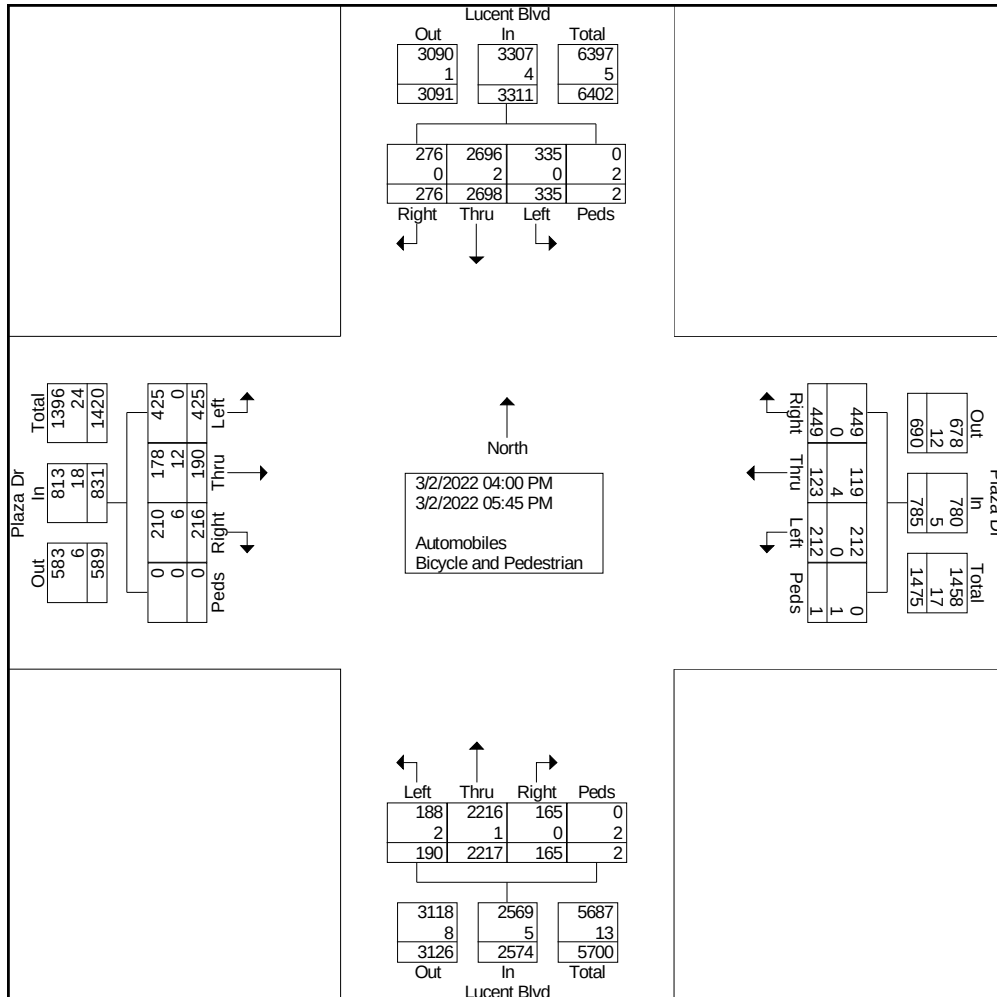
File Name : Plaza and Lucent PM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

	Plaza Dr Eastbound					Plaza Dr Westbound					Lucent Blvd Northbound					Lucent Blvd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	55	34	44	0	133	20	14	68	0	102	24	303	22	0	349	50	319	37	0	406	990
04:15 PM	45	26	36	0	107	23	12	63	0	98	22	271	21	1	315	45	304	37	1	387	907
04:30 PM	61	27	30	0	118	26	16	51	0	93	19	287	17	0	323	44	330	43	0	417	951
04:45 PM	45	20	24	0	89	19	22	49	1	91	21	279	18	1	319	53	332	19	0	404	903
Total	206	107	134	0	447	88	64	231	1	384	86	1140	78	2	1306	192	1285	136	1	1614	3751
05:00 PM	66	18	24	0	108	30	14	78	0	122	29	293	25	0	347	37	362	31	0	430	1007
05:15 PM	61	29	22	0	112	30	16	58	0	104	21	255	23	0	299	41	343	37	0	421	936
05:30 PM	57	16	18	0	91	29	12	51	0	92	16	291	22	0	329	38	406	43	1	488	1000
05:45 PM	35	20	18	0	73	35	17	31	0	83	38	238	17	0	293	27	302	29	0	358	807
Total	219	83	82	0	384	124	59	218	0	401	104	1077	87	0	1268	143	1413	140	1	1697	3750
Grand Total	425	190	216	0	831	212	123	449	1	785	190	2217	165	2	2574	335	2698	276	2	3311	7501
Apprch %	51.1	22.9	26	0		27	15.7	57.2	0.1		7.4	86.1	6.4	0.1		10.1	81.5	8.3	0.1		
Total %	5.7	2.5	2.9	0	11.1	2.8	1.6	6	0	10.5	2.5	29.6	2.2	0	34.3	4.5	36	3.7	0	44.1	
Automobiles	425	178	210	0	813	212	119	449	0	780	188	2216	165	0	2569	335	2696	276	0	3307	7469
% Automobiles	100	93.7	97.2	0	97.8	100	96.7	100	0	99.4	98.9	100	100	0	99.8	100	99.9	100	0	99.9	99.6
Bicycle and Pedestrian	0	12	6	0	18	0	4	0	1	5	2	1	0	2	5	0	2	0	2	4	32
% Bicycle and Pedestrian	0	6.3	2.8	0	2.2	0	3.3	0	100	0.6	1.1	0	0	100	0.2	0	0.1	0	100	0.1	0.4

Highlands Ranch, CO
Kaos
PM Peak
Plaza Dr & Lucent Blvd

File Name : Plaza and Lucent PM
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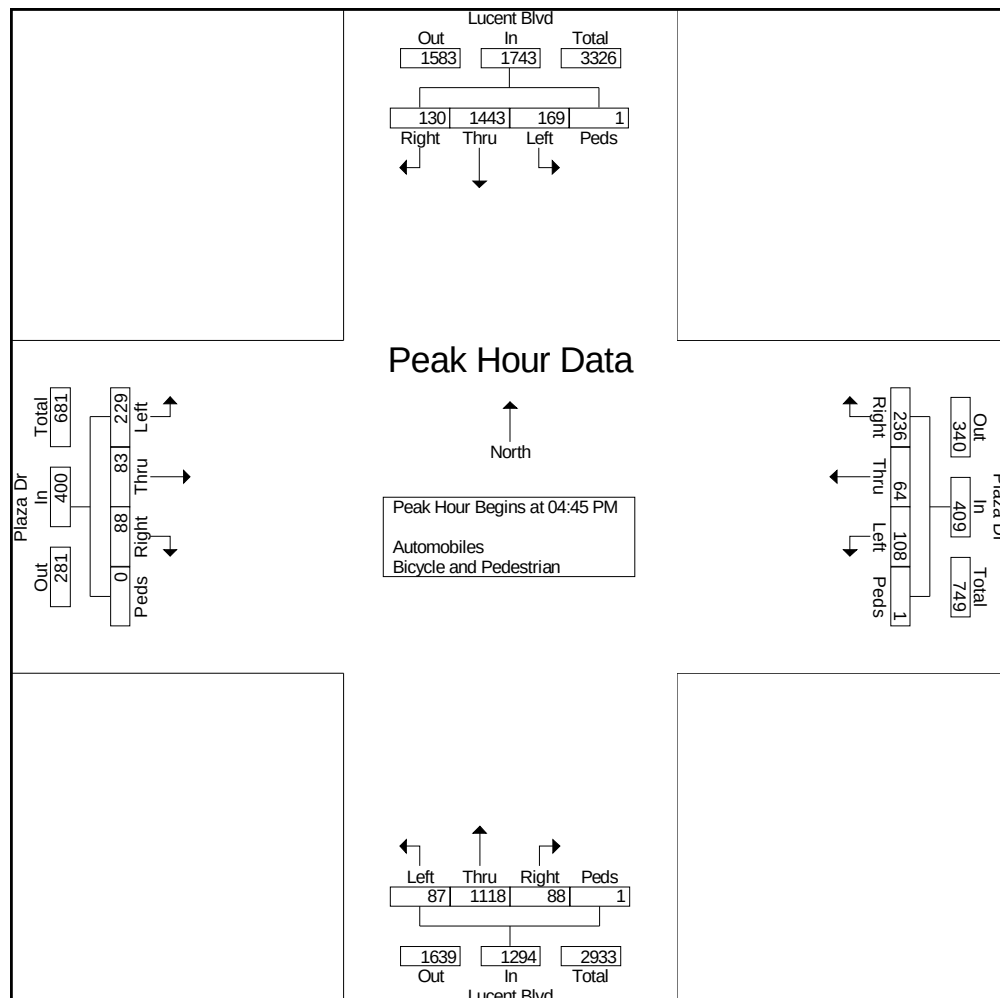




Highlands Ranch, CO
Kaos
PM Peak
Plaza Dr & Lucent Blvd

File Name : Plaza and Lucent PM
Site Code : IPO 596
Start Date : 3/2/2022
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	Plaza Dr Eastbound					Plaza Dr Westbound					Lucent Blvd Northbound					Lucent Blvd Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	45	20	24	0	89	19	22	49	1	91	21	279	18	1	319	53	332	19	0	404	903
05:00 PM	66	18	24	0	108	30	14	78	0	122	29	293	25	0	347	37	362	31	0	430	1007
05:15 PM	61	29	22	0	112	30	16	58	0	104	21	255	23	0	299	41	343	37	0	421	936
05:30 PM	57	16	18	0	91	29	12	51	0	92	16	291	22	0	329	38	406	43	1	488	1000
Total Volume	229	83	88	0	400	108	64	236	1	409	87	1118	88	1	1294	169	1443	130	1	1743	3846
% App. Total	57.2	20.8	22	0		26.4	15.6	57.7	0.2		6.7	86.4	6.8	0.1		9.7	82.8	7.5	0.1		
PHF	.867	.716	.917	.000	.893	.900	.727	.756	.250	.838	.750	.954	.880	.250	.932	.797	.889	.756	.250	.893	.955





Highlands Ranch, CO
Kaos
AM Peak
Plaza Dr Full Access

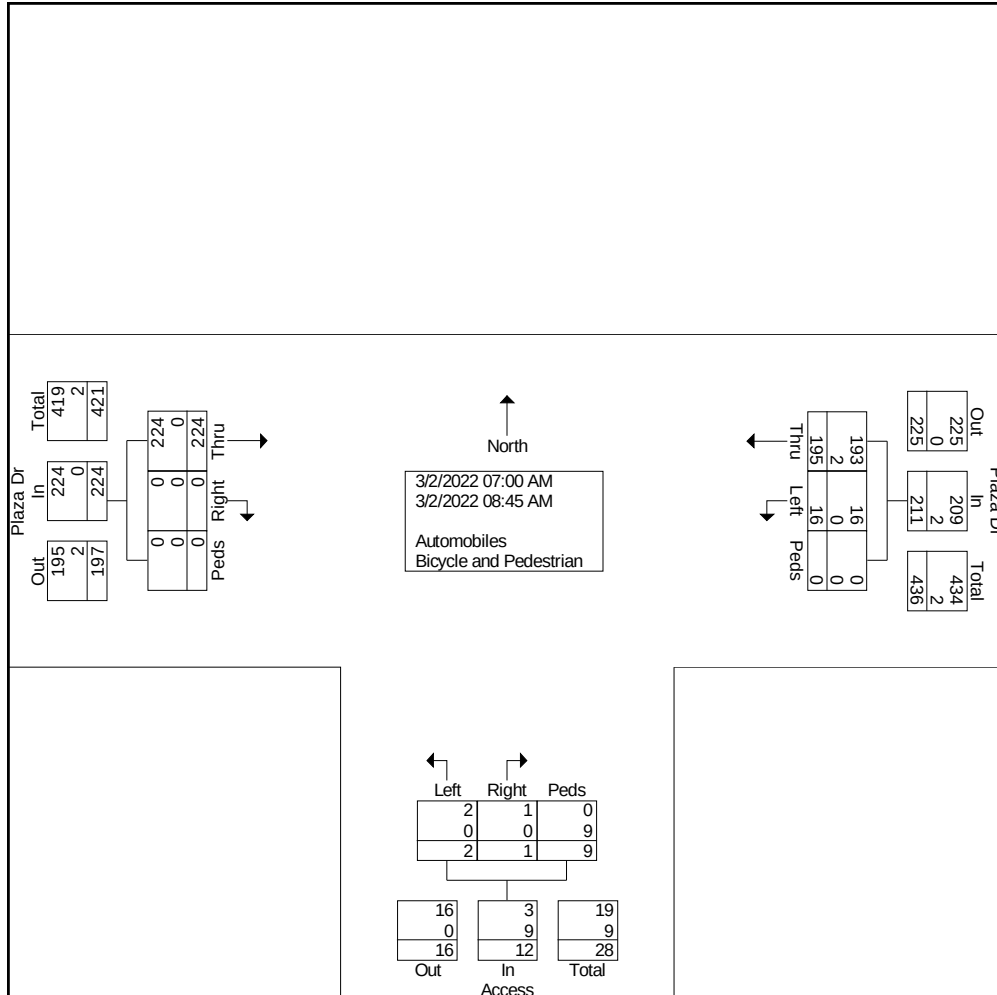
File Name : Plaza Dr Full Access AM
Site Code : IPO 596
Start Date : 3/2/2022
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Groups Printed- Automobiles - Bicycle and Pedestrian

Start Time	Plaza Dr Eastbound				Plaza Dr Westbound				Access Northbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
07:00 AM	20	0	0	20	4	21	0	25	0	0	0	0	45
07:15 AM	22	0	0	22	4	20	0	24	1	1	1	3	49
07:30 AM	19	0	0	19	0	25	0	25	0	0	0	0	44
07:45 AM	46	0	0	46	1	33	0	34	0	0	2	2	82
Total	107	0	0	107	9	99	0	108	1	1	3	5	220
08:00 AM	56	0	0	56	5	32	0	37	0	0	1	1	94
08:15 AM	25	0	0	25	0	21	0	21	0	0	0	0	46
08:30 AM	24	0	0	24	2	32	0	34	0	0	1	1	59
08:45 AM	12	0	0	12	0	11	0	11	1	0	4	5	28
Total	117	0	0	117	7	96	0	103	1	0	6	7	227
Grand Total	224	0	0	224	16	195	0	211	2	1	9	12	447
Apprch %	100	0	0		7.6	92.4	0		16.7	8.3	75		
Total %	50.1	0	0	50.1	3.6	43.6	0	47.2	0.4	0.2	2	2.7	
Automobiles	224	0	0	224	16	193	0	209	2	1	0	3	436
% Automobiles	100	0	0	100	100	99	0	99.1	100	100	0	25	97.5
Bicycle and Pedestrian	0	0	0	0	0	2	0	2	0	0	9	9	11
% Bicycle and Pedestrian	0	0	0	0	0	1	0	0.9	0	0	100	75	2.5

Highlands Ranch, CO
Kaos
AM Peak
Plaza Dr Full Access

File Name : Plaza Dr Full Access AM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 2

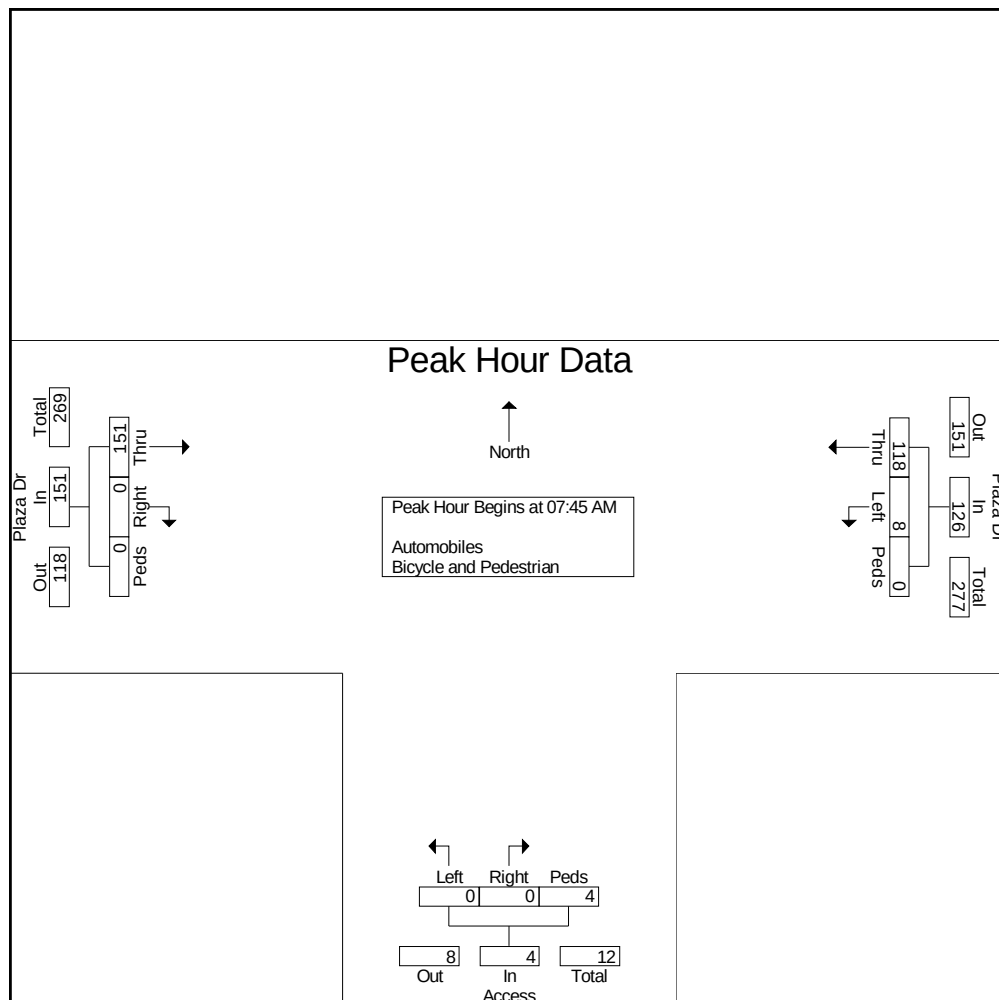




Highlands Ranch, CO
Kaos
AM Peak
Plaza Dr Full Access

File Name : Plaza Dr Full Access AM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 3

	Plaza Dr Eastbound				Plaza Dr Westbound				Access Northbound				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:45 AM													
07:45 AM	46	0	0	46	1	33	0	34	0	0	2	2	82
08:00 AM	56	0	0	56	5	32	0	37	0	0	1	1	94
08:15 AM	25	0	0	25	0	21	0	21	0	0	0	0	46
08:30 AM	24	0	0	24	2	32	0	34	0	0	1	1	59
Total Volume	151	0	0	151	8	118	0	126	0	0	4	4	281
% App. Total	100	0	0		6.3	93.7	0		0	0	100		
PHF	.674	.000	.000	.674	.400	.894	.000	.851	.000	.000	.500	.500	.747





Highlands Ranch, CO
Kaos
PM Peak
Plaza Dr Full Access

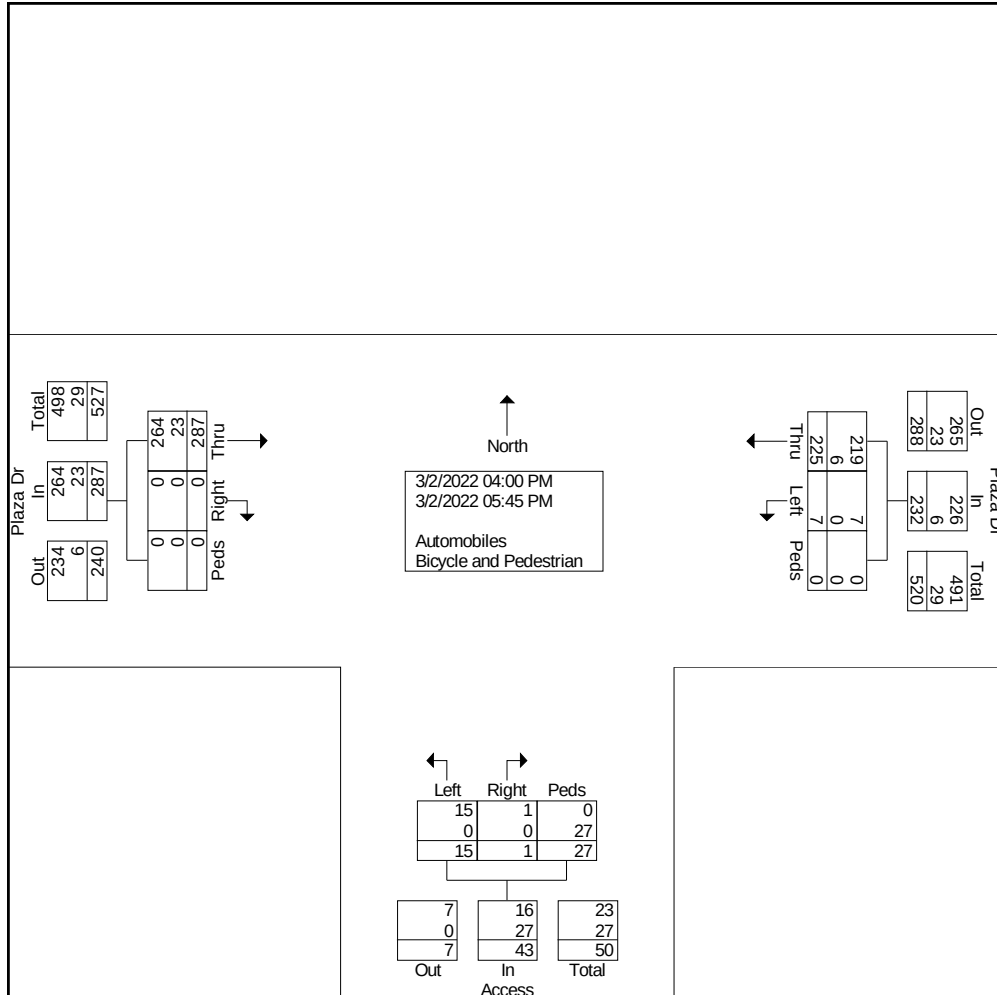
File Name : Plaza Dr Full Access PM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 1

Groups Printed- Automobiles - Bicycle and Pedestrian

Start Time	Plaza Dr Eastbound				Plaza Dr Westbound				Access Northbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
04:00 PM	44	0	0	44	1	32	0	33	7	0	0	7	84
04:15 PM	34	0	0	34	0	28	0	28	3	0	4	7	69
04:30 PM	35	0	0	35	0	34	0	34	2	0	3	5	74
04:45 PM	33	0	0	33	3	25	0	28	0	0	4	4	65
Total	146	0	0	146	4	119	0	123	12	0	11	23	292
05:00 PM	34	0	0	34	0	32	0	32	2	0	5	7	73
05:15 PM	44	0	0	44	2	24	0	26	0	1	3	4	74
05:30 PM	33	0	0	33	1	31	0	32	1	0	4	5	70
05:45 PM	30	0	0	30	0	19	0	19	0	0	4	4	53
Total	141	0	0	141	3	106	0	109	3	1	16	20	270
Grand Total	287	0	0	287	7	225	0	232	15	1	27	43	562
Apprch %	100	0	0		3	97	0		34.9	2.3	62.8		
Total %	51.1	0	0	51.1	1.2	40	0	41.3	2.7	0.2	4.8	7.7	
Automobiles	264	0	0	264	7	219	0	226	15	1	0	16	506
% Automobiles	92	0	0	92	100	97.3	0	97.4	100	100	0	37.2	90
Bicycle and Pedestrian	23	0	0	23	0	6	0	6	0	0	27	27	56
% Bicycle and Pedestrian	8	0	0	8	0	2.7	0	2.6	0	0	100	62.8	10

Highlands Ranch, CO
Kaos
PM Peak
Plaza Dr Full Access

File Name : Plaza Dr Full Access PM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 2

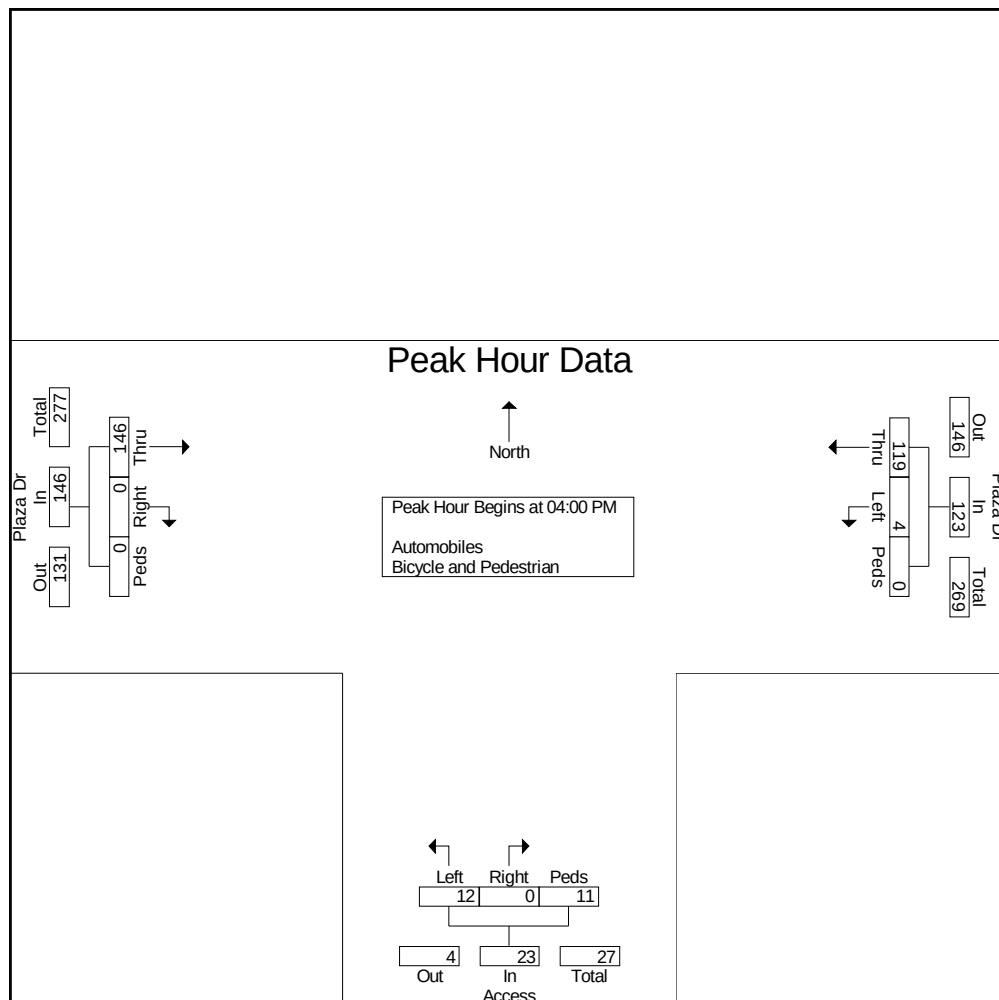




Highlands Ranch, CO
Kaos
PM Peak
Plaza Dr Full Access

File Name : Plaza Dr Full Access PM
Site Code : IPO 596
Start Date : 3/2/2022
Page No : 3

	Plaza Dr Eastbound				Plaza Dr Westbound				Access Northbound				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	44	0	0	44	1	32	0	33	7	0	0	7	84
04:15 PM	34	0	0	34	0	28	0	28	3	0	4	7	69
04:30 PM	35	0	0	35	0	34	0	34	2	0	3	5	74
04:45 PM	33	0	0	33	3	25	0	28	0	0	4	4	65
Total Volume	146	0	0	146	4	119	0	123	12	0	11	23	292
% App. Total	100	0	0		3.3	96.7	0		52.2	0	47.8		
PHF	.830	.000	.000	.830	.333	.875	.000	.904	.429	.000	.688	.821	.869



APPENDIX B

Future Traffic Projections

DRCOG Traffic Projections: Kaos

Location	2020	2050	Growth Factor	Annual Growth
County Line E/O Erickson Dr	11,000	12,000	1.09	0.36%
Lucent Boulevard N/O Plaza Dr	41,000	43,000	1.05	0.20%
Total	11,000	12,000	1.09	0.36%

APPENDIX C

Trip Generation Worksheets

Project Kaos - Highlands Ranch
 Subject Trip Generation for Multifamily Housing (Mid-Rise)
 Designed by MAG Date March 16, 2022 Job No. 096391027
 Checked by _____ Date _____ Sheet No. _____ of _____

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 11th Edition, Fitted Curve Equations

Land Use Code - Multifamily Housing (Mid-Rise) (221)

Independent Variable - Dwelling Units (X)

$$X = 240$$

T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (200 Series Page 275)

(T) = 0.44 (X) - 11.61	Directional Distribution:	23% ent.	77% exit.
(T) = 0.44 * (240.0) - 11.61	T = 94	Average Vehicle Trip Ends	
	22 entering	72 exiting	
	22 + 72 = 94		

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (200 Series Page 276)

(T) = 0.39 (X) + 0.34	Directional Distribution:	61% ent.	39% exit.
(T) = 0.39 * (240.0) + 0.34	T = 94	Average Vehicle Trip Ends	
	57 entering	37 exiting	
	57 + 37 = 94		

Weekday (200 Series Page 274)

(T) = 4.77 (X) - 46.46	Directional Distribution:	50% ent.	50% exit.
(T) = 4.77 * (240.0) - 46.46	T = 1100	Average Vehicle Trip Ends	
	550 entering	550 exiting	
	550 + 550 = 1100		

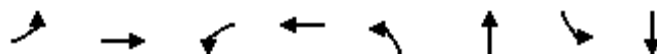
APPENDIX D

Intersection Analysis Worksheets

Timings

1: Erickson Boulevard & County Line Road

2022 Existing AM.syn
03/18/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	41	214	55	186	143	4	15	2
Future Volume (vph)	41	214	55	186	143	4	15	2
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	13.0	33.0	16.0	36.0	21.0	38.0	13.0	30.0
Total Split (%)	13.0%	33.0%	16.0%	36.0%	21.0%	38.0%	13.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	20.4	14.6	22.6	15.6	62.6	57.8	53.2	47.2
Actuated g/C Ratio	0.20	0.15	0.23	0.16	0.63	0.58	0.53	0.47
v/c Ratio	0.18	0.71	0.31	0.46	0.21	0.04	0.02	0.07
Control Delay	25.5	28.0	28.5	37.2	10.5	6.8	10.9	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.5	28.0	28.5	37.2	10.5	6.8	10.9	7.1
LOS	C	C	C	D	B	A	B	A
Approach Delay		27.8		35.4		9.8		8.1
Approach LOS		C		D		A		A

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 25.3

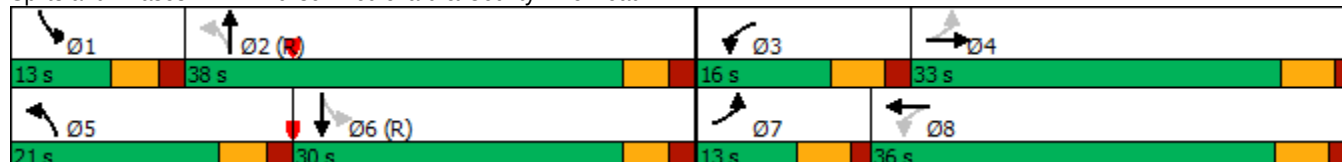
Intersection LOS: C

Intersection Capacity Utilization 44.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road



HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2022 Existing AM.syn

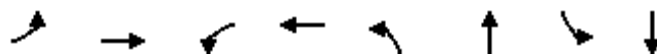
03/18/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	214	180	55	186	28	143	4	30	15	2	42
Future Volume (veh/h)	41	214	180	55	186	28	143	4	30	15	2	42
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	49	255	214	65	221	33	170	5	36	18	2	50
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	279	333	269	186	585	86	821	104	752	765	30	738
Arrive On Green	0.04	0.18	0.18	0.04	0.19	0.19	0.07	0.53	0.53	0.02	0.48	0.48
Sat Flow, veh/h	1781	1867	1509	1781	3107	458	1781	197	1418	1781	61	1533
Grp Volume(v), veh/h	49	242	227	65	125	129	170	0	41	18	0	52
Grp Sat Flow(s),veh/h/ln	1781	1777	1599	1781	1777	1788	1781	0	1615	1781	0	1594
Q Serve(g_s), s	2.2	13.0	13.6	3.0	6.1	6.3	4.6	0.0	1.2	0.5	0.0	1.7
Cycle Q Clear(g_c), s	2.2	13.0	13.6	3.0	6.1	6.3	4.6	0.0	1.2	0.5	0.0	1.7
Prop In Lane	1.00		0.94	1.00		0.26	1.00		0.88	1.00		0.96
Lane Grp Cap(c), veh/h	279	317	285	186	334	336	821	0	856	765	0	767
V/C Ratio(X)	0.18	0.76	0.79	0.35	0.37	0.38	0.21	0.00	0.05	0.02	0.00	0.07
Avail Cap(c_a), veh/h	346	489	440	290	533	536	975	0	856	863	0	767
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	31.8	39.1	39.3	32.5	35.4	35.5	10.6	0.0	11.3	12.6	0.0	13.9
Incr Delay (d2), s/veh	0.3	3.8	5.5	1.1	0.7	0.7	0.1	0.0	0.1	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	5.9	5.7	1.3	2.7	2.8	1.8	0.0	0.5	0.2	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.1	42.9	44.8	33.7	36.1	36.2	10.7	0.0	11.4	12.6	0.0	14.1
LnGrp LOS	C	D	D	C	D	D	B	A	B	B	A	B
Approach Vol, veh/h		518			319			211			70	
Approach Delay, s/veh		42.7			35.7			10.9			13.7	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.5	58.5	10.2	23.9	12.3	53.6	9.2	24.8				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	32.5	10.0	* 28	15.5	24.5	7.5	30.0				
Max Q Clear Time (g_c+l1), s	2.5	3.2	5.0	15.6	6.6	3.7	4.2	8.3				
Green Ext Time (p_c), s	0.0	0.2	0.0	2.3	0.3	0.2	0.0	1.4				
Intersection Summary												
HCM 6th Ctrl Delay			32.9									
HCM 6th LOS			C									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Timings

1: Erickson Boulevard & County Line Road

2022 Existing PM.syn
03/18/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	58	201	65	325	132	3	28	3
Future Volume (vph)	58	201	65	325	132	3	28	3
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	16.0	33.0	16.0	33.0	21.0	38.0	13.0	30.0
Total Split (%)	16.0%	33.0%	16.0%	33.0%	21.0%	38.0%	13.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	23.6	16.6	23.7	16.6	59.7	53.1	51.9	45.5
Actuated g/C Ratio	0.24	0.17	0.24	0.17	0.60	0.53	0.52	0.46
v/c Ratio	0.26	0.54	0.28	0.68	0.19	0.06	0.04	0.07
Control Delay	25.8	30.9	26.6	44.0	11.2	6.5	11.4	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.8	30.9	26.6	44.0	11.2	6.5	11.4	7.7
LOS	C	C	C	D	B	A	B	A
Approach Delay		30.1		41.3		10.0		9.1
Approach LOS		C		D		B		A

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 29.8

Intersection LOS: C

Intersection Capacity Utilization 42.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road

Ø1	Ø2 (R)	Ø3	Ø4
13 s	38 s	16 s	33 s
Ø5	Ø6 (R)	Ø7	Ø8
21 s	30 s	16 s	33 s

HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2022 Existing PM.syn
03/18/2022

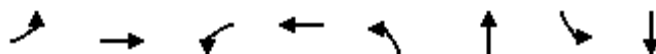
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	201	101	65	325	29	132	3	40	28	3	41
Future Volume (veh/h)	58	201	101	65	325	29	132	3	40	28	3	41
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	65	226	113	73	365	33	148	3	45	31	3	46
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	188	318	153	199	483	43	871	56	835	838	52	790
Arrive On Green	0.04	0.14	0.14	0.05	0.15	0.15	0.06	0.56	0.56	0.03	0.53	0.53
Sat Flow, veh/h	1781	2324	1121	1781	3297	297	1781	100	1500	1781	98	1502
Grp Volume(v), veh/h	65	171	168	73	196	202	148	0	48	31	0	49
Grp Sat Flow(s),veh/h/ln	1781	1777	1669	1781	1777	1817	1781	0	1600	1781	0	1600
Q Serve(g_s), s	3.1	9.2	9.7	3.5	10.6	10.7	3.8	0.0	1.4	0.8	0.0	1.5
Cycle Q Clear(g_c), s	3.1	9.2	9.7	3.5	10.6	10.7	3.8	0.0	1.4	0.8	0.0	1.5
Prop In Lane	1.00		0.67	1.00		0.16	1.00		0.94	1.00		0.94
Lane Grp Cap(c), veh/h	188	243	228	199	261	266	871	0	891	838	0	842
V/C Ratio(X)	0.35	0.70	0.74	0.37	0.75	0.76	0.17	0.00	0.05	0.04	0.00	0.06
Avail Cap(c_a), veh/h	298	489	459	292	480	491	1041	0	891	920	0	842
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	35.4	41.2	41.4	35.2	40.9	41.0	9.4	0.0	10.1	10.1	0.0	11.6
Incr Delay (d2), s/veh	1.1	3.7	4.6	1.1	4.3	4.4	0.1	0.0	0.1	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	4.2	4.2	1.6	4.9	5.1	1.4	0.0	0.5	0.3	0.0	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.5	44.9	46.1	36.3	45.3	45.4	9.5	0.0	10.3	10.1	0.0	11.7
LnGrp LOS	D	D	D	D	D	D	A	A	B	B	A	B
Approach Vol, veh/h	404			471			196			80		
Approach Delay, s/veh	44.0			43.9			9.7			11.1		
Approach LOS	D			D			A			B		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.4	61.1	10.8	19.7	11.4	58.1	9.8	20.7				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	32.5	10.0	* 28	15.5	24.5	10.5	27.0				
Max Q Clear Time (g_c+I1), s	2.8	3.4	5.5	11.7	5.8	3.5	5.1	12.7				
Green Ext Time (p_c), s	0.0	0.2	0.0	1.8	0.2	0.2	0.0	2.0				
Intersection Summary												
HCM 6th Ctrl Delay	35.9											
HCM 6th LOS	D											
Notes												

Timings

1: Erickson Boulevard & County Line Road

2024 Background AM.syn

08/08/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	42	218	56	190	166	4	15	2
Future Volume (vph)	42	218	56	190	166	4	15	2
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	13.0	32.0	17.0	36.0	21.0	38.0	13.0	30.0
Total Split (%)	13.0%	32.0%	17.0%	36.0%	21.0%	38.0%	13.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	20.8	15.0	23.2	16.1	62.1	57.3	51.9	45.8
Actuated g/C Ratio	0.21	0.15	0.23	0.16	0.62	0.57	0.52	0.46
v/c Ratio	0.18	0.73	0.31	0.45	0.25	0.04	0.02	0.07
Control Delay	25.1	28.2	28.2	36.6	11.0	6.9	11.4	7.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.1	28.2	28.2	36.6	11.0	6.9	11.4	7.6
LOS	C	C	C	D	B	A	B	A
Approach Delay		27.9		34.9		10.3		8.6
Approach LOS		C		C		B		A

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 25.1

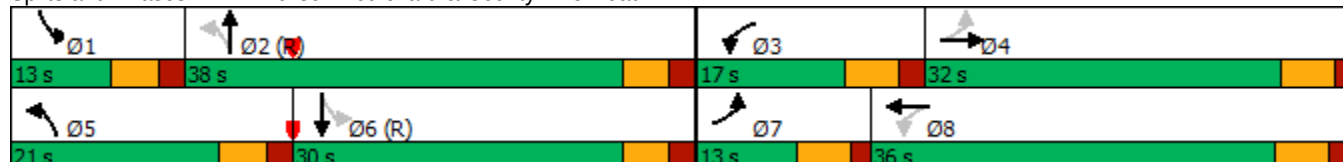
Intersection LOS: C

Intersection Capacity Utilization 46.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road



HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2024 Background AM.syn

08/08/2022

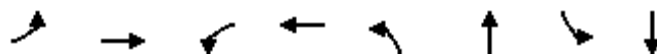
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	218	194	56	190	29	166	4	31	15	2	43
Future Volume (veh/h)	42	218	194	56	190	29	166	4	31	15	2	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	50	260	231	67	226	35	198	5	37	18	2	51
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	285	335	287	186	602	92	814	101	744	742	28	713
Arrive On Green	0.04	0.18	0.18	0.04	0.19	0.19	0.08	0.52	0.52	0.02	0.46	0.46
Sat Flow, veh/h	1781	1814	1554	1781	3090	472	1781	192	1422	1781	60	1534
Grp Volume(v), veh/h	50	254	237	67	129	132	198	0	42	18	0	53
Grp Sat Flow(s),veh/h/ln	1781	1777	1591	1781	1777	1785	1781	0	1614	1781	0	1594
Q Serve(g_s), s	2.2	13.6	14.2	3.0	6.3	6.5	5.5	0.0	1.3	0.5	0.0	1.8
Cycle Q Clear(g_c), s	2.2	13.6	14.2	3.0	6.3	6.5	5.5	0.0	1.3	0.5	0.0	1.8
Prop In Lane	1.00		0.98	1.00		0.26	1.00		0.88	1.00		0.96
Lane Grp Cap(c), veh/h	285	328	294	186	346	348	814	0	844	742	0	741
V/C Ratio(X)	0.18	0.78	0.81	0.36	0.37	0.38	0.24	0.00	0.05	0.02	0.00	0.07
Avail Cap(c_a), veh/h	351	471	422	306	533	536	952	0	844	840	0	741
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	31.3	38.8	39.1	32.1	34.9	35.0	10.8	0.0	11.7	13.4	0.0	14.8
Incr Delay (d2), s/veh	0.3	5.1	7.3	1.2	0.7	0.7	0.2	0.0	0.1	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	6.3	6.1	1.4	2.8	2.9	2.1	0.0	0.5	0.2	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.6	43.9	46.4	33.3	35.6	35.7	11.0	0.0	11.8	13.4	0.0	15.0
LnGrp LOS	C	D	D	C	D	D	B	A	B	B	A	B
Approach Vol, veh/h		541			328			240			71	
Approach Delay, s/veh		43.8			35.2			11.1			14.6	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.5	57.8	10.3	24.5	13.3	52.0	9.3	25.5				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	32.5	11.0	* 27	15.5	24.5	7.5	30.0				
Max Q Clear Time (g_c+I1), s	2.5	3.3	5.0	16.2	7.5	3.8	4.2	8.5				
Green Ext Time (p_c), s	0.0	0.2	0.1	2.2	0.3	0.2	0.0	1.4				
Intersection Summary												
HCM 6th Ctrl Delay			33.0									
HCM 6th LOS			C									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Timings

1: Erickson Boulevard & County Line Road

2024 Background PM.syn

08/08/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	59	205	66	332	151	3	29	3
Future Volume (vph)	59	205	66	332	151	3	29	3
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	23.0	27.0	23.0	27.0	21.0	37.0	13.0	29.0
Total Split (%)	23.0%	27.0%	23.0%	27.0%	21.0%	37.0%	13.0%	29.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	23.9	16.8	24.2	16.9	59.6	52.7	50.9	44.5
Actuated g/C Ratio	0.24	0.17	0.24	0.17	0.60	0.53	0.51	0.44
v/c Ratio	0.26	0.56	0.29	0.68	0.22	0.06	0.05	0.07
Control Delay	25.6	28.8	26.5	43.8	11.5	6.6	11.7	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	28.8	26.5	43.8	11.5	6.6	11.7	7.9
LOS	C	C	C	D	B	A	B	A
Approach Delay		28.3		41.1		10.4		9.4
Approach LOS		C		D		B		A

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 28.9

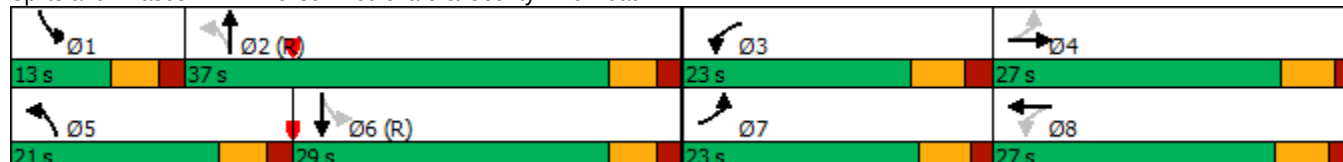
Intersection LOS: C

Intersection Capacity Utilization 43.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road



HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2024 Background PM.syn

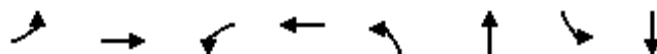
08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	205	124	66	332	30	151	3	41	29	3	42
Future Volume (veh/h)	59	205	124	66	332	30	151	3	41	29	3	42
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	66	230	139	74	373	34	170	3	46	33	3	47
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	191	305	177	194	498	45	865	54	826	822	49	772
Arrive On Green	0.04	0.14	0.14	0.05	0.15	0.15	0.07	0.55	0.55	0.03	0.51	0.51
Sat Flow, veh/h	1781	2163	1257	1781	3295	299	1781	98	1502	1781	96	1504
Grp Volume(v), veh/h	66	187	182	74	200	207	170	0	49	33	0	50
Grp Sat Flow(s),veh/h/ln	1781	1777	1644	1781	1777	1817	1781	0	1600	1781	0	1600
Q Serve(g_s), s	3.1	10.1	10.7	3.5	10.8	10.9	4.4	0.0	1.4	0.9	0.0	1.6
Cycle Q Clear(g_c), s	3.1	10.1	10.7	3.5	10.8	10.9	4.4	0.0	1.4	0.9	0.0	1.6
Prop In Lane	1.00		0.76	1.00		0.16	1.00		0.94	1.00		0.94
Lane Grp Cap(c), veh/h	191	251	232	194	268	274	865	0	880	822	0	822
V/C Ratio(X)	0.34	0.75	0.78	0.38	0.75	0.75	0.20	0.00	0.06	0.04	0.00	0.06
Avail Cap(c_a), veh/h	425	382	353	410	373	381	1023	0	880	902	0	822
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	35.0	41.2	41.5	34.8	40.6	40.7	9.7	0.0	10.4	10.6	0.0	12.2
Incr Delay (d2), s/veh	1.1	4.4	6.3	1.2	5.2	5.4	0.1	0.0	0.1	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	4.7	4.7	1.6	5.1	5.2	1.7	0.0	0.5	0.3	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.1	45.7	47.8	36.1	45.8	46.0	9.8	0.0	10.6	10.6	0.0	12.4
LnGrp LOS	D	D	D	D	D	D	A	A	B	B	A	B
Approach Vol, veh/h		435			481			219			83	
Approach Delay, s/veh		45.1			44.4			10.0			11.7	
Approach LOS		D			D			A			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.5	60.5	10.9	20.1	12.1	56.9	9.9	21.1				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	31.5	17.0	* 22	15.5	23.5	17.5	21.0				
Max Q Clear Time (g_c+I1), s	2.9	3.4	5.5	12.7	6.4	3.6	5.1	12.9				
Green Ext Time (p_c), s	0.0	0.2	0.1	1.4	0.3	0.2	0.1	1.5				
Intersection Summary												
HCM 6th Ctrl Delay			36.2									
HCM 6th LOS			D									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Timings

1: Erickson Boulevard & County Line Road

2024 Total AM.syn
08/08/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	42	218	56	190	191	4	15	2
Future Volume (vph)	42	218	56	190	191	4	15	2
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	13.0	30.0	19.0	36.0	21.0	38.0	13.0	30.0
Total Split (%)	13.0%	30.0%	19.0%	36.0%	21.0%	38.0%	13.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	21.0	15.2	23.4	16.3	61.9	57.1	50.7	44.7
Actuated g/C Ratio	0.21	0.15	0.23	0.16	0.62	0.57	0.51	0.45
v/c Ratio	0.18	0.73	0.31	0.45	0.28	0.04	0.03	0.07
Control Delay	24.9	28.4	28.0	36.3	11.4	7.0	11.7	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.9	28.4	28.0	36.3	11.4	7.0	11.7	8.0
LOS	C	C	C	D	B	A	B	A
Approach Delay		28.1		34.6		10.7		8.9
Approach LOS		C		C		B		A

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 24.9

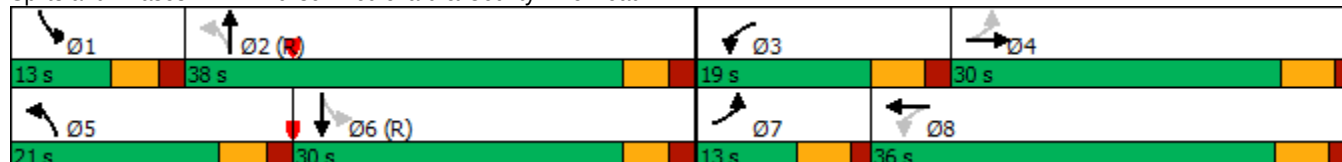
Intersection LOS: C

Intersection Capacity Utilization 48.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road



HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2024 Total AM.syn

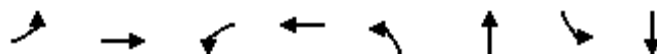
08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	218	202	56	190	29	191	4	31	15	2	43
Future Volume (veh/h)	42	218	202	56	190	29	191	4	31	15	2	43
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	50	260	240	67	226	35	227	5	37	18	2	51
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	285	329	293	184	604	92	817	100	743	728	27	698
Arrive On Green	0.04	0.18	0.18	0.04	0.20	0.20	0.09	0.52	0.52	0.02	0.45	0.45
Sat Flow, veh/h	1781	1779	1583	1781	3090	472	1781	192	1422	1781	60	1534
Grp Volume(v), veh/h	50	260	240	67	129	132	227	0	42	18	0	53
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1785	1781	0	1614	1781	0	1594
Q Serve(g_s), s	2.2	14.0	14.6	3.0	6.3	6.4	6.4	0.0	1.3	0.5	0.0	1.9
Cycle Q Clear(g_c), s	2.2	14.0	14.6	3.0	6.3	6.4	6.4	0.0	1.3	0.5	0.0	1.9
Prop In Lane	1.00		1.00	1.00		0.26	1.00		0.88	1.00		0.96
Lane Grp Cap(c), veh/h	285	329	293	184	347	349	817	0	843	728	0	725
V/C Ratio(X)	0.18	0.79	0.82	0.36	0.37	0.38	0.28	0.00	0.05	0.02	0.00	0.07
Avail Cap(c_a), veh/h	352	435	388	339	533	536	937	0	843	826	0	725
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	31.3	38.9	39.2	32.1	34.9	35.0	11.1	0.0	11.7	14.0	0.0	15.4
Incr Delay (d2), s/veh	0.3	7.1	10.0	1.2	0.7	0.7	0.2	0.0	0.1	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	6.7	6.4	1.4	2.8	2.9	2.4	0.0	0.5	0.2	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.5	46.0	49.2	33.3	35.6	35.7	11.3	0.0	11.8	14.0	0.0	15.6
LnGrp LOS	C	D	D	C	D	D	B	A	B	B	A	B
Approach Vol, veh/h	550			328			269			71		
Approach Delay, s/veh	46.1			35.1			11.3			15.2		
Approach LOS	D			D			B			B		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.5	57.7	10.3	24.5	14.2	51.0	9.3	25.5				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	32.5	13.0	* 25	15.5	24.5	7.5	30.0				
Max Q Clear Time (g_c+l1), s	2.5	3.3	5.0	16.6	8.4	3.9	4.2	8.4				
Green Ext Time (p_c), s	0.0	0.2	0.1	1.9	0.4	0.2	0.0	1.4				
Intersection Summary												
HCM 6th Ctrl Delay				33.6								
HCM 6th LOS				C								
Notes												

Timings

1: Erickson Boulevard & County Line Road

2024 Total PM.syn
08/08/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	59	205	66	332	164	3	29	3
Future Volume (vph)	59	205	66	332	164	3	29	3
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	23.0	26.0	23.0	26.0	21.0	38.0	13.0	30.0
Total Split (%)	23.0%	26.0%	23.0%	26.0%	21.0%	38.0%	13.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	23.9	16.8	24.2	16.9	59.8	52.7	50.4	44.0
Actuated g/C Ratio	0.24	0.17	0.24	0.17	0.60	0.53	0.50	0.44
v/c Ratio	0.26	0.57	0.30	0.68	0.24	0.06	0.05	0.07
Control Delay	25.6	25.1	26.8	43.9	11.7	6.6	11.8	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	25.1	26.8	43.9	11.7	6.6	11.8	8.0
LOS	C	C	C	D	B	A	B	A
Approach Delay		25.2		41.3		10.6		9.5
Approach LOS		C		D		B		A

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 27.6
 Intersection LOS: C
 Intersection Capacity Utilization 44.4%
 ICU Level of Service A
 Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road

Ø1	Ø2 (R)	Ø3	Ø4
13 s	38 s	23 s	26 s
Ø5	Ø6 (R)	Ø7	Ø8
21 s	30 s	23 s	26 s

HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2024 Total PM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	205	144	66	332	30	164	3	41	29	3	42
Future Volume (veh/h)	59	205	144	66	332	30	164	3	41	29	3	42
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	66	230	162	74	373	34	184	3	46	33	3	47
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	198	299	202	192	519	47	858	53	817	807	48	756
Arrive On Green	0.04	0.15	0.15	0.05	0.16	0.16	0.07	0.54	0.54	0.03	0.50	0.50
Sat Flow, veh/h	1781	2030	1371	1781	3295	299	1781	98	1502	1781	96	1504
Grp Volume(v), veh/h	66	200	192	74	200	207	184	0	49	33	0	50
Grp Sat Flow(s),veh/h/ln	1781	1777	1624	1781	1777	1817	1781	0	1600	1781	0	1600
Q Serve(g_s), s	3.1	10.8	11.4	3.5	10.7	10.8	4.8	0.0	1.4	0.9	0.0	1.6
Cycle Q Clear(g_c), s	3.1	10.8	11.4	3.5	10.7	10.8	4.8	0.0	1.4	0.9	0.0	1.6
Prop In Lane	1.00		0.84	1.00		0.16	1.00		0.94	1.00		0.94
Lane Grp Cap(c), veh/h	198	262	240	192	280	286	858	0	870	807	0	804
V/C Ratio(X)	0.33	0.76	0.80	0.39	0.72	0.72	0.21	0.00	0.06	0.04	0.00	0.06
Avail Cap(c_a), veh/h	432	364	333	408	355	363	1007	0	870	887	0	804
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	34.5	40.9	41.2	34.4	40.0	40.0	9.9	0.0	10.7	11.1	0.0	12.8
Incr Delay (d2), s/veh	1.0	6.1	9.2	1.3	4.9	5.1	0.1	0.0	0.1	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	5.1	5.1	1.6	5.0	5.2	1.8	0.0	0.5	0.3	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.5	47.1	50.4	35.7	44.9	45.1	10.0	0.0	10.9	11.1	0.0	12.9
LnGrp LOS	D	D	D	D	D	D	A	A	B	B	A	B
Approach Vol, veh/h	458			481			233			83		
Approach Delay, s/veh	46.8			43.6			10.2			12.2		
Approach LOS	D			D			B			B		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.5	59.9	10.9	20.8	12.6	55.8	9.9	21.8				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	32.5	17.0	* 21	15.5	24.5	17.5	20.0				
Max Q Clear Time (g_c+I1), s	2.9	3.4	5.5	13.4	6.8	3.6	5.1	12.8				
Green Ext Time (p_c), s	0.0	0.2	0.1	1.3	0.3	0.2	0.1	1.4				

Intersection Summary

HCM 6th Ctrl Delay 36.5

HCM 6th LOS D

Notes

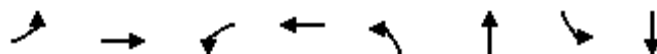
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timings

1: Erickson Boulevard & County Line Road

2045 Background AM.syn

08/08/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	52	269	69	234	200	5	19	3
Future Volume (vph)	52	269	69	234	200	5	19	3
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	13.0	31.0	18.0	36.0	21.0	38.0	13.0	30.0
Total Split (%)	13.0%	31.0%	18.0%	36.0%	21.0%	38.0%	13.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	22.9	17.0	25.6	18.3	59.9	55.0	48.8	42.7
Actuated g/C Ratio	0.23	0.17	0.26	0.18	0.60	0.55	0.49	0.43
v/c Ratio	0.20	0.74	0.34	0.45	0.28	0.05	0.03	0.09
Control Delay	23.6	29.8	27.2	35.2	12.5	7.3	12.7	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.6	29.8	27.2	35.2	12.5	7.3	12.7	8.3
LOS	C	C	C	D	B	A	B	A
Approach Delay		29.2		33.5		11.6		9.4
Approach LOS		C		C		B		A

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 25.7

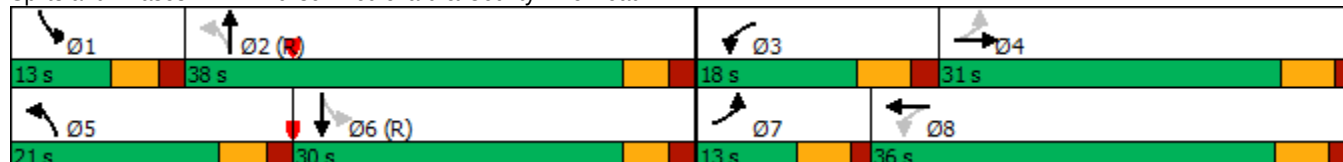
Intersection LOS: C

Intersection Capacity Utilization 51.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road



HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2045 Background AM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	269	236	69	234	35	200	5	38	19	3	53
Future Volume (veh/h)	52	269	236	69	234	35	200	5	38	19	3	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	57	292	257	75	254	38	217	5	41	21	3	58
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	296	362	310	191	658	97	782	88	720	705	34	663
Arrive On Green	0.04	0.20	0.20	0.05	0.21	0.21	0.09	0.50	0.50	0.02	0.44	0.44
Sat Flow, veh/h	1781	1815	1553	1781	3106	459	1781	175	1437	1781	79	1518
Grp Volume(v), veh/h	57	286	263	75	144	148	217	0	46	21	0	61
Grp Sat Flow(s),veh/h/ln	1781	1777	1591	1781	1777	1788	1781	0	1612	1781	0	1597
Q Serve(g_s), s	2.5	15.3	15.9	3.3	6.9	7.1	6.3	0.0	1.5	0.6	0.0	2.2
Cycle Q Clear(g_c), s	2.5	15.3	15.9	3.3	6.9	7.1	6.3	0.0	1.5	0.6	0.0	2.2
Prop In Lane	1.00		0.98	1.00		0.26	1.00		0.89	1.00		0.95
Lane Grp Cap(c), veh/h	296	355	317	191	377	379	782	0	808	705	0	698
V/C Ratio(X)	0.19	0.81	0.83	0.39	0.38	0.39	0.28	0.00	0.06	0.03	0.00	0.09
Avail Cap(c_a), veh/h	359	453	406	321	533	536	904	0	808	800	0	698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.1	38.2	38.4	31.0	33.8	33.9	12.0	0.0	12.8	14.8	0.0	16.5
Incr Delay (d2), s/veh	0.3	8.1	10.9	1.3	0.6	0.7	0.2	0.0	0.1	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	7.4	7.1	1.5	3.0	3.1	2.5	0.0	0.5	0.3	0.0	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.4	46.3	49.2	32.3	34.4	34.5	12.2	0.0	12.9	14.8	0.0	16.7
LnGrp LOS	C	D	D	C	C	C	B	A	B	B	A	B
Approach Vol, veh/h	606			367			263			82		
Approach Delay, s/veh	46.1			34.0			12.3			16.3		
Approach LOS	D			C			B			B		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.7	55.6	10.7	26.0	14.2	49.2	9.5	27.2				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	32.5	12.0	* 26	15.5	24.5	7.5	30.0				
Max Q Clear Time (g_c+I1), s	2.6	3.5	5.3	17.9	8.3	4.2	4.5	9.1				
Green Ext Time (p_c), s	0.0	0.2	0.1	2.1	0.3	0.2	0.0	1.6				

Intersection Summary

HCM 6th Ctrl Delay	34.1
HCM 6th LOS	C

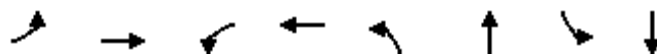
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timings 1: Erickson Boulevard & County Line Road

2045 Background PM.syn

08/08/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	73	253	82	409	182	4	35	4
Future Volume (vph)	73	253	82	409	182	4	35	4
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	20.0	29.0	20.0	29.0	21.0	38.0	13.0	30.0
Total Split (%)	20.0%	29.0%	20.0%	29.0%	21.0%	38.0%	13.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	26.7	19.3	27.1	19.4	57.1	49.7	47.0	40.4
Actuated g/C Ratio	0.27	0.19	0.27	0.19	0.57	0.50	0.47	0.40
v/c Ratio	0.31	0.59	0.34	0.71	0.27	0.07	0.06	0.09
Control Delay	24.5	30.1	25.5	42.6	13.5	7.2	13.5	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.5	30.1	25.5	42.6	13.5	7.2	13.5	8.8
LOS	C	C	C	D	B	A	B	A
Approach Delay		29.2		39.9		12.1		10.6
Approach LOS		C		D		B		B

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 29.2

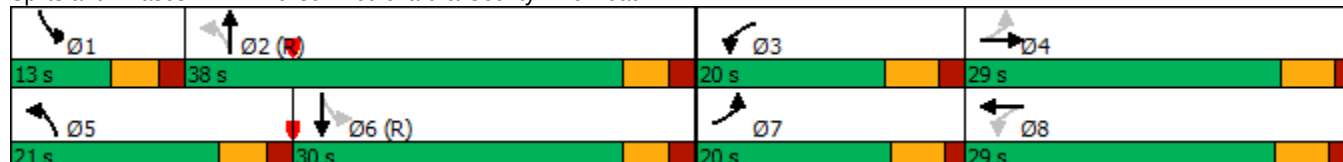
Intersection LOS: C

Intersection Capacity Utilization 47.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road



HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2045 Background PM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	73	253	148	82	409	36	182	4	50	35	4	52
Future Volume (veh/h)	73	253	148	82	409	36	182	4	50	35	4	52
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	79	275	161	89	445	39	198	4	54	38	4	57
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	203	355	202	209	573	50	817	57	773	766	50	707
Arrive On Green	0.05	0.16	0.16	0.06	0.17	0.17	0.08	0.52	0.52	0.03	0.47	0.47
Sat Flow, veh/h	1781	2183	1240	1781	3307	289	1781	110	1491	1781	105	1496
Grp Volume(v), veh/h	79	222	214	89	238	246	198	0	58	38	0	61
Grp Sat Flow(s),veh/h/ln	1781	1777	1647	1781	1777	1818	1781	0	1602	1781	0	1601
Q Serve(g_s), s	3.6	12.0	12.5	4.1	12.8	12.9	5.5	0.0	1.8	1.1	0.0	2.1
Cycle Q Clear(g_c), s	3.6	12.0	12.5	4.1	12.8	12.9	5.5	0.0	1.8	1.1	0.0	2.1
Prop In Lane	1.00		0.75	1.00		0.16	1.00		0.93	1.00		0.93
Lane Grp Cap(c), veh/h	203	289	268	209	308	315	817	0	830	766	0	757
V/C Ratio(X)	0.39	0.77	0.80	0.43	0.77	0.78	0.24	0.00	0.07	0.05	0.00	0.08
Avail Cap(c_a), veh/h	371	418	387	357	409	418	954	0	830	842	0	757
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	33.1	40.1	40.3	32.9	39.5	39.5	10.9	0.0	12.1	12.5	0.0	14.4
Incr Delay (d2), s/veh	1.2	5.3	7.3	1.4	6.5	6.7	0.2	0.0	0.2	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	5.6	5.6	1.8	6.1	6.3	2.1	0.0	0.7	0.4	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.3	45.4	47.6	34.3	46.0	46.2	11.1	0.0	12.2	12.5	0.0	14.7
LnGrp LOS	C	D	D	C	D	D	B	A	B	B	A	B
Approach Vol, veh/h		515			573			256			99	
Approach Delay, s/veh		44.6			44.2			11.3			13.8	
Approach LOS		D			D			B			B	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.8	57.3	11.7	22.3	13.3	52.8	10.6	23.3				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	32.5	14.0	* 24	15.5	24.5	14.5	23.0				
Max Q Clear Time (g_c+I1), s	3.1	3.8	6.1	14.5	7.5	4.1	5.6	14.9				
Green Ext Time (p_c), s	0.0	0.3	0.1	1.8	0.3	0.2	0.1	1.8				

Intersection Summary

HCM 6th Ctrl Delay 36.5

HCM 6th LOS D

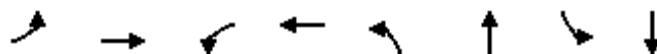
Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timings

1: Erickson Boulevard & County Line Road

2045 Total AM.syn
08/08/2022

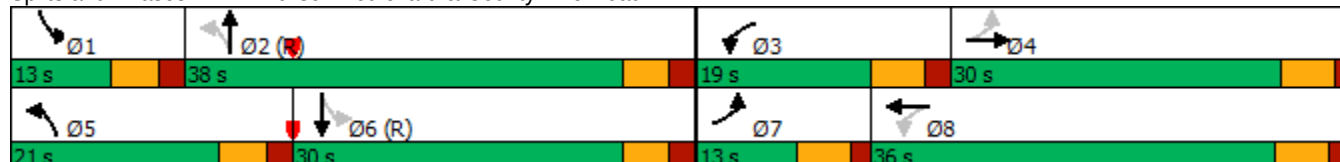


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	55	270	70	235	225	5	20	5
Future Volume (vph)	55	270	70	235	225	5	20	5
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	13.0	30.0	19.0	36.0	21.0	38.0	13.0	30.0
Total Split (%)	13.0%	30.0%	19.0%	36.0%	21.0%	38.0%	13.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	23.2	17.3	25.9	18.6	59.6	54.6	47.6	41.5
Actuated g/C Ratio	0.23	0.17	0.26	0.19	0.60	0.55	0.48	0.42
v/c Ratio	0.20	0.74	0.35	0.44	0.32	0.05	0.03	0.09
Control Delay	23.5	29.4	27.1	34.8	13.0	7.3	13.1	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.5	29.4	27.1	34.8	13.0	7.3	13.1	8.8
LOS	C	C	C	C	B	A	B	A
Approach Delay		28.8		33.2		12.1		9.9
Approach LOS		C		C		B		A

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.74
 Intersection Signal Delay: 25.2
 Intersection LOS: C
 Intersection Capacity Utilization 52.8%
 ICU Level of Service A
 Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road



HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2045 Total AM.syn

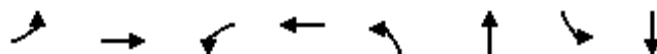
08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	270	245	70	235	35	225	5	40	20	5	55
Future Volume (veh/h)	55	270	245	70	235	35	225	5	40	20	5	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	60	293	266	76	255	38	245	5	43	22	5	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	298	358	317	190	661	97	780	84	720	689	52	629
Arrive On Green	0.04	0.20	0.20	0.05	0.21	0.21	0.10	0.50	0.50	0.02	0.42	0.42
Sat Flow, veh/h	1781	1786	1577	1781	3107	457	1781	168	1443	1781	123	1480
Grp Volume(v), veh/h	60	291	268	76	144	149	245	0	48	22	0	65
Grp Sat Flow(s),veh/h/ln	1781	1777	1586	1781	1777	1788	1781	0	1611	1781	0	1604
Q Serve(g_s), s	2.6	15.7	16.2	3.3	7.0	7.1	7.3	0.0	1.5	0.7	0.0	2.4
Cycle Q Clear(g_c), s	2.6	15.7	16.2	3.3	7.0	7.1	7.3	0.0	1.5	0.7	0.0	2.4
Prop In Lane	1.00		0.99	1.00		0.26	1.00		0.90	1.00		0.92
Lane Grp Cap(c), veh/h	298	357	318	190	378	381	780	0	803	689	0	682
V/C Ratio(X)	0.20	0.82	0.84	0.40	0.38	0.39	0.31	0.00	0.06	0.03	0.00	0.10
Avail Cap(c_a), veh/h	359	435	389	336	533	536	884	0	803	782	0	682
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.0	38.2	38.4	30.9	33.7	33.8	12.3	0.0	12.9	15.4	0.0	17.2
Incr Delay (d2), s/veh	0.3	9.7	12.9	1.4	0.6	0.7	0.2	0.0	0.1	0.0	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	7.7	7.4	1.5	3.1	3.1	2.8	0.0	0.6	0.3	0.0	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.3	47.9	51.3	32.3	34.4	34.4	12.5	0.0	13.1	15.5	0.0	17.5
LnGrp LOS	C	D	D	C	C	C	B	A	B	B	A	B
Approach Vol, veh/h	619			369			293			87		
Approach Delay, s/veh	47.7			34.0			12.6			17.0		
Approach LOS	D			C			B			B		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.8	55.4	10.8	26.1	15.2	48.0	9.6	27.3				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	32.5	13.0	* 25	15.5	24.5	7.5	30.0				
Max Q Clear Time (g_c+l1), s	2.7	3.5	5.3	18.2	9.3	4.4	4.6	9.1				
Green Ext Time (p_c), s	0.0	0.2	0.1	1.9	0.4	0.3	0.0	1.6				
Intersection Summary												
HCM 6th Ctrl Delay	34.5											
HCM 6th LOS	C											
Notes												

Timings

1: Erickson Boulevard & County Line Road

2045 Total PM.syn
08/08/2022

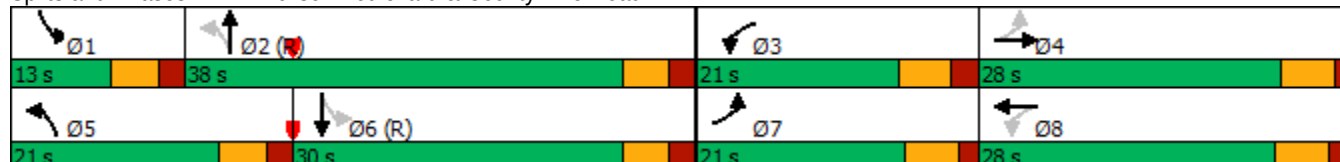


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	75	255	85	410	195	5	35	5
Future Volume (vph)	75	255	85	410	195	5	35	5
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.5	23.5	11.0	24.0	10.5	23.5	10.5	23.5
Total Split (s)	21.0	28.0	21.0	28.0	21.0	38.0	13.0	30.0
Total Split (%)	21.0%	28.0%	21.0%	28.0%	21.0%	38.0%	13.0%	30.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5	6.0	6.0	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	27.0	19.4	27.2	19.5	57.0	49.4	46.4	39.8
Actuated g/C Ratio	0.27	0.19	0.27	0.20	0.57	0.49	0.46	0.40
v/c Ratio	0.32	0.60	0.36	0.71	0.29	0.07	0.06	0.10
Control Delay	24.5	27.6	25.8	42.5	13.8	7.4	13.7	8.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.5	27.6	25.8	42.5	13.8	7.4	13.7	8.9
LOS	C	C	C	D	B	A	B	A
Approach Delay		27.1		39.9		12.4		10.7
Approach LOS		C		D		B		B

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.71
 Intersection Signal Delay: 28.3
 Intersection LOS: C
 Intersection Capacity Utilization 48.8%
 ICU Level of Service A
 Analysis Period (min) 15

Splits and Phases: 1: Erickson Boulevard & County Line Road



HCM 6th Signalized Intersection Summary

1: Erickson Boulevard & County Line Road

2045 Total PM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	255	170	85	410	40	195	5	50	35	5	55
Future Volume (veh/h)	75	255	170	85	410	40	195	5	50	35	5	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	82	277	185	92	446	43	212	5	54	38	5	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	211	350	227	210	590	57	803	69	749	747	57	680
Arrive On Green	0.05	0.17	0.17	0.06	0.18	0.18	0.08	0.51	0.51	0.03	0.46	0.46
Sat Flow, veh/h	1781	2068	1339	1781	3276	315	1781	136	1470	1781	123	1480
Grp Volume(v), veh/h	82	237	225	92	241	248	212	0	59	38	0	65
Grp Sat Flow(s),veh/h/ln	1781	1777	1629	1781	1777	1814	1781	0	1606	1781	0	1604
Q Serve(g_s), s	3.8	12.8	13.3	4.2	12.9	13.0	6.0	0.0	1.9	1.1	0.0	2.3
Cycle Q Clear(g_c), s	3.8	12.8	13.3	4.2	12.9	13.0	6.0	0.0	1.9	1.1	0.0	2.3
Prop In Lane	1.00		0.82	1.00		0.17	1.00		0.92	1.00		0.92
Lane Grp Cap(c), veh/h	211	301	276	210	320	327	803	0	818	747	0	737
V/C Ratio(X)	0.39	0.79	0.82	0.44	0.75	0.76	0.26	0.00	0.07	0.05	0.00	0.09
Avail Cap(c_a), veh/h	394	400	367	373	391	399	931	0	818	823	0	737
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	32.5	39.8	40.0	32.4	38.9	38.9	11.2	0.0	12.5	13.2	0.0	15.2
Incr Delay (d2), s/veh	1.2	7.4	10.1	1.4	6.5	6.6	0.2	0.0	0.2	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	6.1	6.1	1.9	6.1	6.3	2.3	0.0	0.7	0.4	0.0	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.7	47.2	50.2	33.9	45.3	45.6	11.4	0.0	12.7	13.2	0.0	15.5
LnGrp LOS	C	D	D	C	D	D	B	A	B	B	A	B
Approach Vol, veh/h	544			581			271			103		
Approach Delay, s/veh	46.4			43.6			11.6			14.6		
Approach LOS	D			D			B			B		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	8.8	56.5	11.8	22.9	13.8	51.4	10.8	24.0				
Change Period (Y+Rc), s	5.5	5.5	6.0	* 6	5.5	5.5	5.5	6.0				
Max Green Setting (Gmax), s	7.5	32.5	15.0	* 23	15.5	24.5	15.5	22.0				
Max Q Clear Time (g_c+I1), s	3.1	3.9	6.2	15.3	8.0	4.3	5.8	15.0				
Green Ext Time (p_c), s	0.0	0.3	0.1	1.6	0.3	0.3	0.1	1.7				
Intersection Summary												
HCM 6th Ctrl Delay	36.8											
HCM 6th LOS	D											
Notes												

Intersection	
Intersection Delay, s/veh	8.9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	53	5	58	2	34	36	109	114	1
Future Vol, veh/h	0	1	1	53	5	58	2	34	36	109	114	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	61	6	67	2	39	41	125	131	1
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.2	8.6	8.5	9.1
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	3%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	47%	100%	50%	0%	100%	0%	0%	100%	0%
Vol Right, %	50%	0%	50%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	72	0	2	53	5	58	109	114	1
LT Vol	2	0	0	53	0	0	109	0	0
Through Vol	34	0	1	0	5	0	0	114	0
RT Vol	36	0	1	0	0	58	0	0	1
Lane Flow Rate	83	0	2	61	6	67	125	131	1
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.117	0	0.003	0.101	0.009	0.088	0.19	0.18	0.001
Departure Headway (Hd)	5.099	5.746	5.393	5.959	5.457	4.755	5.453	4.952	4.251
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	702	0	661	602	656	753	659	725	841
Service Time	2.838	3.497	3.144	3.69	3.189	2.487	3.182	2.681	1.979
HCM Lane V/C Ratio	0.118	0	0.003	0.101	0.009	0.089	0.19	0.181	0.001
HCM Control Delay	8.5	8.5	8.2	9.4	8.2	7.9	9.5	8.8	7
HCM Lane LOS	A	N	A	A	A	A	A	A	A
HCM 95th-tile Q	0.4	0	0	0.3	0	0.3	0.7	0.7	0

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	2	3	28	1	109	1	77	65	69	62	2
Future Vol, veh/h	0	2	3	28	1	109	1	77	65	69	62	2
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	4	37	1	143	1	101	86	91	82	3
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.3	8.9	9.7	9
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	1%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	54%	100%	40%	0%	100%	0%	0%	100%	0%
Vol Right, %	45%	0%	60%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	143	0	5	28	1	109	69	62	2
LT Vol	1	0	0	28	0	0	69	0	0
Through Vol	77	0	2	0	1	0	0	62	0
RT Vol	65	0	3	0	0	109	0	0	2
Lane Flow Rate	188	0	7	37	1	143	91	82	3
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.266	0	0.01	0.062	0.002	0.193	0.143	0.117	0.003
Departure Headway (Hd)	5.097	5.911	5.487	6.051	5.549	4.846	5.672	5.17	4.467
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	702	0	647	591	643	737	631	691	797
Service Time	2.849	3.686	3.263	3.8	3.298	2.595	3.421	2.918	2.215
HCM Lane V/C Ratio	0.268	0	0.011	0.063	0.002	0.194	0.144	0.119	0.004
HCM Control Delay	9.7	8.7	8.3	9.2	8.3	8.8	9.4	8.6	7.2
HCM Lane LOS	A	N	A	A	A	A	A	A	A
HCM 95th-tile Q	1.1	0	0	0.2	0	0.7	0.5	0.4	0

Intersection												
Intersection Delay, s/veh	9.1											
Intersection LOS	A											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	54	5	79	2	35	37	121	116	1
Future Vol, veh/h	0	1	1	54	5	79	2	35	37	121	116	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	62	6	91	2	40	43	139	133	1
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.3	8.7	8.7	9.4
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	3%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	47%	100%	50%	0%	100%	0%	0%	100%	0%
Vol Right, %	50%	0%	50%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	74	0	2	54	5	79	121	116	1
LT Vol	2	0	0	54	0	0	121	0	0
Through Vol	35	0	1	0	5	0	0	116	0
RT Vol	37	0	1	0	0	79	0	0	1
Lane Flow Rate	85	0	2	62	6	91	139	133	1
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.123	0	0.004	0.104	0.009	0.121	0.213	0.186	0.001
Departure Headway (Hd)	5.203	5.854	5.501	6.017	5.515	4.813	5.519	5.018	4.317
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	687	0	648	595	648	744	651	715	827
Service Time	2.95	3.613	3.26	3.755	3.253	2.551	3.254	2.753	2.051
HCM Lane V/C Ratio	0.124	0	0.003	0.104	0.009	0.122	0.214	0.186	0.001
HCM Control Delay	8.7	8.6	8.3	9.5	8.3	8.2	9.8	8.9	7.1
HCM Lane LOS	A	N	A	A	A	A	A	A	A
HCM 95th-tile Q	0.4	0	0	0.3	0	0.4	0.8	0.7	0

Intersection	
Intersection Delay, s/veh	9.5
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	2	3	29	1	127	1	79	66	91	63	2
Future Vol, veh/h	0	2	3	29	1	127	1	79	66	91	63	2
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	4	38	1	167	1	104	87	120	83	3
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.5	9.2	10	9.4
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	1%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	54%	100%	40%	0%	100%	0%	0%	100%	0%
Vol Right, %	45%	0%	60%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	146	0	5	29	1	127	91	63	2
LT Vol	1	0	0	29	0	0	91	0	0
Through Vol	79	0	2	0	1	0	0	63	0
RT Vol	66	0	3	0	0	127	0	0	2
Lane Flow Rate	192	0	7	38	1	167	120	83	3
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.279	0	0.01	0.065	0.002	0.23	0.191	0.121	0.003
Departure Headway (Hd)	5.237	6.073	5.649	6.158	5.656	4.953	5.749	5.247	4.543
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	682	0	627	579	630	720	621	680	782
Service Time	3.004	3.869	3.445	3.92	3.417	2.714	3.51	3.008	2.304
HCM Lane V/C Ratio	0.282	0	0.011	0.066	0.002	0.232	0.193	0.122	0.004
HCM Control Delay	10	8.9	8.5	9.4	8.4	9.2	9.9	8.7	7.3
HCM Lane LOS	A	N	A	A	A	A	A	A	A
HCM 95th-tile Q	1.1	0	0	0.2	0	0.9	0.7	0.4	0

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	54	5	104	2	35	37	129	116	1
Future Vol, veh/h	0	1	1	54	5	104	2	35	37	129	116	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	62	6	120	2	40	43	148	133	1
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.4	8.8	8.8	9.5
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	3%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	47%	100%	50%	0%	100%	0%	0%	100%	0%
Vol Right, %	50%	0%	50%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	74	0	2	54	5	104	129	116	1
LT Vol	2	0	0	54	0	0	129	0	0
Through Vol	35	0	1	0	5	0	0	116	0
RT Vol	37	0	1	0	0	104	0	0	1
Lane Flow Rate	85	0	2	62	6	120	148	133	1
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.125	0	0.004	0.104	0.009	0.161	0.23	0.188	0.001
Departure Headway (Hd)	5.296	5.937	5.585	6.047	5.546	4.844	5.587	5.085	4.383
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	674	0	637	592	644	738	642	704	813
Service Time	3.055	3.709	3.356	3.793	3.291	2.589	3.33	2.828	2.126
HCM Lane V/C Ratio	0.126	0	0.003	0.105	0.009	0.163	0.231	0.189	0.001
HCM Control Delay	8.8	8.7	8.4	9.5	8.3	8.5	10	9	7.1
HCM Lane LOS	A	N	A	A	A	A	A	A	A
HCM 95th-tile Q	0.4	0	0	0.3	0	0.6	0.9	0.7	0

Intersection	
Intersection Delay, s/veh	9.9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	2	3	29	1	140	1	79	66	111	63	2
Future Vol, veh/h	0	2	3	29	1	140	1	79	66	111	63	2
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	4	38	1	184	1	104	87	146	83	3
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.6	9.6	10.3	9.8
HCM LOS	A	A	B	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	1%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	54%	100%	40%	0%	100%	0%	0%	100%	0%
Vol Right, %	45%	0%	60%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	146	0	5	29	1	140	111	63	2
LT Vol	1	0	0	29	0	0	111	0	0
Through Vol	79	0	2	0	1	0	0	63	0
RT Vol	66	0	3	0	0	140	0	0	2
Lane Flow Rate	192	0	7	38	1	184	146	83	3
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.285	0	0.011	0.066	0.002	0.258	0.235	0.122	0.003
Departure Headway (Hd)	5.346	6.309	5.884	6.242	5.74	5.036	5.8	5.297	4.593
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	667	0	612	571	619	707	615	671	771
Service Time	3.128	4.009	3.584	4.014	3.512	2.808	3.575	3.072	2.368
HCM Lane V/C Ratio	0.288	0	0.011	0.067	0.002	0.26	0.237	0.124	0.004
HCM Control Delay	10.3	9	8.6	9.5	8.5	9.6	10.4	8.8	7.4
HCM Lane LOS	B	N	A	A	A	A	B	A	A
HCM 95th-tile Q	1.2	0	0	0.2	0	1	0.9	0.4	0

Intersection	
Intersection Delay, s/veh	9.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	67	6	93	3	43	45	147	143	1
Future Vol, veh/h	0	1	1	67	6	93	3	43	45	147	143	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	73	7	101	3	47	49	160	155	1
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.5	9	9.1	9.7
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	3%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	47%	100%	50%	0%	100%	0%	0%	100%	0%
Vol Right, %	49%	0%	50%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	91	0	2	67	6	93	147	143	1
LT Vol	3	0	0	67	0	0	147	0	0
Through Vol	43	0	1	0	6	0	0	143	0
RT Vol	45	0	1	0	0	93	0	0	1
Lane Flow Rate	99	0	2	73	7	101	160	155	1
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.147	0	0.003	0.125	0.01	0.139	0.249	0.22	0.001
Departure Headway (Hd)	5.364	6.06	5.707	6.167	5.666	4.963	5.6	5.099	4.397
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	665	0	622	580	630	719	641	703	811
Service Time	3.126	3.842	3.489	3.921	3.419	2.716	3.343	2.841	2.139
HCM Lane V/C Ratio	0.149	0	0.003	0.126	0.011	0.14	0.25	0.22	0.001
HCM Control Delay	9.1	8.8	8.5	9.8	8.5	8.5	10.2	9.3	7.1
HCM Lane LOS	A	N	A	A	A	A	B	A	A
HCM 95th-tile Q	0.5	0	0	0.4	0	0.5	1	0.8	0

Intersection	
Intersection Delay, s/veh	9.5
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	3	4	35	1	153	1	97	82	108	78	3
Future Vol, veh/h	0	3	4	35	1	153	1	97	82	108	78	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	4	38	1	166	1	105	89	117	85	3
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.5	9.2	10.1	9.4
HCM LOS	A	A	B	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	1%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	54%	100%	43%	0%	100%	0%	0%	100%	0%
Vol Right, %	46%	0%	57%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	180	0	7	35	1	153	108	78	3
LT Vol	1	0	0	35	0	0	108	0	0
Through Vol	97	0	3	0	1	0	0	78	0
RT Vol	82	0	4	0	0	153	0	0	3
Lane Flow Rate	196	0	8	38	1	166	117	85	3
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.285	0	0.012	0.065	0.002	0.229	0.188	0.124	0.004
Departure Headway (Hd)	5.239	6.083	5.679	6.17	5.668	4.965	5.756	5.254	4.55
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	681	0	623	578	628	718	621	679	781
Service Time	3.004	3.881	3.477	3.936	3.434	2.73	3.517	3.014	2.31
HCM Lane V/C Ratio	0.288	0	0.013	0.066	0.002	0.231	0.188	0.125	0.004
HCM Control Delay	10.1	8.9	8.5	9.4	8.4	9.2	9.9	8.8	7.3
HCM Lane LOS	B	N	A	A	A	A	A	A	A
HCM 95th-tile Q	1.2	0	0	0.2	0	0.9	0.7	0.4	0

Intersection	
Intersection Delay, s/veh	9.7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	5	5	70	10	120	5	45	45	155	145	5
Future Vol, veh/h	0	5	5	70	10	120	5	45	45	155	145	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	5	5	76	11	130	5	49	49	168	158	5
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.8	9.3	9.4	10
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	5%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	47%	100%	50%	0%	100%	0%	0%	100%	0%
Vol Right, %	47%	0%	50%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	0	10	70	10	120	155	145	5
LT Vol	5	0	0	70	0	0	155	0	0
Through Vol	45	0	5	0	10	0	0	145	0
RT Vol	45	0	5	0	0	120	0	0	5
Lane Flow Rate	103	0	11	76	11	130	168	158	5
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.159	0	0.018	0.132	0.017	0.183	0.268	0.229	0.007
Departure Headway (Hd)	5.551	6.306	5.952	6.254	5.752	5.049	5.723	5.221	4.519
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	640	0	605	571	618	706	625	684	786
Service Time	3.336	4.006	3.652	4.025	3.522	2.819	3.484	2.982	2.28
HCM Lane V/C Ratio	0.161	0	0.018	0.133	0.018	0.184	0.269	0.231	0.006
HCM Control Delay	9.4	9	8.8	10	8.6	9	10.6	9.5	7.3
HCM Lane LOS	A	N	A	A	A	A	B	A	A
HCM 95th-tile Q	0.6	0	0.1	0.5	0.1	0.7	1.1	0.9	0

Intersection	
Intersection Delay, s/veh	10
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	5	5	35	5	170	5	100	85	130	80	5
Future Vol, veh/h	0	5	5	35	5	170	5	100	85	130	80	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	5	5	38	5	185	5	109	92	141	87	5
Number of Lanes	1	1	0	1	1	1	0	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	1	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	3	3	2
HCM Control Delay	8.8	9.6	10.6	9.8
HCM LOS	A	A	B	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	3%	0%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	53%	100%	50%	0%	100%	0%	0%	100%	0%
Vol Right, %	45%	0%	50%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	190	0	10	35	5	170	130	80	5
LT Vol	5	0	0	35	0	0	130	0	0
Through Vol	100	0	5	0	5	0	0	80	0
RT Vol	85	0	5	0	0	170	0	0	5
Lane Flow Rate	207	0	11	38	5	185	141	87	5
Geometry Grp	8	8	8	8	8	8	7	7	7
Degree of Util (X)	0.309	0	0.018	0.067	0.009	0.261	0.23	0.129	0.007
Departure Headway (Hd)	5.395	6.381	6.027	6.3	5.798	5.094	5.848	5.346	4.642
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	659	0	598	565	612	698	609	665	763
Service Time	3.182	4.081	3.727	4.081	3.579	2.875	3.627	3.124	2.42
HCM Lane V/C Ratio	0.314	0	0.018	0.067	0.008	0.265	0.232	0.131	0.007
HCM Control Delay	10.6	9.1	8.8	9.5	8.6	9.7	10.4	8.9	7.5
HCM Lane LOS	B	N	A	A	A	A	B	A	A
HCM 95th-tile Q	1.3	0	0.1	0.2	0	1	0.9	0.4	0

Timings

3: Plaza Drive & Lucent Boulevard

2022 Existing AM.syn
03/18/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	 	 	 	 		 	 	 	 
Traffic Volume (vph)	221	141	46	125	196	242	1294	360	776
Future Volume (vph)	221	141	46	125	196	242	1294	360	776
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases	8								
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	19.0	32.0	12.0	25.0	25.0	22.0	51.0	25.0	54.0
Total Split (%)	15.8%	26.7%	10.0%	20.8%	20.8%	18.3%	42.5%	20.8%	45.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	11.9	19.3	5.0	10.0	36.2	14.5	52.8	19.2	57.6
Actuated g/C Ratio	0.10	0.16	0.04	0.08	0.30	0.12	0.44	0.16	0.48
v/c Ratio	0.71	0.49	0.36	0.47	0.37	0.64	0.69	0.72	0.44
Control Delay	64.4	24.3	63.1	57.3	10.9	57.3	29.8	55.3	20.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.4	24.3	63.1	57.3	10.9	57.3	29.8	55.3	20.9
LOS	E	C	E	E	B	E	C	E	C
Approach Delay	41.5		33.3		33.9		30.3		
Approach LOS	D		C		C		C		

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 33.6

Intersection LOS: C

Intersection Capacity Utilization 72.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2022 Existing AM.syn
03/18/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	221	141	155	46	125	196	242	1294	94	360	776	180
Future Volume (veh/h)	221	141	155	46	125	196	242	1294	94	360	776	180
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	243	155	170	51	137	215	266	1422	103	396	853	198
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	301	326	291	118	478	424	329	2082	151	460	1916	442
Arrive On Green	0.09	0.18	0.18	0.03	0.13	0.13	0.10	0.43	0.43	0.13	0.46	0.46
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4859	352	3456	4146	957
Grp Volume(v), veh/h	243	155	170	51	137	215	266	996	529	396	700	351
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1807	1728	1702	1698
Q Serve(g_s), s	8.3	9.4	11.8	1.7	4.2	13.8	9.1	28.4	28.4	13.5	16.7	16.8
Cycle Q Clear(g_c), s	8.3	9.4	11.8	1.7	4.2	13.8	9.1	28.4	28.4	13.5	16.7	16.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.19	1.00		0.56
Lane Grp Cap(c), veh/h	301	326	291	118	478	424	329	1458	774	460	1573	785
V/C Ratio(X)	0.81	0.48	0.58	0.43	0.29	0.51	0.81	0.68	0.68	0.86	0.44	0.45
Avail Cap(c_a), veh/h	360	378	337	144	533	449	446	1458	774	547	1573	785
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.8	43.8	44.8	56.8	46.7	37.2	53.2	27.7	27.7	50.9	21.8	21.9
Incr Delay (d2), s/veh	10.9	1.1	1.9	2.5	0.3	0.9	7.8	2.6	4.8	11.5	0.9	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	4.2	4.8	0.8	1.9	5.5	4.3	11.9	13.1	6.6	6.8	7.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	64.6	44.9	46.7	59.3	47.1	38.2	61.0	30.3	32.6	62.5	22.8	23.7
LnGrp LOS	E	D	D	E	D	D	E	C	C	E	C	C
Approach Vol, veh/h		568			403			1791			1447	
Approach Delay, s/veh		53.9			43.9			35.5			33.9	
Approach LOS		D			D			D			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	22.0	57.9	11.1	29.0	17.9	62.0	17.0	23.1				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	44.5	5.0	* 26	15.5	* 48	12.5	18.0				
Max Q Clear Time (g_c+I1), s	15.5	30.4	3.7	13.8	11.1	18.8	10.3	15.8				
Green Ext Time (p_c), s	0.5	8.7	0.0	1.5	0.4	8.4	0.2	0.4				
Intersection Summary												
HCM 6th Ctrl Delay			38.2									
HCM 6th LOS			D									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Timings

3: Plaza Drive & Lucent Boulevard

2022 Existing PM.syn

03/18/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	229	83	108	64	236	87	1118	169	1443
Future Volume (vph)	229	83	108	64	236	87	1118	169	1443
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases					8				
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	25.0	32.0	18.0	25.0	25.0	16.0	65.0	25.0	74.0
Total Split (%)	17.9%	22.9%	12.9%	17.9%	17.9%	11.4%	46.4%	17.9%	52.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	16.6	12.5	9.6	8.0	24.9	9.1	79.4	12.5	82.8
Actuated g/C Ratio	0.12	0.09	0.07	0.06	0.18	0.06	0.57	0.09	0.59
v/c Ratio	0.59	0.48	0.48	0.33	0.63	0.41	0.44	0.58	0.55
Control Delay	64.8	32.4	69.5	67.3	30.2	67.9	18.9	68.5	18.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.8	32.4	69.5	67.3	30.2	67.9	18.9	68.5	18.9
LOS	E	C	E	E	C	E	B	E	B
Approach Delay		51.0		46.4			22.2		23.7
Approach LOS		D		D			C		C

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 28.5

Intersection LOS: C

Intersection Capacity Utilization 67.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2022 Existing PM.syn
03/18/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	229	83	88	108	64	236	87	1118	88	169	1443	130
Future Volume (veh/h)	229	83	88	108	64	236	87	1118	88	169	1443	130
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	239	86	92	112	67	246	91	1165	92	176	1503	135
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	295	291	260	160	457	310	137	2573	203	231	2657	239
Arrive On Green	0.09	0.16	0.16	0.05	0.13	0.13	0.04	0.53	0.53	0.07	0.56	0.56
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4825	381	3456	4769	428
Grp Volume(v), veh/h	239	86	92	112	67	246	91	822	435	176	1073	565
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1802	1728	1702	1793
Q Serve(g_s), s	9.5	6.0	7.2	4.5	2.3	18.0	3.6	20.8	20.8	7.0	28.5	28.5
Cycle Q Clear(g_c), s	9.5	6.0	7.2	4.5	2.3	18.0	3.6	20.8	20.8	7.0	28.5	28.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	1.00		0.24
Lane Grp Cap(c), veh/h	295	291	260	160	457	310	137	1816	961	231	1897	999
V/C Ratio(X)	0.81	0.30	0.35	0.70	0.15	0.79	0.67	0.45	0.45	0.76	0.57	0.57
Avail Cap(c_a), veh/h	457	324	289	272	457	310	234	1816	961	469	1897	999
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.9	51.4	51.9	65.8	54.2	53.6	66.3	20.1	20.1	64.2	20.0	20.0
Incr Delay (d2), s/veh	6.1	0.6	0.8	5.4	0.1	13.2	5.5	0.8	1.5	5.1	1.2	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	2.7	3.0	2.1	1.1	9.4	1.7	8.5	9.2	3.3	11.5	12.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	69.0	52.0	52.8	71.2	54.3	66.9	71.8	20.9	21.6	69.3	21.3	22.4
LnGrp LOS	E	D	D	E	D	E	E	C	C	E	C	C
Approach Vol, veh/h	417			425			1348			1814		
Approach Delay, s/veh	61.9			66.0			24.6			26.3		
Approach LOS	E			E			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	15.4	81.2	13.5	30.0	12.0	84.5	18.5	25.0				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	58.5	11.0	* 26	9.5	* 68	18.5	18.0				
Max Q Clear Time (g_c+I1), s	9.0	22.8	6.5	9.2	5.6	30.5	11.5	20.0				
Green Ext Time (p_c), s	0.4	11.1	0.1	0.8	0.1	16.5	0.4	0.0				
Intersection Summary												
HCM 6th Ctrl Delay	33.6											
HCM 6th LOS	C											
Notes												

Timings

3: Plaza Drive & Lucent Boulevard

2024 Background AM.syn

08/08/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	 		 			 	 	 	
Traffic Volume (vph)	245	150	47	131	200	253	1320	367	792
Future Volume (vph)	245	150	47	131	200	253	1320	367	792
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases					8				
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	19.0	32.0	12.0	25.0	25.0	22.0	51.0	25.0	54.0
Total Split (%)	15.8%	26.7%	10.0%	20.8%	20.8%	18.3%	42.5%	20.8%	45.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	12.2	19.8	5.0	10.2	36.6	14.9	52.2	19.4	56.7
Actuated g/C Ratio	0.10	0.16	0.04	0.08	0.30	0.12	0.44	0.16	0.47
v/c Ratio	0.77	0.51	0.36	0.48	0.37	0.65	0.71	0.73	0.46
Control Delay	68.1	24.0	63.3	57.3	11.2	57.2	30.7	55.6	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.1	24.0	63.3	57.3	11.2	57.2	30.7	55.6	21.6
LOS	E	C	E	E	B	E	C	E	C
Approach Delay		43.2		33.7			34.7		30.8
Approach LOS		D		C			C		C

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 34.5

Intersection LOS: C

Intersection Capacity Utilization 73.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2024 Background AM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	245	150	169	47	131	200	253	1320	96	367	792	194
Future Volume (veh/h)	245	150	169	47	131	200	253	1320	96	367	792	194
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	269	165	186	52	144	220	278	1451	105	403	870	213
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	326	342	305	119	486	431	341	2028	147	467	1842	449
Arrive On Green	0.09	0.19	0.19	0.03	0.14	0.14	0.10	0.42	0.42	0.14	0.45	0.45
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4860	352	3456	4097	998
Grp Volume(v), veh/h	269	165	186	52	144	220	278	1016	540	403	722	361
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1807	1728	1702	1691
Q Serve(g_s), s	9.2	9.9	12.9	1.8	4.4	14.1	9.5	29.8	29.8	13.7	17.8	17.9
Cycle Q Clear(g_c), s	9.2	9.9	12.9	1.8	4.4	14.1	9.5	29.8	29.8	13.7	17.8	17.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.19	1.00		0.59
Lane Grp Cap(c), veh/h	326	342	305	119	486	431	341	1421	754	467	1531	760
V/C Ratio(X)	0.83	0.48	0.61	0.44	0.30	0.51	0.82	0.72	0.72	0.86	0.47	0.47
Avail Cap(c_a), veh/h	360	378	337	144	533	452	446	1421	754	547	1531	760
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.4	43.1	44.3	56.8	46.6	36.9	53.0	29.0	29.0	50.8	23.1	23.1
Incr Delay (d2), s/veh	13.5	1.1	2.7	2.5	0.3	0.9	8.7	3.1	5.7	12.0	1.0	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	4.5	5.3	0.8	2.0	5.6	4.5	12.6	13.9	6.7	7.3	7.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.9	44.2	47.0	59.3	46.9	37.9	61.7	32.2	34.8	62.8	24.1	25.2
LnGrp LOS	E	D	D	E	D	D	E	C	C	E	C	C
Approach Vol, veh/h	620		416				1834		1486			
Approach Delay, s/veh	54.9		43.7				37.4		34.9			
Approach LOS	D		D				D		C			
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	22.2	56.6	11.1	30.1	18.3	60.5	17.8	23.4				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	44.5	5.0	* 26	15.5	* 48	12.5	18.0				
Max Q Clear Time (g_c+I1), s	15.7	31.8	3.8	14.9	11.5	19.9	11.2	16.1				
Green Ext Time (p_c), s	0.5	8.2	0.0	1.5	0.4	8.6	0.1	0.3				
Intersection Summary												
HCM 6th Ctrl Delay	39.6											
HCM 6th LOS	D											
Notes												

Timings

3: Plaza Drive & Lucent Boulevard

2024 Background PM.syn

08/08/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	 	 	 	 		 	 	 	 
Traffic Volume (vph)	250	90	110	71	241	101	1140	172	1472
Future Volume (vph)	250	90	110	71	241	101	1140	172	1472
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases	8								
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	25.0	32.0	18.0	25.0	25.0	16.0	65.0	25.0	74.0
Total Split (%)	17.9%	22.9%	12.9%	17.9%	17.9%	11.4%	46.4%	17.9%	52.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	17.2	13.2	9.6	8.3	25.3	9.6	78.5	12.6	81.5
Actuated g/C Ratio	0.12	0.09	0.07	0.06	0.18	0.07	0.56	0.09	0.58
v/c Ratio	0.62	0.49	0.49	0.35	0.64	0.44	0.45	0.58	0.58
Control Delay	65.4	31.7	69.7	67.5	30.8	68.2	19.6	68.5	20.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.4	31.7	69.7	67.5	30.8	68.2	19.6	68.5	20.2
LOS	E	C	E	E	C	E	B	E	C
Approach Delay	50.8			47.1			23.3		
Approach LOS	D			D			C		

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 29.5

Intersection LOS: C

Intersection Capacity Utilization 69.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2024 Background PM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	90	99	110	71	241	101	1140	90	172	1472	154
Future Volume (veh/h)	250	90	99	110	71	241	101	1140	90	172	1472	154
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	260	94	103	115	74	251	105	1188	94	179	1533	160
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	316	301	268	164	457	311	152	2539	201	235	2567	268
Arrive On Green	0.09	0.17	0.17	0.05	0.13	0.13	0.04	0.53	0.53	0.07	0.55	0.55
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4824	382	3456	4697	490
Grp Volume(v), veh/h	260	94	103	115	74	251	105	838	444	179	1111	582
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1802	1728	1702	1782
Q Serve(g_s), s	10.3	6.5	8.1	4.6	2.6	18.0	4.2	21.7	21.7	7.1	30.7	30.8
Cycle Q Clear(g_c), s	10.3	6.5	8.1	4.6	2.6	18.0	4.2	21.7	21.7	7.1	30.7	30.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	1.00		0.27
Lane Grp Cap(c), veh/h	316	301	268	164	457	311	152	1792	948	235	1861	974
V/C Ratio(X)	0.82	0.31	0.38	0.70	0.16	0.81	0.69	0.47	0.47	0.76	0.60	0.60
Avail Cap(c_a), veh/h	457	324	289	272	457	311	234	1792	948	469	1861	974
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.5	51.0	51.7	65.7	54.3	53.7	66.0	20.8	20.8	64.1	21.4	21.4
Incr Delay (d2), s/veh	7.8	0.6	0.9	5.4	0.2	14.4	5.5	0.9	1.7	5.1	1.4	2.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	3.0	3.3	2.2	1.2	9.7	2.0	8.9	9.6	3.3	12.5	13.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.3	51.6	52.6	71.1	54.5	68.1	71.5	21.7	22.5	69.2	22.8	24.1
LnGrp LOS	E	D	D	E	D	E	E	C	C	E	C	C
Approach Vol, veh/h	457			440			1387			1872		
Approach Delay, s/veh	62.5			66.6			25.7			27.6		
Approach LOS	E			E			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	15.5	80.2	13.6	30.7	12.7	83.0	19.3	25.0				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	58.5	11.0	* 26	9.5	* 68	18.5	18.0				
Max Q Clear Time (g_c+I1), s	9.1	23.7	6.6	10.1	6.2	32.8	12.3	20.0				
Green Ext Time (p_c), s	0.4	11.3	0.1	0.9	0.1	16.9	0.5	0.0				
Intersection Summary												
HCM 6th Ctrl Delay	34.9											
HCM 6th LOS	C											
Notes												

Timings

3: Plaza Drive & Lucent Boulevard

2024 Total AM.syn
08/08/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	270	157	47	133	200	257	1320	367	792
Future Volume (vph)	270	157	47	133	200	257	1320	367	792
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases	8								
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	19.0	32.0	12.0	25.0	25.0	22.0	51.0	25.0	54.0
Total Split (%)	15.8%	26.7%	10.0%	20.8%	20.8%	18.3%	42.5%	20.8%	45.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	12.4	20.1	5.0	10.3	36.6	15.1	52.0	19.3	56.2
Actuated g/C Ratio	0.10	0.17	0.04	0.09	0.30	0.13	0.43	0.16	0.47
v/c Ratio	0.84	0.53	0.36	0.48	0.37	0.66	0.71	0.73	0.47
Control Delay	73.7	23.8	63.3	57.3	11.2	57.2	30.9	55.6	21.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.7	23.8	63.3	57.3	11.2	57.2	30.9	55.6	21.8
LOS	E	C	E	E	B	E	C	E	C
Approach Delay	45.9		33.8		34.9		30.9		
Approach LOS	D		C		C		C		

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 35.1

Intersection LOS: D

Intersection Capacity Utilization 74.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2024 Total AM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	270	157	183	47	133	200	257	1320	96	367	792	202
Future Volume (veh/h)	270	157	183	47	133	200	257	1320	96	367	792	202
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	297	173	201	52	146	220	282	1451	105	403	870	222
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	351	355	317	119	486	431	344	1992	144	467	1791	455
Arrive On Green	0.10	0.20	0.20	0.03	0.14	0.14	0.10	0.41	0.41	0.14	0.44	0.44
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4860	352	3456	4059	1030
Grp Volume(v), veh/h	297	173	201	52	146	220	282	1016	540	403	729	363
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1807	1728	1702	1685
Q Serve(g_s), s	10.1	10.4	13.9	1.8	4.4	14.1	9.6	30.1	30.1	13.7	18.3	18.4
Cycle Q Clear(g_c), s	10.1	10.4	13.9	1.8	4.4	14.1	9.6	30.1	30.1	13.7	18.3	18.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.19	1.00		0.61
Lane Grp Cap(c), veh/h	351	355	317	119	486	431	344	1396	741	467	1502	743
V/C Ratio(X)	0.85	0.49	0.63	0.44	0.30	0.51	0.82	0.73	0.73	0.86	0.49	0.49
Avail Cap(c_a), veh/h	360	378	337	144	533	452	446	1396	741	547	1502	743
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.0	42.6	44.0	56.8	46.6	36.9	53.0	29.8	29.8	50.8	23.8	23.9
Incr Delay (d2), s/veh	16.6	1.0	3.6	2.5	0.3	0.9	9.0	3.4	6.2	12.0	1.1	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	4.7	5.8	0.8	2.0	5.6	4.6	12.8	14.2	6.7	7.5	7.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	69.6	43.6	47.5	59.3	47.0	37.9	61.9	33.1	36.0	62.8	25.0	26.2
LnGrp LOS	E	D	D	E	D	D	E	C	D	E	C	C
Approach Vol, veh/h	671				418				1838			
Approach Delay, s/veh	56.3				43.7				38.4			
Approach LOS	E				D				D			
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	22.2	55.7	11.1	31.0	18.5	59.4	18.7	23.4				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	44.5	5.0	* 26	15.5	* 48	12.5	18.0				
Max Q Clear Time (g_c+l1), s	15.7	32.1	3.8	15.9	11.6	20.4	12.1	16.1				
Green Ext Time (p_c), s	0.5	8.1	0.0	1.6	0.4	8.7	0.0	0.3				

Intersection Summary

HCM 6th Ctrl Delay	40.6
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timings

3: Plaza Drive & Lucent Boulevard

2024 Total PM.syn
08/08/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	263	94	110	77	241	112	1140	172	1472
Future Volume (vph)	263	94	110	77	241	112	1140	172	1472
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases					8				
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	25.0	32.0	18.0	25.0	25.0	16.0	65.0	25.0	74.0
Total Split (%)	17.9%	22.9%	12.9%	17.9%	17.9%	11.4%	46.4%	17.9%	52.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	15.9	14.9	9.6	8.6	28.2	10.1	76.9	12.6	79.4
Actuated g/C Ratio	0.11	0.11	0.07	0.06	0.20	0.07	0.55	0.09	0.57
v/c Ratio	0.70	0.47	0.49	0.37	0.59	0.47	0.46	0.58	0.60
Control Delay	69.6	30.4	69.7	67.5	28.8	68.3	20.4	68.5	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.6	30.4	69.7	67.5	28.8	68.3	20.4	68.5	21.6
LOS	E	C	E	E	C	E	C	E	C
Approach Delay		52.7		46.3			24.4		26.0
Approach LOS		D		D			C		C

Intersection Summary

Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.70
 Intersection Signal Delay: 30.7
 Intersection Capacity Utilization 69.8%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service C

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2024 Total PM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	263	94	106	110	77	241	112	1140	90	172	1472	174
Future Volume (veh/h)	263	94	106	110	77	241	112	1140	90	172	1472	174
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	274	98	110	115	80	251	117	1188	94	179	1533	181
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	330	308	274	164	457	311	165	2520	199	235	2496	294
Arrive On Green	0.10	0.17	0.17	0.05	0.13	0.13	0.05	0.52	0.52	0.07	0.54	0.54
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4824	382	3456	4630	546
Grp Volume(v), veh/h	274	98	110	115	80	251	117	838	444	179	1127	587
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1802	1728	1702	1772
Q Serve(g_s), s	10.9	6.8	8.6	4.6	2.8	18.0	4.7	21.8	21.9	7.1	31.9	32.0
Cycle Q Clear(g_c), s	10.9	6.8	8.6	4.6	2.8	18.0	4.7	21.8	21.9	7.1	31.9	32.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	1.00		0.31
Lane Grp Cap(c), veh/h	330	308	274	164	457	311	165	1778	941	235	1835	955
V/C Ratio(X)	0.83	0.32	0.40	0.70	0.18	0.81	0.71	0.47	0.47	0.76	0.61	0.61
Avail Cap(c_a), veh/h	457	324	289	272	457	311	234	1778	941	469	1835	955
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	62.2	50.7	51.4	65.7	54.4	53.7	65.7	21.2	21.2	64.1	22.2	22.3
Incr Delay (d2), s/veh	8.9	0.6	0.9	5.4	0.2	14.4	5.5	0.9	1.7	5.1	1.5	3.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	3.1	3.5	2.2	1.3	9.7	2.2	8.9	9.7	3.3	13.1	14.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.1	51.2	52.4	71.1	54.6	68.1	71.2	22.1	22.9	69.2	23.8	25.2
LnGrp LOS	E	D	D	E	D	E	E	C	C	E	C	C
Approach Vol, veh/h	482				446		1399		1893			
Approach Delay, s/veh	62.8				66.4		26.4		28.5			
Approach LOS	E				E		C		C			
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	15.5	79.6	13.6	31.2	13.2	82.0	19.9	25.0				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	58.5	11.0	* 26	9.5	* 68	18.5	18.0				
Max Q Clear Time (g_c+I1), s	9.1	23.9	6.6	10.6	6.7	34.0	12.9	20.0				
Green Ext Time (p_c), s	0.4	11.3	0.1	1.0	0.1	16.9	0.5	0.0				

Intersection Summary

HCM 6th Ctrl Delay 35.8

HCM 6th LOS D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timings

3: Plaza Drive & Lucent Boulevard

2045 Background AM.syn

08/08/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	298	183	58	160	246	310	1627	453	976
Future Volume (vph)	298	183	58	160	246	310	1627	453	976
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases	8								
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	19.0	32.0	12.0	25.0	25.0	22.0	51.0	25.0	54.0
Total Split (%)	15.8%	26.7%	10.0%	20.8%	20.8%	18.3%	42.5%	20.8%	45.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	12.5	21.1	5.0	11.2	40.5	16.7	48.0	22.2	53.6
Actuated g/C Ratio	0.10	0.18	0.04	0.09	0.34	0.14	0.40	0.18	0.45
v/c Ratio	0.91	0.56	0.44	0.53	0.42	0.71	0.94	0.77	0.59
Control Delay	82.6	24.7	66.1	57.4	13.8	57.7	45.1	55.4	25.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	82.6	24.7	66.1	57.4	13.8	57.7	45.1	55.4	25.7
LOS	F	C	E	E	B	E	D	E	C
Approach Delay	49.8		35.4		47.0		33.8		
Approach LOS	D		D		D		C		

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 120
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.94
 Intersection Signal Delay: 41.8
 Intersection Capacity Utilization 84.5%
 Analysis Period (min) 15

Intersection LOS: D
 ICU Level of Service E

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2045 Background AM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	298	183	206	58	160	246	310	1627	118	453	976	236
Future Volume (veh/h)	298	183	206	58	160	246	310	1627	118	453	976	236
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	324	199	224	63	174	267	337	1768	128	492	1061	259
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	360	379	338	126	533	487	396	1809	131	543	1681	410
Arrive On Green	0.10	0.21	0.21	0.04	0.15	0.15	0.11	0.37	0.37	0.16	0.41	0.41
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4860	351	3456	4096	999
Grp Volume(v), veh/h	324	199	224	63	174	267	337	1237	659	492	882	438
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1807	1728	1702	1691
Q Serve(g_s), s	11.1	11.9	15.5	2.1	5.3	16.8	11.5	43.0	43.2	16.8	24.7	24.8
Cycle Q Clear(g_c), s	11.1	11.9	15.5	2.1	5.3	16.8	11.5	43.0	43.2	16.8	24.7	24.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.19	1.00		0.59
Lane Grp Cap(c), veh/h	360	379	338	126	533	487	396	1267	673	543	1397	694
V/C Ratio(X)	0.90	0.52	0.66	0.50	0.33	0.55	0.85	0.98	0.98	0.91	0.63	0.63
Avail Cap(c_a), veh/h	360	379	338	144	533	487	446	1267	673	547	1397	694
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.1	41.8	43.2	56.7	45.6	34.7	52.1	37.2	37.2	49.7	28.1	28.2
Incr Delay (d2), s/veh	24.6	1.3	4.8	3.0	0.4	1.3	13.4	20.3	30.1	18.8	2.2	4.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	5.4	6.5	1.0	2.4	6.7	5.7	21.1	24.3	8.6	10.4	10.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.7	43.1	48.0	59.7	45.9	36.0	65.5	57.4	67.3	68.5	30.3	32.5
LnGrp LOS	E	D	D	E	D	D	E	E	E	E	C	C
Approach Vol, veh/h		747			504			2233			1812	
Approach Delay, s/veh		59.6			42.4			61.6			41.2	
Approach LOS		E			D			E			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	24.8	51.2	11.4	32.6	20.2	55.8	19.0	25.0				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	44.5	5.0	* 26	15.5	* 48	12.5	18.0				
Max Q Clear Time (g_c+I1), s	18.8	45.2	4.1	17.5	13.5	26.8	13.1	18.8				
Green Ext Time (p_c), s	0.0	0.0	0.0	1.6	0.3	9.8	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			52.5									
HCM 6th LOS			D									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Timings

3: Plaza Drive & Lucent Boulevard

2045 Background PM.syn

08/08/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	304	109	136	86	297	121	1406	212	1814
Future Volume (vph)	304	109	136	86	297	121	1406	212	1814
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases					8				
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	25.0	32.0	18.0	25.0	25.0	16.0	65.0	25.0	74.0
Total Split (%)	17.9%	22.9%	12.9%	17.9%	17.9%	11.4%	46.4%	17.9%	52.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	17.0	15.7	10.2	8.9	31.0	10.5	73.1	15.0	77.6
Actuated g/C Ratio	0.12	0.11	0.07	0.06	0.22	0.08	0.52	0.11	0.55
v/c Ratio	0.76	0.50	0.57	0.40	0.68	0.49	0.60	0.60	0.75
Control Delay	72.0	30.8	72.0	67.7	35.3	68.3	25.4	65.9	26.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.0	30.8	72.0	67.7	35.3	68.3	25.4	65.9	26.5
LOS	E	C	E	E	D	E	C	E	C
Approach Delay		54.3		50.3			28.6		30.3
Approach LOS		D		D			C		C

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 34.5

Intersection LOS: C

Intersection Capacity Utilization 77.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2045 Background PM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	304	109	120	136	86	297	121	1406	111	212	1814	184
Future Volume (veh/h)	304	109	120	136	86	297	121	1406	111	212	1814	184
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	317	114	125	142	90	309	126	1465	116	221	1890	192
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	371	315	281	191	457	331	174	2402	190	278	2471	250
Arrive On Green	0.11	0.18	0.18	0.06	0.13	0.13	0.05	0.50	0.50	0.08	0.52	0.52
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4824	382	3456	4713	476
Grp Volume(v), veh/h	317	114	125	142	90	309	126	1034	547	221	1362	720
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1802	1728	1702	1785
Q Serve(g_s), s	12.6	7.9	9.9	5.7	3.2	18.0	5.0	30.7	30.7	8.8	44.4	45.0
Cycle Q Clear(g_c), s	12.6	7.9	9.9	5.7	3.2	18.0	5.0	30.7	30.7	8.8	44.4	45.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	1.00		0.27
Lane Grp Cap(c), veh/h	371	315	281	191	457	331	174	1695	897	278	1785	936
V/C Ratio(X)	0.85	0.36	0.45	0.74	0.20	0.93	0.72	0.61	0.61	0.80	0.76	0.77
Avail Cap(c_a), veh/h	457	324	289	272	457	331	234	1695	897	469	1785	936
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.4	50.7	51.5	65.1	54.5	54.4	65.5	25.3	25.3	63.3	26.4	26.6
Incr Delay (d2), s/veh	12.4	0.7	1.1	6.5	0.2	32.6	7.0	1.6	3.1	5.2	3.2	6.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.2	3.6	4.0	2.7	1.4	13.7	2.4	12.7	13.8	4.1	18.5	20.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	73.8	51.4	52.6	71.6	54.7	87.1	72.5	27.0	28.4	68.4	29.6	32.6
LnGrp LOS	E	D	D	E	D	F	E	C	C	E	C	C
Approach Vol, veh/h	556			541			1707			2303		
Approach Delay, s/veh	64.4			77.6			30.8			34.2		
Approach LOS	E			E			C			C		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.2	76.2	14.8	31.8	13.6	79.9	21.5	25.0				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	58.5	11.0	* 26	9.5	* 68	18.5	18.0				
Max Q Clear Time (g_c+I1), s	10.8	32.7	7.7	11.9	7.0	47.0	14.6	20.0				
Green Ext Time (p_c), s	0.4	13.2	0.1	1.1	0.1	15.5	0.4	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			41.0									
HCM 6th LOS			D									
Notes												

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timings

3: Plaza Drive & Lucent Boulevard

2045 Total AM.syn

08/08/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	325	190	60	165	250	315	1630	455	980
Future Volume (vph)	325	190	60	165	250	315	1630	455	980
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases					8				
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	19.0	32.0	12.0	25.0	25.0	22.0	51.0	25.0	54.0
Total Split (%)	15.8%	26.7%	10.0%	20.8%	20.8%	18.3%	42.5%	20.8%	45.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	12.5	21.3	5.0	11.4	40.7	16.8	47.8	22.3	53.3
Actuated g/C Ratio	0.10	0.18	0.04	0.10	0.34	0.14	0.40	0.19	0.44
v/c Ratio	0.99	0.59	0.45	0.53	0.43	0.71	0.94	0.78	0.60
Control Delay	98.8	26.0	66.6	57.4	14.1	57.8	46.1	55.6	26.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.8	26.0	66.6	57.4	14.1	57.8	46.1	55.6	26.0
LOS	F	C	E	E	B	E	D	E	C
Approach Delay		58.2		35.7			47.9		34.0
Approach LOS		E		D			D		C

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 43.6

Intersection LOS: D

Intersection Capacity Utilization 85.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2045 Total AM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	325	190	220	60	165	250	315	1630	120	455	980	245
Future Volume (veh/h)	325	190	220	60	165	250	315	1630	120	455	980	245
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	353	207	239	65	179	272	342	1772	130	495	1065	266
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	360	379	338	127	533	488	400	1804	132	545	1667	416
Arrive On Green	0.10	0.21	0.21	0.04	0.15	0.15	0.12	0.37	0.37	0.16	0.41	0.41
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4855	355	3456	4074	1017
Grp Volume(v), veh/h	353	207	239	65	179	272	342	1241	661	495	890	441
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1806	1728	1702	1687
Q Serve(g_s), s	12.2	12.5	16.8	2.2	5.4	17.2	11.7	43.3	43.5	16.9	25.1	25.1
Cycle Q Clear(g_c), s	12.2	12.5	16.8	2.2	5.4	17.2	11.7	43.3	43.5	16.9	25.1	25.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.20	1.00		0.60
Lane Grp Cap(c), veh/h	360	379	338	127	533	488	400	1265	671	545	1393	690
V/C Ratio(X)	0.98	0.55	0.71	0.51	0.34	0.56	0.85	0.98	0.98	0.91	0.64	0.64
Avail Cap(c_a), veh/h	360	379	338	144	533	488	446	1265	671	547	1393	690
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.6	42.1	43.7	56.7	45.6	34.7	52.1	37.3	37.4	49.7	28.4	28.4
Incr Delay (d2), s/veh	42.1	1.6	6.6	3.1	0.4	1.4	13.8	21.3	31.2	19.0	2.3	4.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.4	5.6	7.2	1.0	2.4	6.8	5.8	21.4	24.6	8.7	10.6	10.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	95.7	43.7	50.4	59.8	46.0	36.1	65.9	58.6	68.6	68.7	30.6	32.9
LnGrp LOS	F	D	D	E	D	D	E	E	E	E	C	C
Approach Vol, veh/h	799		516				2244		1826			
Approach Delay, s/veh	68.7		42.5				62.6		41.5			
Approach LOS	E		D				E		D			
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	24.9	51.1	11.4	32.6	20.4	55.6	19.0	25.0				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	44.5	5.0	* 26	15.5	* 48	12.5	18.0				
Max Q Clear Time (g_c+I1), s	18.9	45.5	4.2	18.8	13.7	27.1	14.2	19.2				
Green Ext Time (p_c), s	0.0	0.0	0.0	1.5	0.2	9.8	0.0	0.0				
Intersection Summary												
HCM 6th Ctrl Delay			54.4									
HCM 6th LOS			D									
Notes												

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timings

3: Plaza Drive & Lucent Boulevard

2045 Total PM.syn

08/08/2022

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	320	115	140	95	300	135	1410	215	1815
Future Volume (vph)	320	115	140	95	300	135	1410	215	1815
Turn Type	Prot	NA	Prot	NA	pm+ov	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	1	5	2	1	6
Permitted Phases	8								
Detector Phase	7	4	3	8	1	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	25.0	12.0	25.0	11.0	11.5	22.5	11.0	24.0
Total Split (s)	25.0	32.0	18.0	25.0	25.0	16.0	65.0	25.0	74.0
Total Split (%)	17.9%	22.9%	12.9%	17.9%	17.9%	11.4%	46.4%	17.9%	52.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.5	2.5	3.0	3.0	2.0	2.5	2.5	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	7.0	7.0	6.0	6.5	6.5	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effect Green (s)	17.3	16.3	10.2	9.3	31.4	11.1	72.3	15.1	76.4
Actuated g/C Ratio	0.12	0.12	0.07	0.07	0.22	0.08	0.52	0.11	0.55
v/c Ratio	0.79	0.51	0.58	0.42	0.68	0.52	0.61	0.60	0.77
Control Delay	73.4	30.2	72.5	67.9	35.4	68.5	26.0	66.0	27.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.4	30.2	72.5	67.9	35.4	68.5	26.0	66.0	27.9
LOS	E	C	E	E	D	E	C	E	C
Approach Delay	54.7		50.9		29.5		31.6		
Approach LOS	D		D		C		C		

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 35.6

Intersection LOS: D

Intersection Capacity Utilization 78.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: Plaza Drive & Lucent Boulevard



HCM 6th Signalized Intersection Summary

3: Plaza Drive & Lucent Boulevard

2045 Total PM.syn

08/08/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	320	115	130	140	95	300	135	1410	115	215	1815	205
Future Volume (veh/h)	320	115	130	140	95	300	135	1410	115	215	1815	205
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	333	120	135	146	99	312	141	1469	120	224	1891	214
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	386	320	286	195	457	332	189	2371	194	281	2401	270
Arrive On Green	0.11	0.18	0.18	0.06	0.13	0.13	0.05	0.49	0.49	0.08	0.52	0.52
Sat Flow, veh/h	3456	1777	1585	3456	3554	1585	3456	4811	393	3456	4657	523
Grp Volume(v), veh/h	333	120	135	146	99	312	141	1039	550	224	1379	726
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1702	1800	1728	1702	1776
Q Serve(g_s), s	13.3	8.3	10.7	5.8	3.5	18.0	5.6	31.2	31.2	8.9	46.2	46.9
Cycle Q Clear(g_c), s	13.3	8.3	10.7	5.8	3.5	18.0	5.6	31.2	31.2	8.9	46.2	46.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.22	1.00		0.29
Lane Grp Cap(c), veh/h	386	320	286	195	457	332	189	1677	887	281	1755	916
V/C Ratio(X)	0.86	0.37	0.47	0.75	0.22	0.94	0.75	0.62	0.62	0.80	0.79	0.79
Avail Cap(c_a), veh/h	457	324	289	272	457	332	234	1677	887	469	1755	916
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.1	50.5	51.4	65.1	54.7	54.4	65.2	25.9	25.9	63.2	27.6	27.8
Incr Delay (d2), s/veh	13.7	0.7	1.2	7.0	0.2	33.7	9.6	1.7	3.2	5.2	3.6	7.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	3.8	4.4	2.8	1.6	13.9	2.7	13.0	14.1	4.1	19.4	21.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	74.8	51.2	52.6	72.1	54.9	88.1	74.8	27.7	29.2	68.4	31.2	34.8
LnGrp LOS	E	D	D	E	D	F	E	C	C	E	C	C
Approach Vol, veh/h	588			557			1730			2329		
Approach Delay, s/veh	64.9			78.0			32.0			35.9		
Approach LOS	E			E			C			D		
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.4	75.5	14.9	32.2	14.2	78.7	22.1	25.0				
Change Period (Y+Rc), s	6.0	6.5	7.0	* 7	6.5	* 6.5	6.5	7.0				
Max Green Setting (Gmax), s	19.0	58.5	11.0	* 26	9.5	* 68	18.5	18.0				
Max Q Clear Time (g_c+I1), s	10.9	33.2	7.8	12.7	7.6	48.9	15.3	20.0				
Green Ext Time (p_c), s	0.5	13.1	0.1	1.2	0.1	14.5	0.4	0.0				

Intersection Summary

HCM 6th Ctrl Delay 42.4

HCM 6th LOS D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↱		↰	↰↱			↰↱			↰↱	
Traffic Vol, veh/h	3	158	10	19	138	3	20	0	36	11	0	7
Future Vol, veh/h	3	158	10	19	138	3	20	0	36	11	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	172	11	21	150	3	22	0	39	12	0	8
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	153	0	0	183	0	0	301	379	92	286	383	77
Stage 1	-	-	-	-	-	-	184	184	-	194	194	-
Stage 2	-	-	-	-	-	-	117	195	-	92	189	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1425	-	-	1389	-	-	629	552	947	644	549	968
Stage 1	-	-	-	-	-	-	800	746	-	789	739	-
Stage 2	-	-	-	-	-	-	875	738	-	905	743	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1425	-	-	1389	-	-	616	543	947	609	540	968
Mov Cap-2 Maneuver	-	-	-	-	-	-	656	583	-	649	577	-
Stage 1	-	-	-	-	-	-	798	745	-	787	728	-
Stage 2	-	-	-	-	-	-	855	727	-	866	742	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.9			9.8			10		
HCM LOS							A			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	817	1425	-	-	1389	-	-	744				
HCM Lane V/C Ratio	0.075	0.002	-	-	0.015	-	-	0.026				
HCM Control Delay (s)	9.8	7.5	-	-	7.6	-	-	10				
HCM Lane LOS	A	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				

Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	160	21	38	143	9	16	0	30	6	0	4
Future Vol, veh/h	9	160	21	38	143	9	16	0	30	6	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	174	23	41	155	10	17	0	33	7	0	4
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	165	0	0	197	0	0	366	453	99	349	459	83
Stage 1	-	-	-	-	-	-	206	206	-	242	242	-
Stage 2	-	-	-	-	-	-	160	247	-	107	217	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1411	-	-	1373	-	-	565	501	937	581	497	960
Stage 1	-	-	-	-	-	-	777	730	-	740	704	-
Stage 2	-	-	-	-	-	-	826	701	-	887	722	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1411	-	-	1373	-	-	547	482	937	545	479	960
Mov Cap-2 Maneuver	-	-	-	-	-	-	606	537	-	598	529	-
Stage 1	-	-	-	-	-	-	772	725	-	735	683	-
Stage 2	-	-	-	-	-	-	798	680	-	850	717	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			1.5			9.9			10.2		
HCM LOS							A			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	787	1411	-	-	1373	-	-	704				
HCM Lane V/C Ratio	0.064	0.007	-	-	0.03	-	-	0.015				
HCM Control Delay (s)	9.9	7.6	-	-	7.7	-	-	10.2				
HCM Lane LOS	A	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0				

Intersection												
Int Delay, s/veh	2.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	195	10	20	170	5	20	0	40	15	0	10
Future Vol, veh/h	5	195	10	20	170	5	20	0	40	15	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	212	11	22	185	5	22	0	43	16	0	11
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	190	0	0	223	0	0	365	462	112	348	465	95
Stage 1	-	-	-	-	-	-	228	228	-	232	232	-
Stage 2	-	-	-	-	-	-	137	234	-	116	233	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1381	-	-	1343	-	-	566	495	920	582	493	943
Stage 1	-	-	-	-	-	-	754	714	-	750	711	-
Stage 2	-	-	-	-	-	-	852	710	-	876	711	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1381	-	-	1343	-	-	551	485	920	546	483	943
Mov Cap-2 Maneuver	-	-	-	-	-	-	608	542	-	603	537	-
Stage 1	-	-	-	-	-	-	751	711	-	747	700	-
Stage 2	-	-	-	-	-	-	828	699	-	832	708	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.8			10			10.3		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	786	1381	-	-	1343	-	-	705				
HCM Lane V/C Ratio	0.083	0.004	-	-	0.016	-	-	0.039				
HCM Control Delay (s)	10	7.6	-	-	7.7	-	-	10.3				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.1				

Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	195	25	40	175	10	20	0	30	10	0	5
Future Vol, veh/h	10	195	25	40	175	10	20	0	30	10	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	212	27	43	190	11	22	0	33	11	0	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	201	0	0	239	0	0	429	535	120	410	543	101
Stage 1	-	-	-	-	-	-	248	248	-	282	282	-
Stage 2	-	-	-	-	-	-	181	287	-	128	261	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1368	-	-	1325	-	-	510	450	909	526	445	935
Stage 1	-	-	-	-	-	-	734	700	-	701	676	-
Stage 2	-	-	-	-	-	-	803	673	-	862	691	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1368	-	-	1325	-	-	492	432	909	492	427	935
Mov Cap-2 Maneuver	-	-	-	-	-	-	492	432	-	492	427	-
Stage 1	-	-	-	-	-	-	728	694	-	695	654	-
Stage 2	-	-	-	-	-	-	772	651	-	824	685	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			1.4			10.8			11.3		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	679	1368	-	-	1325	-	-	584				
HCM Lane V/C Ratio	0.08	0.008	-	-	0.033	-	-	0.028				
HCM Control Delay (s)	10.8	7.7	-	-	7.8	-	-	11.3				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile O(veh)	0.3	0	-	-	0.1	-	-	0.1				

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↱		↰	↰↱			↰↱			↰↱	
Traffic Vol, veh/h	4	201	0	8	149	7	0	0	0	29	0	11
Future Vol, veh/h	4	201	0	8	149	7	0	0	0	29	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	218	0	9	162	8	0	0	0	32	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	170	0	0	218	0	0	325	414	109	301	410	85
Stage 1	-	-	-	-	-	-	226	226	-	184	184	-
Stage 2	-	-	-	-	-	-	99	188	-	117	226	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1405	-	-	1349	-	-	604	527	924	629	530	957
Stage 1	-	-	-	-	-	-	756	716	-	800	746	-
Stage 2	-	-	-	-	-	-	896	743	-	875	716	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1405	-	-	1349	-	-	592	522	924	625	525	957
Mov Cap-2 Maneuver	-	-	-	-	-	-	634	568	-	662	569	-
Stage 1	-	-	-	-	-	-	754	714	-	798	741	-
Stage 2	-	-	-	-	-	-	879	738	-	873	714	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.4			0			10.3		
HCM LOS							A			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1405	-	-	1349	-	-	723
HCM Lane V/C Ratio	-	0.003	-	-	0.006	-	-	0.06
HCM Control Delay (s)	0	7.6	-	-	7.7	-	-	10.3
HCM Lane LOS	A	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.2

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	185	0	4	172	17	12	0	0	15	0	6
Future Vol, veh/h	11	185	0	4	172	17	12	0	0	15	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	201	0	4	187	18	13	0	0	16	0	7
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	205	0	0	201	0	0	327	438	101	329	429	103
Stage 1	-	-	-	-	-	-	225	225	-	204	204	-
Stage 2	-	-	-	-	-	-	102	213	-	125	225	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1364	-	-	1368	-	-	602	511	935	600	517	932
Stage 1	-	-	-	-	-	-	757	716	-	779	732	-
Stage 2	-	-	-	-	-	-	893	725	-	866	716	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1364	-	-	1368	-	-	592	505	935	595	511	932
Mov Cap-2 Maneuver	-	-	-	-	-	-	633	555	-	639	561	-
Stage 1	-	-	-	-	-	-	750	710	-	772	730	-
Stage 2	-	-	-	-	-	-	884	723	-	858	710	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.2			10.8			10.3		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	633	1364	-	-	1368	-	-	702				
HCM Lane V/C Ratio	0.021	0.009	-	-	0.003	-	-	0.033				
HCM Control Delay (s)	10.8	7.7	-	-	7.6	-	-	10.3				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	240	0	10	180	10	0	0	0	30	0	15
Future Vol, veh/h	5	240	0	10	180	10	0	0	0	30	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	261	0	11	196	11	0	0	0	33	0	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	207	0	0	261	0	0	391	500	131	365	495	104
Stage 1	-	-	-	-	-	-	271	271	-	224	224	-
Stage 2	-	-	-	-	-	-	120	229	-	141	271	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1361	-	-	1300	-	-	543	471	894	566	474	931
Stage 1	-	-	-	-	-	-	712	684	-	758	717	-
Stage 2	-	-	-	-	-	-	872	713	-	847	684	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1361	-	-	1300	-	-	528	465	894	561	468	931
Mov Cap-2 Maneuver	-	-	-	-	-	-	587	528	-	615	528	-
Stage 1	-	-	-	-	-	-	709	681	-	755	711	-
Stage 2	-	-	-	-	-	-	849	707	-	844	681	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.4			0			10.6		
HCM LOS							A			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	-	1361	-	-	1300	-	-	693				
HCM Lane V/C Ratio	-	0.004	-	-	0.008	-	-	0.071				
HCM Control Delay (s)	0	7.7	-	-	7.8	-	-	10.6				
HCM Lane LOS	A	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.2				

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	220	0	5	205	20	15	0	0	15	0	10
Future Vol, veh/h	15	220	0	5	205	20	15	0	0	15	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	239	0	5	223	22	16	0	0	16	0	11
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	245	0	0	239	0	0	393	526	120	396	515	123
Stage 1	-	-	-	-	-	-	271	271	-	244	244	-
Stage 2	-	-	-	-	-	-	122	255	-	152	271	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1318	-	-	1325	-	-	541	455	909	538	462	905
Stage 1	-	-	-	-	-	-	712	684	-	738	703	-
Stage 2	-	-	-	-	-	-	869	695	-	835	684	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1318	-	-	1325	-	-	528	448	909	532	455	905
Mov Cap-2 Maneuver	-	-	-	-	-	-	584	513	-	592	520	-
Stage 1	-	-	-	-	-	-	703	676	-	729	700	-
Stage 2	-	-	-	-	-	-	855	692	-	825	676	-
Approach	EB		WB				NB			SB		
HCM Control Delay, s	0.5		0.2				11.3			10.5		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	584	1318	-	-	1325	-	-	687				
HCM Lane V/C Ratio	0.028	0.012	-	-	0.004	-	-	0.04				
HCM Control Delay (s)	11.3	7.8	-	-	7.7	-	-	10.5				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile O(veh)	0.1	0	-	-	0	-	-	0.1				

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Vol, veh/h	0	237	149	4	0	7
Future Vol, veh/h	0	237	149	4	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	258	162	4	0	8
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	83
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	-	0	960
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	960
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		8.8		
HCM LOS				A		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	960		
HCM Lane V/C Ratio	-	-	-	0.008		
HCM Control Delay (s)	-	-	-	8.8		
HCM Lane LOS	-	-	-	A		
HCM 95th %tile Q(veh)	-	-	-	0		

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↗
Traffic Vol, veh/h	0	203	185	11	0	4
Future Vol, veh/h	0	203	185	11	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	221	201	12	0	4
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	107
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	-	0	926
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	926
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		8.9		
HCM LOS				A		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	926		
HCM Lane V/C Ratio	-	-	-	0.005		
HCM Control Delay (s)	-	-	-	8.9		
HCM Lane LOS	-	-	-	A		
HCM 95th %tile Q(veh)	-	-	-	0		

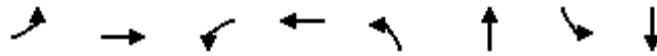
Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	275	180	5	0	10
Future Vol, veh/h	0	275	180	5	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	299	196	5	0	11
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	101
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	-	0	935
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	935
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		8.9		
HCM LOS				A		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	935		
HCM Lane V/C Ratio	-	-	-	0.012		
HCM Control Delay (s)	-	-	-	8.9		
HCM Lane LOS	-	-	-	A		
HCM 95th %tile Q(veh)	-	-	-	0		

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	240	215	15	0	5
Future Vol, veh/h	0	240	215	15	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	261	234	16	0	5
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	-	0	-	0	-	125
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	-	0	902
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	902
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		9		
HCM LOS				A		
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	-	-	-	902		
HCM Lane V/C Ratio	-	-	-	0.006		
HCM Control Delay (s)	-	-	-	9		
HCM Lane LOS	-	-	-	A		
HCM 95th %tile Q(veh)	-	-	-	0		

APPENDIX E

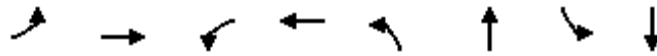
Queues Analysis Worksheets

1: Erickson Boulevard & County Line Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	50	500	67	261	227	42	18	53
v/c Ratio	0.18	0.73	0.31	0.45	0.28	0.04	0.03	0.07
Control Delay	24.9	28.4	28.0	36.3	11.4	7.0	11.7	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.9	28.4	28.0	36.3	11.4	7.0	11.7	8.0
Queue Length 50th (ft)	23	89	31	74	63	1	4	1
Queue Length 95th (ft)	42	119	52	94	115	21	15	26
Internal Link Dist (ft)		308		275		1177		185
Turn Bay Length (ft)	350		600				50	
Base Capacity (vph)	283	970	295	1053	830	939	740	741
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.52	0.23	0.25	0.27	0.04	0.02	0.07
Intersection Summary								

1: Erickson Boulevard & County Line Road



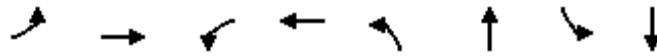
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	66	392	74	407	184	49	33	50
v/c Ratio	0.26	0.57	0.30	0.68	0.24	0.06	0.05	0.07
Control Delay	25.6	25.1	26.8	43.9	11.7	6.6	11.8	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	25.1	26.8	43.9	11.7	6.6	11.8	8.0
Queue Length 50th (ft)	30	71	34	127	51	1	8	1
Queue Length 95th (ft)	54	110	60	165	101	24	25	28
Internal Link Dist (ft)		308		275		1177		185
Turn Bay Length (ft)	350		600				50	
Base Capacity (vph)	396	813	378	717	807	864	727	731
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.48	0.20	0.57	0.23	0.06	0.05	0.07
Intersection Summary								

Queues

2045 Total AM.syn

08/08/2022

1: Erickson Boulevard & County Line Road



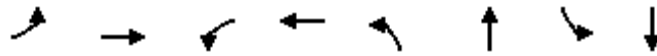
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	60	559	76	293	245	48	22	65
v/c Ratio	0.20	0.74	0.35	0.44	0.32	0.05	0.03	0.09
Control Delay	23.5	29.4	27.1	34.8	13.0	7.3	13.1	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.5	29.4	27.1	34.8	13.0	7.3	13.1	8.8
Queue Length 50th (ft)	27	109	35	83	73	1	6	2
Queue Length 95th (ft)	49	156	60	110	142	26	20	36
Internal Link Dist (ft)		308		275		1177		185
Turn Bay Length (ft)	350		600				50	
Base Capacity (vph)	301	970	296	1053	794	901	693	701
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.58	0.26	0.28	0.31	0.05	0.03	0.09
Intersection Summary								

Queues

2045 Total PM.syn

08/08/2022

1: Erickson Boulevard & County Line Road



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	82	462	92	489	212	59	38	65
v/c Ratio	0.32	0.60	0.36	0.71	0.29	0.07	0.06	0.10
Control Delay	24.5	27.6	25.8	42.5	13.8	7.4	13.7	8.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.5	27.6	25.8	42.5	13.8	7.4	13.7	8.9
Queue Length 50th (ft)	35	95	40	151	66	2	11	2
Queue Length 95th (ft)	61	137	67	193	128	30	31	36
Internal Link Dist (ft)		308		275		1177		185
Turn Bay Length (ft)	350		600				50	
Base Capacity (vph)	366	878	354	796	760	821	667	674
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.53	0.26	0.61	0.28	0.07	0.06	0.10
Intersection Summary								



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	297	374	52	146	220	282	1556	403	1092
v/c Ratio	0.84	0.53	0.36	0.48	0.37	0.66	0.71	0.73	0.47
Control Delay	73.7	23.8	63.3	57.3	11.2	57.2	30.9	55.6	21.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.7	23.8	63.3	57.3	11.2	57.2	30.9	55.6	21.8
Queue Length 50th (ft)	118	64	20	57	36	108	352	155	193
Queue Length 95th (ft)	#189	112	42	90	92	149	458	200	260
Internal Link Dist (ft)		2568		360			1117		582
Turn Bay Length (ft)	300		225			275		250	
Base Capacity (vph)	357	854	143	530	606	470	2185	589	2344
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.83	0.44	0.36	0.28	0.36	0.60	0.71	0.68	0.47

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

3: Plaza Drive & Lucent Boulevard

08/08/2022



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	274	208	115	80	251	117	1282	179	1714
v/c Ratio	0.70	0.47	0.49	0.37	0.59	0.47	0.46	0.58	0.60
Control Delay	69.6	30.4	69.7	67.5	28.8	68.3	20.4	68.5	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.6	30.4	69.7	67.5	28.8	68.3	20.4	68.5	21.6
Queue Length 50th (ft)	125	44	53	37	97	53	249	81	360
Queue Length 95th (ft)	172	83	85	65	182	85	327	119	460
Internal Link Dist (ft)		2529		360			1117		582
Turn Bay Length (ft)	300		225			275		250	
Base Capacity (vph)	453	683	269	455	490	261	2766	465	2845
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.30	0.43	0.18	0.51	0.45	0.46	0.38	0.60
Intersection Summary									



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	353	446	65	179	272	342	1902	495	1331
v/c Ratio	0.99	0.59	0.45	0.53	0.43	0.71	0.94	0.78	0.60
Control Delay	98.8	26.0	66.6	57.4	14.1	57.8	46.1	55.6	26.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.8	26.0	66.6	57.4	14.1	57.8	46.1	55.6	26.0
Queue Length 50th (ft)	142	84	25	70	62	131	528	185	269
Queue Length 95th (ft)	#241	136	50	106	135	179	#666	251	344
Internal Link Dist (ft)		2340		360			1117		582
Turn Bay Length (ft)	300		225			275		250	
Base Capacity (vph)	357	878	143	530	640	494	2013	640	2226
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.51	0.45	0.34	0.42	0.69	0.94	0.77	0.60

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues

2045 Total PM.syn

3: Plaza Drive & Lucent Boulevard

08/08/2022



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	333	255	146	99	313	141	1589	224	2105
v/c Ratio	0.79	0.51	0.58	0.42	0.68	0.52	0.61	0.60	0.77
Control Delay	73.4	30.2	72.5	67.9	35.4	68.5	26.0	66.0	27.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.4	30.2	72.5	67.9	35.4	68.5	26.0	66.0	27.9
Queue Length 50th (ft)	152	53	67	46	155	64	364	102	539
Queue Length 95th (ft)	207	97	104	76	241	98	481	138	657
Internal Link Dist (ft)		2348		360			1117		582
Turn Bay Length (ft)	300		225			275		250	
Base Capacity (vph)	453	704	269	455	503	278	2602	480	2741
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.36	0.54	0.22	0.62	0.51	0.61	0.47	0.77
Intersection Summary									

APPENDIX F

Conceptual Site Plan



HIGHLANDS RANCH FILING NO. 159

A PORTION OF PLANNING AREA 79
LOCATED IN THE NORTHEAST QUARTER OF SECTION 5, TOWNSHIP 6 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
COUNTY OF DOUGLAS, STATE OF COLORADO.
9.686 ACRES – 1 LOT – SB2023-022

LEGAL DESCRIPTION

A PARCEL OF LAND SITUATED IN THE NORTHEAST QUARTER OF SECTION 5, TOWNSHIP 6 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF DOUGLAS, STATE OF COLORADO; BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE EAST QUARTER CORNER OF SAID SECTION 5, AND CONSIDERING THE SOUTH LINE OF THE NORTHEAST QUARTER OF SAID SECTION 5 TO BEAR SOUTH 89°29'31" WEST, WITH ALL BEARINGS CONTAINED HEREIN RELATIVE THERETO;

THENCE ALONG THE EAST LINE OF SAID NORTHEAST QUARTER, NORTH 00°35'26" WEST, A DISTANCE OF 958.54 TO A POINT ON THE NORTHERLY RIGHT-OF-WAY OF PLAZA DRIVE AS DESCRIBED IN THE OFFICIAL RECORDS OF THE DOUGLAS COUNTY CLERK AND RECORDER, RECORDED UNDER RECEPTION NUMBER 2007050446, AND THE **POINT OF BEGINNING**;

THENCE, ALONG SAID NORTHERLY RIGHT-OF-WAY, THE FOLLOWING SIX (6) COURSES;

1. NORTH 53°49'50" WEST, A DISTANCE OF 227.16 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE SOUTHWESTERLY HAVING A RADIUS OF 900.00 FEET;
2. NORTHWESTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 09°28'55", AN ARC LENGTH OF 148.94 FEET;
3. TANGENT TO SAID CURVE, NORTH 63°18'45" WEST, A DISTANCE OF 312.94 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE NORTHEASTERLY HAVING A RADIUS OF 800.00 FEET;
4. NORTHWESTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 14°24'48", AN ARC LENGTH OF 201.25 FEET;
5. TANGENT TO SAID CURVE, NORTH 48°53'57" WEST, A DISTANCE OF 100.00 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE SOUTHWESTERLY HAVING A RADIUS OF 900.00 FEET;
6. NORTHWESTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 27°41'48", AN ARC LENGTH OF 435.06 FEET TO THE SOUTHWEST CORNER OF THAT PARCEL OF LAND DESCRIBED IN THE DOCUMENT RECORDED UNDER RECEPTION NUMBER 2015056862 IN SAID RECORDS;

THENCE DEPARTING SAID NORTHERLY RIGHT-OF-WAY, ALONG THE WESTERLY BOUNDARY OF SAID PARCEL, NORTH 03°04'28" EAST, A DISTANCE OF 150.30 FEET TO A POINT ON THE SOUTHERLY RIGHT-OF-WAY OF STATE HIGHWAY C-470, AS DESCRIBED IN THE DOCUMENT RECORDED IN BOOK 483 AT PAGE 195 IN SAID RECORDS BEING A POINT ON A NON-TANGENT CURVE CONCAVE SOUTHERLY HAVING A RADIUS OF 5579.58 FEET, THE RADIUS POINT OF SAID CURVE BEARS SOUTH 09°16'43" WEST;

THENCE, ALONG SAID SOUTHERLY RIGHT-OF-WAY, THE FOLLOWING THREE (3) COURSES;

1. DEPARTING SAID WESTERLY BOUNDARY, EASTERLY ALONG SAID CURVE THROUGH A CENTRAL ANGLE OF 10°30'15", AN ARC LENGTH OF 1022.92 FEET;
2. NON-TANGENT TO SAID CURVE, SOUTH 69°32'53" EAST, A DISTANCE OF 197.38 FEET;
3. SOUTH 69°13'01" EAST, A DISTANCE OF 29.42 FEET TO A POINT ON SAID EAST LINE OF THE NORTHEAST QUARTER OF SECTION 5;

THENCE DEPARTING SAID SOUTHERLY RIGHT-OF-WAY, SOUTH 00°35'26" EAST, ALONG SAID EAST LINE, A DISTANCE OF 541.55 FEET TO THE **POINT OF BEGINNING**;

CONTAINING AN AREA OF 9.686 ACRES, (421,904 SQUARE FEET), MORE OR LESS.

DEDICATION STATEMENT

THE UNDERSIGNED, BEING ALL THE OWNERS, MORTGAGEES, BENEFICIARIES OF DEEDS OF TRUST AND HOLDERS OF OTHER INTERESTS IN THE LAND DESCRIBED HEREIN, HAVE LAID OUT, SUBDIVIDED AND PLATTED SAID LANDS INTO ONE LOT AND EASEMENTS, AS SHOWN HEREON UNDER THE NAME AND SUBDIVISION OF **HIGHLANDS RANCH FILING NO. 159**. THE UTILITY EASEMENTS SHOWN HEREON ARE HEREBY DEDICATED FOR PUBLIC UTILITIES AND CABLE COMMUNICATION SYSTEMS AND OTHER PURPOSES AS SHOWN HEREON. THE ENTITIES RESPONSIBLE FOR PROVIDING THE SERVICES FOR WHICH THE EASEMENTS ARE ESTABLISHED ARE HEREBY GRANTED THE PERPETUAL RIGHT OF INGRESS AND EGRESS FROM AND TO ADJACENT PROPERTIES FOR INSTALLATION, MAINTENANCE AND REPLACEMENT OF UTILITY LINES AND RELATED FACILITIES. THE UTILITY AND SIDEWALK EASEMENTS SHOWN HEREON ARE DEDICATED AND CONVEYED TO DOUGLAS COUNTY COLORADO, FOR PUBLIC USES AND PURPOSES.

**CENTRAL PARK AT HIGHLANDS RANCH, LLC,
A COLORADO LIMITED LIABILITY COMPANY**

BY: *SHEA PROPERTIES MANAGEMENT COMPANY, INC., A DELAWARE CORPORATION,
ITS MANAGER*

BY: _____

NAME: _____

TITLE: _____

BY: _____

NAME: _____

TITLE: _____

STATE OF COLORADO)
COUNTY OF _____) SS

ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____, 20____, BY _____

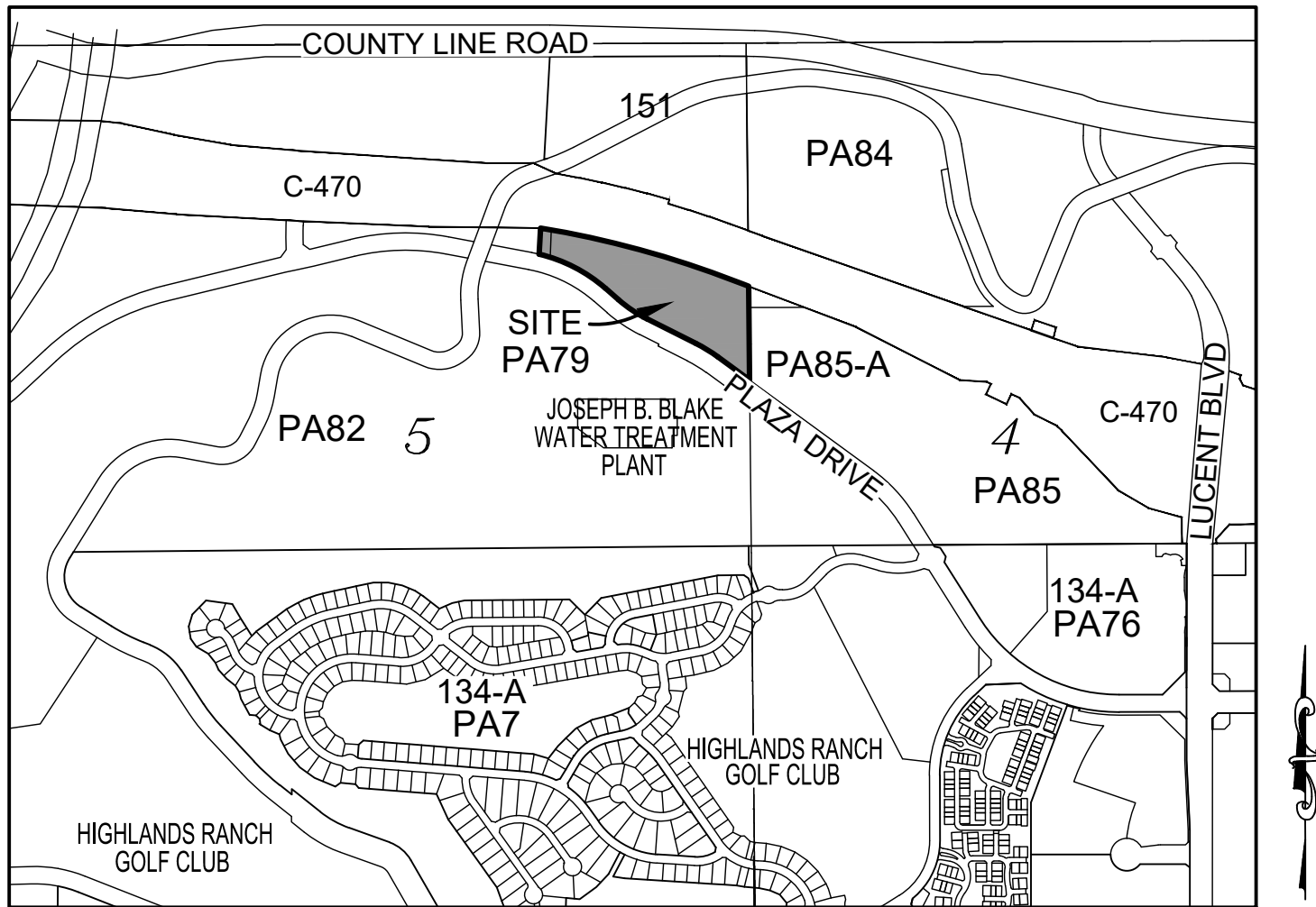
AS _____, AND _____, AS _____

OF *SHEA PROPERTIES MANAGEMENT COMPANY, INC., A DELAWARE CORPORATION, MANAGER OF CENTRAL PARK AT HIGHLANDS RANCH, LLC, A COLORADO LIMITED LIABILITY COMPANY.*

WITNESS MY HAND AND OFFICIAL SEAL:

MY COMMISSION EXPIRES: _____

NOTARY PUBLIC DATE _____



PLANNED DEVELOPMENT & VICINITY MAP
SCALE: 1" = 1000'

SHEET INDEX:
SHEET 1: TITLE SHEET
SHEET 2: EXISTING CONDITIONS
SHEET 3: NEW EASEMENTS

GENERAL NOTES

- 1) FIDELITY NATIONAL TITLE INSURANCE COMPANY TITLE INSURANCE COMPANY COMMITMENT NO. 100-N0018336-020-JY, AMENDMENT NO. 2 DATED MARCH 22, 2023 AT 7:00 A.M. WAS RELIED UPON FOR RECORD INFORMATION REGARDING RIGHTS-OF-WAY, EASEMENTS AND ENCUMBRANCES. THIS SURVEY DOES NOT REPRESENT A TITLE SEARCH BY AZTEC CONSULTANTS INC. TO DETERMINE OWNERSHIP, RIGHTS-OF-WAY, EASEMENTS OR OTHER MATTERS OF PUBLIC RECORD.
- 2) THE BEARINGS SHOWN HEREON ARE BASED UPON THE SOUTH LINE OF THE NORTHEAST QUARTER OF SECTION 5, TOWNSHIP 6 SOUTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, BEING SOUTH 89°29'31" WEST, BETWEEN FOUND MONUMENTS AS SHOWN HEREON.
- 3) THE FLOOD ZONES SHOWN HEREON ARE APPROXIMATELY AS SHOWN ON THE FEDERAL EMERGENCY MANAGEMENT AGENCY, NATIONAL FLOOD INSURANCE PROGRAM, FLOOD INSURANCE RATE MAP FOR DOUGLAS COUNTY, COLORADO, MAP NUMBER 08035C0017F, DATED SEPTEMBER 30, 2005 AND MAP NUMBER 08035C0009F, DATED SEPTEMBER 30, 2005. OTHER AREAS, ZONE X IN THE LEGEND OF THE ABOVE MENTIONED MAPS IS DESCRIBED AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.
- 4) NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVERED SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON.
- 5) ANY PERSON WHO KNOWINGLY REMOVES, ALTERS OR DEFACES ANY PUBLIC LAND SURVEY MONUMENT(S) OR LAND BOUNDARY MONUMENT(S), OR ACCESSORY COMMITS A CLASS TWO MISDEMEANOR PURSUANT TO 18-4-508 CRS.
- 6) DISTANCES ON THIS PLAT ARE GROUND DISTANCES EXPRESSED IN U.S. SURVEY FEET AND DECIMALS THEREOF. A U.S. SURVEY FOOT IS DEFINED AS EXACTLY 1200/3937 METERS.
- 7) THE PUBLIC SIDEWALK EASEMENT AS LOCATED WITHIN LOT 1 IS HEREBY DEDICATED TO DOUGLAS COUNTY FOR SIDEWALK IMPROVEMENTS.

SURVEYOR'S CERTIFICATE

I, MICHAEL J. NOFFSINGER, A DULY LICENSED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THIS PLAT TRULY AND CORRECTLY REPRESENTS THE RESULTS OF A SURVEY MADE ON MAY 19, 2022, BY ME OR UNDER MY DIRECT SUPERVISION AND THAT ALL MONUMENTS EXIST AS SHOWN HEREON; THAT MATHEMATICAL CLOSURE ERRORS ARE LESS THAN 1:50,000 (SECOND ORDER) AND THAT SAID PLAT HAS BEEN PREPARED IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS OF THE STATE OF COLORADO DEALING WITH MONUMENTS, SUBDIVISIONS OR SURVEYING OF LAND AND ALL APPLICABLE PROVISIONS OF THE DOUGLAS COUNTY SUBDIVISION RESOLUTION. THIS CERTIFICATION IS BASED ON MY KNOWLEDGE, INFORMATION AND BELIEF AND IS NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.

I ATTEST THE ABOVE ON THIS _____ DAY OF _____, 2026.

MICHAEL J. NOFFSINGER, LICENSED PROFESSIONAL LAND SURVEYOR
COLORADO P.L.S. NO. 38367
FOR AND ON BEHALF OF AZTEC CONSULTANTS, INC.

TITLE VERIFICATION

WE, _____ COMPANY, DO HEREBY CERTIFY THAT WE HAVE EXAMINED THE TITLE OF ALL LAND PLATTED HEREON AND THAT TITLE TO SUCH LAND IS IN THE DEDICATOR(S) FREE AND CLEAR OF ALL LIENS, TAXES AND ENCUMBRANCES.

COMPANY

BY: _____

TITLE: _____

DATE: _____

STATE OF COLORADO)
COUNTY OF _____) SS

ACKNOWLEDGED BEFORE ME THIS _____ DAY OF _____, 2026

BY _____ AS _____

WITNESS MY HAND AND OFFICIAL SEAL

MY COMMISSION EXPIRES: _____

NOTARY PUBLIC _____

PLANNING COMMISSION CERTIFICATE

THE MINOR DEVELOPMENT FINAL PLAT FILE NO. _____ WAS REVIEWED BY THE PLANNING

COMMISSION ON _____

PLANNING DIRECTOR, _____ DATE _____
ON BEHALF OF THE PLANNING COMMISSION

BOARD OF COUNTY COMMISSIONERS CERTIFICATE

THIS PLAT WAS APPROVED FOR FILING BY THE BOARD OF COUNTY COMMISSIONERS OF DOUGLAS COUNTY, COLORADO, ON THE _____ DAY OF _____, 2026, SUBJECT TO ANY CONDITIONS SPECIFIED HEREON. THE DEDICATION OF UTILITY AND SIDEWALK EASEMENTS ARE ACCEPTED.

ALL EXPENSES INCURRED WITH RESPECT TO IMPROVEMENTS FOR ALL UTILITY SERVICES, PAVING, GRADING, LANDSCAPING, CURBS, GUTTERS, SIDEWALKS, ROAD LIGHTING, ROAD SIGNS, FLOOD PROTECTION DEVICES, DRAINAGE STRUCTURES, AND ALL OTHER IMPROVEMENTS THAT MAY BE REQUIRED SHALL BE THE RESPONSIBILITY OF THE SUBDIVIDER AND NOT DOUGLAS COUNTY.

THIS ACCEPTANCE DOES NOT GUARANTEE THAT THE SOIL CONDITIONS, SUBSURFACE GEOLOGY, GROUNDWATER CONDITIONS OR FLOODING CONDITIONS OF THE LOT SHOWN HEREON ARE SUCH THAT A BUILDING PERMIT, WELL PERMIT OR SEWAGE DISPOSAL PERMIT WILL BE ISSUED.

CHAIR, BOARD OF COUNTY COMMISSIONERS



AzTec Proj. No: 49320-21

DEVELOPER
SHEA PROPERTIES

8351 EAST BELLEVIEW AVENUE
DENVER, COLORADO 80237
303.773.1700

DATE OF
PREPARATION:

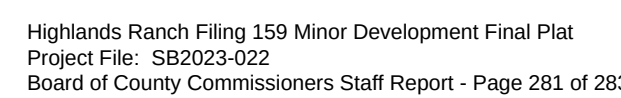
6/3/2022

SCALE:

N/A

SHEET 1 OF 3

A PORTION OF PLANNING AREA 79
LOCATED IN THE NORTHEAST QUARTER OF SECTION 5, TOWNSHIP 6 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
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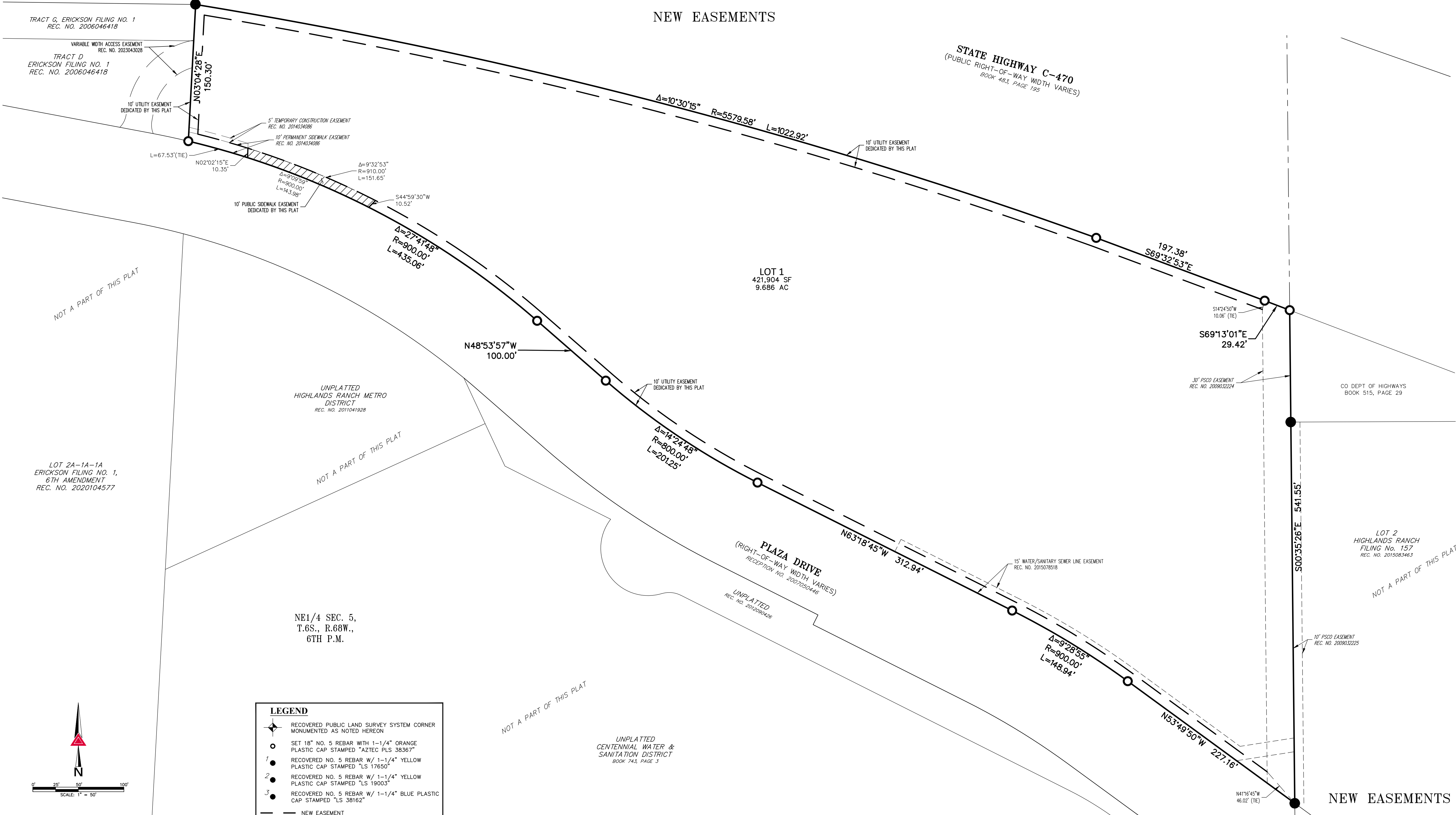


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NEW EASEMENTS

STATE HIGHWAY C-470
(PUBLIC RIGHT-OF-WAY WIDTH VARIES)
BOOK 483, PAGE 195



LEGEND

- RECOVERED PUBLIC LAND SURVEY SYSTEM CORNER MONUMENTED AS NOTED HEREON
- SET 18" NO. 5 REBAR WITH 1-1/4" ORANGE PLASTIC CAP STAMPED "AZTEC PLS 38367"
- RECOVERED NO. 5 REBAR W/ 1-1/4" YELLOW PLASTIC CAP STAMPED "LS 17650"
- RECOVERED NO. 5 REBAR W/ 1-1/4" YELLOW PLASTIC CAP STAMPED "LS 19003"
- RECOVERED NO. 5 REBAR W/ 1-1/4" BLUE PLASTIC CAP STAMPED "LS 38162"
- NEW EASEMENT
- EXISTING EASEMENT
- NEW SIDEWALK EASEMENT

AZTEC
CONSULTANTS, INC.

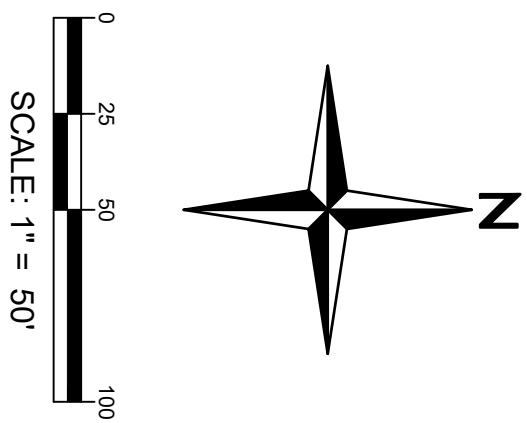
300 East Mineral Ave., Suite 1
Littleton, Colorado 80122
Phone: (303) 713-1898
Fax: (303) 713-1897
www.aztecconsultants.com

AzTec Proj. No.: 49320-21

DEVELOPER
SHEA PROPERTIES

8351 EAST BELLEVUE AVENUE
DENVER, COLORADO 80237
303.773.1700

DATE OF PREPARATION:	6/3/2022
SCALE:	1"=50'
SHEET 3 OF 3	



三十一

HIGHLANDS RANCH - FILING NO. 159

EXHIBIT

SUPPLEMENTAL ANALYSIS

[illegible]

**NOT FOR
CONSTRUCTION**

