

THE VILLAGES / TEN TRAILS MPD
PHASE 1B PLAT A – PRELIMINARY PLAT
PLN20-0107

EXHIBIT 1

TITLE: Phase 1B Plat A Preliminary Plat Planset

PREPARED BY: David Evans and Associates, Inc. on behalf of
Oakpointe LLC

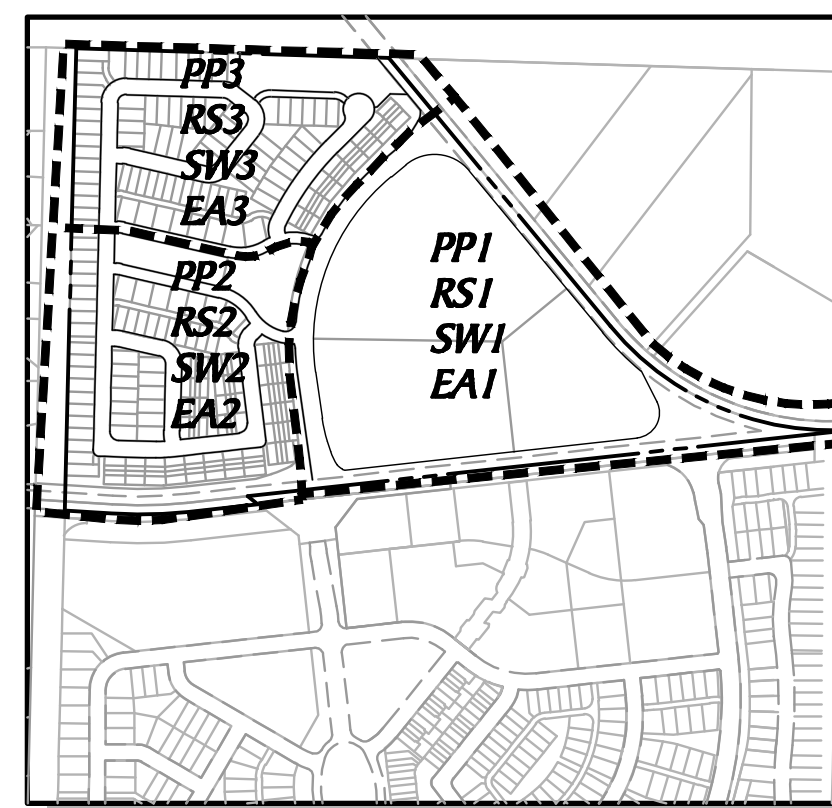
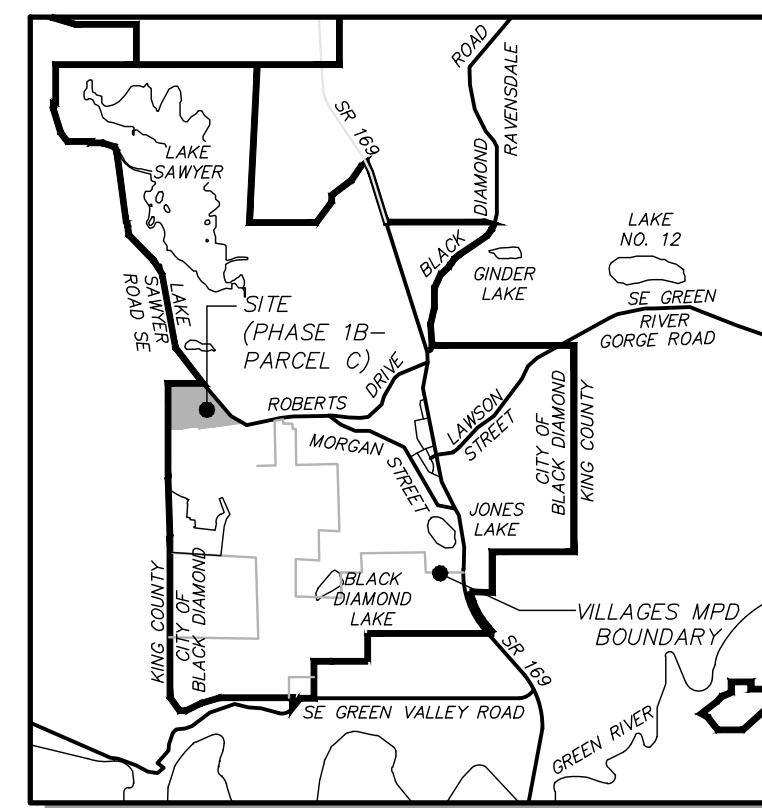
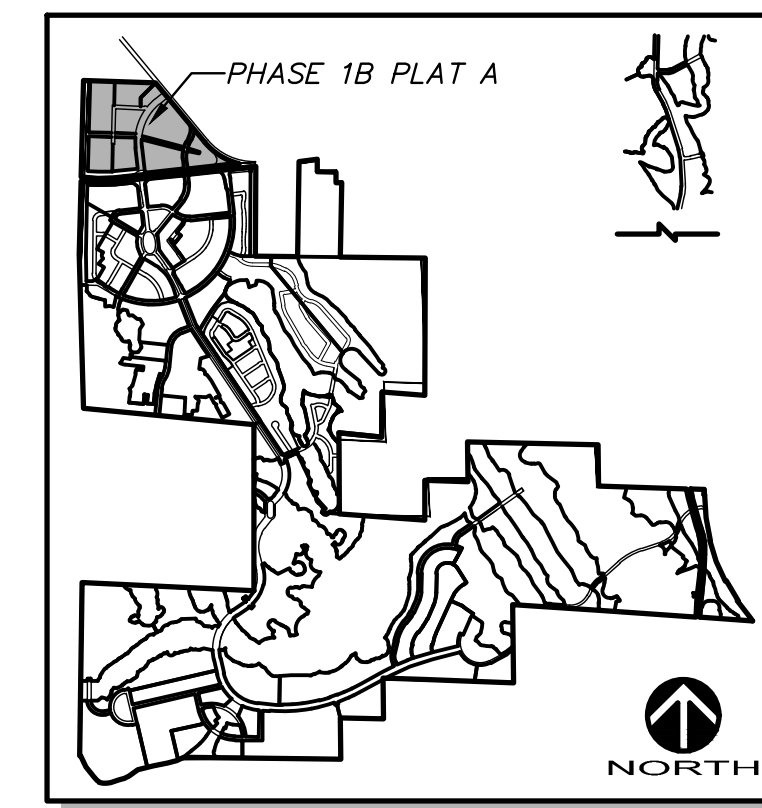
DATE: Submitted June 20, 2023;

Revision Block: Revision #4 dated June 22, 2022

TEN TRAILS

Phase 1B Plat A

NW 1/4 OF SECTION 15, TWP. 21N, RGE. 6E, W.M.



KEY MAP-VILLAGES MPD

VICINITY MAP

SHEET INDEX

GENERAL NOTES

- UNLESS OTHERWISE NOTED IN THIS PRELIMINARY PLAT, THE WATER, SEWER AND STORMWATER SYSTEMS NECESSARY TO SERVE THE DIVISION OF THIS PRELIMINARY PLAT AND/OR WHEN ANY APPLICABLE UNIT THRESHOLD FOR SUCH SYSTEMS HAS BEEN TRIGGERED, MUST BE COMPLETED PRIOR TO FINAL PLAT APPROVAL OF SUCH DIVISION OR SUCH UNIT. WATER, SEWER, AND STORMWATER FACILITIES, HOWEVER, MAY BE BONDED IN ACCORDANCE WITH SECTION 7.1.4 OF THE VILLAGES MPD DEVELOPMENT AGREEMENT.
- UNLESS OTHERWISE NOTED WITHIN THIS PRELIMINARY PLAT, ALL WATER AND SEWER PIPELINES WILL BE PUBLICLY OWNED AND OPERATED AND WILL BE WITHIN DEDICATED EASEMENT OR RIGHT OF WAY. STORMWATER PIPELINES MAY BE PRIVATELY OWNED AS LONG AS THE AREA SERVED BY THE PIPELINE IS ENTITLED BY EASEMENT AND OWNED BY THE APPLICABLE OWNERS ASSOCIATION.
- WATER CAPITAL FACILITY CHARGES AND SEWER CAPITAL FACILITY CHARGES SHALL NOT BE IMPOSED FOR DEVELOPMENT IN THIS PRELIMINARY PLAT.
- ALL UTILITIES SHALL BE IN COMPLIANCE WITH THE APPLICABLE CITY OF BLACK DIAMOND CODES AND STANDARDS SET FORTH IN EXHIBIT E OF THE VILLAGES MPD DEVELOPMENT AGREEMENT.
- WATER SUPPLY IS AVAILABLE FOR AN ADDITIONAL 400 ERU IN ACCORDANCE WITH SECTION 7.2.1 OF THE VILLAGES MPD DEVELOPMENT AGREEMENT.
- ALL STORMWATER TREATMENT SYSTEMS SHALL BE OWNED BY THE APPLICABLE OWNERS ASSOCIATION.
- IMPROVEMENTS SHOWN IN VARIOUS TRACTS THROUGHOUT THIS PRELIMINARY PLAT ARE SCHEMATIC ONLY AND NOT APPROVED IN THIS APPLICATION.
- PEDESTRIAN CROSSING FACILITIES SHALL BE PROVIDED AT ALL LEGS OF ALL INTERSECTIONS PURSUANT TO THE CITY'S ENGINEERING DESIGN AND CONSTRUCTION STANDARDS (EDCS) (EXHIBIT E TO THE VILLAGES MPD DEVELOPMENT AGREEMENT) UNLESS A MODIFICATION TO THE CITY'S EDOS IS SUBMITTED TO THE CITY ENGINEER FOR REVIEW AND APPROVAL CONSISTENT WITH SECTION 6.2 OF THE VILLAGES MPD DEVELOPMENT AGREEMENT AND SECTION 1.3 OF THE EDOS. FACILITIES SHOWN ON THIS PRELIMINARY PLAT ARE SCHEMATIC AND NOT APPROVED IN THIS APPLICATION.
- THE FOLLOWING NOTE SHALL BE PLACED ON THE FINAL PLAT: "SCHOOL MITIGATION FEES SHALL BE DUE PRIOR TO BUILDING PERMIT ISSUANCE FOR EACH SINGLE FAMILY AND MULTI-FAMILY DWELLING UNIT. DURING THE FIRST FIVE YEARS FOLLOWING JANUARY 24, 2011, THE SCHOOL MITIGATION FEES SHALL BE \$4,670.00 PER SINGLE FAMILY UNIT AND \$1,501.00 PER MULTI-FAMILY UNIT. THEREAFTER, THE MITIGATION FEE SHALL BE THE RATE ADOPTED BY THE CITY OF BLACK DIAMOND SCHOOL IMPACT FEE OR SCHOOL MITIGATION FEE ORDINANCE, IF ANY, PROVIDED THAT THE MAXIMUM SCHOOL MITIGATION FEE DUE FOR EACH DWELLING UNIT SHALL BE \$12,453 PER SINGLE FAMILY DWELLING UNIT AND \$4,003 PER MULTI-FAMILY DWELLING UNIT, AS APPLICABLE, BUT IN NO EVENT, EVEN IN THE ABSENCE OF A SCHOOL IMPACT FEE OR MITIGATION FEE ORDINANCE, SHALL THE MITIGATION FEES BE LESS THAN \$7,783.00 PER SINGLE FAMILY DWELLING UNIT AND \$2,502.00 PER MULTI-FAMILY DWELLING UNIT."
- THE CITY SHALL NOT ISSUE UTILITY PERMITS FOR ANY ROAD OR STORMWATER IMPROVEMENTS WITHIN A DIVISION OF THIS PLAT UNTIL CDD BLACK DIAMOND PARTNERS LLC OR ITS SUCCESSOR OR ASSIGNS HAS DEMONSTRATED OWNERSHIP OF ANY TDRS NEEDED FOR THAT SPECIFIC DIVISION.
- IN THE EVENT THAT THE APPLICABLE OWNERS ASSOCIATION FAILS TO PERFORM ANY MAINTENANCE OF PRIVATE ALLEY, AUTO COURT OR PUBLIC STREET-SIDE LANDSCAPING FEATURE AS REQUIRED BY SECTION 5.5.7 OF THE VILLAGES MPD DEVELOPMENT AGREEMENT AND, AS A RESULT, THE CITY OF BLACK DIAMOND PERFORMS SAID MAINTENANCE, THE LOT OWNERS OF THE PLAT ACKNOWLEDGE AND AGREE ON BEHALF OF THEMSELVES AND ALL SUCCESSORS AND ASSIGNS THAT, IF NOT PAID WITHIN THIRTY (30) DAYS OF INVOICING BY THE CITY, THE CITY'S TOTAL COST ARISING FROM THE CITY'S PERFORMANCE OF SAID REQUIRED LANDSCAPING MAINTENANCE PLUS ANY PENALTIES AND INTEREST THEREON AS PROVIDED BY THE VILLAGES MPD DEVELOPMENT AGREEMENT RECORDED UNDER KING COUNTY RECORDING NO. 20120130000655 SHALL BE A LIEN AGAINST ALL PROPERTY, INCLUDING INDIVIDUAL LOTS, WITHIN THIS PLAT, AND SAID LIEN MAY BE FORECLOSED IN THE SAME MANNER PROVIDED FOR THE FORECLOSURE OF LIENS FOR UNPAID SEWER RATES AND CHARGES SET FORTH IN RCW 35.67.220 - .280, AS AMENDED.
- IN THE EVENT THAT THE APPLICABLE OWNERS ASSOCIATION FAILS TO PERFORM ANY MAINTENANCE OF PRIVATE STREET, ALLEY, OR AUTO COURT AS REQUIRED BY SECTION 6.5 OF THE VILLAGES MPD DEVELOPMENT AGREEMENT RECORDED UNDER KING COUNTY RECORDING NO. 20120130000655 AND, AS A RESULT, THE CITY OF BLACK DIAMOND PERFORMS SAID REQUIRED MAINTENANCE, THE LOT OWNERS OF THE PLAT ACKNOWLEDGE AND AGREE ON BEHALF OF THEMSELVES AND ALL SUCCESSORS AND ASSIGNS THAT, IF NOT PAID WITHIN THIRTY (30) DAYS OF INVOICING BY THE CITY, THE CITY'S TOTAL COST ARISING FROM THE CITY'S PERFORMANCE OF SAID REQUIRED PRIVATE STREET MAINTENANCE PLUS ANY PENALTIES AND INTEREST THEREON AS PROVIDED BY THE VILLAGES MPD DEVELOPMENT AGREEMENT SHALL BE A LIEN AGAINST ALL PROPERTY, INCLUDING INDIVIDUAL LOTS, WITHIN THIS PLAT, AND SAID LIEN MAY BE FORECLOSED IN THE SAME MANNER PROVIDED FOR THE FORECLOSURE OF LIENS FOR UNPAID SEWER RATES AND CHARGES SET FORTH IN RCW 35.67.220 - .280, AS AMENDED.
- AREAS WITHIN THE SITE ARE ANTICIPATED TO BE CLEARED AND PROVISIONS MADE FOR COMPLIANCE WITH THE TREE ORDINANCE AS SPECIFIED IN EXHIBIT E OF THE VILLAGES MPD DEVELOPMENT AGREEMENT.
- PURSUANT TO SECTION 6.5(B) OF THE VILLAGES MPD DEVELOPMENT AGREEMENT, THE MASTER DEVELOPER SHALL MAINTAIN ALL PRIVATE STREETS, ALLEYS, AND AUTO COURTS SERVING 20 UNITS OR LESS FOR A PERIOD OF THREE YEARS FROM RECORDING OF FINAL PLAT OR OTHER IMPLEMENTING APPROVAL. THE MASTER DEVELOPER, IN ITS SOLE DISCRETION, MAY ELECT TO TRANSFER THE PRIVATE STREET MAINTENANCE OBLIGATION TO AN APPLICABLE OWNERS ASSOCIATION OR OTHER ACCEPTABLE ENTITY FOLLOWING ITS INITIAL THREE YEAR OBLIGATION.
- PERMANENT PUBLIC ACCESS EASEMENTS CONSISTENT WITH SECTION 9.9.3 OF THE VILLAGES MPD DEVELOPMENT AGREEMENT SHALL BE PROVIDED FOR ALL PARKS AND TRAILS ON THE FINAL PLAT.

SITE INFORMATION

GROSS SITE AREA	2,380,608 SF/54.65 AC
GROSS RESIDENTIAL DENSITY	258 UNITS/25.23 = 10.23 UNITS/ACRE
NET RESIDENTIAL DENSITY	258/19.94 = 12.94 UNITS/ACRE
DENSITY FROM TDR'S	69
LAND USE DESIGNATIONS	V1 - V3 - MASTER PLANNED DEVELOPMENT MEDIUM DENSITY RESIDENTIAL (MPD-M) - 7-12 DU/ACRE V-4 - MASTER PLANNED DEVELOPMENT HIGH DENSITY RESIDENTIAL (MPD-H) - 13-18 DU/ACRE V5 - V6 - MASTER PLANNED DEVELOPMENT HIGH DENSITY RESIDENTIAL (MPD-H) - 13-30 DU/ACRE V7, V8 AND V9 MASTER PLANNED DEVELOPMENT COMMERCIAL/OFFICE/RETAIL (V7 AND V9 POTENTIAL LIGHT INDUSTRIAL OVERLAY)

PROJECT INFORMATION

DEVELOPER:	CDD BLACK DIAMOND PARTNERS LLC 3025 112TH AVENUE NE, SUITE 100 BELLEVUE, WA 98004 (425) 898-2100 CONTACT: JUSTIN WORTMAN
SURVEYOR/ENGINEER/ PLANNER:	DAVID EVANS AND ASSOCIATES, INC 20300 WOODINVILLE SNOHOMISH ROAD NE WOODINVILLE, WA 98072 (425) 415-2000 CONTACT: BEAU J. WILLERT, P.E.
PARCEL NUMBERS:	152106-9005/152106-9097

VERTICAL DATUM

NAVD 88.

ORIGINAL BENCHMARK - WGS SURVEY DATA WAREHOUSE, SURVEY CONTROL POINT DESIGNATION "2253", DATABASE POINT ID #43270. BENCHMARK IS A USC & GS BRASS DISK, STAMPED "CGS 2 253 1944", SET IN A DRILL HOLE IN THE CONCRETE BASE OF A RAILROAD OVERPASS PIER, LOCATED ALONG THE BURLINGTON-NORTHERN RAILROAD LINE, APPROXIMATELY 1/4 MILE SOUTH OF THE INTERSECTION OF SE 280TH STREET AND STATE HIGHWAY 169. THE RAILROAD OVERPASS PIER IS 3 RAILS NORTHWEST OF STATE HIGHWAY 169 AND THE BRASS DISK IS APPROXIMATELY 5.9 FEET HIGHER THAN THE RAILROAD TRACK.
ELEVATION = 568.227 FEET

BASIS OF BEARING

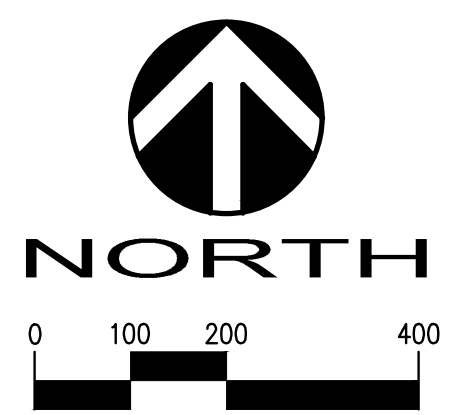
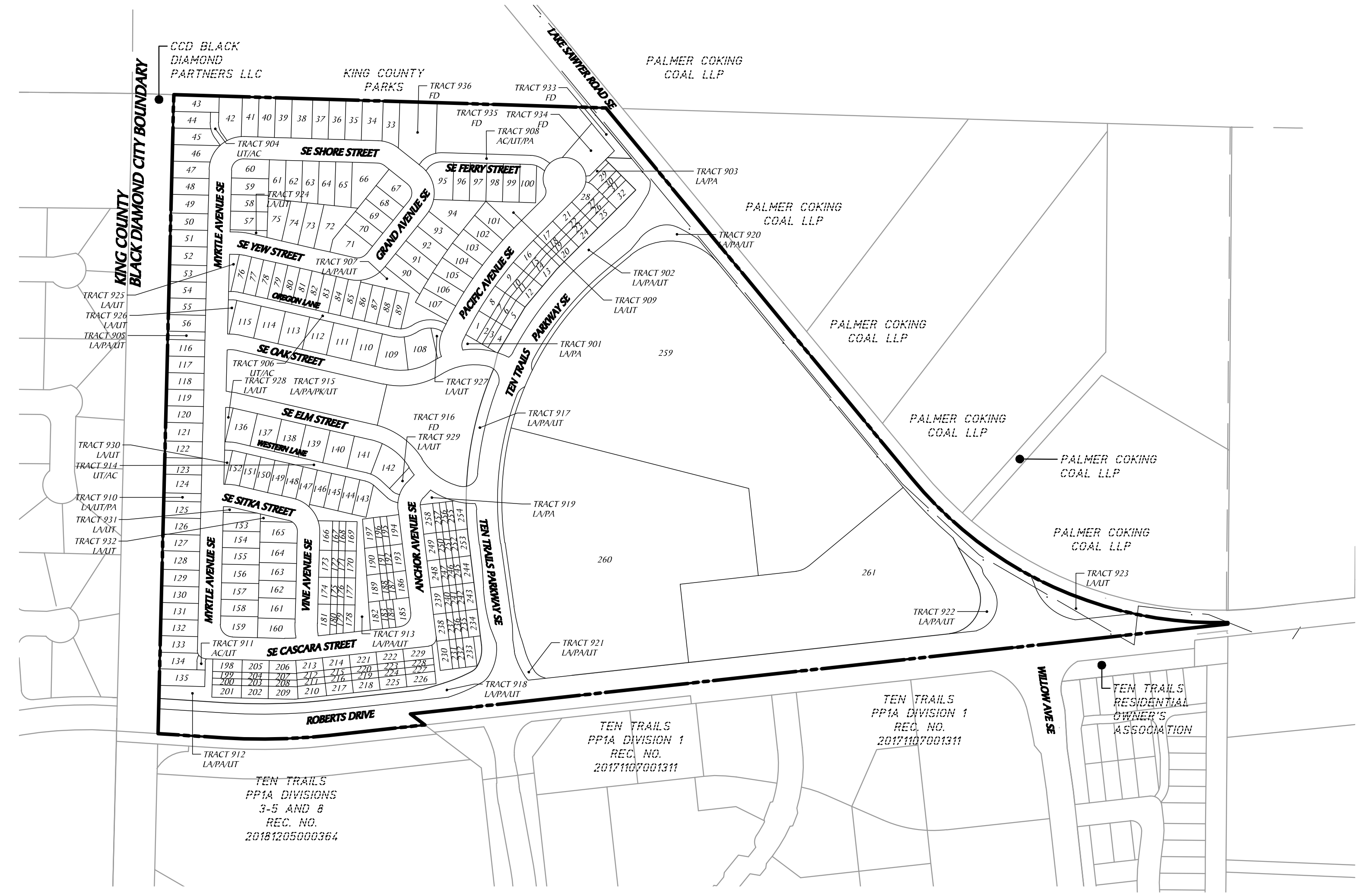
WASHINGTON NORTH ZONE NAD '83/91

HELD A BEARING OF NORTH 36°41'51" WEST FROM KING COUNTY SURVEY CONTROL POINT #7537 TO CONTROL POINT #7535

NOTES

THE PROPERTY BOUNDARIES SHOWN OUTSIDE OF THE PRELIMINARY PLAT BOUNDARY HAVE BEEN COMPILED FROM THE KING COUNTY ASSESSOR'S MAPS FOR THE NORTHWEST QUARTER OF SECTION 15 AND THE NORTHEAST QUARTER OF SECTION 16, ALL IN TOWNSHIP 21 NORTH, RANGE 6 EAST, W.M. THEY ARE SHOWN HEREON TO AID IN THE INTERPRETATION OF THE MAP.

THE CONTOURS WEST OF THE PRELIMINARY PLAT BOUNDARY WERE INTERPOLATED FROM PUBLIC DOMAIN AIRBORNE LIDAR DATA ACQUIRED IN 2003 BY THE PUGET SOUND LIDAR CONSORTIUM (PSLC) AND BLENDED WITH THE ON-SITE GROUND TOPOGRAPHIC SURVEY. LIDAR HAS DEMONSTRATED ADVANTAGES IN DEFINING GROUND SURFACES IN SHADOWED AREAS BUT MAY NOT ADEQUATELY DEFINE THE GROUND IN OBSCURED AREAS. THE ACCURACY OF THE CONTOURS AND DIGITAL TERRAIN MODEL IS CONTINGENT ON THE ACCURACY OF THE PSLC DATA. IT IS NOT EXPECTED THAT THESE CONTOURS CONFORM TO NATIONAL STANDARDS FOR SPATIAL DATA ACCURACY. THIS DATA IS INTENDED FOR PRELIMINARY SITE EVALUATION ONLY.



DAVID EVANS AND ASSOCIATES INC.
20300 Woodinville Snohomish Rd NE
Woodinville Washington 98072
Phone: 425.415.2000

PRELIMINARY PLAT COVER SHEET
PROJECT NOTES AND INFORMATION

TEN TRAILS

PHASE 1B PLAT A
CITY OF BLACK DIAMOND, WASHINGTON

DATE:	BY:	OK:
3/1/21	DATE:	DATE:
4/8/21	DATE:	DATE:
6/20/21	DATE:	DATE:



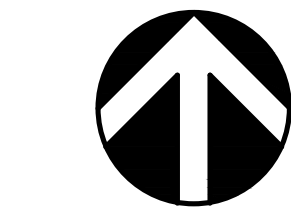
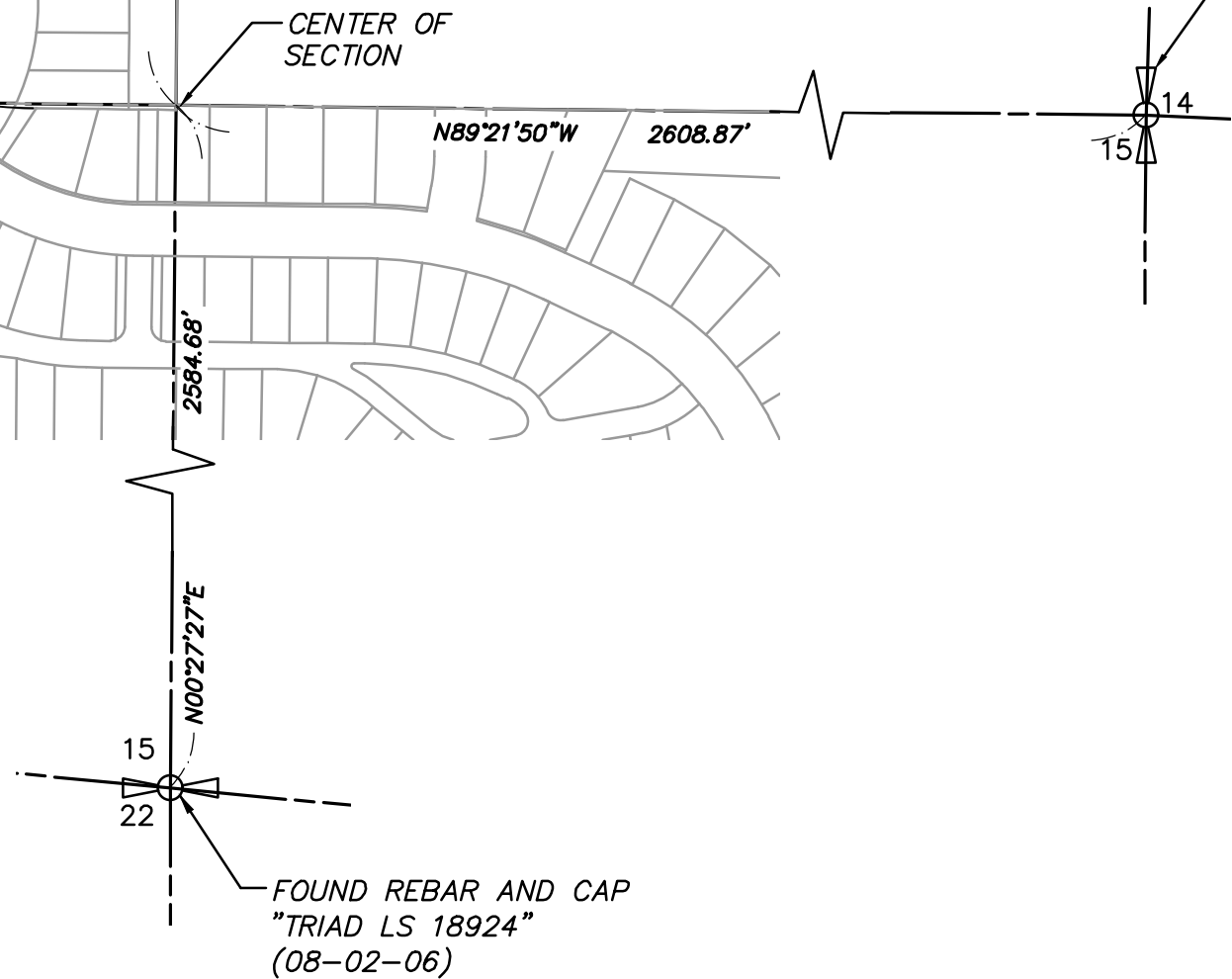
STAMP NOT VALID
UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=200' VERT.:

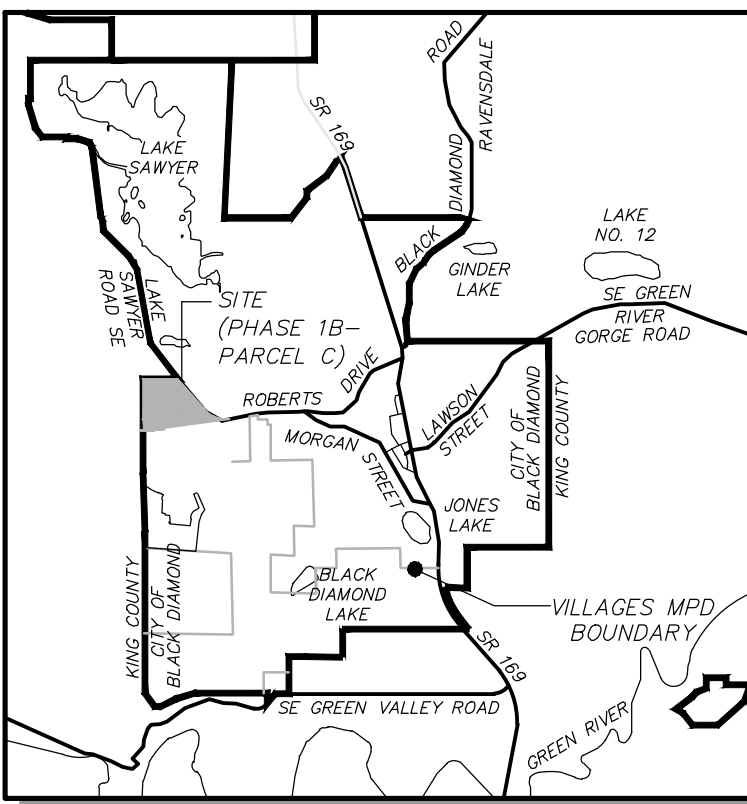
PROJECT NO.
OAKPCBDP6001

SHEET NO.
CV1

OF



LOTS 1 AND 2 OF CITY OF BLACK DIAMOND LOT LINE ADJUSTMENT NO. PLN 21-0077
FILED IN VOLUME 459 OF SURVEYS, AT PAGE 231 AND RECORDED UNDER RECORDING
NO. 20211220900009, RECORDS OF KING COUNTY, WASHINGTON.



VICINITY MAP

CITY OF BLACK DIAMOND,

REVIEWED BY:		DATE:	
NO.	DATE	REVISION	BY
1	5/11/21	REMOVED PER CITY COMMENTS LETTER DATED 1/11/21	DAM TFM
2	5/11/21	REMOVED PARAGRAPH 4 TO FUTURE DEVELOPMENT TRACT	DAM TFM
3	4/8/22	REVISED UNDERGROUND PER UPDATED LOT LINE ADJUSTMENT	ARC/ MM
4	6/20/22	REVISED DIMENSIONS 5 AND 6 AND STORMWATER SYSTEM	DAM TFM
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FIRST SUBMITTAL DATE: 8/27/20
SCALE: HORIZ.: VERT.:

SHEET NO.

CV2

TEN TRAILS

Phase 1B Plat A

NW 1/4 OF SECTION 15, TWP. 21N, RGE. 6E, W.M.

NET OPEN SPACE TRACT TABLE

TRACT	USE**	SIZE (SF)	PARK TYPE	OWNERSHIP	MAINTENANCE	CONSERVATION DEED CATEGORY PER SECTION 2.4
TRACT 901	LA/PA	1,387		A.O.A.	A.O.A.	vii
TRACT 902	LA/PA/UT	19,586		A.O.A.	A.O.A.	vii
TRACT 903	LA/PA	729		A.O.A.	A.O.A.	vii
TRACT 905	LA/PA/UT	1,800		A.O.A.	A.O.A.	iv
TRACT 907	LA/PA/UT	7,481		A.O.A.	A.O.A.	v
TRACT 909	LA/UT	5,678		A.O.A.	A.O.A.	vii
TRACT 910	LA/UT/PA	1,800		A.O.A.	A.O.A.	iv
TRACT 912	LA/PA/UT	15,667		A.O.A.	A.O.A.	vii
TRACT 913	LA/PA/UT	13,634		A.O.A.	A.O.A.	v
TRACT 915	LA/PA/PK/UT	38,430	NEIGHBORHOOD PARK	A.O.A.	A.O.A.	v
TRACT 917	LA/PA/UT	5,429		A.O.A.	A.O.A.	vii
TRACT 918	LA/PA/UT	26,613		A.O.A.	A.O.A.	vii
TRACT 919	LA/PA	1,343		A.O.A.	A.O.A.	vii
TRACT 922	LA/PA/UT	6,628		A.O.A.	A.O.A.	vii
TRACT 923	LA/UT	8,909		A.O.A.	A.O.A.	vii
TRACT 924	LA/UT	783		A.O.A.	A.O.A.	vii
TRACT 925	LA/UT	1,301		A.O.A.	A.O.A.	vii
TRACT 926	LA/UT	1,010		A.O.A.	A.O.A.	vii
TRACT 927	LA/UT	1,064		A.O.A.	A.O.A.	vii
TRACT 928	LA/UT	783		A.O.A.	A.O.A.	vii
TRACT 929	LA/UT	1,491		A.O.A.	A.O.A.	vii
TRACT 930	LA/UT	869		A.O.A.	A.O.A.	vii
TRACT 931	LA/UT	666		A.O.A.	A.O.A.	vii
TRACT 932	LA/UT	808		A.O.A.	A.O.A.	vii

TOTAL NET AREA IN OPEN SPACE TRACTS = 163,888 SF/3.76 AC

OPEN SPACE TRACT TABLE & TRACT TABLE NOTES

TOTAL OPEN SPACE AREA = 163,888 SF/3.76 AC

PERMANENT PUBLIC ACCESS EASEMENTS CONSISTENT WITH SECTION 9.9.3 OF THE VILLAGES MPD DEVELOPMENT AGREEMENT SHALL BE PROVIDED FOR ALL PARKS AND TRAILS ON THE FINAL PLAT.

*OPEN SPACE, AS DEFINED IN SECTION 14 OF THE VILLAGES MPD DEVELOPMENT AGREEMENT IS COMPRISED OF LA (LANDSCAPE); PA (PEDESTRIAN ACCESS); PK (PARK); NL (NATURAL LANDSCAPE) AND SA (SENSITIVE AREA AND BUFFER).

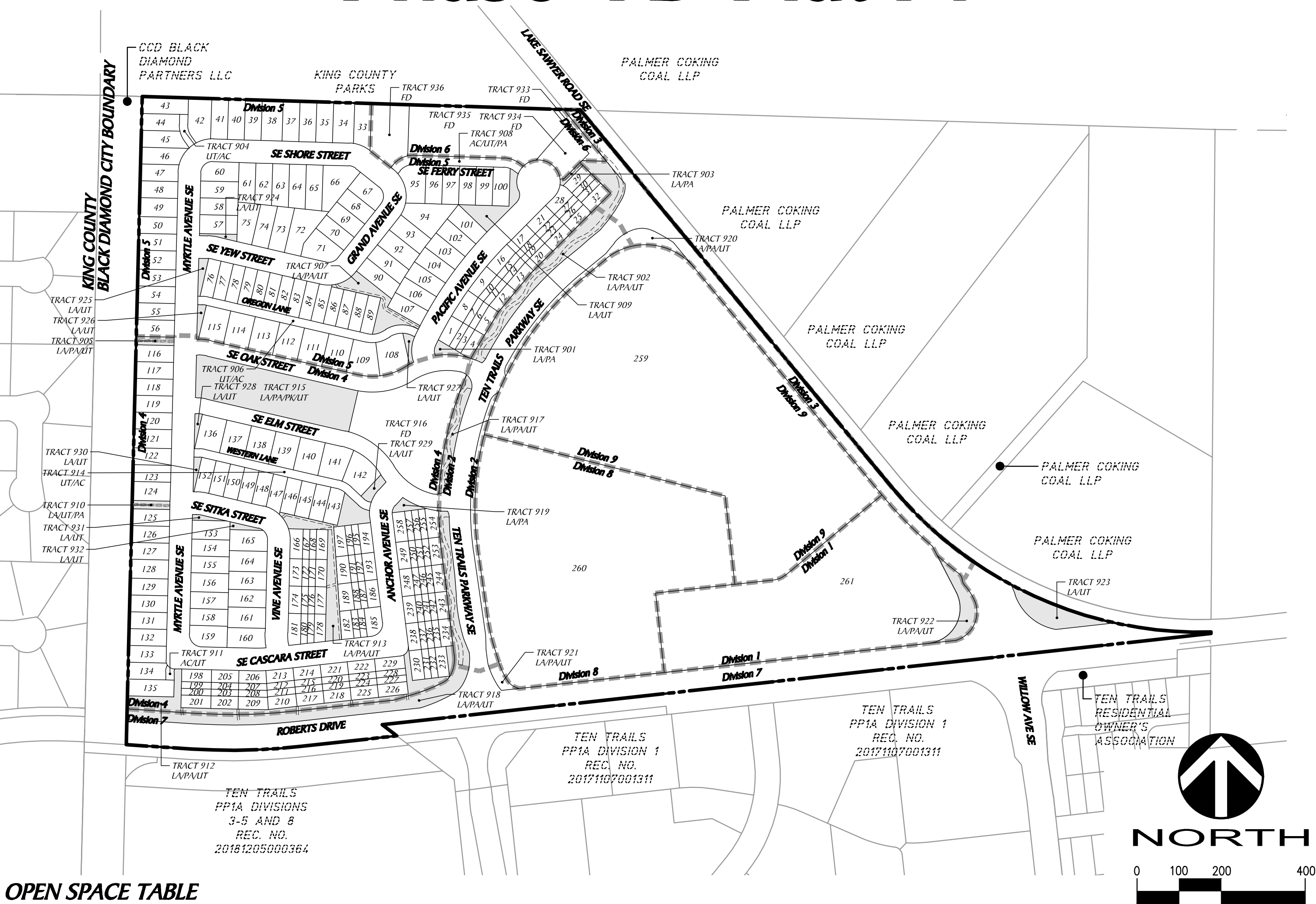
**THESE ARE PROPOSED PRIMARY USES, BUT DOES NOT PRECLUDE UTILITIES AND ACCESS FROM BEING INSTALLED WHERE APPROPRIATE IN COMPLIANCE WITH THE SENSITIVE AREAS ORDINANCE AS FOUND IN EXHIBIT E OF THE VILLAGES MPD DEVELOPMENT AGREEMENT.

HIGHLIGHTED TRACTS IN THE NET OPEN SPACE TRACT TABLE REPRESENT THE AREAS THAT ARE COUNTED IN THE OPEN SPACE TABLES BELOW ON THIS SHEET. THESE TRACTS (902, 917 AND 918) EXCLUDE A 4.5' WIDTH OF LANDSCAPE FROM THE OPEN SPACE TOTAL ALONG TEN TRAILS PARKWAY AND ROBERTS DRIVE (9,208 SF TOTAL EXCLUDED)

TRACT TABLE

TRACT 901	LA/PA	1,387	A.O.A.	A.O.A.
TRACT 902	LA/PA/UT	22,069	A.O.A.	A.O.A.
TRACT 903	LA/PA	729	A.O.A.	A.O.A.
TRACT 904	UT/AC	1,587	A.O.A.	A.O.A.
TRACT 905	LA/PA/UT	1,800	A.O.A.	A.O.A.
TRACT 906	UT/AC	10,740	A.O.A.	A.O.A.
TRACT 907	LA/PA/UT	7,481	A.O.A.	A.O.A.
TRACT 908	AC/UT/PA	6,891	A.O.A.	A.O.A.
TRACT 909	LA/UT	5,678	A.O.A.	A.O.A.
TRACT 910	LA/UT/PA	1,800	A.O.A.	A.O.A.
TRACT 911	AC/UT	593	A.O.A.	A.O.A.
TRACT 912	LA/PA/UT	15,667	A.O.A.	A.O.A.
TRACT 913	LA/PA/UT	13,634	A.O.A.	A.O.A.
TRACT 914	UT/AC	8,912	A.O.A.	A.O.A.
TRACT 915	LA/PA/PK/UT	38,430	A.O.A.	A.O.A.
TRACT 916	FD	46,927	A.O.A.	A.O.A.
TRACT 917	LA/PA/UT	6,631	A.O.A.	A.O.A.
TRACT 918	LA/PA/UT	32,136	A.O.A.	A.O.A.
TRACT 919	LA/PA	1,343	A.O.A.	A.O.A.
TRACT 920	LA/PA/UT	9,221	A.O.A.	A.O.A.
TRACT 921	LA/PA/UT	9,429	A.O.A.	A.O.A.
TRACT 922	LA/PA/UT	6,628	A.O.A.	A.O.A.
TRACT 923	LA/UT	8,909	A.O.A.	A.O.A.
TRACT 924	LA/UT	783	A.O.A.	A.O.A.
TRACT 925	LA/UT	1,301	A.O.A.	A.O.A.
TRACT 926	LA/UT	1,010	A.O.A.	A.O.A.
TRACT 927	LA/UT	1,064	A.O.A.	A.O.A.
TRACT 928	LA/UT	783	A.O.A.	A.O.A.
TRACT 929	LA/UT	1,491	A.O.A.	A.O.A.
TRACT 930	LA/UT	869	A.O.A.	A.O.A.
TRACT 931	LA/UT	666	A.O.A.	A.O.A.
TRACT 932	LA/UT	808	A.O.A.	A.O.A.
TRACT 933	FD	3,464	A.O.A.	A.O.A.
TRACT 934	FD	7,397	A.O.A.	A.O.A.
TRACT 935	FD	42,091	A.O.A.	A.O.A.
TRACT 936	FD	11,895	A.O.A.	A.O.A.

TOTAL AREA IN TRACTS = 332,243 SF/7.63 AC



OPEN SPACE TABLE

PHASE 1B PLAT A	GROSS ACRES	BDUGAA/OPEN SPACE REQUIREMENT	MPD REQUIREMENT (IF APPLICABLE)	REQUIRED OPEN SPACE	OPEN SPACE PREVIOUSLY RECORDED	REQUIRED OPEN SPACE LESS PREVIOUSLY RECORDED PLATS	OPEN SPACE PROVIDED IN THIS PLAT	REMAINING OPEN SPACE REQUIRED
WEST ANNEXATION AREA PARCEL C PARCEL D PARCEL G	54.62 225.99 8.06	63.30	0	63.3	17.94 (PASSIVE) 16.58 (ACTIVE) (PP1A, DIV. 1) (PH2, PLAT C, DIV. 1) (PP1A, DIV. 2) (V-13) (PP1A DIVS. 3-5 AND 8) (PH2, PLAT C, DIV. 2) (V-24) (PLAT 2A, DIVS 1-3) (PLAT 2A, DIV 4) (PP1A, DIV. 6) (PLAT 2A, DIVS. 5) (PLAT 2E) (PLAT 2D, DIV.1)	28.78	2.88(PASSIVE) 0.88 (ACTIVE)	25.02
PARCEL E	151.15	0	75.58	75.58	94.63 (PASSIVE) 2.18 (ACTIVE) (PH2, PLAT C, DIV. 1) (PH2, PLAT C, DIV. 2) (PLAT 2E) (PLAT 2D, DIV.1)	0	0 (PASSIVE) 0 (ACTIVE)	0
PARCEL BDA	395.74	0	197.87	197.87	1.39 (PASSIVE) 0.95 (ACTIVE) (PLAT 2D, DIV.1)	195.53	0 (PASSIVE) 0 (ACTIVE)	195.53
TOTAL IN CITY/UGA MPD OPEN SPACE	1196.4	145	336.4	481.4	113.96 (PASSIVE) 19.71 (ACTIVE)	347.73	2.88 (PASSIVE) 0.88 (ACTIVE)	343.97

MPD OPEN SPACE TABLE

	OPEN SPACE DEDICATED	PERCENTAGE OF BUILD OUT COMPLETED
OVERALL MPD TO DATE (RECORDED PLATS)	133.67	28%
OVERALL MPD UPON PROJECT APPROVAL OF PHASE 1B PLAT A	137.43	33%
WEST ANNEXATION AREA (PARCEL C,D,G) TO DATE (RECORDED PLATS)	34.52	66%
WEST ANNEXATION AREA (PARCEL C,D,G) UPON PROJECT APPROVAL OF PHASE 1B PLAT A	38.28	85%
PARCEL E TO DATE (RECORDED PLATS)	96.81	95%
PARCEL E UPON PROJECT APPROVAL OF PHASE 1B PLAT A	96.81	95%
PARCEL BDA TO DATE (RECORDED PLATS)	2.34	1%
PARCEL BDA UPON PROJECT APPROVAL OF PHASE 1B PLAT A	2.34	1%

LOT SUMMARY

	LOT NUMBERS	LOTS	UNITS	PRODUCT TYPE	GARAGE
DIVISION 1					
	261	1	1	COMMERCIAL LOTS	NOT APPLICABLE
		1	1		
DIVISION 2					
	NONE	0	0	NOT APPLICABLE	NOT APPLICABLE
		0	0		
DIVISION 3					
	NONE	0	0	NOT APPLICABLE	NOT APPLICABLE
		0	0		
DIVISION 4					
	116-135	20	20	SF DETACHED	FRONT
	136-152	17	17	SF DETACHED	ALLEY
	153-165	13	13	SF DETACHED	FRONT
	166-233	68	68	SF ATTACHED	AUTOCOURT
	234-258	25	25	MULTIFAMILY	AUTOCOURT
		143	143		
DIVISION 5					
	1-32	32	32	SF ATTACHED	AUTOCOURT
	33-75	43	43	SF DETACHED	FRONT
	76-89	14	14	SF ATTACHED	ALLEY
	90-107	18	18	SF DETACHED	FRONT
	108-115	8	8	SF DETACHED	ALLEY
		115	115		
DIVISION 6					
	NONE	0	0	SF DETACHED	FRONT
		0	0		
DIVISION 7					
	NONE	0	0	NOT APPLICABLE	NOT APPLICABLE
		0	0		
DIVISION 8					
	260	1	1	COMMERCIAL LOTS	NOT APPLICABLE
		1	1		
DIVISION 9					
	259	1	1	COMMERCIAL LOTS	NOT APPLICABLE
		1	1		
TOTAL		261	261		

LEGEND

SOFT SURFACE TRAIL

CONCRETE TRAIL

OPEN SPACE* TRACT/LOT DESIGNATIONS
LA - LANDSCAPE
PA - PEDESTRIAN ACCESS
PK - PARK

OTHER TRACT DESIGNATIONS
AC - ACCESS
FD - FUTURE DEVELOPMENT
UT - UTILITY

A.O.A. APPLICABLE OWNERS ASSOCIATION

IN-CITY OPEN SPACE IDENTIFICATION PURSUANT TO CONSERVATION EASEMENT DEED

IN ACCORDANCE WITH RECITAL 2.4 AND PARAGRAPH 4 OF EXHIBIT B OF THE CONSERVATION EASEMENT DEED BY AND BETWEEN BD VILLAGE PARTNERS, LP AND THE CITY OF BLACK DIAMOND RECORDED ON MARCH 23 UNDER KING COUNTY RECORDING NO. 20060323001818 (THE "CONSERVATION EASEMENT DEED"), CCD BLACK DIAMOND PARTNERS LLC PROPOSES, FOR THE AREA COVERED BY THIS PRELIMINARY PLAT APPLICATION, TO AMEND THE BOUNDARIES OF THE IN-CITY OPEN SPACE, AS DEFINED IN THE CONSERVATION EASEMENT DEED, TO INCLUDE ONLY TRACTS 901-903, 905, 907, 909, 910, 912, 913, 915, 917-919, 922 AND 923-932.

TRACTS 905 AND 910 ARE LANDSCAPED AREAS CONSISTING OF 3,600 SQUARE FEET. SAID TRACTS PRESERVE AND PROTECT THE CONSERVATION VALUES, AS DEFINED IN THE CONSERVATION EASEMENT DEED, IDENTIFIED IN RECITAL 2.3 BY ENHANCING THE VALUE TO THE PUBLIC OF ADJUTING OR NEIGHBORING PARKS, FORESTS, WILDLIFE PRESERVES, NATURE RESERVATIONS OR SANCTUARIES OR OTHER OPEN SPACES (RECITAL 2.3(V)).

TRACTS 907, 913 AND 915 ARE LANDSCAPED AREAS CONSISTING OF 89,544 SQUARE FEET. SAID TRACTS PRESERVE AND PROTECTS THE CONSERVATION VALUES, AS DEFINED IN THE CONSERVATION EASEMENT DEED, IDENTIFIED IN RECITAL 2.3 BY PRESERVING VISUAL QUALITY ALONG HIGHWAY, ROAD, AND STREET CORRIDORS OR SCENIC VISTAS (RECITAL 2.3(VI)).

TRACTS 901-903, 909, 912, 917-919, 922 AND 923-932 ARE LANDSCAPED AREAS CONSISTING OF 100,743 SQUARE FEET. SAID TRACTS PRESERVE AND PROTECTS THE CONSERVATION VALUES, AS DEFINED IN THE CONSERVATION EASEMENT DEED, IDENTIFIED IN RECITAL 2.3 BY PRESERVING VISUAL QUALITY ALONG HIGHWAY, ROAD, AND STREET CORRIDORS OR SCENIC VISTAS (RECITAL 2.3(VI)).



DAVID EVANS AND ASSOCIATES INC.
20300 Woodinville Snohomish Rd NE
Woodinville Washington 98072
Phone: 425.415.2000

PRELIMINARY PLAT
TRACT AND OPEN SPACE EXHIBIT

TEN TRAILS

CITY OF BLACK DIAMOND, PHASE 1B PLAT A

DATE:	BY:	OK
REVISION	DATE	BY
1	3/1/21	JAM/PM
2	3/1/21	JAM/PM
3	4/8/21	JAM/PM
4	6/20/21	JAM/PM



STAMP NOT VALID
UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=200'VERT.: 1"=200'

PROJECT NO.
OAKPCBDP6001

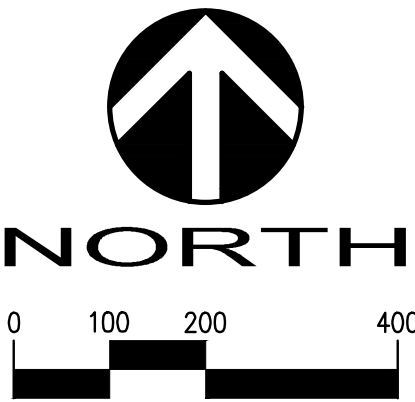
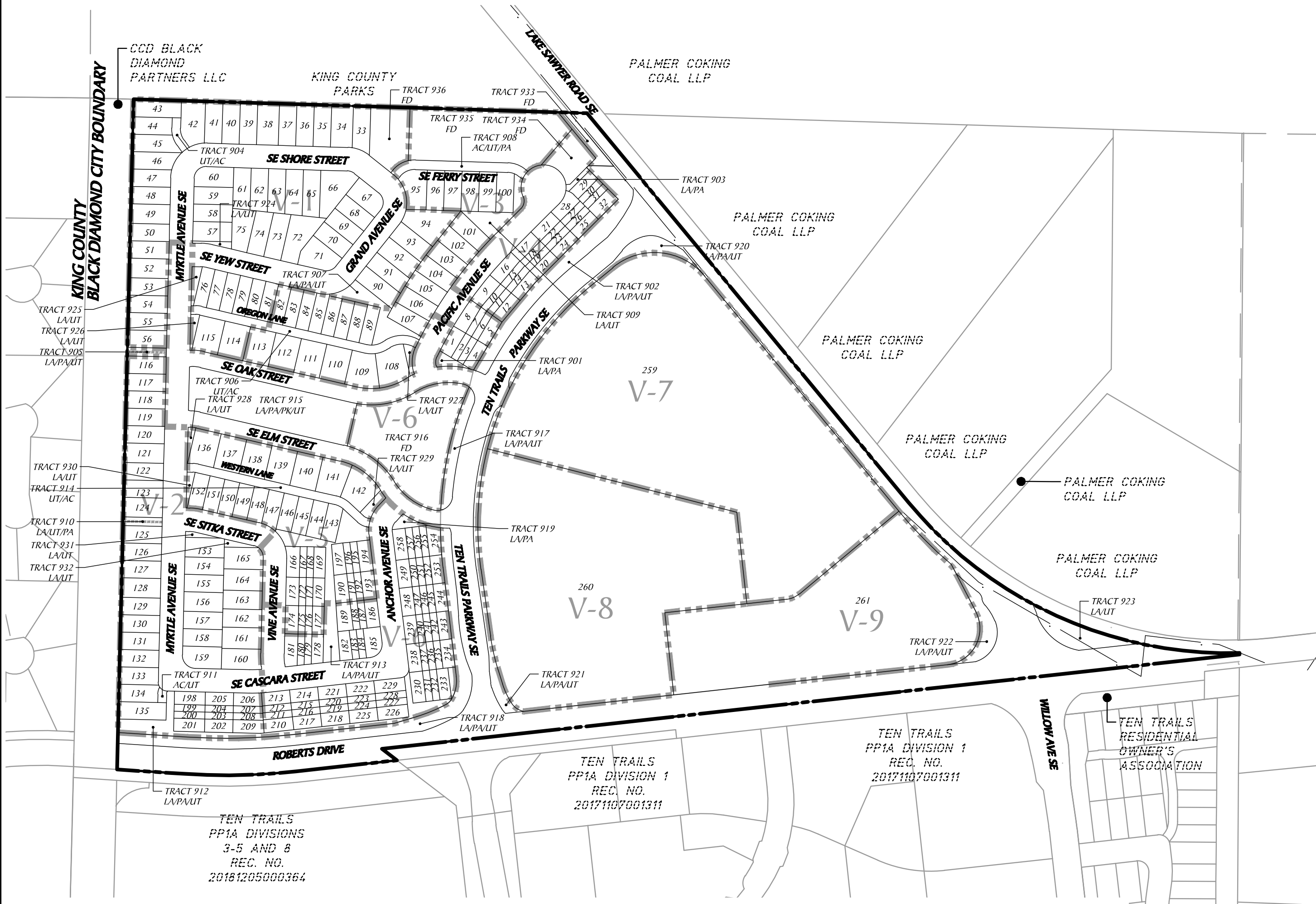
SHEET NO.

CV3

NW 1/4 OF SECTION 15, TWP. 21N, RGE. 6E, W.M.

TEN TRAILS

Phase 1B Plat A



LAND USE CAPACITY TABLE (PHASE 1B PLAT A PRELIMINARY PLAT)

	GROSS DEVELOPMENT PARCEL AREA (ACRES)	NET DEVELOPMENT PARCEL AREA (ACRES)	MPD ZONING	RANGE OF RESIDENTIAL UNITS FOR PARCEL	SQUARE FEET RANGE FOR COMMERCIAL / OFFICE / RETAIL PARCEL	MULTI FAMILY RESIDENTIAL (UNITS)	SINGLEFAMILY RESIDENTIAL (UNITS)	COMMERCIAL / OFFICE / RETAIL SQUARE FOOTAGE	GROSS RESIDENTIAL PARCEL DENSITY	NET RESIDENTIAL PARCEL DENSITY
AUTHORIZED BY THE VILLAGES MPD PERMIT AND DEVELOPMENT AGREEMENT						1200	3600	775,000		
PREVIOUS PLATS/PROJECTS										
PHASE 1A						245	393	190,000		
V-13						0	62	0		
PHASE 2 PLAT A						0	211	0		
PHASE 2 PLAT C						0	201	0		
PHASE 2 PLAT E						0	43	0		
V-24						0	61	0		
PHASE 2 PLAT 2 D						0	232			
TOTAL PREVIOUS PLATS/PROJECTS						245	1203	190,000		
CURRENTLY REMAINING VILLAGES MPD						955	2,397	585,000		
PHASE 1B PLAT A										
V-1 (MPD-M 7-12 DU/AC)	7.27	5.60	MPD-M	51-87		0	56	0	7.70	10.00
V-2 (MPD-M 7-12 DU/AC)	4.83	3.59	MPD-M	34-58		0	45	0	9.32	12.53
V-3 (MPD-M 7-12 DU/AC)	4.24	3.83	MPD-H	30-51		0	35	0	8.25	9.14
V-4 (MPD-H 13-18 DU/AC)	1.53	1.01	MPD-H	20-28		0	24	0	15.69	23.76
V-5 (MPD-H 13-30 DU/AC)	2.84	2.43	MPD-H	37-85		0	37	0	13.03	15.23
V-6 (MPD-H 13-30 DU/AC)	4.52	3.48	MPD-H	59-136		25	36	0	13.50	17.53
V-7 (C/O/R)	8.45	8.45	C/O/R			0	0	91,273		
V-8 (C/O/R)	6.05	6.05	C/O/R			0	0	65,227		
V-9 (C/O/R)	3.83	3.83	C/O/R			0	0	48,500		
TOTAL RESIDENTIAL DEVELOPMENT PARCEL AREAS	25.23	19.94				25	233	0	10.23	12.94
TOTAL ALL DEVELOPMENT PARCEL AREAS	43.56	38.27								
REMAINING VILLAGES MPD						930	2,164	380,000		

- GROSS RESIDENTIAL PARCEL DENSITY = RESIDENTIAL UNITS / GROSS DEVELOPMENT PARCEL AREA
 - NET RESIDENTIAL PARCEL DENSITY = RESIDENTIAL UNITS / NET DEVELOPMENT PARCEL AREA (EXCLUDES STREETS, ROADS, AND ALLEYS, PUBLIC OR PRIVATE)
- OVERALL PHASE 1B PARCEL C GROSS RESIDENTIAL PARCEL DENSITY = 10.23 UNITS/ACRE (258 UNITS / 25.23)
- OVERALL PHASE 1B PARCEL C NET RESIDENTIAL PARCEL DENSITY = 12.94 UNITS/ACRE (258 UNITS / 19.94)

LOT SIZE INFORMATION

SINGLE FAMILY LOT INFORMATION

MINIMUM PROPOSED LOT SIZE (SINGLE FAMILY) 1,040 SF

MAXIMUM PROPOSED LOT SIZE (SINGLE FAMILY) 6,591 SF

AVERAGE LOT SIZE (SINGLE FAMILY) 2,723 SF

(702,599 SF/258 LOTS)

TRANSFER OF DEVELOPMENT RIGHTS (TDR) INFORMATION

PER DEVELOPMENT TABLE 4-9:

PLANNED DENSITY = 315 UNITS

BASE DENSITY = 189 UNITS (60% OF PLANNED DENSITY)

TDR'S NEEDED = 126 UNITS

SITE PLAN: 258 UNITS - 189 BASE DENSITY UNITS = 69 TDR'S



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20300 Woodinville Snohomish Rd NE
Woodinville Washington 98072
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PRELIMINARY PLAT
PARCEL/DENSITY EXHIBIT/SITE INFORMATION/CALCULATIONS

TEN TRAILS

CITY OF BLACK DIAMOND, PHASE 1B PLAT A

WASHINGTON

REVIEWED BY:	DATE:	BY:	OK
NO.	DATE	REVISION	
1	3/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/1/21	
2	4/8/22	REVISED DIVISION 6 TO FUTURE DEVELOPMENT	
3	6/20/22	REVISED DIVISIONS 5 AND 6 AND STORMWATER SYSTEM	

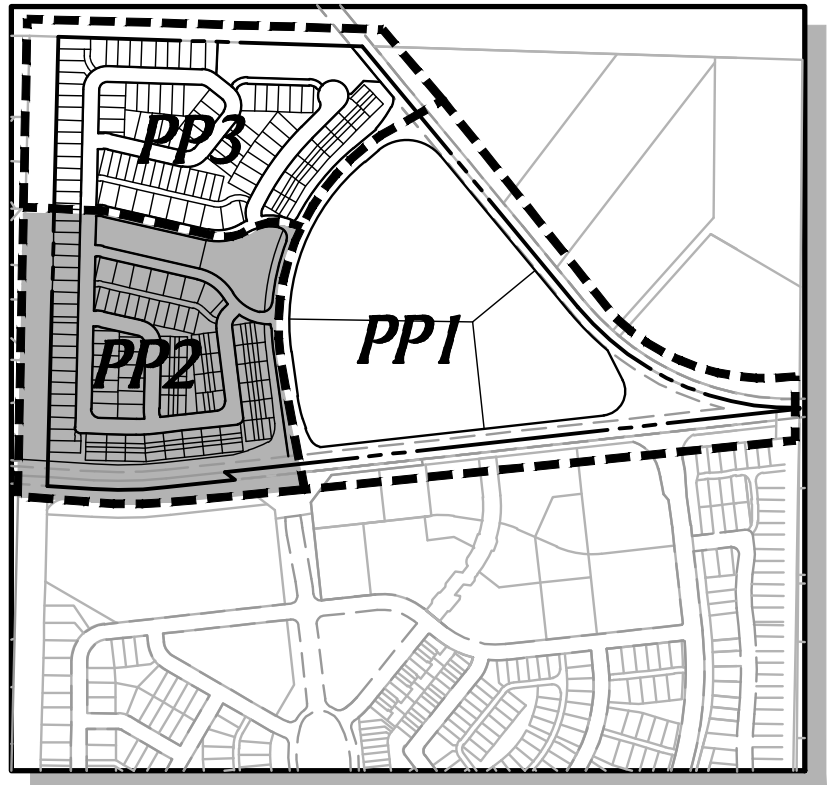


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FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=200' VERT.:

PROJECT NO.
OAKPCBDP6001

SHEET NO.
CV4



SHEET INDEX

PRELIMINARY PLAT

TEN TRAILS
CITY OF BLACK DIAMOND, PHASE 1B PLAT A

NO.	DATE	REVISION	BY	CHK
1	5/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/11/21	DAW/PM	DAW/PM
2	5/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/11/21	DAW/PM	DAW/PM
3	4/8/22	REVISED PER CITY COMMENTS LETTER DATED 1/11/21	DAW/PM	DAW/PM
4	6/20/22	REVISED PER CITY COMMENTS LETTER DATED 1/11/21	DAW/PM	DAW/PM

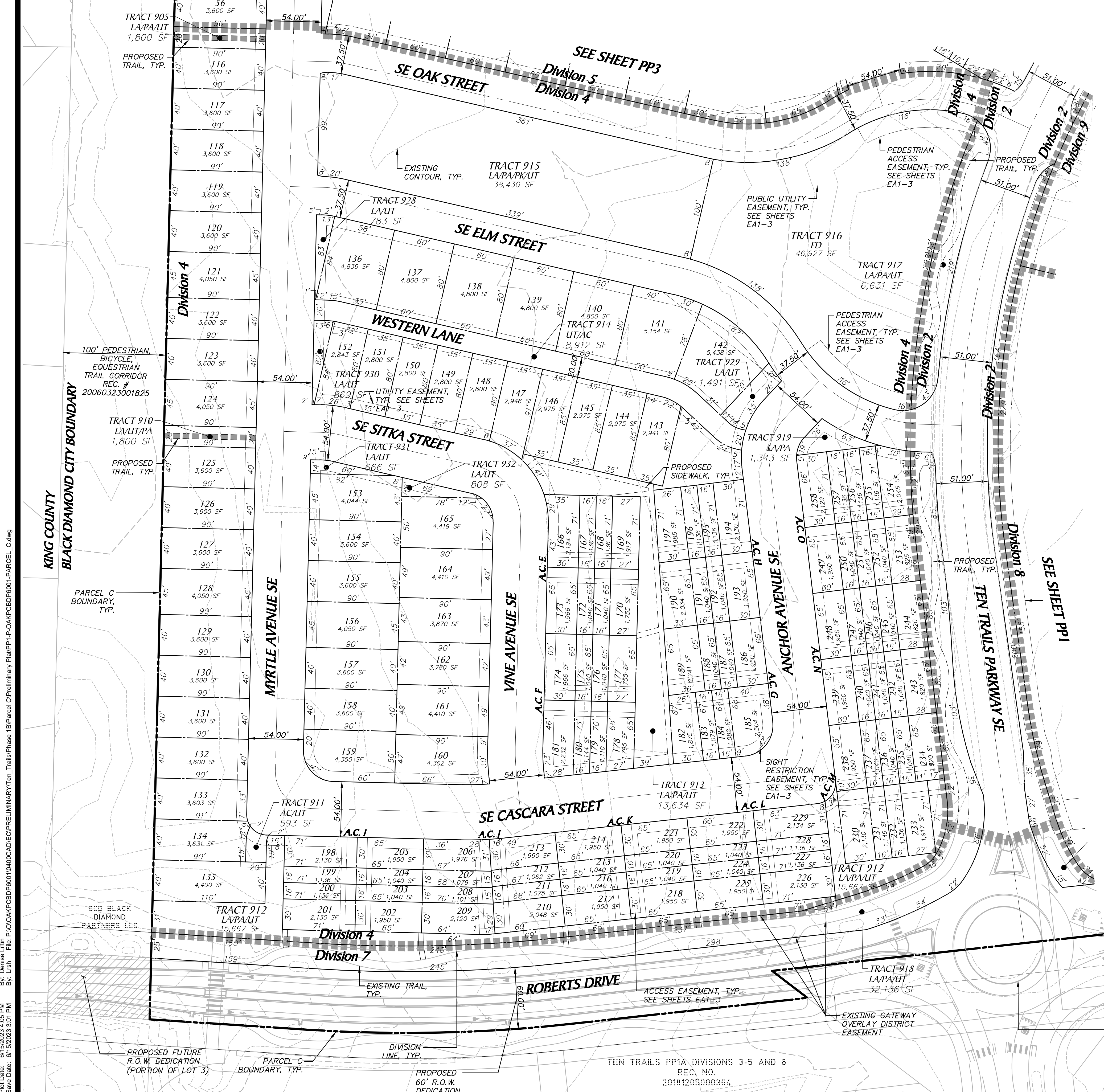


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FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=50' VERT.: 1"=20'

PROJECT NO.
OAKPCBDP6001

SHEET NO.
PP2

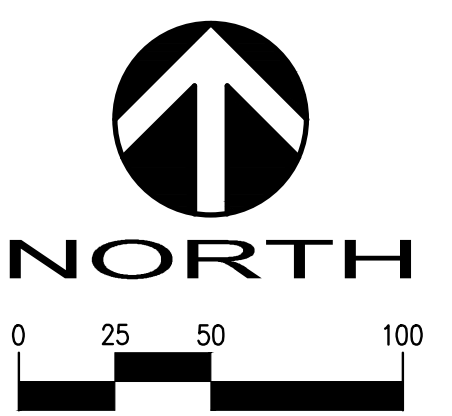


TRACT DESIGNATION LEGEND

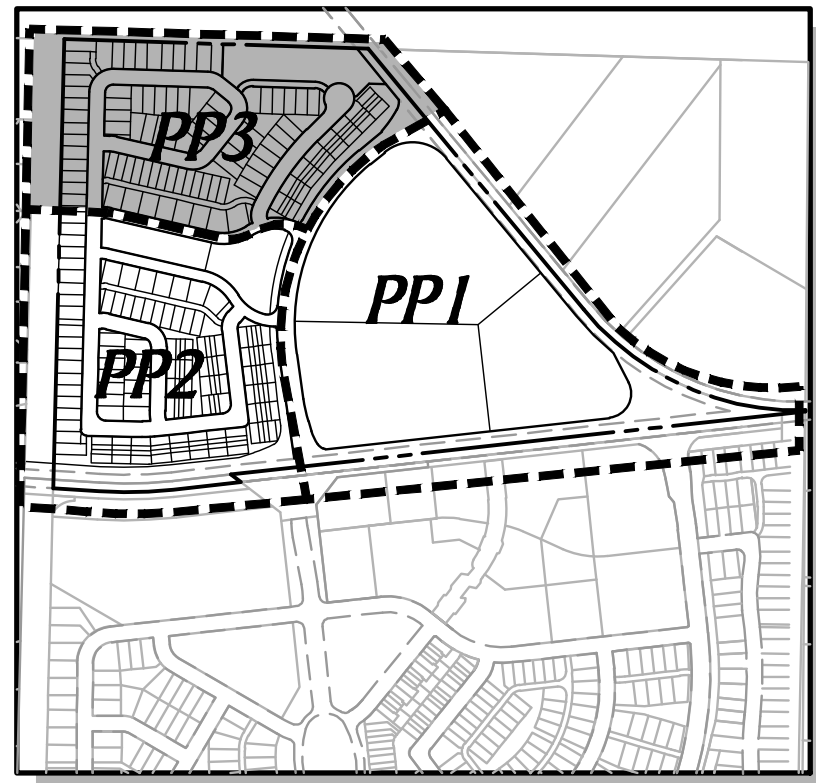
- AC - ACCESS
- FD - FUTURE DEVELOPMENT
- LA - LANDSCAPE
- PA - PEDESTRIAN ACCESS
- PK - PARK
- UT - UTILITY

AUTOCOURT NOTE

AUTOCOURTS ARE LABELED AT ENTRY FROM THE ROAD WITH THE DESIGNATION A.C. XX



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Save Date: 6/15/2023 3:01 PM
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SHEET INDEX

WASHINGTON

PRELIMINARY PLAT

TEN TRAILS
CITY OF BLACK DIAMOND, PHASE 1B PLAT A

NO.	DATE	REVISION	BY	CHK
1	3/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/11/21	DAW/PM	
2	4/1/21	REVISED DIVISION 5 TO FUTURE DEVELOPMENT	DAW/PM	
3	4/1/21	REVISED DIVISIONS 5 AND 6 AND STANDARDIZED SYSTEM	DAW/PM	
4	6/20/22			



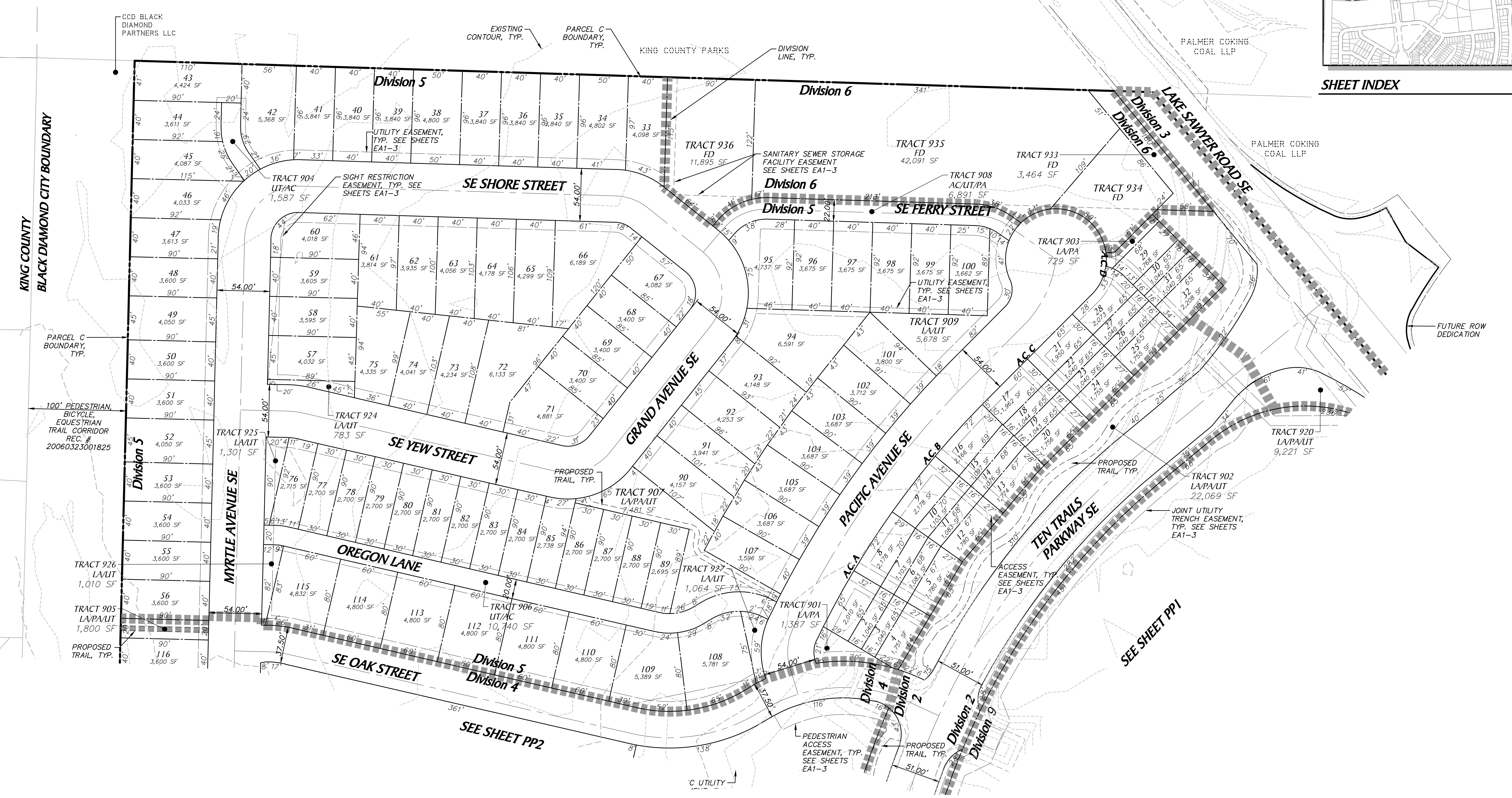
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FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=50' VERT.: 1"=20'

PROJECT NO.
OAKPCBDP6001

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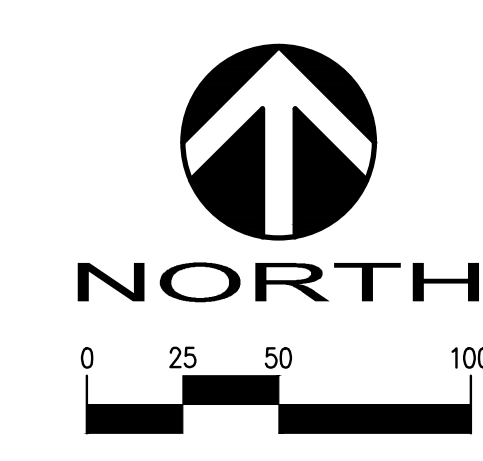


TRACT DESIGNATION LEGEND

AC - ACCESS
FD - FUTURE DEVELOPMENT
LA - LANDSCAPE
PA - PEDESTRIAN ACCESS
PK - PARK
UT - UTILITY

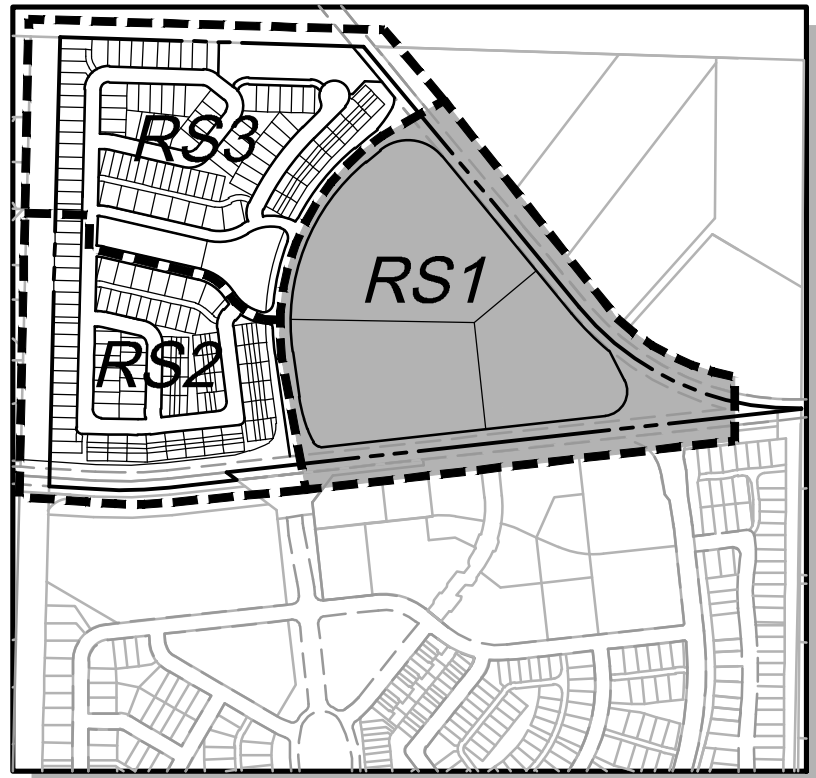
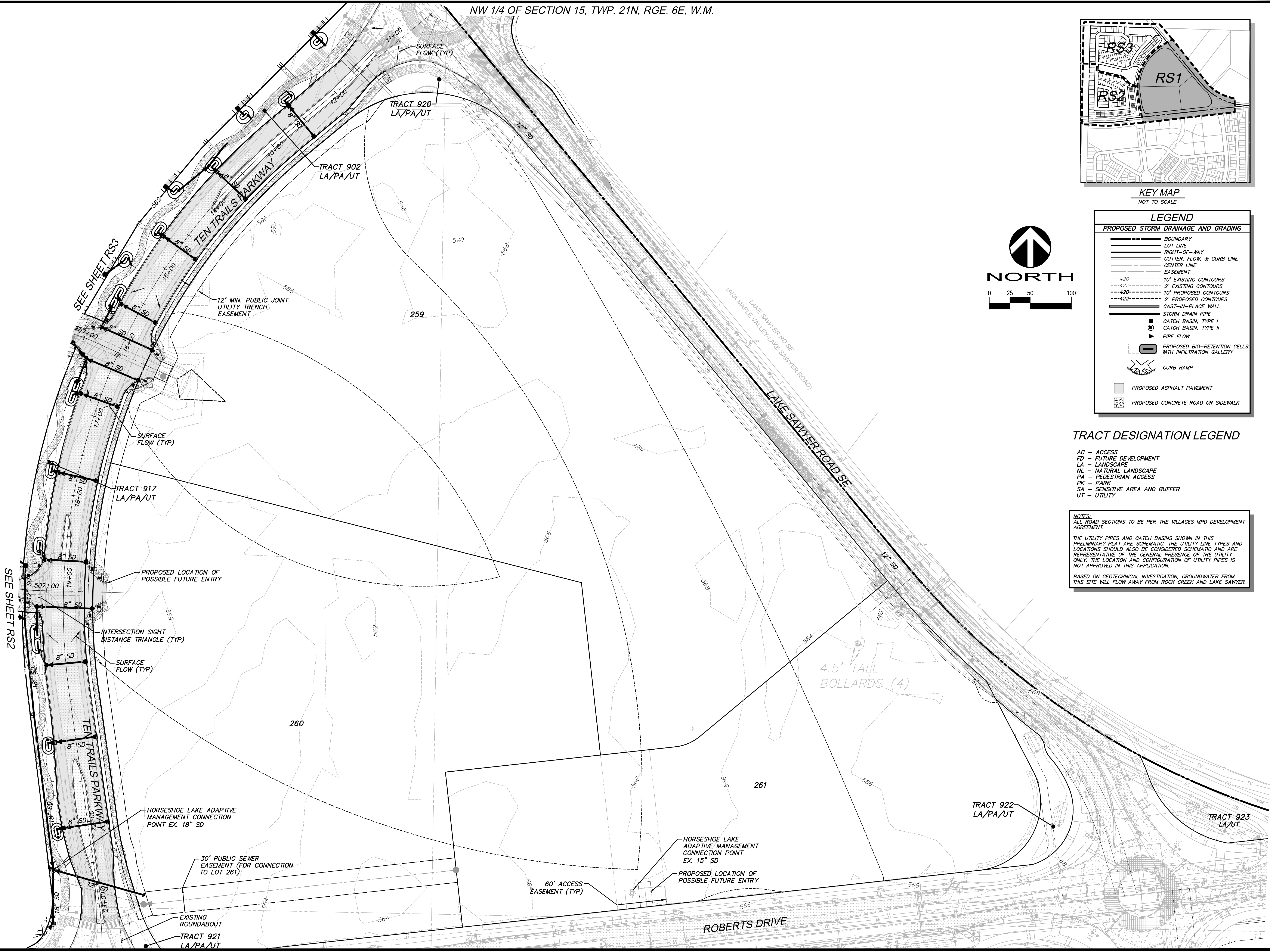
AUTOCOURT NOTE

AUTOCOURTS ARE LABELED AT ENTRY FROM THE ROAD WITH THE DESIGNATION A.C. XX

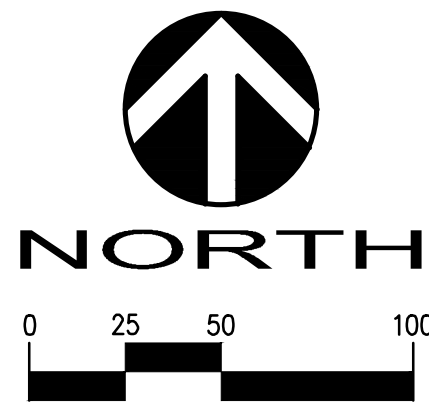


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NW 1/4 OF SECTION 15, TWP. 21N, RGE. 6E, W.M.



KEY MAP
NOT TO SCALE



LEGEND	
PROPOSED STORM DRAINAGE AND GRADING	
	BOUNDARY
	LOT LINE
	RIGHT-OF-WAY
	GUTTER, FLOW, & CURB LINE
	CENTER LINE
	EASEMENT
	10' EXISTING CONTOURS
	2' EXISTING CONTOURS
	10' PROPOSED CONTOURS
	2' PROPOSED CONTOURS
	CAST-IN-PLACE WALL
	STORM DRAIN PIPE
	CATCH BASIN, TYPE I
	CATCH BASIN, TYPE II
	PIPE FLOW
	PROPOSED BIO-RETENTION CELLS WITH INFILTRATION GALLERY
	CURB RAMP
	PROPOSED ASPHALT PAVEMENT
	PROPOSED CONCRETE ROAD OR SIDEWALK

TRACT DESIGNATION LEGEND

AC - ACCESS
FD - FUTURE DEVELOPMENT
LA - LANDSCAPE
NL - NATURAL LANDSCAPE
PA - PEDESTRIAN ACCESS
PK - PARK
SA - SENSITIVE AREA AND BUFFER
UT - UTILITY

NOTES:
ALL ROAD SECTIONS TO BE PER THE VILLAGES MPD DEVELOPMENT AGREEMENT.
THE UTILITY PIPES AND CATCH BASINS SHOWN IN THIS PRELIMINARY PLAT ARE SCHEMATIC. THE UTILITY LINE TYPES AND LOCATIONS SHOULD ALSO BE CONSIDERED SCHEMATIC AND ARE REPRESENTATIVE OF THE GENERAL PRESENCE OF THE UTILITY ONLY. THE LOCATION AND CONFIGURATION OF UTILITY PIPES IS NOT APPROVED IN THIS APPLICATION.
BASED ON GEOTECHNICAL INVESTIGATION, GROUNDWATER FROM THIS SITE, WILL FLOW AWAY FROM ROCK CREEK AND LAKE SAWYER.



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Woodinville Washington 98072
Phone: 425.415.2000

ROAD, STORM DRAINAGE AND GRADING PLAN

TEN TRAILS

PHASE 1B PLAT A

CITY OF BLACK DIAMOND

DESIGNED: DATE:

NO.	DATE	REVISION
1	3/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/11/21
2	3/1/21	REVISED DIVISION 8 TO FUTURE DEVELOPMENT TO DISTRICT
3	4/8/22	REVISED DIVISIONS 5 AND 6 AND STORMWATER SYSTEM
4	6/20/22	

 BY:

BY	CHK
DAW/PM	
DAW/PM	
DAW/PM	

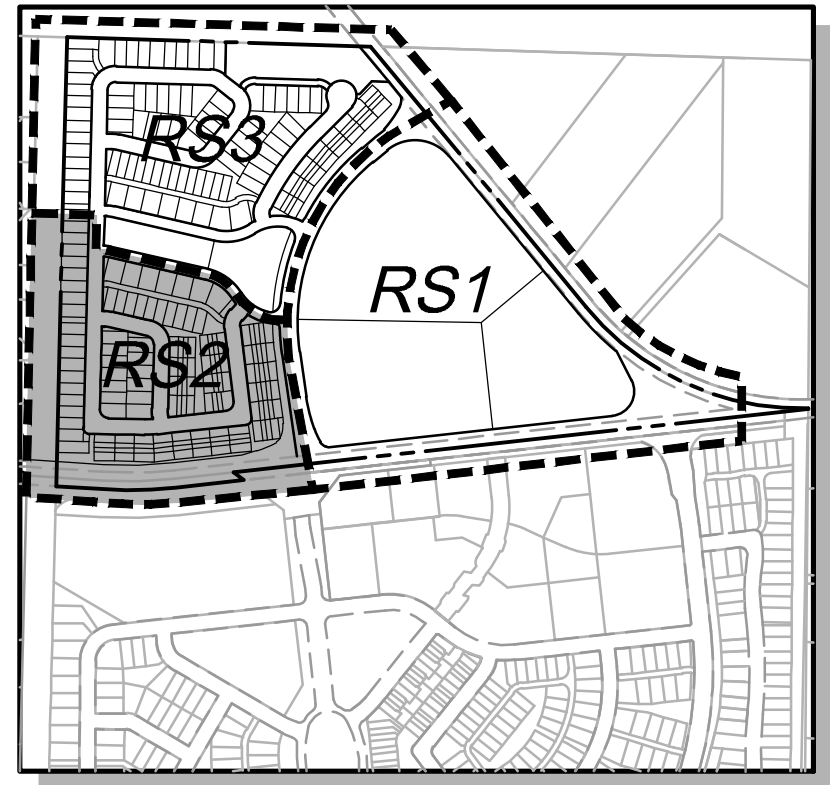
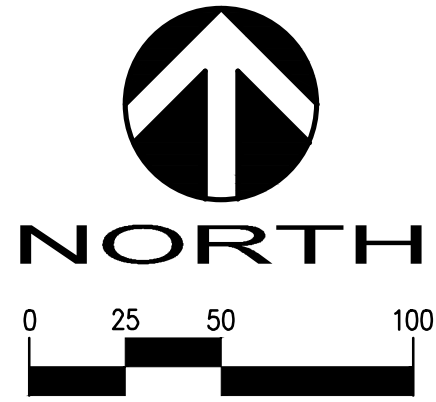
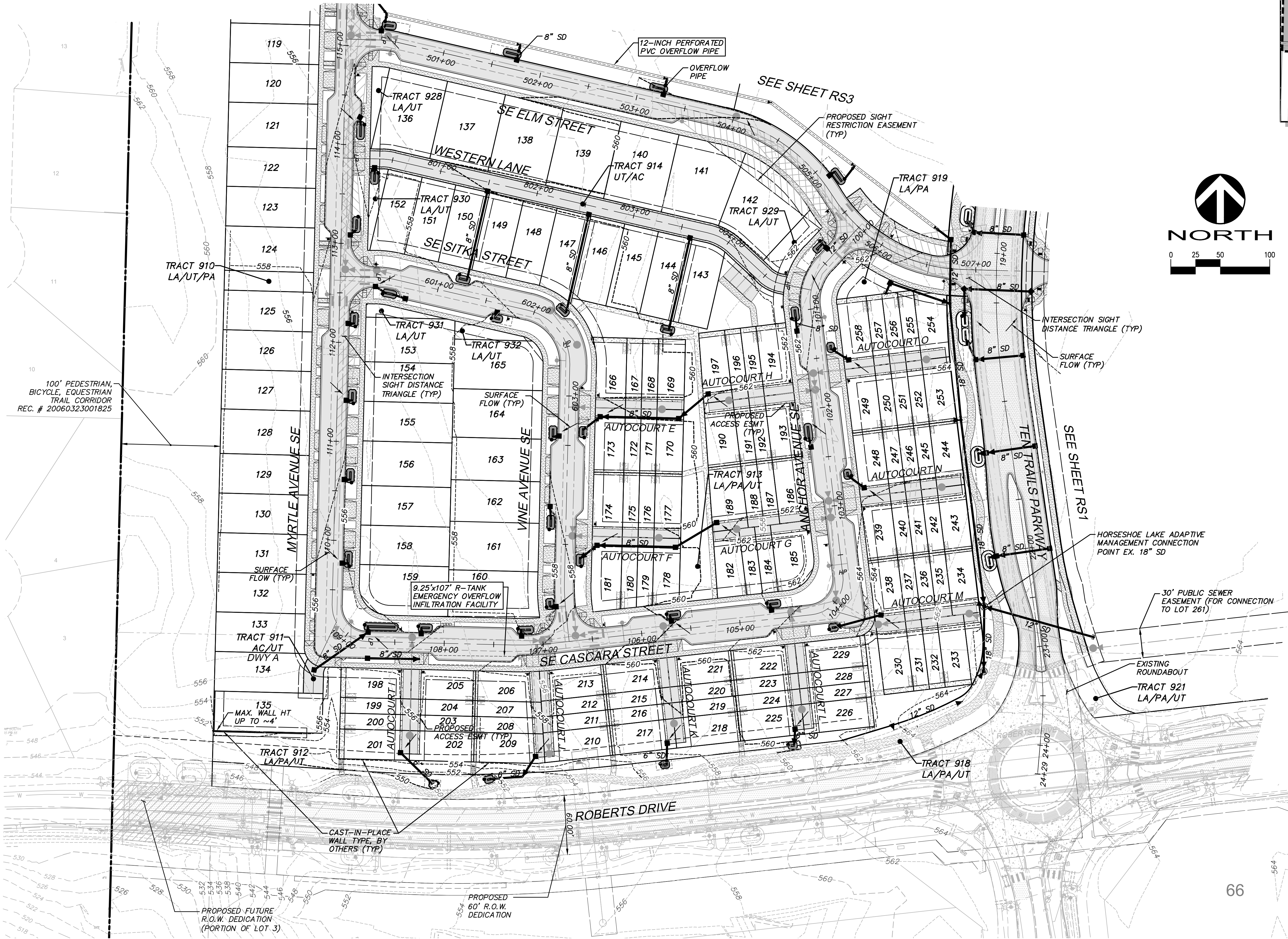
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FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=50' VERT.:
PROJECT NO.
OAKPCBDP6001
SHEET NO.
RS1
OF

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By: Dave Merriam
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NW 1/4 OF SECTION 15, TWP. 21N, RGE. 6E, W.M.



KEY MAP
NOT TO SCALE

LEGEND
PROPOSED STORM DRAINAGE AND GRADING

- BOUNDARY
- LOT LINE
- RIGHT-OF-WAY
- GUTTER, FLOW, & CURB LINE
- CENTER LINE
- EASEMENT
- 10' EXISTING CONTOURS
- 2' EXISTING CONTOURS
- 10' PROPOSED CONTOURS
- 2' PROPOSED CONTOURS
- CAST-IN-PLACE WALL
- STORM DRAIN PIPE
- CATCH BASIN, TYPE I
- CATCH BASIN, TYPE II
- PIPE FLOW
- PROPOSED BIO-RETENTION CELLS WITH INFILTRATION GALLERY
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- PROPOSED ASPHALT PAVEMENT
- PROPOSED CONCRETE ROAD OR SIDEWALK

TRACT DESIGNATION LEGEND

- AC - ACCESS
- FD - FUTURE DEVELOPMENT
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- PK - PARK
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- UT - UTILITY

NOTES:
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THE UTILITY PIPES AND CATCH BASINS SHOWN IN THIS PRELIMINARY PLAT ARE SCHEMATIC. THE UTILITY LINE TYPES AND LOCATIONS SHOULD ALSO BE CONSIDERED SCHEMATIC AND ARE REPRESENTATIVE OF THE GENERAL PRESENCE OF THE UTILITY ONLY. THE LOCATION AND CONFIGURATION OF UTILITY PIPES IS NOT APPROVED IN THIS APPLICATION.
BASED ON GEOTECHNICAL INVESTIGATION, GROUNDWATER FROM THIS SITE WILL FLOW AWAY FROM ROCK CREEK AND LAKE SAWYER.

ROAD, STORM DRAINAGE AND GRADING PLAN

TEN TRAILS

PHASE 1B PLAT A

CITY OF BLACK DIAMOND

NO.	DATE	REVISION	BY	CHK
1	3/1/21	ISSUED FOR CITY COMMENTS LETTER DATED 1/11/21	DAW/PM	
2	3/1/21	REVISED DIVISION 6 TO FUTURE DEVELOPMENT AGREEMENT	DAW/PM	
3	4/8/22	REVISED DIVISIONS 5 AND 6 AND STORMWATER SYSTEM	DAW/PM	
4	6/20/22		DAW/PM	



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FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=50' VERT.:

PROJECT NO.
OAKPCBDP6001

SHEET NO.
RS2

OF

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Save Date: 6/23/2022 4:53 PM
By: Doug Merriam
Bv: Dxme File: P



TEN TRAILS
PHASE 1B PLAT A

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NO.	DATE	REVISION	BY	CHK
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3	6/11/21	REVISED UNWORK PER UPDATED LOT LINE ADJUSTMENT	DAW/TPM	
4	6/22/22	REVISED DRAWINGS 5 AND 6 AND STORMWATER SYSTEM	DAW/TPM	
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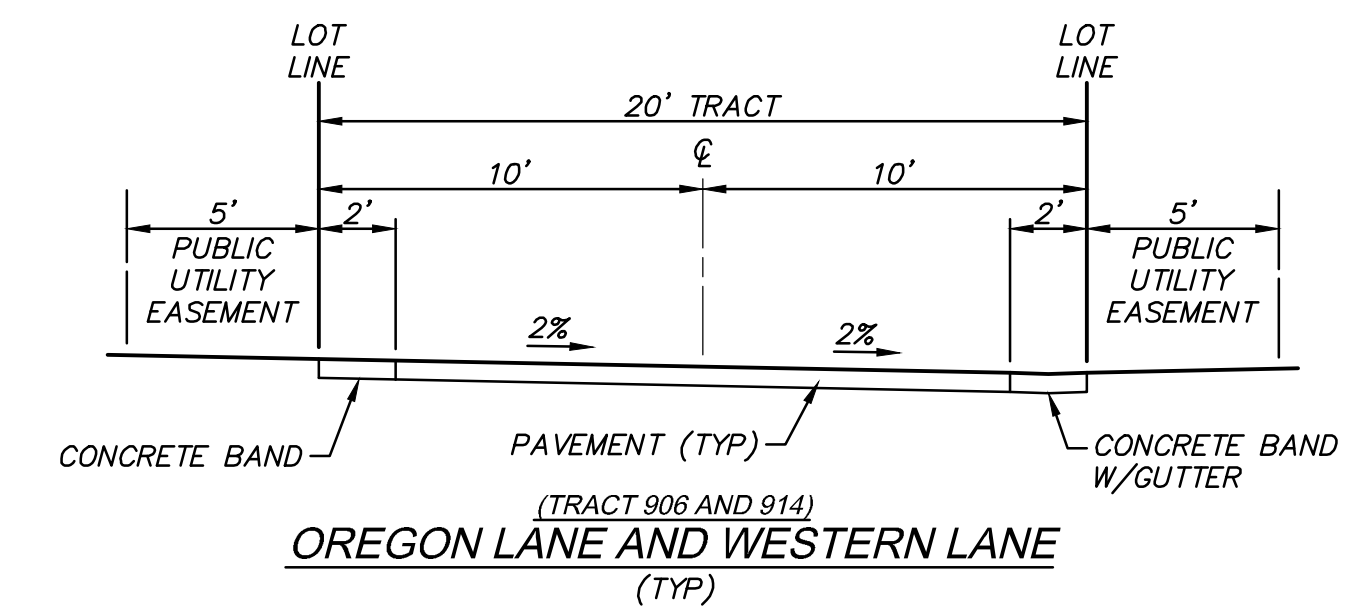
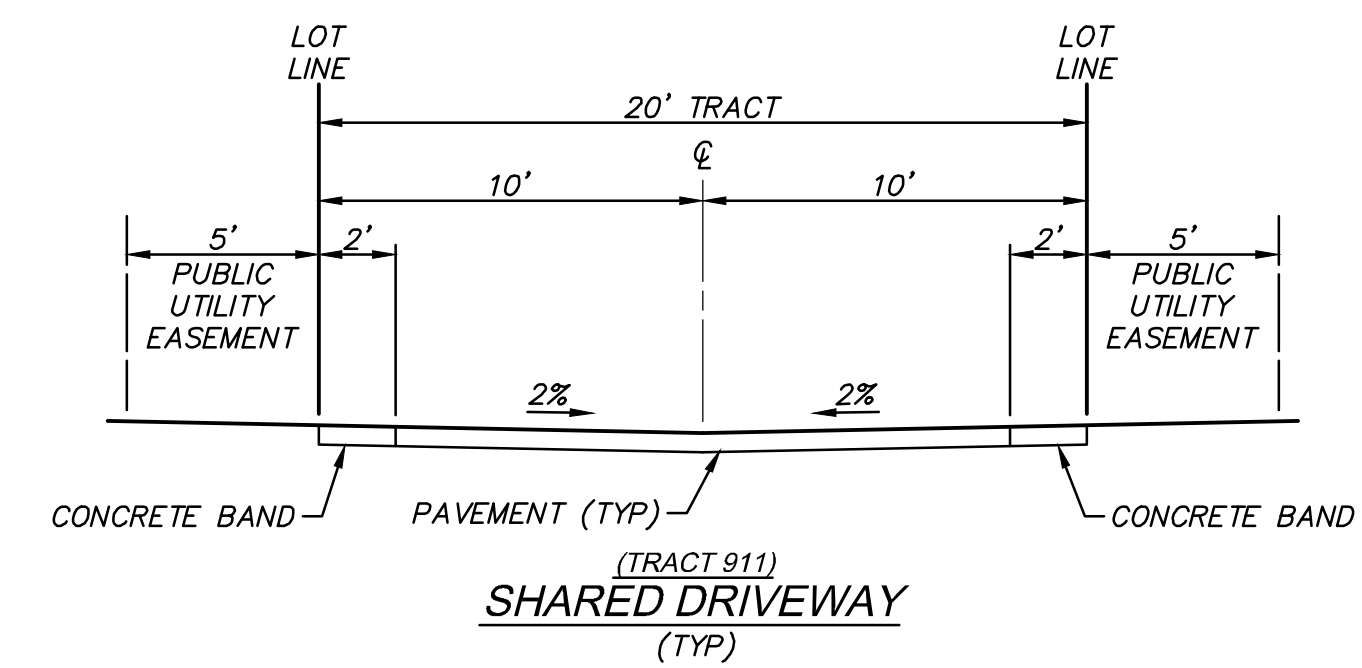
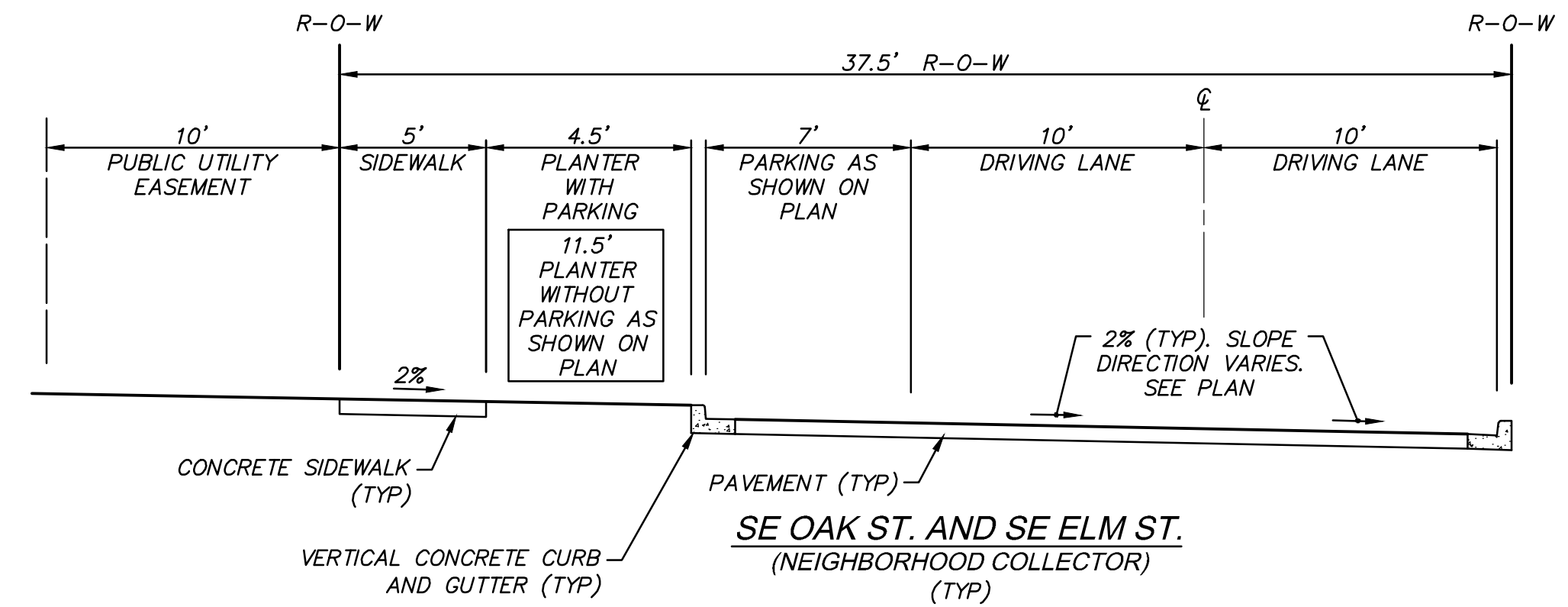
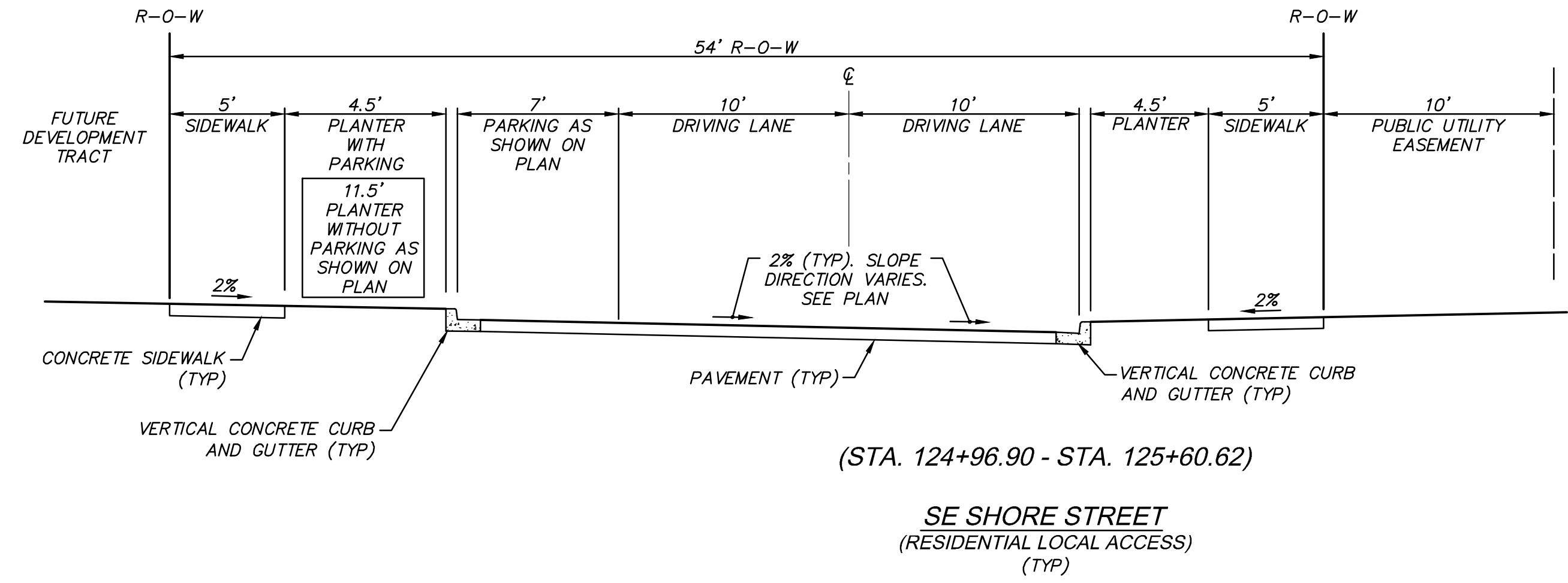
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PROJECT NO.
OAKPCBDP6001

SHEET NO.

OF



TRACT LINE

22' TRACT

TRACT/LOT LINE

2'

2'

10'

10'

2%

2%

2'

10'

PUBLIC UTILITY EASEMENT

SANITARY SEWER STORAGE FACILITY EASEMENT REC. NO. 20170815000309

CONCRETE BAND

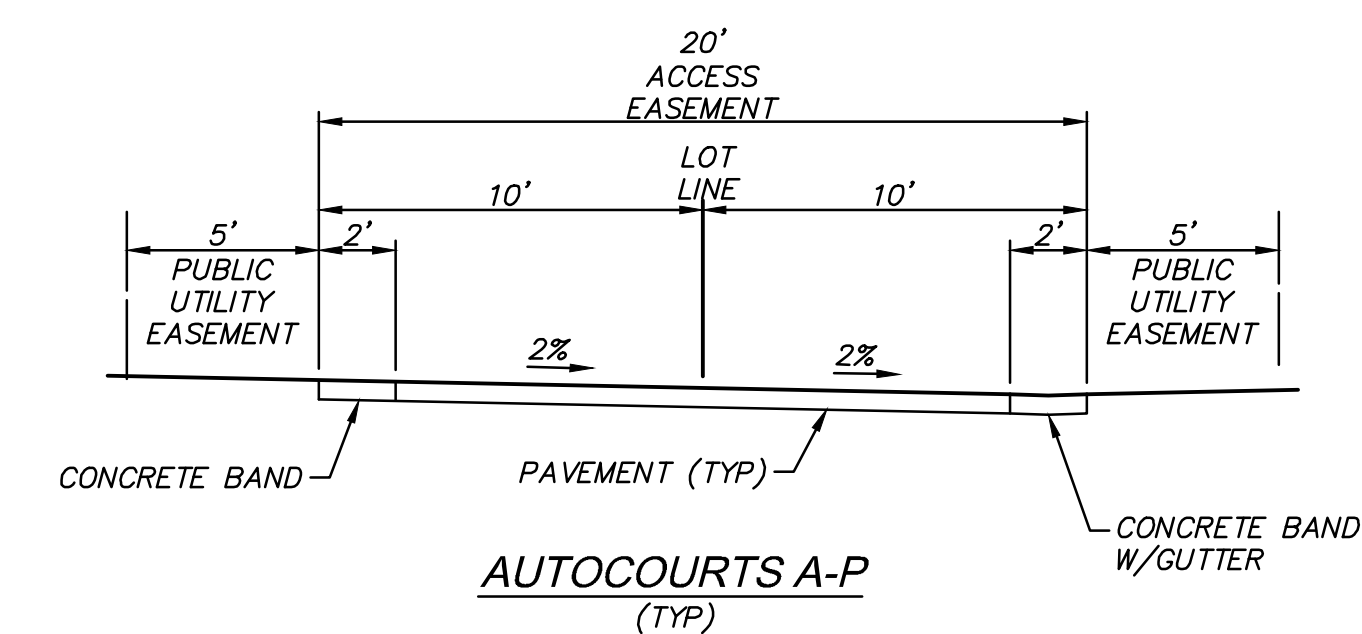
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CONCRETE BAND W/ GUTTER

(TRACT 908)

SE FERRY STREET

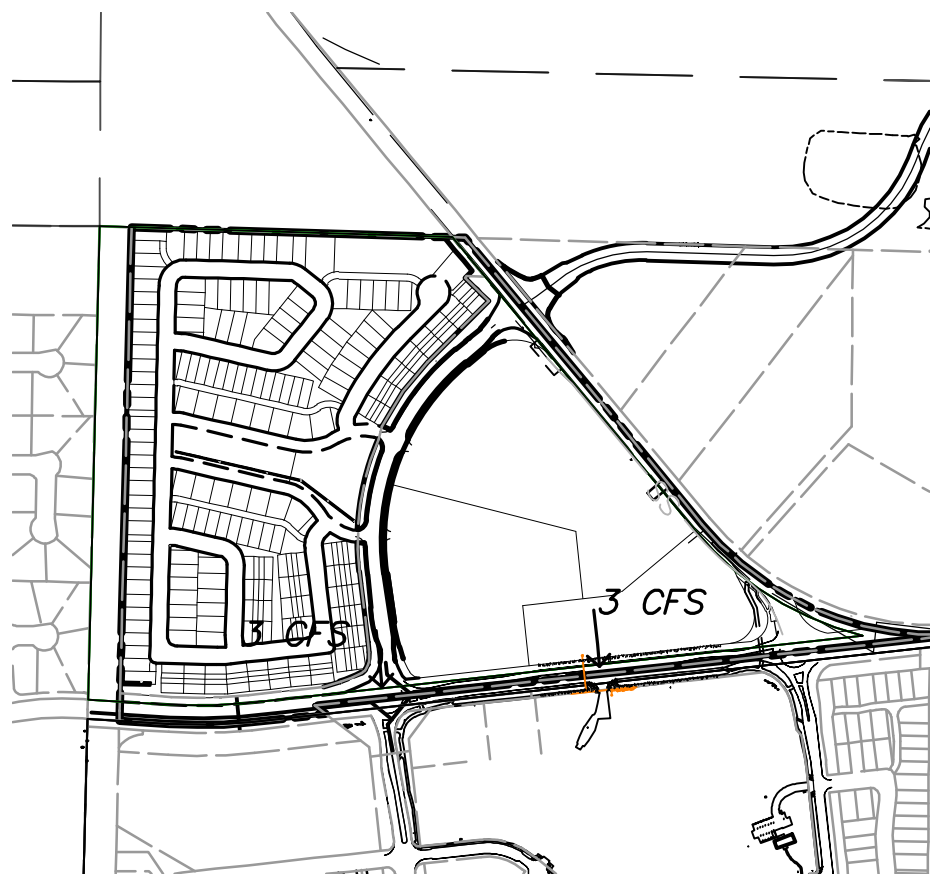
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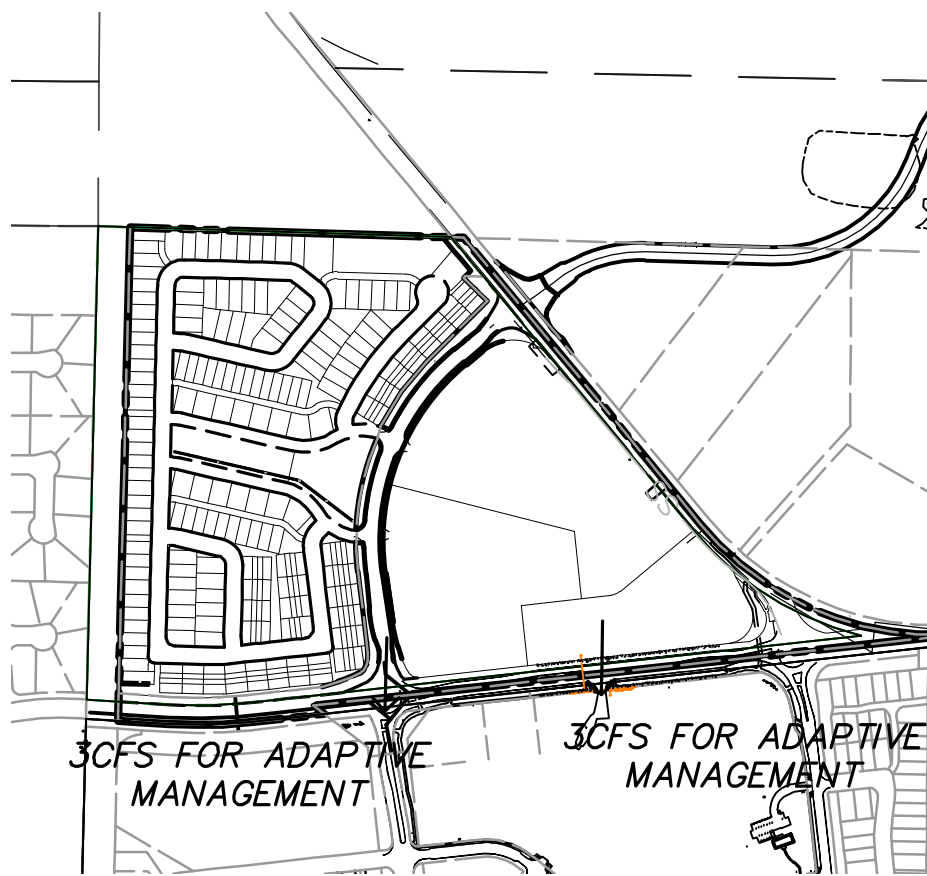
STORMWATER MANAGEMENT ZONES

- 1A AREA WITHIN 1/4 MILE OF HORSESHOE LAKE AND TRIBUTARY TO HORSESHOE LAKE - RUNOFF FROM PGIS OF COMM. AND MULTI-FAMILY DEVELOPMENTS WITHIN THIS ZONE REQUIRES ENHANCED TREATMENT PRIOR TO INFILTRATION IN ACCORDANCE WITH VOLUME V, CHAPTER 3.4 OF THE 2012 DOE STORMWATER MANAGEMENT MANUAL AMENDED IN 2014 FOR WESTERN WASHINGTON
- 1A & 1B HORSESHOE LAKE GROUNDWATER TRIBUTARY AREA - RUNOFF FROM PGIS OF COMM. AND MULTI-FAMILY DEVELOPMENTS WITHIN ZONE 1B REQUIRES BASIC TREATMENT PRIOR TO INFILTRATION IN ACCORDANCE WITH VOLUME V, CHAPTER 3.4 OF THE 2012 DOE STORMWATER MANAGEMENT MANUAL AMENDED IN 2014 FOR WESTERN WASHINGTON
- 1C AREA NOT TRIBUTARY TO HORSESHOE LAKE

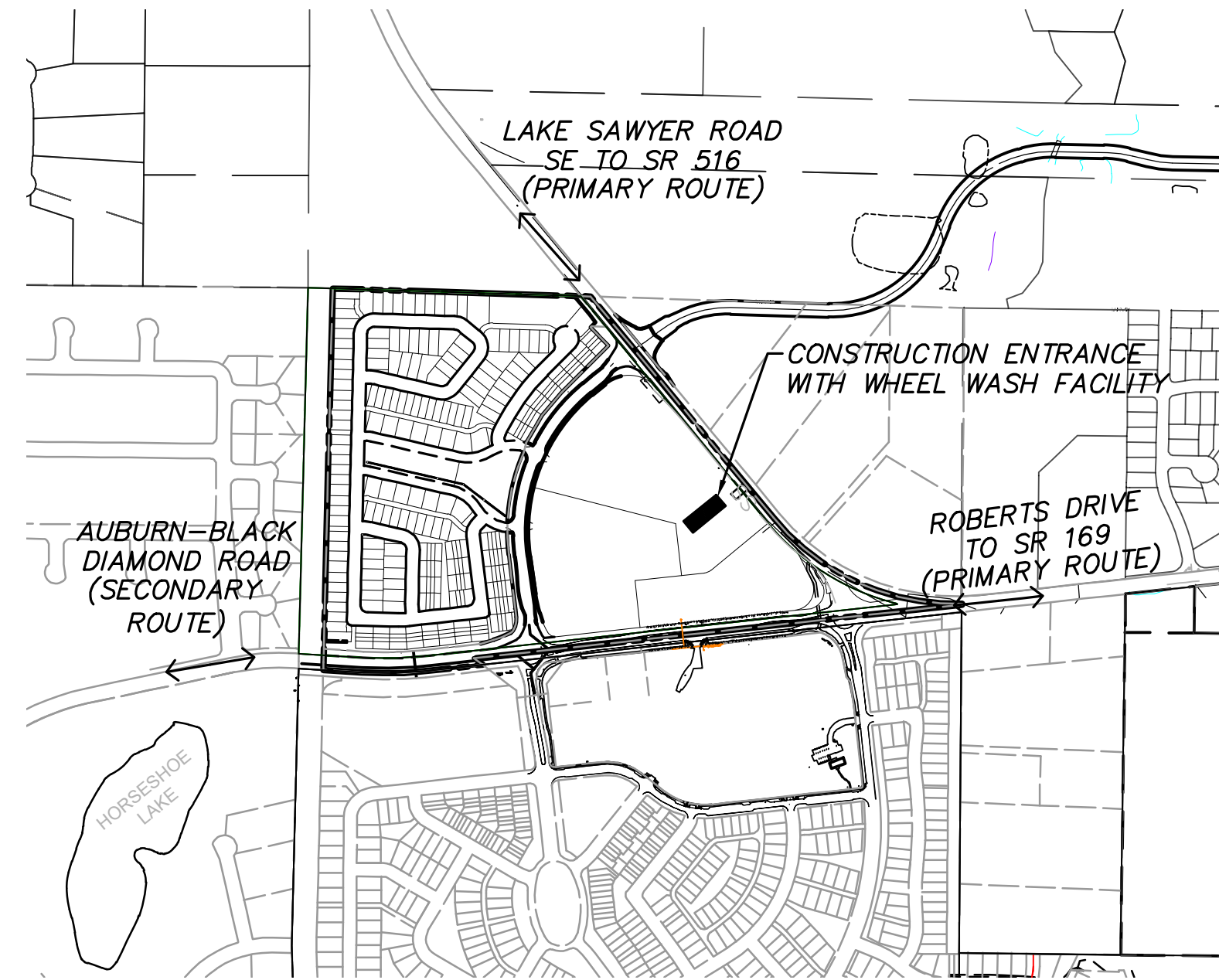


CAPACITY REQUIREMENTS

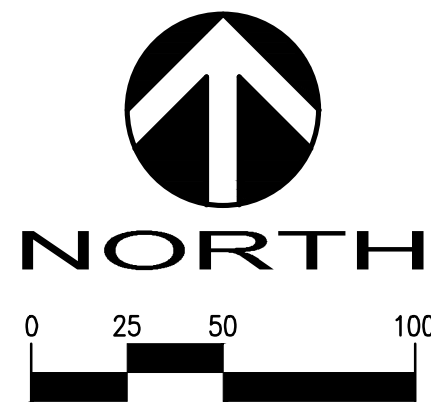
STORMWATER CAPACITY SHOWN ENTERING PHASE 1A RESERVED FOR FUTURE PHASES OF DEVELOPMENT OF THE VILLAGES MPD



ADAPTIVE MANAGEMENT



- NOTES:
- MASTER DEVELOPER SHALL INCLUDE THE FOLLOWING PROVISION IN CLEARING, GRADING AND CONSTRUCTION CONTRACTS: "EXCEPT FOR THE WESTERLY 1,000 FEET OF SE GREEN VALLEY ROAD, SE GREEN VALLEY ROAD SHALL NOT BE USED AS A CONSTRUCTION HAUL ROUTE BY CONTRACTORS OR ITS AGENTS."
 - CONSTRUCTION TRAFFIC CONTROL DESIGN WILL BE PROVIDED AS PART OF FINAL ENGINEERING PLANS FOR REVIEW AND APPROVAL BY THE CITY OF BLACK DIAMOND.



PRELIMINARY
HAUL ROUTE PLAN



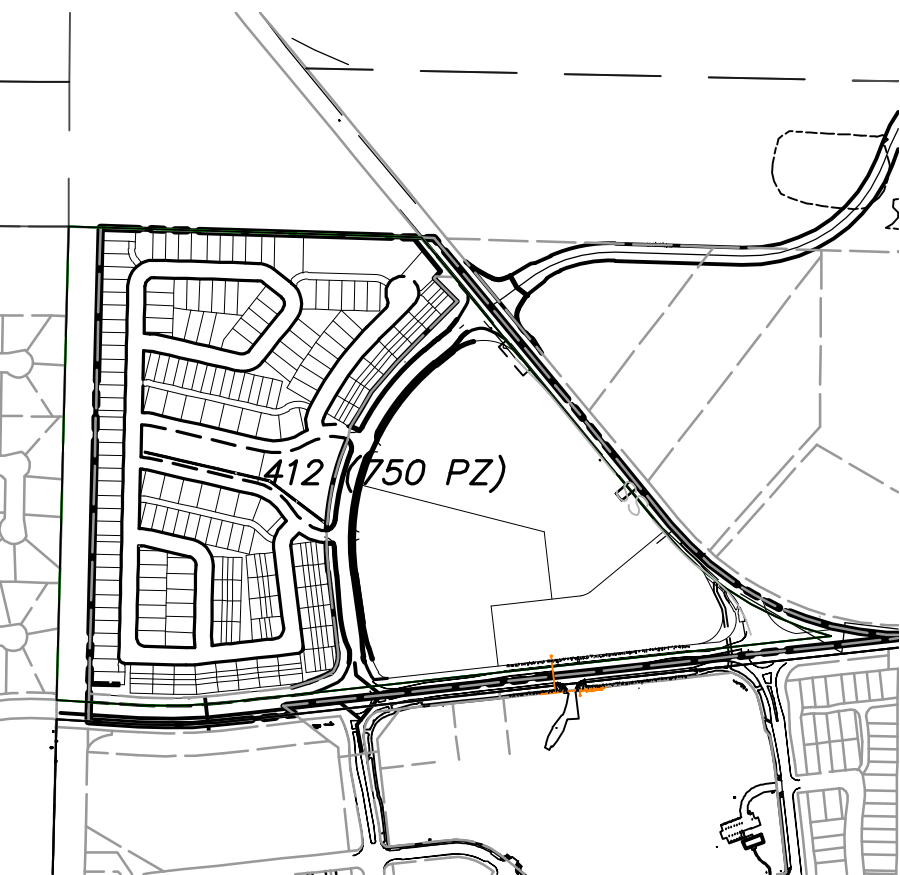
CAPACITY REQUIREMENTS
(THIS PERMIT)

WASTEWATER FLOW THIS PROJECT:
AVERAGE WET DAY FLOW: 187 GPD / ERU x 400 ERUs = 74,800 GPD
INFILTRATION / INFLOW (700 GPAD) : 50 AC x 700 GPAD = 35,000 GPD
TOTAL PEAK FLOW FOR PROJECT: 112,044 GPD
[4.0*(74,800 GPD + 35,000 GPD)/24 HRS = 13,925 GPH (0.52 CFS)]

*CONSERVATIVELY ASSUME TO BE 4.0

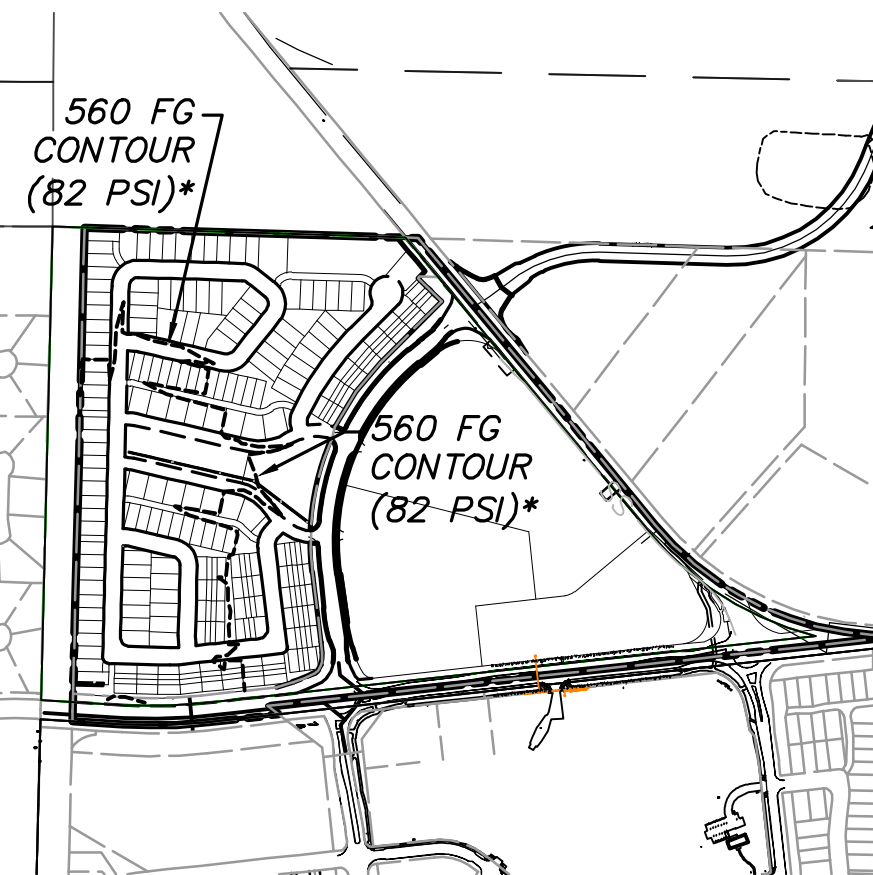


PIPE ROUTES
→ GRAVITY



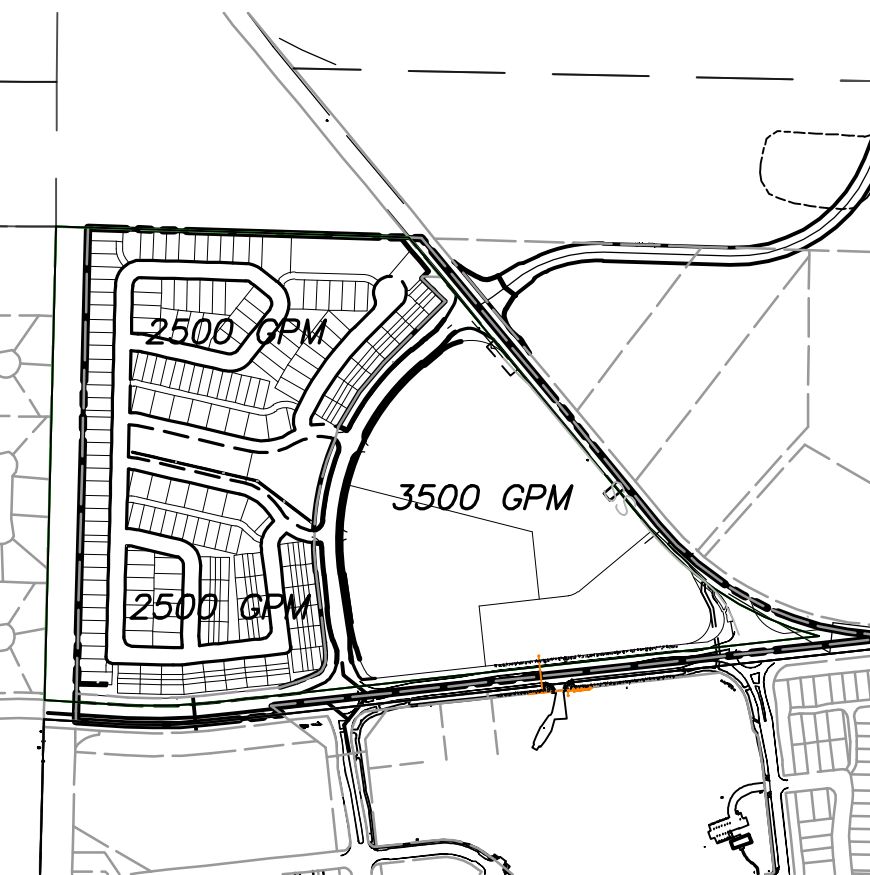
CAPACITY REQUIREMENTS

WATER DEMAND THIS PROJECT:
AVERAGE DAILY DEMAND (ADD) = 187GPD/ERU x 400 ERUs = 74,800 GPD
MAXIMUM DAILY DEMAND (MDD) = 2.5(ADD) = 187,00 GPD



PRESSURE REQUIREMENTS

() * APPROXIMATE STATIC WATER PRESSURE BASED ON 750 PRESSURE ZONE



FIREFLOW REQUIREMENTS

2500 GPM IS THE FIRE FLOW REQUIREMENT FOR MASTER PLANNED DEVELOPMENT OVERLAY PER BOEDCS 6.1.05.4. THIS FIRE FLOW REQUIREMENT BY ZONING IS TO COVER ALLOWED USES WITHIN THE ZONING. BASED ON DISCUSSIONS WITH MDT STAFF THE FIRE FLOW REQUIREMENT WILL BE REDUCED TO 1500 GPM FOR SINGLE FAMILY RESIDENTIAL DEVELOPMENT WHEN PROPOSED LAND USE IS CONFIRMED. PLANS FOR TRACT 916 AND LOTS 271-273 ARE NOT AVAILABLE AT THIS TIME AND HAVE CONSERVATIVELY BEEN ASSUMED AT 3500 GPM



ACCESS EXHIBIT

SHADED AREAS INDICATE AREAS THAT ARE MORE THAN 150' FROM A PUBLIC STREET ROW

SEWER AVAILABILITY

*TABLE 11-4-1 OF THE VILLAGES MASTER PLANNED DEVELOPMENT AGREEMENT SHOWS THAT WASTEWATER STORAGE FACILITIES ARE NOT REQUIRED PRIOR TO ISSUANCE OF THE CERTIFICATE OF OCCUPANCY FOR THE DWELLING UNIT THAT USES THE 1150TH ERU

WATER AVAILABILITY

WATER AVAILABILITY IS PROVIDED IN SECTION 7.2.1 OF THE VILLAGES MASTER PLANNED DEVELOPMENT AGREEMENT (DEVELOPMENT AGREEMENT). THE DEVELOPMENT AGREEMENT NOTES THAT ANY IMPLEMENTING PROJECT APPLICATION PROCESS THAT CALLS FOR A CERTIFICATE OF WATER AVAILABILITY SHALL BE SATISFIED BY REFERENCE TO THE AGREEMENT.

UTILITY ERU CALCULATION

ASSUMPTIONS:
1 SFR = 1 ERU
1 MF = 0.67 ERU
COMM/OFFICE/RETAIL 1,200 SQ. FT = 1 ERU
133 SFR (1 ERU) + 125 MF (0.67 ERU) + ((220,000 SQ. FT)/1,200 SQ. FT PER ERU) = 400 ERUs

UTILITY AVAILABILITY AREAS

TEN TRAILS

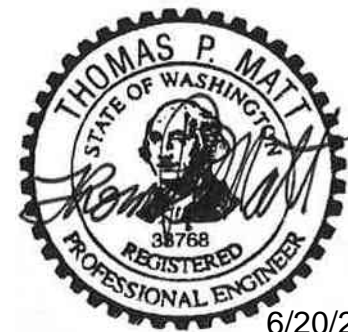
PHASE 1B PLAT A

CITY OF BLACK DIAMOND

NO.	DATE	REVISION	BY	CHK
1	5/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/1/21	DAW/PM	
2	5/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/1/21	DAW/PM	
3	4/8/22	REVISED DIVISION 5 AND 6 AND STORMWATER SYSTEM	DAW/PM	
4	6/20/22	REVISED DIVISIONS 5 AND 6 AND STORMWATER SYSTEM	DAW/PM	

CADD: a

DESIGNED: a



6/20/22

STAMP NOT VALID
UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: VERT.:

PROJECT NO.
OAKPCBDP6001

SHEET NO.

UA1

OF



STAMP NOT VALID
UNLESS SIGNED AND DATED

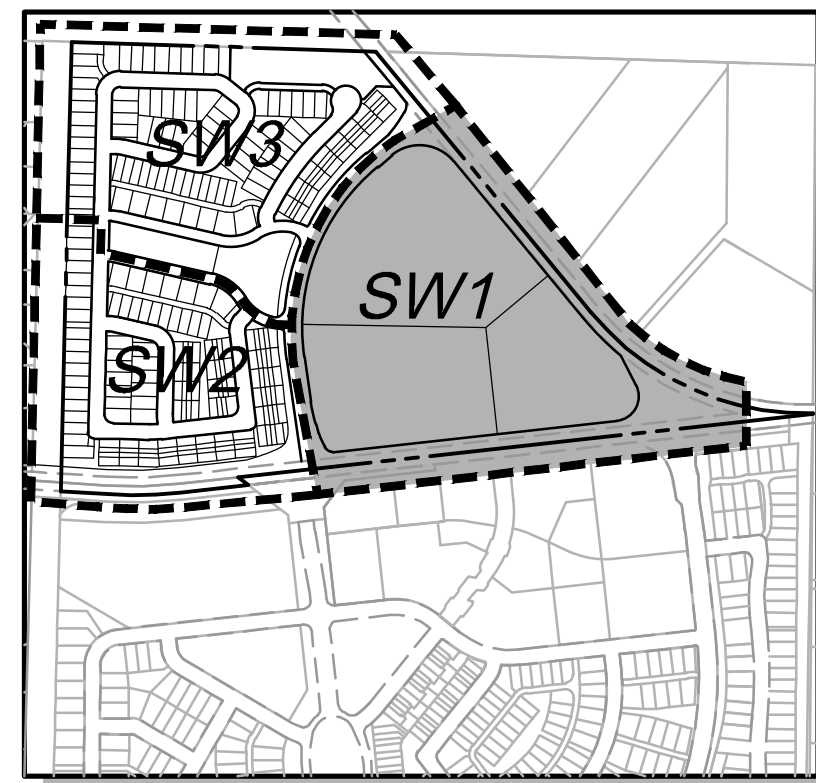
FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=50' VERT.:

PROJECT NO.
OAKPCBDP6001

SHEET NO.

SW1

OF



KEY MAP
NOT TO SCALE

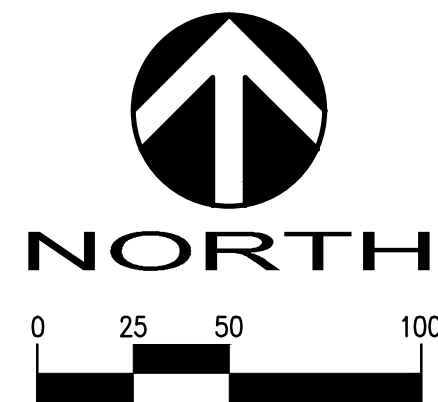
ALL SANITARY SEWER
MAIN TO BE 8" PVC

LEGEND

	PROPOSED SEWER AND WATER
	BOUNDARY
	LOT LINE
	RIGHT-OF-WAY
	GUTTER, FLOW, & CURB LINE
	CENTER LINE
	EASEMENT
-420-	1' EXISTING CONTOURS
-422-	2' EXISTING CONTOURS
-420-	1' PROPOSED CONTOURS
-422-	2' PROPOSED CONTOURS
	OF WETLAND
	PROPOSED BUTTER LINE
	CAST-IN-PLACE WALL
	SEWER PIPE
	WATER PIPE (750PZ)
	WATER PIPE (850PZ)
	GUARD RAIL
	SEWER MANHOLE
	FIRE HYDRANT

TRACT DESIGNATION LEGEND

AC - ACCESS
FD - FUTURE DEVELOPMENT
LA - LANDSCAPE
NL - NATURAL LANDSCAPE
PA - PEDESTRIAN ACCESS
PK - PARK
SA - SENSITIVE AREA AND BUFFER
UT - UTILITY



NORTH

NW 1/4 OF SECTION 15, TWP. 21N, RGE. 6E, W.M.

SEE SHEET SW2

Plot Date: 6/24/2022 9:20 AM
By: Doug Merriam
By: Dxm File: P:\OAKPCBDP6001\0400CAD\ECIPRE\IMINARY\Ten Trails\Phase 1B\Parcel CIP\ Preliminary Plat\SW-P-OAKPCBDP6001-PARCEL C.dwg
Save Date: 6/24/2022 9:03 AM

By: Doug Merriam
By: Dxme File: P:

6/24/2022 9:20 AM
6/24/2022 9:03 AM



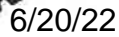
LEGEND

PROPOSED SEWER AND WATER	
==	BOUNDARY
---	LOT LINE
---	RIGHT-OF-WAY
---	OUTLET, FLOW, & CURB LINE
---	CENTER LINE
---	EASEMENT
-420-	10' EXISTING CONTOURS
-422-	2' EXISTING CONTOURS
-420-----	10' PROPOSED CONTOURS
-422-----	2' PROPOSED CONTOURS
.....	EDGE OF WETLAND
.....	PROPOSED BUFFER LINE
.....	EAST-IN-PLACE WALL
---	SEWER PIPE
---	WATER PIPE (750PZ)
---	WATER PIPE (850PZ)
---	GUARD RAIL
●	SEWER MANHOLE
●	FIRE HYDRANT

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PA - PEDESTRIAN ACCESS
PK - PARK
SA - SENSITIVE AREA AND BUFFER
UT - UTILITY

NO.	DATE	REVISION	BY	CHK
△	5/10/21	REVISED PER CITY COMMENTS LETTER DATED 4/1/21	DAM	PMU
△	5/17/21	REVISED DIVISION 6 TO FUTURE DEVELOPMENT TRACT		
△	5/18/21	REVISED LINEWORK PERT UPDATED LOT LINE ADJUSTMENT	KAC	MMU
△	6/9/22	REVISED DIVISIONS 3 AND 4 AND SUMMITTER SYSTEM	DAM	PMU
△				
△				
△				
△				

DESIGNED: DL CADDED: DL



STAMP NOT VALID
UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=50' VERT.:
PROJECT NO. OAKPCBDP6001

SHEET NO. SW2

OF



DAVID EVANS
AND ASSOCIATES INC.
20300 Woodinville Snohomish Rd NE
Woodinville Washington 98072
Phone: 425.415.2000

SANITARY SEWER AND WATER PLAN

TEN TRAILS

PHASE 1B PLAT A

CITY OF BLACK DIAMOND

DESIGNED: AL

NO.	DATE	REVISION	BY	CHK
1	5/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/11/21	DAW/PM	
2	5/1/21	REVISED DIVISION 8 TO FUTURE DEVELOPMENT DISTRICT	DAW/PM	
3	4/8/22	REVISED DIVISIONS 5 AND 6 AND STORMWATER SYSTEM	DAW/PM	
4	6/20/22			



STAMP NOT VALID
UNLESS SIGNED AND DATED

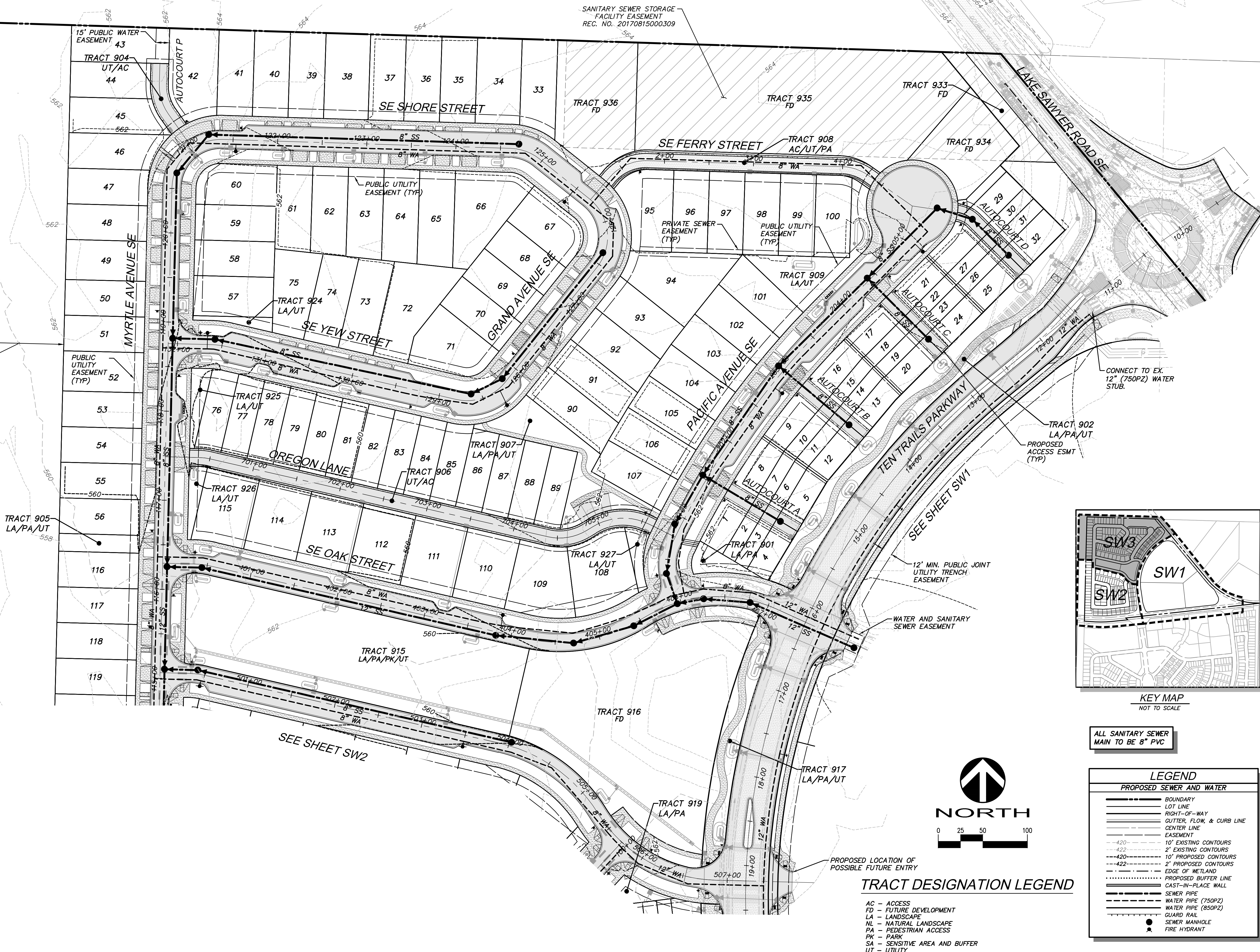
FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ. 1"=50' VERT.:

PROJECT NO.
OAKPCBDP6001

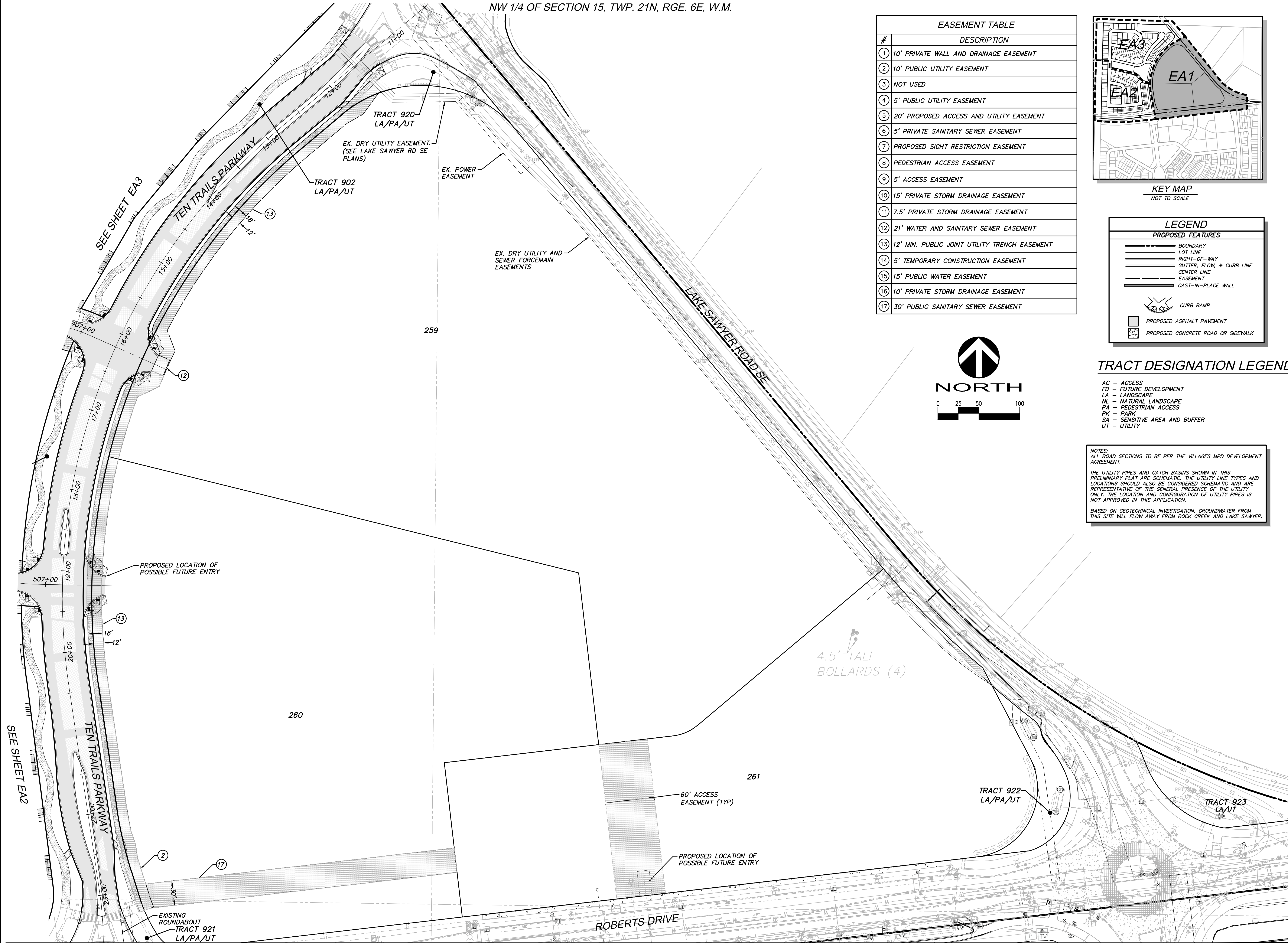
SHEET NO.

SW3

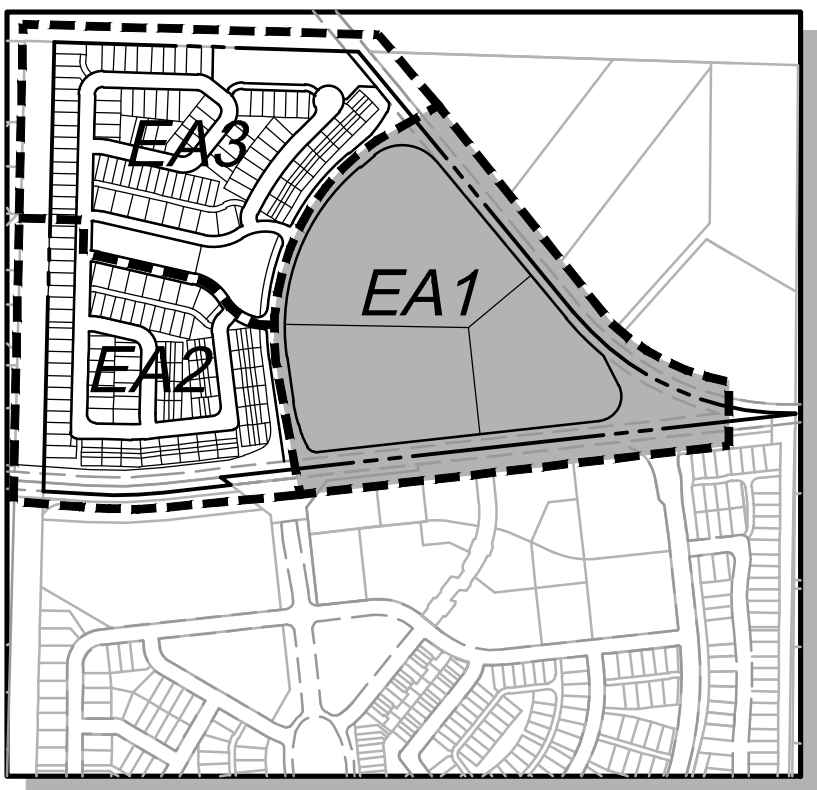
OF



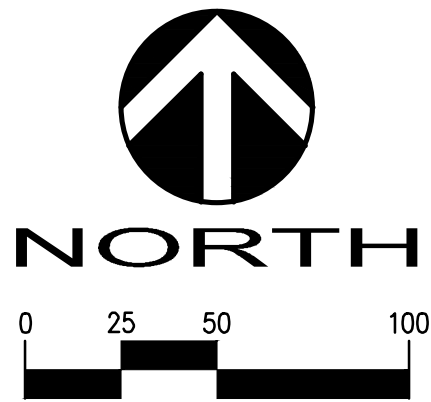
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EASEMENT TABLE	
#	DESCRIPTION
①	10' PRIVATE WALL AND DRAINAGE EASEMENT
②	10' PUBLIC UTILITY EASEMENT
③	NOT USED
④	5' PUBLIC UTILITY EASEMENT
⑤	20' PROPOSED ACCESS AND UTILITY EASEMENT
⑥	5' PRIVATE SANITARY SEWER EASEMENT
⑦	PROPOSED SIGHT RESTRICTION EASEMENT
⑧	PEDESTRIAN ACCESS EASEMENT
⑨	5' ACCESS EASEMENT
⑩	15' PRIVATE STORM DRAINAGE EASEMENT
⑪	7.5' PRIVATE STORM DRAINAGE EASEMENT
⑫	21' WATER AND SAINTARY SEWER EASEMENT
⑬	12' MIN. PUBLIC JOINT UTILITY TRENCH EASEMENT
⑭	5' TEMPORARY CONSTRUCTION EASEMENT
⑮	15' PUBLIC WATER EASEMENT
⑯	10' PRIVATE STORM DRAINAGE EASEMENT
⑰	30' PUBLIC SANITARY SEWER EASEMENT



LEGEND	
PROPOSED FEATURES	
	BOUNDARY
	LOT LINE
	RIGHT-OF-WAY
	GUTTER, FLOW, & CURB LINE
	CENTER LINE
	EASEMENT
	CAST-IN-PLACE WALL
	CURB RAMP
	PROPOSED ASPHALT PAVEMENT
	PROPOSED CONCRETE ROAD OR SIDEWALK



TRACT DESIGNATION LEGEND

AC - ACCESS
FD - FUTURE DEVELOPMENT
LA - LANDSCAPE
NL - NATURAL LANDSCAPE
PA - PEDESTRIAN ACCESS
PK - PARK
SA - SENSITIVE AREA AND BUFFER
UT - UTILITY

NOTES:
ALL ROAD SECTIONS TO BE PER THE VILLAGES MPD DEVELOPMENT AGREEMENT.
THE UTILITY PIPES AND CATCH BASINS SHOWN IN THIS PRELIMINARY PLAN ARE SCHEMATIC. THE UTILITY LINE TYPES AND LOCATIONS SHOULD ALSO BE CONSIDERED SCHEMATIC AND ARE REPRESENTATIVE OF THE GENERAL PRESENCE OF THE UTILITY ONLY. THE LOCATION AND CONFIGURATION OF UTILITY PIPES IS NOT APPROVED IN THIS APPLICATION.
BASED ON GEOTECHNICAL INVESTIGATION, GROUNDWATER FROM THIS SITE WILL FLOW AWAY FROM ROCK CREEK AND LAKE SAWYER.

DAVID EVANS AND ASSOCIATES INC.
20300 Woodinville Snohomish Rd NE
Woodinville Washington 98072
Phone: 425.415.2000

EASEMENT PLAN

TEN TRAILS

PHASE 1B PLAT A

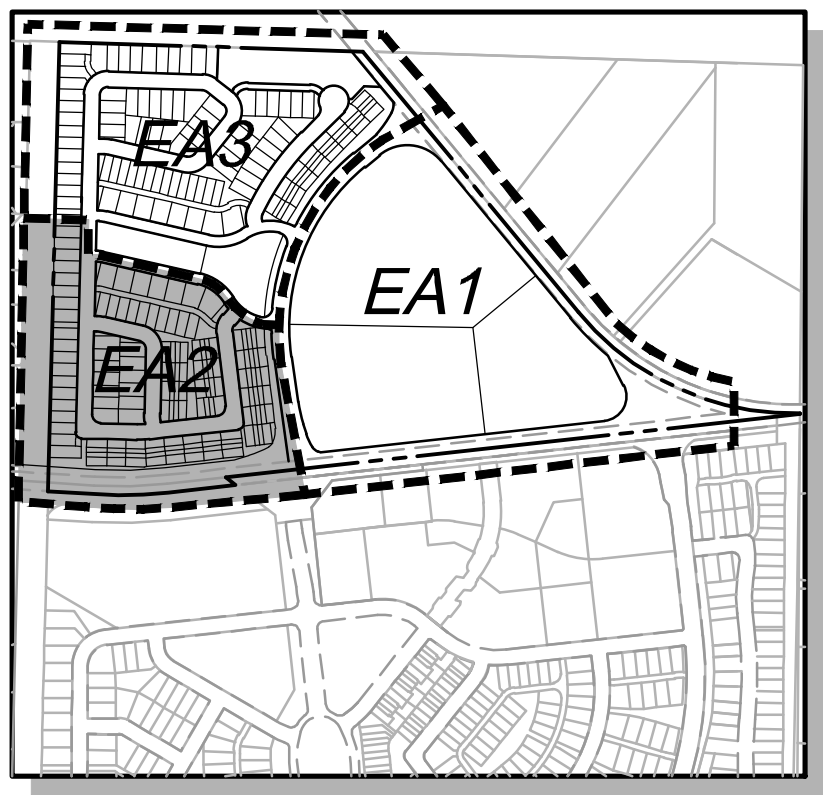
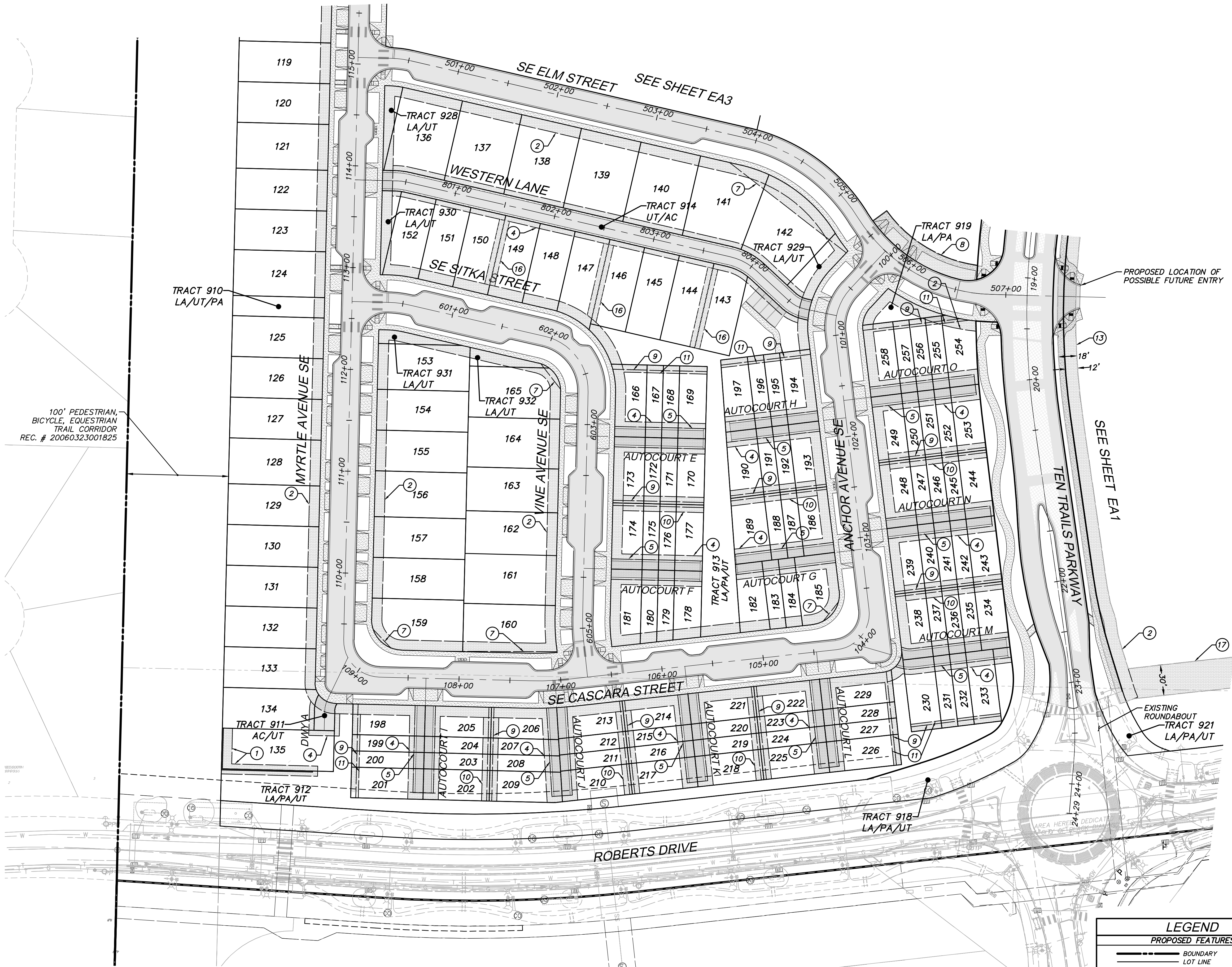
CITY OF BLACK DIAMOND

DESIGNED:

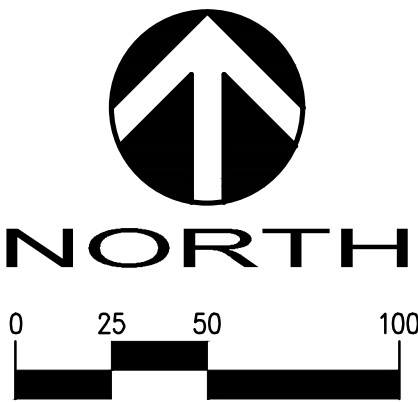
DATE:

NO.	DATE	REVISION
1	5/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/11/21
2	5/1/21	REVISED DIVISION 6 TO FUTURE DEVELOPMENT AGREEMENT
3	4/8/22	REVISED DIVISIONS 5 AND 6 AND STORMWATER SYSTEM
4	6/20/22	

STAMP NOT VALID
UNLESS SIGNED AND DATED
FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=50' VERT.:
PROJECT NO.
OAKPCBDP6001
SHEET NO.
EA1
OF



KEY MAP
NOT TO SCALE



EASEMENT TABLE	
#	DESCRIPTION
1	10' PRIVATE WALL AND DRAINAGE EASEMENT
2	10' PUBLIC UTILITY EASEMENT
3	NOT USED
4	5' PUBLIC UTILITY EASEMENT
5	20' PROPOSED ACCESS AND UTILITY EASEMENT
6	5' PRIVATE SANITARY SEWER EASEMENT
7	PROPOSED SIGHT RESTRICTION EASEMENT
8	PEDESTRIAN ACCESS EASEMENT
9	5' ACCESS EASEMENT
10	15' PRIVATE STORM DRAINAGE EASEMENT
11	7.5' PRIVATE STORM DRAINAGE EASEMENT
12	21' WATER AND SAINTARY SEWER EASEMENT
13	12' MIN. PUBLIC JOINT UTILITY TRENCH EASEMENT
14	5' TEMPORARY CONSTRUCTION EASEMENT
15	15' PUBLIC WATER EASEMENT
16	10' PRIVATE STORM DRAINAGE EASEMENT
17	30' PUBLIC SANITARY SEWER EASEMENT

TRACT DESIGNATION LEGEND

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LEGEND	
PROPOSED FEATURES	
	BOUNDARY
	LOT LINE
	RIGHT-OF-WAY
	GUTTER, FLOW, & CURB LINE
	CENTER LINE
	EASEMENT
	CAST-IN-PLACE WALL
	CURB RAMP
	PROPOSED ASPHALT PAVEMENT
	PROPOSED CONCRETE ROAD OR SIDEWALK

NOTES:
ALL ROAD SECTIONS TO BE PER THE VILLAGES MPD DEVELOPMENT AGREEMENT.

THE UTILITY PIPES AND CATCH BASINS SHOWN IN THIS PRELIMINARY PLAT ARE SCHEMATIC. THE UTILITY LINE TYPES AND LOCATIONS SHOULD ALSO BE CONSIDERED SCHEMATIC AND ARE REPRESENTATIVE OF THE GENERAL PRESENCE OF THE UTILITY ONLY. THE LOCATION AND CONFIGURATION OF UTILITY PIPES IS NOT APPROVED IN THIS APPLICATION.

BASED ON GEOTECHNICAL INVESTIGATION, GROUNDWATER FROM THIS SITE WILL FLOW AWAY FROM ROCK CREEK AND LAKE SAWYER.



DAVID EVANS
AND ASSOCIATES INC.
20300 Woodinville Snohomish Rd NE
Woodinville Washington 98072
Phone: 425.415.2000

EASEMENT PLAN

TEN TRAILS

PHASE 1B PLAT A

CITY OF BLACK DIAMOND

DESIGNED: JAL

NO.	DATE	REVISION	BY	CHK
1	5/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/1/21	JAM	JPM
2	5/1/21	REVISED DIVISION 6 TO FUTURE DEVELOPMENT TO DISTRICT	JAM	JPM
3	4/8/22	REVISED DIVISIONS 5 AND 6 AND STORMWATER SYSTEM	JAM	JPM
4	6/20/22			



STAMP NOT VALID
UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE: 8/27/2020
SCALE: HORIZ.: 1"=50' VERT.:

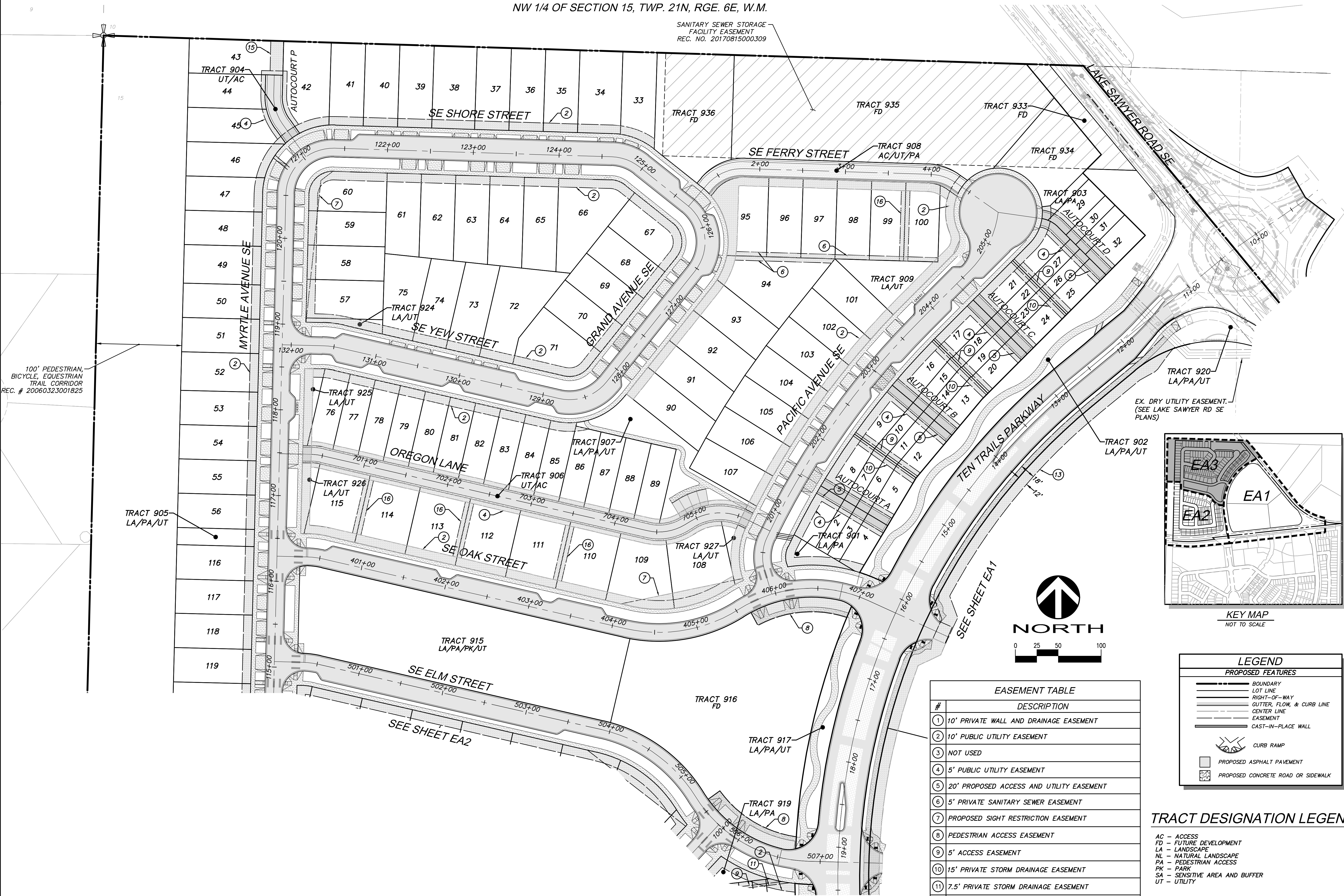
PROJECT NO.
OAKPCBDP6001

SHEET NO.

EA2

OF

By: David Merriam
Save Date: 6/23/2022 4:31 PM
File: P:\OAKPCBDP6001\0400CAD\CDP\PRELIMINARY\Ten Trails\Phase 1B\Parcel C\Preliminary Plate\A-P-OAKPCBDP6001-PARCEL C.dwg



NO.	DATE	REVISION
1	5/1/21	REVISED PER CITY COMMENTS LETTER DATED 1/11/21
2	5/1/21	REVISED DIVISION 6 TO FUTURE DEVELOPMENT AND DISTRICT
3	4/19/22	REVISED DIVISIONS 5 AND 6 AND STORMWATER SYSTEM
4	6/20/22	



THE VILLAGES / TEN TRAILS MPD
PHASE 1B PLAT A – PRELIMINARY PLAT
PLN20-0107

EXHIBIT 2

TITLE: Design Review Committee Approval Letter

PREPARED BY: Oakpointe LLC

DATE: June 30, 2022

Ten Trails Homeowners' Association
Design Review Committee
c/o Oakpointe, LLC
3025 112th Avenue NE, Suite 100
Bellevue, WA 98004

June 30, 2022

Andy Williamson
Community Development Director
City of Black Diamond
P.O. Box 599
24301 Roberts Drive
Black Diamond, WA 98010

**RE: Ten Trails MPD Phase 1B Plat A Preliminary Plat
aka: Mountain View
Design Review Committee Approval**

Dear Mr. Williamson:

The Design Review Committee (the "DRC") for the Homeowners' Association for CCD Black Diamond Partners Ten Trails Master Planned Development ("MPD") hereby notifies the City of Black Diamond that it has reviewed and approved the Phase 1B Plat A Preliminary Plat dated August 27, 2020 and revised June 20, 2022. The DRC found that the Phase 1B Plat A Preliminary Plat (Mountain View) complies with the City's MPD Framework Design Standards and Guidelines and the DRC Design Guidelines as well as the MPD Project Specific Design Standards and Guidelines contained in The Villages MPD Development Agreement dated December 12, 2011.

If you have questions regarding the Design Review Committee's review of the Villages MPD Phase 1B Plat A Preliminary Plat, please call me at (425) 898-2100.

Very Truly Yours,

A handwritten signature in black ink, appearing to read "Kevin Thomas". The signature is stylized with a large "K" and a long horizontal stroke at the end.

Kevin Thomas
Design Review Committee

THE VILLAGES / TEN TRAILS MPD
PHASE 1B PLAT A – PRELIMINARY PLAT
PLN20-0107

EXHIBIT 3

TITLE: Public Comments Received During Notice of Application
and Notice of Public Hearing Comment Periods

PREPARED BY: Fourteen (14) Public Commenters

DATE: Various

Alex Campbell

From: Joe Riordan <joe.riordan.ak@gmail.com>
Sent: Thursday, December 31, 2020 10:07 AM
To: Alex Campbell
Subject: Comment on Ten Trails MPD Phase 1B Plat A Preliminary Plat PLN20-0107

Dear Mr. Campbell,

Please notify me at the email address this message is sent from of all updates, notices, or decisions on OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>). Additionally, please send me all future city land use project public notices.

I adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond.

I would also add my concerns that any clearing and cut / fill should not be done unless the developer provides a bond that ensures future restoration in the event, however unlikely, that the developer can't finish what's been started. History is full of developments that start out strong but then run into difficulties that result in a stalled or abandoned project that the town is left holding the bag to deal with. If that were to happen in this situation the cost would be considerable and we would be remiss in not making it a requirement.

Thank you,
Joe Riordan P.E.
29116 - 218th Pl
Black Diamond, WA

--

Joe Riordan P.E.
Energy Professionals LLC
Seattle, WA
(cell) 425-457-0273

Alex Campbell

From: Joan Gangl <jfgangl@aol.com>
Sent: Thursday, December 31, 2020 10:13 AM
To: Alex Campbell
Subject: Comment on Ten Trails MPD Phase 1B Plat A Preliminary Plat PLN20-0107

Dear Mr. Campbell,

Please notify me at the email address this message is sent from of all updates, notices, or decisions on OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>). Additionally, please send me all future city land use project public notices.

I adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond.

Thank you,

Joan Gangl

30720 229th PL SE

Black Diamond, WA 98010

Alex Campbell

From: Alan Gangl <argangl52@gmail.com>
Sent: Thursday, December 31, 2020 10:59 AM
To: Alex Campbell

Subject: Comment on Ten Trails MPD Phase 1B Plat A Preliminary Plat PLN20-0107

Dear Mr. Campbell,

Please notify me at the email address this message is sent from of all updates, notices, or decisions on OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted

at [http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-](http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf)

0107%20Notice%20of%20Application.pdf). Additionally, please send me all future city land use project public notices.

I adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond.

Thank you,

Alan Gangl

30720 229th Pl SE

Black Diamond, Wa 98010

argangl52@gmail.com

Alex Campbell

From: briordan21 <briordan21@gmail.com>
Sent: Thursday, December 31, 2020 10:59 AM
To: Alex Campbell
Cc: saveblackdiamond@gmail.com
Subject: Comment on Ten Trails MPD Phase 1B Plat A Preliminary Plat PLN20-0107

Dear Mr. Campbell,

Please notify me at the email address this message is sent from of all updates, notices, or decisions on OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>).

Additionally, please send me all future city land use project public notices.

I adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond.

Thank you,
Brenda Riordan
29116 218th PL SE
Black Diamond, WA. 98010

Sent from my iPhone

Alex Campbell

From: Kristen Bryant <kristenbry@gmail.com>
Sent: Thursday, December 31, 2020 12:27 PM
To: Alex Campbell
Subject: Comment on Ten Trails MPD Phase 1B Plat A Preliminary Plat PLN20-0107

Dear Mr. Campbell,

Please notify me at the email address this message is sent from of all updates, notices, or decisions on OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>). Additionally, please send me all future city land use project public notices.

I adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond.

Thank you,

Kristen Bryant - 425-247-9619

On Thu, Dec 31, 2020 at 12:24 PM Save Black Diamond <saveblackdiamond@gmail.com> wrote:
Hello Mr. Campbell and Happy New Year.

Please accept the attached initial comments on the new Ten Trails Preliminary Plat PLN20-0107, per the public notice at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>.

We welcome a dialog about these comments and how the project can better satisfy any safety and environmental concerns in the Black Diamond's area.

Thank you,
Save Black Diamond

Alex Campbell

From: Philip Acosta <philamatic@comcast.net>
Sent: Thursday, December 31, 2020 12:30 PM
To: Alex Campbell
Cc: saveblackdiamond@gmail.com
Subject: Comment on Ten Trails MPD Phase 1B Plat A Preliminary Plat PLN20-0107

Dear Mr. Campbell,

In reading the "Detailed Implementation Schedule Phase 1B Regional Infrastructure Improvements" I noted item 12 on page 5 of that document that improvements to SR169/SE 288th have been put into phases on undoubtably the heaviest used and most in need of improvements in Black Diamond.

I have spoken many times to the council and planning commission regarding the safety concerns that this intersection plays in the day to day life of our citizenry. It's design alone with vehicles sitting in a hole of sorts on 288th, below road grade, trying to make a left turn (northbound) while the view is obstructed from oncoming (southbound) both thru and turning traffic.

According to "Improvement Details" a rechannelization would provide a refuge and merge lane to receive eastbound left turning vehicles from 288th. Apparently this suggested improvement was done at a cost over lives equation. How does the idea of providing a refuge for vehicles to merge not once but twice into traffic while looking into their right hand mirrors and facing into 50MPH head on traffic improve traffic flow and safety. The current and everyday increasing volumes at this intersection, one of only two east west corridors in Black Diamond has got to move directly into a controlled traffic signal phase not only to alleviate volumes manufactured from the Ten Trails development but many more developments under construction or planned for this area.

Please notify me at the email address this message is sent from of all updates, notices, or decisions on OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>).

Additionally, please send me all future city land use project public notices.

I adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond.

Best Regards
Philip N Acosta
Black Diamond
206 406 4404

Alex Campbell

From: Angela Rossman Fettig <angimal80@hotmail.com>
Sent: Thursday, December 31, 2020 1:25 PM
To: Alex Campbell
Cc: Save Black Diamond
Subject: Comment on Ten Trails MPD Phase 1B Plat A Preliminary Plat PLN20-0107

Dear Mr. Campbell,

Please notify me at angimal80@hotmail.com of all updates, notices, or decisions on OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>).

Additionally, please send me all future city land use project public notices.

I adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond.

Thank you,
Angela Fettig
25423 Kanasket Drive
Black Diamond, WA 98010

Sent from my iPhone

Alex Campbell

From: cnsolutions1@netscape.net
Sent: Thursday, December 31, 2020 2:32 PM
To: Alex Campbell
Subject: Comment on Ten Trails MPD Phase 1B Plat A Preliminary Plat PLN20-0107

Dear Mr. Campbell,

Please notify us at the email address this message is sent from of all updates, notices, or decisions on OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>). Additionally, please send us all future city land use project public notices.

We adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond.

Thank you,

Jeff and Cheri Merrill
30712 229th Place SE
Black Diamond, WA 98010

Alex Campbell

From: CenturyLink Customer <g.davis001@q.com>
Sent: Thursday, December 31, 2020 2:32 PM
To: Alex Campbell
Subject: Comment on Ten Trails MPD Phase 1B Plat A Preliminary Plat PLN20-0107

Dear Mr. Campbell, Please notify me at the email address this message is sent from of all updates, notices, or decisions on OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>). Additionally, please send me all future city land use project public notices. I adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond. Thank you

Gary Davis
Black Diamond, WA
g.davis001@q.com

Alex Campbell

From: Save Black Diamond <saveblackdiamond@gmail.com>
Sent: Thursday, December 31, 2020 4:19 PM
To: Alex Campbell; Andy Williamson
Cc: Kristen Bryant; info@bryantstractorandmower.com; Fetting, Angela; Gary Davis; gotrocks886@gmail.com
Subject: Re: Comment on Phase 1B Preliminary Plat A (Mountainview)
Attachments: CommentsPhase1BMountainViewPreliminaryPlat.pdf

Hello again,

In the email earlier today, it looks like we forgot to attach the comment letter! Please accept the attached.

If you could let us know it was received, that would be great.

Thank you.

On Thu, Dec 31, 2020 at 12:24 PM Save Black Diamond <saveblackdiamond@gmail.com> wrote:

Hello Mr. Campbell and Happy New Year.

Please accept the attached initial comments on the new Ten Trails Preliminary Plat PLN20-0107, per the public notice at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>.

We welcome a dialog about these comments and how the project can better satisfy any safety and environmental concerns in the Black Diamond's area.

Thank you,
Save Black Diamond

To: City Master Development Review Team (MDRT), Black Diamond, WA

Comments on Ten Trails MPD Phase 1B Plat A Preliminary Plat (MountainView). Application PLN20-0107, Applicant Oakpointe / CCD Black Diamond Partners LLC.

Date: December 31, 2020

From: Save Black Diamond

Transportation

There are unanswered questions about the long-term traffic congestion and safety with this Preliminary Plat when added to the previously approved Preliminary Plats (for well over 1,000 units) in the Ten Trails development. Every Ten Trails Phase requires a mid-phase traffic analysis. That requirement is critical to accurately assessing and addressing cumulative impacts to the city streets. To date we have not seen a mid-phase traffic analysis. However the developer is about to start its third simultaneous phase?

The Development Agreement also requires a new traffic model at 850 units. This new model should be publicly reviewed and developer transportation project requirements adjusted to assure no decrease in transportation levels of service prior to approval of this new plat.

Further, the large off-site intersection requirements of the first Ten Trails phase (1A), the 327-unit fix of intersections at Ravensdale Road/SR 169 and Roberts Drive / SR 169, have still not been met. This is despite Ten Trails building well beyond 327 units. This plat should not be approved until the required intersection fixes (not interim fixes, but full fixes) are complete for these intersections. How can the city continue to permit additional expansion and growth while not enforcing the required improvements from earlier phases? This does not serve the majority of city residents and taxpayers, and degrades public safety.

This new plat, combined with the other plats in progress, adds too much traffic on Lake Sawyer Road (a.k.a. 228th to 216th Ave SE) to allow safe turning from residential arterials and driveways. The transportation analysis fails to address whether there is sufficient road/lane capacity on Lake Sawyer Road.

The **safety of pedestrians** on the Lake Sawyer Road, SE 288th Street, and on Roberts Drive must be accounted for but has not been addressed. Additionally, the light, glare, and aesthetics from additional traffic will greatly change the character of these roads. What is being done to protect the neighborhood residents from these negative and unsafe impacts?

Sawyer Woods Elementary School is on the Lake Sawyer Road corridor. How is walkability to this school being increased and the safety of students being ensured? Has the city collaborated with the school district to address impacts to their school site?

Regional Infrastructure Improvements Schedule

The proposed September 28, 2020 *Detailed Implementation Schedule Phase 1B Regional Infrastructure Improvements* provides a list of intersection improvements. Some of these conflict with previously scheduled improvements from previous Phase's Regional Infrastructure Schedules. These conflicts must be addressed. Also of concern is that some intersection projects have been changed and modified from Development Agreement requirements.

Notably absent from the Schedule seems to be the east-west "Pipeline Road" required not only by the 2011 Development Agreement, but also by the 1996 Black Diamond Urban Growth Area Agreement. This new road is necessary to allow residents along Roberts Drive and SE 288th Street some peace, safe vehicle access, and walkability in their neighborhoods.

This Regional Schedule should apply to any and all development that is part of the 2011 Development Agreements, and should not be limited to totals from only Phase 1A, Phase 1B, and Phase 2 alone. Please remove all reference to those phases and replace it with "any and all phases."

If transportation concurrency requirements are not met, Black Diamond is obligated to deny new development until traffic concurrency can be demonstrated. The proposed schedule allows development despite concurrency failures. Failures that exist or will exist soon include, but are not limited to: the Kent-Kangley / Landsburg Rd; the Ravensdale Rd / SR 169; and Roberts Dr / SR 169 intersections.

The Development Agreement includes language intended to ensure traffic improvements are made prior to level of service (LoS) falling below existing levels, and prior to LoS failure. The new Schedule ignores this intent and instead proposes a schedule that will allow delays in construction until years after intersections fail. The proposed Schedule may further extend the years of failing intersection conditions because it includes a giant loophole that the Designated Official can waive any of the requirements in the schedule. Please remove all language giving the Designated Official any discretion, and make the Schedule's ERU occupancy "trigger" numbers a hard requirement. The legal requirements of the 2011 Development Agreement should not be construed to allow delays. Discretionary delays fail to serve the public good and are not good and fair governance.

Please record on the face of the plat that no building permits can be issued until the road improvements listed in the Development Agreement and identified in the Phase 1A, Phase 2, and Phase 1B Regional schedules are complete.

Fiscal Analysis

For previous Master Planned Development (MPD) plats, actual city revenue was short of the projected revenue in the fiscal analysis. The new 2020 Fiscal Analysis does not sufficiently and

realistically demonstrate that the fiscal requirements of the Development Agreement will be met. For example, the City of Black Diamond has not had yet realized new commercial development as approved in 2012 for Plat 1A. The city must create and utilize an enforcement mechanism so that the Fiscal Analysis is not just a report sitting on a shelf. The new plat should not be approved without a financial guarantee that fiscal improvement commitments to the city, as intended by the provisions and language in the Development Agreement, will be met. Anything else is a failure of responsibility to the citizenry.

Government Facilities / Public Services

The City of Black Diamond is facing a shortage of space at city hall, in its old and small police department building, and its public works capital equipment. The new plat has not demonstrated how it will contribute to the city's capital needs in these areas despite the fact that the new plat will increase use of these services.

Emergency Services

Fire and emergency services are not sufficiently provided for the new plat. The developer has not yet built the fire station required by the Development Agreement, and is not on track to do so. The city does not know how it is going to fund its fire department, which also provides emergency medical services, after 2022. The developer should provide additional fire impact fees and emergency services funds before this plat is approved.

Otherwise, safety of residents is reduced by the additional demand for these services without additional capacity. That is allowing the Master Developer to reduce the safety of all other citizens in the city, which is not in the interest of public good.

Open Space

Multiple open space tracts, such as tracts 908 and 909, are too small to meet the minimum requirements to count toward project open space. The effect is that they are meaningless when considering the original intent and goals of the open space requirements for the project. The project was supposed to keep a small-town feel with natural spaces, not small pockets of grass that simply feel like the yard of the adjacent house.

The sidewalk areas, roadside vegetation strips, and road-side paths also are not to be counted toward project open space.

The developer can add meaningful, compliant open space by moving/removing some houses and continuing this new plat's open space tract west of tract 915 through to the city limits to the west. This boundary has a forested buffer next to the rural "101 Pines" housing. This would be

more meaningful open space because it would allow a wildlife and natural space corridor to connect to the buffer.

Commercial Plans

This Phase 1B MountainView Preliminary Plat application contains significant detail on the housing, but not on the commercial lots. The first preliminary plat, plat 1A processed in 2012, had a mix of commercial and housing development. However, as of 2020 the commercial buildings in Plat 1A do not exist while many of the houses do. This creates a problem of analysis based on too many assumptions, especially in fiscal and transportation impact review. Clearing and grading is occurring too many years in advance and leaves an undeveloped eyesore. To approve the preliminary plat's commercial element at this time is to lock in traffic analysis with no effective way to consider changes needed in the future.

There should be no clearing and grading of the commercial space. The city should require a new traffic analysis, public review, and city consultant approval prior to issuance building permits for commercial development.

Stormwater

The Drainage Report indicates that stormwater will be infiltrated on-site or at the Phase 1A stormwater treatment facility. The Phase 1A stormwater treatment facility was not sized or designed to add stormwater from Phase 1B. Use of the Phase 1A pond is inappropriate as it increases the risk of flooding or failure to treat all stormwater during heavy storm events.

The stormwater should follow Low Impact Development (LID) design and remain in the same drainage basin it is currently in. The proposed "stormwater vaults" do not meet LID requirements.

The proposal to "maintain" flow to Horseshoe Lake "adaptively" is insufficient. There is no assurance that stormwater will be managed by someone with the technical expertise to ensure that properly treated stormwater flows to Horseshoe Lake at the proper time.

Natural Contours / Grading

The Development Agreement requires the developer to maintain the natural contours of the land. The proposed 20% cut and fill proposal does not meet this requirement. The failure to keep the natural contours can negatively affect stormwater LID options, negatively impact groundwater flows, and remove the small-town character and natural beauty of Black Diamond. Each of those areas are addressed within the Development Agreement and the requirements must be upheld and enforced.

Alex Campbell

From: Judy Carrier <gotrocks886@gmail.com>
Sent: Thursday, December 31, 2020 4:45 PM
To: Alex Campbell
Subject: Comments Ten Trails Phase 1B MountainView Plat

Hi, Mr. Campbell,

Please notify me at my email address on this message that you received it prior to 5 PM, December 31, and send all updates, notices, or decisions about OakPointe's Ten Trails Phase 1B MountainView Plat (Plat A, as posted at <http://ci.blackdiamond.wa.us/Docs/Notices/2020/PLN20-0107%20Notice%20of%20Application.pdf>). Additionally, please send me all future city land use project public notices.

I adopt and incorporate by reference the comments on the proposed preliminary plat PLN20-0107 sent in by Save Black Diamond.

Thank you, Stay Safe, and Happy New Year,
Judith Carrier

Alex Campbell

From: Claussen, Kimberly <Kimberly.Claussen@kingcounty.gov>
Sent: Friday, June 9, 2023 9:02 AM
To: Alex Campbell
Subject: PLN20-0107/PLN20-0108 - Ten Trails MPD Phase 1 Plat B (Mountain View) Preliminary Plat

Follow Up Flag: Flag for follow up
Flag Status: Flagged

Hi – Thank you for the opportunity to comment on the proposed Mountain View Preliminary Plat.

Description of proposal: Preliminary Plat approval to subdivide two parcels comprising 54.65 acres into 261 lots, which would provide a mix of 233 single-family lots, 25 multi-family lots, and 3 commercial lots. The plat will be constructed in phases. The 233 single-family residential lots will range in size from 1,040 SF to 6,930 SF, with an average lot size of 2,829 SF, providing for a variety of attached and detached units. The three commercial lots will comprise approximately 220,000 SF, with 180,000 SF of retail space and 40,000 SF of office space. A portion of the office space proposes a location for a new city campus. Approximately 3.61 acres of open space will be provided in tracts within the proposed subdivision, which will consist of a neighborhood park, open space trails, and landscape uses. There are no

This proposal adjoins the south boundary of a King County Green to Cedar River trail site (parcel 102106-9099). Please continue to coordinate with King County Parks regarding construction along the shared property line, especially removal of trees, impacts to tree dripline(s). In addition, access, if any, to the KC Parks site will require King County review, permit(s) and permissions.

Please let me know if you have any questions. Thanks.



Kim Claussen (she/her)
PPM IV, Capital Planning
King County Department of Natural Resources and Parks
E: kimberly.claussen@kingcounty.gov
T: 206-477-0329



King County

Department of Natural Resources and Parks
Wastewater Treatment Division

King Street Center, KSC-NR-5505
201 South Jackson Street
Seattle, WA 98104-3855

June 16, 2023

sent via email: mdavis@blackdiamondwa.gov
KC OAP Ref No.: 1998

Mona Davis
City of Black Diamond
24301 Roberts Drive
Black Diamond, WA 98010

Dear Mona Davis:

The King County Wastewater Treatment Division (WTD) has received the Mitigated Determination of Nonsignificance (MDNS) for the Ten Trails MPD Phase 1 Plat B (Mountain View) PLN20-0107 Preliminary Plat / PLN20-0108 SEPA Checklist, that proposes approval to subdivide two parcels comprising 54.65 acres into 261 lots, which would provide a mix of 233 single-family lots, 25 multi-family lots, and 3 commercial lots, constructed in phases.

A King County operated facility, the 16-inch Black Diamond Trunk is located in the shoulder of Lake Sawyer RD SE along the east property line. (See enclosed record drawing).

In order to protect this wastewater facility during construction, **WTD requires that City of Black Diamond submit construction drawings for the project**, so that WTD can assess its potential impacts. Please send drawings to:

Local Public Agency Program
King County WTD, Engineering and Technical Resources
201 South Jackson Street, KSC-NR-0503
Seattle, WA 98104-3855
(206) 477-5414 / lpa.team@kingcounty.gov

King County has a permanent easement on the proposed development site. Please contact King County regarding this easement, at:

Bill Wilbert
Permitting Compliance and Property Acquisition
King County Wastewater Treatment Division
201 South Jackson Street, KSC-NR-0512
Seattle, WA 98104-3855
(206) 477-5523 / bill.wilbert@kingcounty.gov

June 16, 2023

Page 2 of 2

Thank you for the opportunity to review and comment on this proposal.

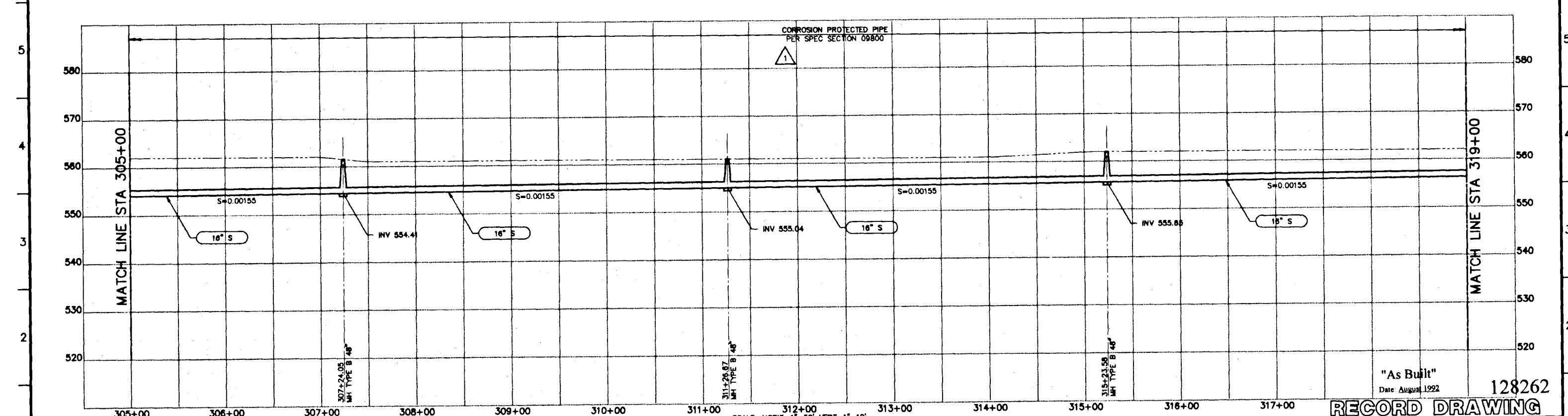
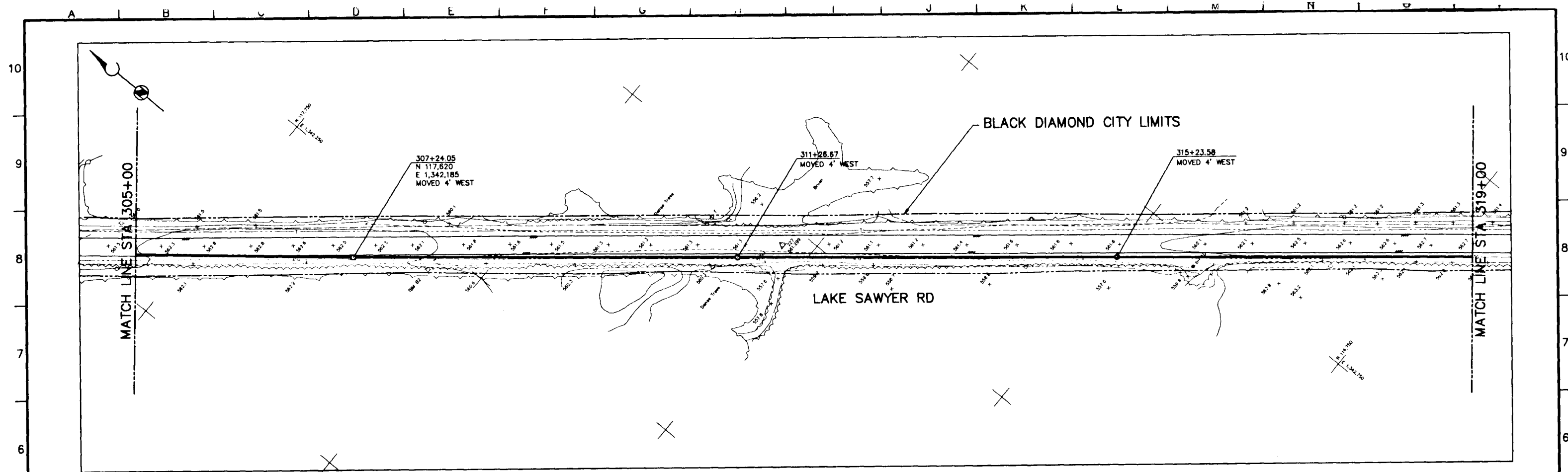
Sincerely,

Rachael Hartman

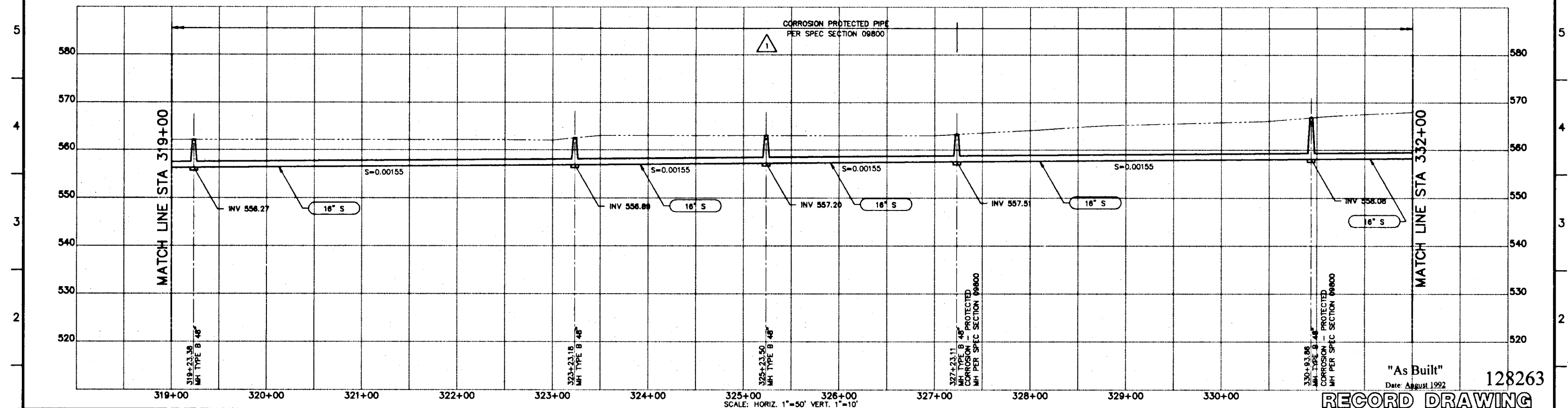
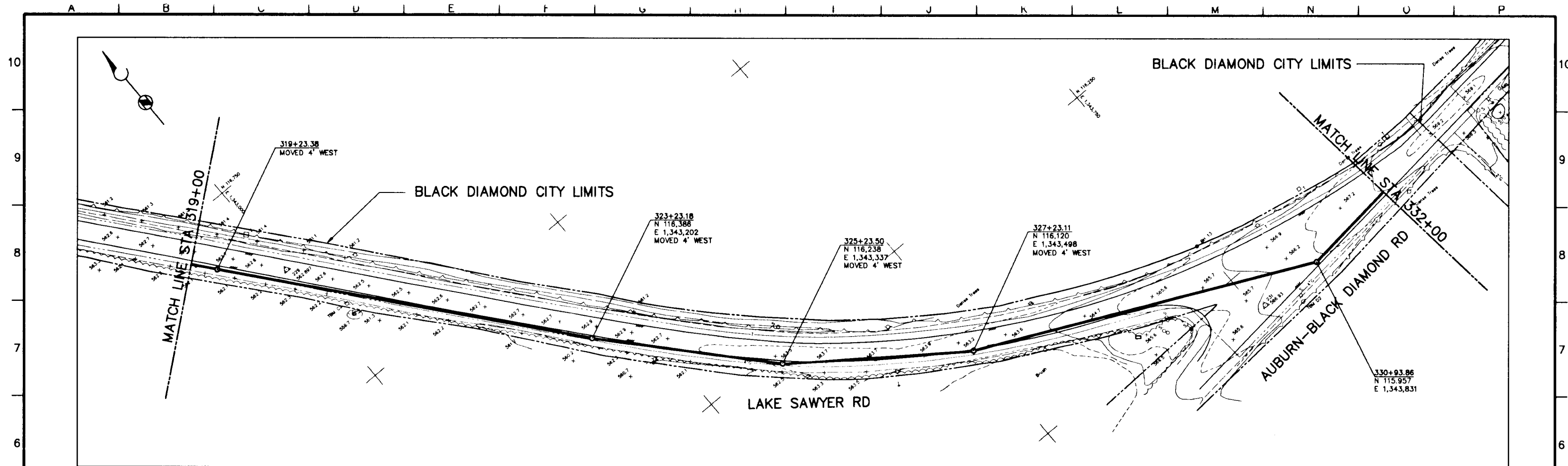
Rachael Hartman, Environmental Planner

cc: Mark Lampard, Local Public Agency Coordinator
Ann Fowler, Project Manager
Claire Christian, Permitting Compliance and Property Acquisition
Sharman Herrin, Government Relations
Nicole Smith, Comprehensive Planning

Enclosure



BC Brown and Caldwell Consultants Seattle, Washington	LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" SCALE ACCORDINGLY)	"King County Department of Natural Resources and Parks Does Not Warrant or Guarantee the Accuracy or Completeness of the Data Shown Herein"	RECORD DRAWING REVISION		8/92
	FILE 50320035.DWG DRAWN CADD TEAM DESIGNED L.K. MILLER CHECKED M.V. O'NEAL CHECKED T. KELLEY		1 ADDENDUM		MO 5/91
SUBMITTED: PROJECT MANAGER DATE: APPROVED: BROWN AND CALDWELL DATE: APPROVED: DATE:		REVISIONS		CONTRACT DRAWING ADDENDA HAVE BEEN INCORPORATED IN ACCORDANCE WITH SPECIFI- CATION SECTION 00710-3.05	
CITY OF BLACK DIAMOND WASTEWATER PUMPING AND CONVEYANCE FACILITIES		PLAN AND PROFILE GRAVITY SEWER 305+00 TO STA 319+00		DRAWING NUMBER G35 SHEET NUMBER 31	



BC Brown and Caldwell
Consultants
Seattle, Washington

SUBMITTED: _____ DATE: _____
APPROVED: _____ DATE: _____
APPROVED: _____ DATE: _____

LINE IS 2 INCHES
AT FULL SIZE
(IF NOT 2" SCALE ACCORDINGLY)

FILE 50326036.DWG

DRAWN CADD TEAM
DESIGNED L.K. MILLER
CHECKED M.V. O'NEAL
CHECKED T. KELLEY

"King County Department of
Natural Resources and Parks
Does Not Warrant or Guarantee
the Accuracy or Completeness of
the Data Shown Herein"

ZONE	REV.	DESCRIPTION	BY	DATE	APP.
	1	ADDENDUM	MO	5/91	
REVISIONS					

CONTRACT DRAWING ADDENDA
HAVE BEEN INCORPORATED IN
ACCORDANCE WITH SPECIFI-
CATION SECTION 00710-3.05

CONTRACTOR _____
OWNER _____
ENGINEER _____

CITY OF BLACK DIAMOND

**WASTEWATER PUMPING
AND
CONVEYANCE FACILITIES**

PLAN AND PROFILE
GRAVITY SEWER
STA 319+00 TO STA 332+00

DRAWING NUMBER
G36

SHEET NUMBER
32

Alex Campbell

From: Friends BlackDiamond <friendsofblackdiamond@comcast.net>
Sent: Thursday, June 22, 2023 2:49 PM
To: Mona Davis; Alex Campbell
Cc: kristenbry@gmail.com; Gary Davis; ladygreyreiver@comcast.net; r.mixdog4@comcast.net; Angela Rossman Fettig; sherriejns1@msn.com; argangl52@gmail.com; garlicman1951@gmail.com
Subject: Comments Ten Trails 1B PLN20-0107 Preliminary Plat , PLN20-0108 SEPA DNS
Attachments: Plat1B SEPAComments 2023-06-22Friends of Black Diamond.pdf

To Community Development Director / SEPA Official Mona Davis and MDRT Sr. Planner Alex Campbell,

Attached please find SEPA and Preliminary Plat 1B comments for the subject Ten Trails 1B Preliminary Plat.

Please keep us informed of any decisions, hearings, appeal rights, and make us parties of record.

Thank you,

Friends of Black Diamond

and

Kristen Bryant - kristenbry@gmail.com

William Bryant - 25100 Roberts Dr, Black Diamond

Gary Davis - g.davis001@q.com

Lisa Winters - ladygreyreiver@comcast.net

Renee Mix - r.mixdog4@comcast.net

Angela Fettig - angimal80@hotmail.com

Gary Jones - garlicman1951@gmail.com

Sherrie Jones - sherriejns1@msn.com

Alan Gangl - argangl52@gmail.com

Friends of Black Diamond

June 22, 2023

To City of Black Diamond Community Development Department, 24301 Roberts Drive, Black Diamond, WA 98010, and MDRT (Master Development Review Team).

Director Mona Davis, mdavis@blackdiamondwa.gov

Comments on SEPA Determination and on Ten Trails Preliminary Plat 1B. Notices released June 7, 2023

PLN20-0107 Preliminary Plat / PLN20-0108 SEPA Checklist, Project Name: Ten Trails MPD Phase 1 Plat B (Mountain View) Preliminary Plat

Comments

These comments are submitted both for the SEPA DNS and the Preliminary Plat Public Hearing/ Comment opportunities.

The violations of Ordinance 11-970, the Ten Trails Development Agreement, listed below are SEPA issues because many Ord. 970 requirements were put in place in part to satisfy the need to mitigate for adverse environmental impacts under SEPA.

During the 2009 Environmental Impact Statement process and 2010 - 2011 MPD and Development Agreement hearings for the Ten Trails development, many people in tiny Black Diamond worked to identify adverse impacts in their testimony during the city planning process. The master development plan was improved based on this input, then Council approved the Ten Trails development by ordinance.

Now that violations of Ordinance 970 are occurring, a Determination of Significance under SEPA is required for this new Preliminary Plat. The DNS and adoption of the previous EIS is no longer appropriate because requirements (in Ord. 970) created in part to satisfy adverse impacts identified by that EIS are not being fulfilled.

(1) Late satellite fire station: no construction contract by 750th unit. Not under construction 1.5 years later at over 1,000 occupied units.

We set a "Level of Service" for the fire department, and Black Diamond knows we need to build another fire station as population grows. This is part of Growth Management.

Of course, this was known in 2010. The Ten Trails Development Agreement requires that the developer build two fire stations. The first is overdue. City Ordinance 970 section 13.1.4.iii subsection "b" says: "...the construction contract shall be awarded no later than the time of issuance of a Certificate of Occupancy for the 750th Dwelling Unit."

Below is a copy of that section from the Development Agreement, as well as a city report showing there were 775 Ten Trails units occupied by the end of 2021. The construction contract is now a year and a half late. Since then, the developer has been allowed to add more and more units bringing us to at least 1000 to occupied by the end of last year. And none of us have adequate fire protection.

The longer it takes to get that fire station in place while we continue to allow our population to increase means that inevitably some sick person will be forced to wait too long, and their health will be harmed.

The handouts also show a public records request for any contract for the fire station. The city response confirms was no construction contract. What's also disturbing is, at two separate council meetings (June 16 and August 11, 2022) the Director incorrectly stated there is a fire station contract to meet this requirement.

The requirement is not really met if a construction contract just sits on the shelf. Until the developer comes into compliance, the city should not accept any further subdivision applications. How can more development governed by the Development Agreement be valid / permitted while the DA is being violated?

The Preliminary Plat should be denied and the SEPA DNS revoked. A SEPA DS should be issued.

(1) Late satellite fire station: no construction contract by 750th unit. Not under construction 1.5 years later at over 1,000 occupied units.

Ord. 970, Development Agreement, Fire Mitigation Section 13.4.D.iii.(b), pg. 123:

**The Villages Master Planned Development
Development Agreement**

Developer, then the Master Developer shall provide and/or acquire a site for the satellite fire station as credit against existing or future fire mitigation or impact fees.

- iii. Construction. The Master Developer shall construct or cause to construct, the satellite fire station designed pursuant to subsection D(i) above on the site selected pursuant to subsection D(ii) above as credit against existing or future fire mitigation or impact fees. Master Developer shall cause the letting of a contract for construction of such fire station as follows:
 - a. If the construction of the satellite fire station is financed pursuant to a Community Facilities District (CFD) established under RCW Ch. 36.145, the construction contract shall be awarded no later than the time of issuance of a Certificate of Occupancy for the 500th Dwelling Unit; or
 - b. If the construction of the satellite fire station is not financed pursuant to a Community Facilities District established under RCW Ch. 36.145, the construction contract shall be awarded no later than the time of issuance of a Certificate of Occupancy for the 750th Dwelling Unit.
- iv. Equipment. The Master Developer shall provide the fire and/or emergency response apparatus reasonably necessary for operation of the satellite fire station described in this subsection D prior to such station commencing operation as credit against existing or future fire mitigation or impact fees subject to the following conditions:
 - a. Pursuant to the Fire Impact Fee Study, apparatus shall not exceed the following: an engine (\$726,856), aid car (\$251,420), staff vehicle (\$55,000), and brush truck (\$90,000).
- v. Funding. The design, site selection, construction, and equipment described in this subsection, shall be funded as follows:

(1) Late satellite fire station: no construction contract by 750th unit. Not under construction 1.5 years later at over 1,000 occupied units.

City of Black Diamond Report showing 775 occupied dwelling units by **2021**:

Copy of New Home Sales at Ten Trails.xlsx [Protected View]						
	A	B	C	D	E	F
1	City of Black Diamond					
2	Master Planned Development					
3	Ten Trails Homes Sales/Closings (Based on new City water accounts)					
4	As of December 31, 2021					
5						
6	MONTH	2019	2020	2021	2022	
7	January	7	16	13	22	
8	February	8	27	13		
9	March	13	24	27		
10	April	9	12	21		
11	May	12	19	20		
12	June	9	21	29		
13	July	18	24	9		
14	August	12	23	16		
15	September	7	19	19		
16	October	13	23	19		
17	November	19	25	23		
18	December	16	16	18		
19	TOTAL	143	249	227	22	641
20	*11 Homes were sold in 2018*				*	11
21	** 76 apartment units became occupied in 2021**				**	123
22	** 47 Rental homes by AMH Drv LLC V24 are occupied**				TOTAL	775
23						
24	2018 2nd half	11	11			
25	2019 1st half	58	69			
26	2019 2nd half	85	154			
27	2020 1st half	119	273			
28	2020 2nd half	130	403			
29	2021 1st half	123	526			
30	2021 2nd half	104	630			
31	2022 1st half	22	652			
32	2022 2nd half	0	652			
33	Running Total		652			

(1) Late satellite fire station: no construction contract by 750th unit. Not under construction 1.5 years later at over 1,000 occupied units.

Public Records Request for fire station construction contract:

PRR Bowie 22-070_Construction Contract (fire dept)

Carina Thornquist

To: gbowie2014@gmail.com

CC: Brenda Martinez

Sent: 8/30/2022 4:45 PM

Dear Mr. Bowie,

Thank you for your records request which we received on 8/25 regarding Construction Contract (fire dept).

I double checked to see if there were any additional contracts that Andy spoke of at the joint meeting. The result was only the one page document.

The requested documents have been assembled on a thumb drive (along with PRR 22-068) and are waiting at the front desk for you. The cost for a thumb drive is \$2.96. I would suggest paying by either cash or check as they charge \$3.00 to process a credit card.

The City will now consider this request closed.

Please don't hesitate to reach out to me should you need any further assistance.

Regards,

Carina A. Thornquist

Deputy City Clerk

City of Black Diamond

(1) Late satellite fire station: no construction contract by 750th unit. Not under construction 1.5 years later at over 1,000 occupied units.

Only document provided in response to above records request does not include construction, just "clearing, grading, striping, grubbing, and erosion control" :

PLN22-0018
Fire Station

FILE COPY

OAKPOINTE

April 5, 2022

City of Black Diamond
Andy Williamson, MDRT Director
24301 Roberts Drive
Black Diamond, WA 98010

RE: Lawson Hills Fire Station Contractor

Dear Mr. Williamson,

This letter is to inform you that CCD Black Diamond Partners LLC has entered into a General Contractor Agreement with Goodfellow Bros. LLC to provide labor, equipment, and materials necessary for clearing, grading, striping, grubbing and erosion control on King County Parcel No. 1321069022, also known as the Lawson Hills Fire Station.


Goodfellow Bros. LLC will begin work upon written notification by Oakpointe to proceed.

If you have any questions or would like to discuss further, please let us know.

Owner:

CCD Black Diamond Partners LLC, a Delaware limited liability company

By: Oakpointe LLC, its Manager

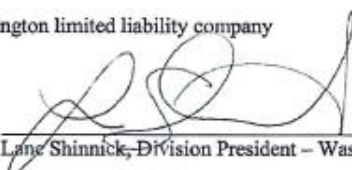
By: 
Brian Ross, Manager

Date: 4.11.22

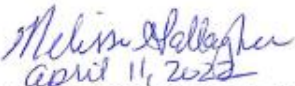
General Contractor:

Goodfellow Bros. LLC, a Washington limited liability company

By: Goodfellow Bros. LLC

By: 
Lane Shinnick, Division President - Washington

Date: 4-11-22


April 11, 2022

MELISSA GALLAGHER
Notary Public
State of Washington
Commission # 164459
My Comm. Expires Feb 26, 2025

3025 112th Ave NE SUITE 100
BELLEVUE, WA 98004
WWW.OAKPOINTE.COM

(2) City athletic fields not paid for or constructed by 800 units.

Cities in the state of Washington are required to have Parks and Recreation standards. So, in 2008, Black Diamond adopted a Parks Plan. One of the things this plan did was set the number of sports fields needed based on population size.

This was important because the city was then able to require a large developer seeking a 15-year development agreement to pay for sports fields. The fields are for the whole city, not just Ten Trails.

Public input during the environmental review and development agreement hearing process was also extremely important. The developer proposed paying a set fee per house, but the public said a set fee would be insufficient. Therefore, Section 9.5.3.B of the Development Agreement requires the developer either build the fields, or that public bid be advertised to construct the fields when Ten Trails reaches 800 units. The developer must pay the actual cost. This was good for government finances and taxpayers. But what good is it if it's not followed?

Ordinance 970 , the Development Agreement, sets the first sports field requirements. Table 9.5.5 requires a soccer field, a baseball field, and a tennis court by the 800th dwelling unit. In the past couple of months at public comment to the City Council, it was pointed out twice that the development now has over 1,000 units, but the city has not gotten the sports fields or the payment.

Then, City Council heard two Ten Trails Development updates over the last month: one from the City staff and one from the developer, OakPointe. *Those presentations didn't mention the sports fields requirement nor the status of any of the requirements in this report.* We haven't been given an update on when the city will collect the money or an update on any public bid, payment, or construction plans.

Some people have wondered if the fields were supposed to be built as part of the proposed elementary school. *No.* See Development Agreement section 9.5.2. There has been no agreement to provide these fields on the school site. Even if such an agreement were made it cannot change the timing threshold of 800 units.

While the developer is in violation of the Development Agreement Ordinance, the city should stop accepting new subdivision applications.

(2) City-wide Athletic Fields Not Funded or Constructed by 800 units as Required.

The following pages of the handout contain the parts of Ordinance 970, Development Agreement section 9.5 referenced above with the sports fields requirements.

Ord. 970, Development Agreement, Section 9.5, pg. 79:

9.5.2 Unless otherwise noted on Table 9-5, Recreational Facilities constructed by the Master Developer, may be located: (1) within The Villages MPD in Community Parks, community center or Neighborhood Parks; (2) on joint use school sites if agreed to by the City and School District as provided in the School Agreement; (3) within off-site Regional Parks subject to City agreement; or (4) on a mutually acceptable off-site location. The Recreational Facilities may be provided in combination with one another and other informal space or each facility may be provided as a standalone amenity. Pursuant to Condition of Approval No. 88 of the MPD Permit Approval, if a joint use facility is proposed on a school site or on an alternative site consistent with the School Agreement, the Master Developer shall provide for one or more youth/adult softball fields, soccer fields, tennis courts or basketball courts in such joint use facility.

9.5.3 The Master Developer shall have the option to request that the Designated Official accept a lump sum payment in lieu of constructing any of the individual Recreational Facilities in Table 9-5. The request shall be made prior to triggering the need for the next Recreation Facility. Pursuant to Condition of Approval No. 93 of the MPD Permit Approval, the Designated Official retains sole discretion to determine when and if a lump sum payment will be accepted in lieu of the Master Developer constructing a Recreational Facility. The Designated Official's determination shall be based on the following three criteria: (i) availability of land; (ii) adequacy of funds to construct City-approved recreational facilities; and (iii) City's ability to maintain recreational facilities. Pursuant to Condition of Approval No. 91 of the MPD Permit Approval, the amount of the payment that may be provided in lieu of construction shall be set through the following process:

- A. Commencing upon the Designated Official's agreement to accept a lump sum amount for a specific Recreational Facility, the City shall publish a bid request for design and construction of the Recreational Facility. The bid request shall be based on reasonable standards agreed to by the Master Developer and City. The City reserves the right to include additional elements in the bid beyond what the Master Developer is required to construct for the facility. Such additional elements shall not be the responsibility for the Master Developer to fund. For instance, additional elements may include lighting, concession areas, or other elements as determined by the Designated Official.

(2) City-wide Athletic Fields Not Funded or Constructed by 800 units as Required.

Ord. 970, Development Agreement, Section 9.5, Pg. 80:

**The Villages Master Planned Development
Development Agreement**

- B. Upon acceptance of a bid, the Designated Official and Master Developer shall agree to set the lump sum amount in accordance with the accepted bid. Upon execution of a contract accepting the bid for design and construction, the Master Developer shall deposit with the City the agreed to lump sum amount.

(2) City-wide Athletic Fields Not Funded or Constructed by 800 units as Required.

Ord. 970, Development Agreement, Section 9.5, pgs. 81-82:

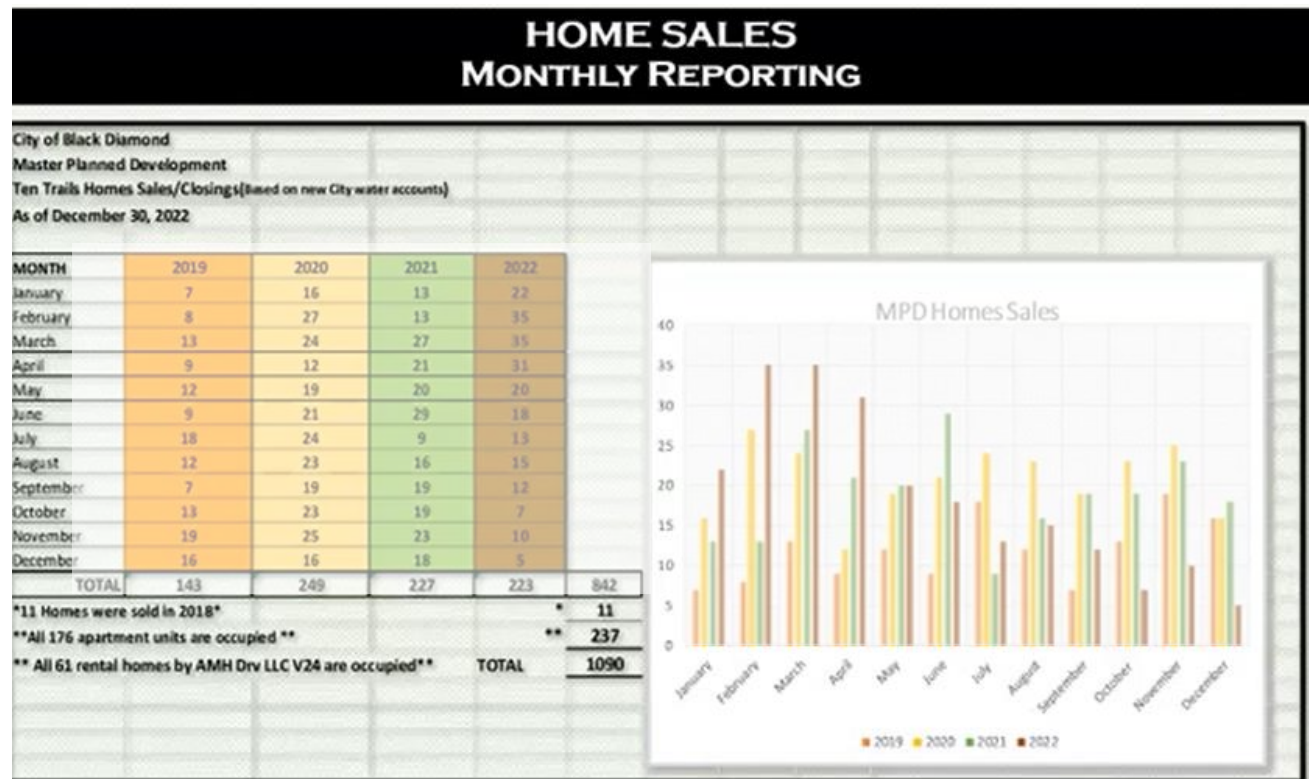
The Villages Master Planned Development Development Agreement				
9.5.5 Recreation Facilities				
TABLE 9-5				
Facility Type	Level of Service	Required Facilities	Timing of Facilities	Fee-in-Lieu
Basketball Court	1:2000	6	Master Developer shall provide a minimum of one (1) Basketball Court facility per every 800 Dwelling Units constructed. One such facility must be Constructed (or, if applicable, a fee-in-lieu paid) prior to the 800 th , 1600 th , 2400 th , 3000 th , 3600 th , and 4800 th Unit receiving a Certificate of Occupancy.	The Master Developer may elect to request that the City accept a fee-in lieu of constructing the required Basketball Courts. The fee shall be set per Section 9.5.3.
Soccer Field	1:2000	6	Master Developer shall provide a minimum of one (1) soccer field per every 800 Dwelling Units constructed. One soccer field must be Constructed (or, if applicable, a fee-in-lieu paid) prior to the 800 th , 1600 th , 2400 th , 3000 th , 3600 th , and 4800 th Unit receiving a Certificate of Occupancy. Up to three (3) of the required soccer fields shall be designed as Micro Soccer Fields.	The Master Developer may elect to request that the City accept a fee-in lieu of constructing the required soccer fields. The fee shall be set per Section 9.5.3.

(2) City-wide Athletic Fields Not Funded or Constructed by 800 units as Required.

The Villages Master Planned Development Development Agreement				
Facility Type	Level of Service	Required Facilities	Timing of Facilities	Fee-in-Lieu
Tennis Court	1:2000	6	Master Developer shall provide a minimum of one (1) tennis court per every 800 Dwelling Units constructed. One tennis court must be Constructed (or, if applicable, a fee-in-lieu paid) prior to the 800 th , 1600 th , 2400 th , 3000 th , 3600 th , and 4800 th Unit receiving a Certificate of Occupancy.	The Master Developer may elect to request that the City accept a fee-in lieu of construction for up to 3 of the tennis courts. The fee shall be set per Section 9.5.3.
Youth Baseball/Adult Softball field	1:2000	6	Master Developer shall provide a minimum of one (1) Youth Baseball / Adult Softball field per every 800 Dwelling Units constructed. One such field must be Constructed (or, if applicable, a fee-in-lieu paid) prior to the 800 th , 1600 th , 2400 th , 3000 th , 3600 th , and 4800 th Unit receiving a Certificate of Occupancy.	The Master Developer may elect to request that the City accept a fee in lieu of constructing the necessary facility. The fee shall be set per Section 9.5.3.

(2) City-wide Athletic Fields Not Funded or Constructed by 800 units as Required.

City staff presentation March 2, 2023, showing over 1,090 occupied units by end of 2022:



(3) Failure to meet fiscal requirement that development revenue provide sufficient funding for Fire and Police staff to serve growth.

Ordinance 970, the Ten Trails Development Agreement, requires that the increase in fire and police operational costs due to new growth be covered by new tax revenue brought in from the development. If the new tax revenue is insufficient, the Ordinance has fail-safe provisions that require developer OakPointe to make up the difference.

Specifically, Section 13.6.1 requires that a "fiscal analysis" be completed every five years to determine if new tax revenue is sufficient to maintain levels of service for police and fire. Section 13.6.6 then requires that every year, an "annual review" compare the projections of that fiscal analysis to the budget.

However, if you listen to the recent City meetings on the budget and on fire and police operational costs, you would never know that these requirements exist.

Council had a meeting on April 27, 2023, where the same consultant who reviewed the developers' most recent Fiscal Analysis presented a separate city budget forecast out to the year 2030. The Consultant recommended increasing taxes to pay for fire and police staff increases.

What happened? Why didn't staff or the fiscal consultant describe Ordinance 970 Section 13.6.1's requirement that new development pay for increased costs for fire and police?

Now, within only a few months of a slowdown in home sales, the city council is paying a consultant to recommend raising taxes. There is no evidence or analysis to show that police and fire operational increases are anything other than what is needed due to population increase. Therefore, they are required to be paid for by the developer or taxes from new development, per Ordinance 970.

We have a problem providing public safety for the people that are already here, so why are we adding to the problem by approving more development?

The City should not accept or approve more applications for subdivisions governed by the Development Agreement while the Development Agreement is being violated.

(3) Failure to meet fiscal requirement that development revenue provide sufficient funding for Fire and Police staff to serve growth.

Legal Requirements and Level of Services related to Police and Fire Operations:

Black Diamond Municipal Code (BDMC) 18.98.080(A)(5):

"The project, at all phases and at build-out, will not result in the lowering of established staffing levels of service including those related to public safety."

Ord 946, Approval of Master Planned Development, Ex B Conclusions of Law, pg. 23:

"A condition of approval {No. 100} has been added to Exhibit C to require that the Development Agreement include specific provisions for mitigating fire service impacts to ensure protection concurrent with project build out. The conditions of approval regarding fiscal impacts also include a condition (No. 156) that requires that the fiscal analysis ensure that revenues from the project are sufficient to pay the project's pro rata share to maintain staffing levels of service."

Ord. 970, Development Agreement Section 13.6(1)(i), pg. 129:

"... Each updated fiscal analysis shall confirm that revenue from The Villages MPD is sufficient to maintain levels of service for police and fire services as such levels of service are adopted in the Comprehensive Plan (Exhibit 'E')."

Vested City of Black Diamond Comprehensive Plan June 2009, pg. 8-9:

8.4.3. Level of Service

The current LOS for police is 3.5 officers per 1,000 residents. As the City grows, the LOS standard can be reduced to 2.75 officers per 1,000 residents through efficiency gains in the provision of police services. The LOS for police is proposed to decrease with each 1,500 to 2,000 increment of population growth, as shown in Table 8-1. .

Table 8-1. Police Level of Service

Population Level	4,000-5,000	5,000-7,500	7,500-10,000	10,000-13,000	13,000-16,000	16,000-20,000
Police Officers	8	8.2	12.5	14.7	21	29
Sergeants	2.6	2.3	3.25	3.7	4.6	6.25
Administration	1.5	1.6	1.6	2	2.6	4.75
Total Staff	12.1	12.1	17.35	20.4	28.2	40

Vested City of Black Diamond Comprehensive Plan June 2009, pg. 8-24:

8.7.3. Level of Service

The City has an LOS standard of 1.4 on-duty career firefighters per 1,000 population.

(3) Failure to meet fiscal requirement that development revenue provide sufficient funding for Fire and Police staff to serve growth.

Ord. 970, Development Agreement Section 13.6.5(a) and .6, pg. 133:

"13.6.5(a)

.... Possible options for addressing the shortfall may include, but are not limited to:

... ii. Pursuant to Condition of Approval No. 156, interim funding of necessary service and maintenance costs (staff and equipment) between the time of individual project entitlements and off-setting tax revenues. However, if a deficit is projected as part of the fiscal analysis for Phase 3, then a payment shall not be accepted by the City.

6. Annual review of Fiscal Results

a. As part of the Annual Review pursuant to the terms of the Funding Agreement, the Designated Official and Master Developer shall meet to review the projections of the Fiscal Analysis compared to the City's budget.

i. If interim funding is provided pursuant to subsection 5.a.ii above, then the Annual Review shall include development of a payment schedule. The payment schedule shall be determined by comparing the projected revenues and expenses shown in the fiscal analysis to the City's projected budget for the upcoming calendar year."

Ord. 946 The Villages MPD, Ex. C - Conditions of Approval, Condition 156.b, pg. 27 of 29:

"156. ... The applicant shall be responsible for addressing any projected city fiscal shortfall that is identified in the fiscal projections required by this condition. This shall include provisions for interim funding of necessary service and maintenance costs (staff and equipment) between the time of individual project entitlements and off-setting tax revenues; provided, however, that in the event that the fiscal projection prepared prior to the commencement of Phase III indicates a likelihood of significant ongoing deficits in the city's general fund associated with operations or maintenance for properties within the MPD, the applicant must address the projected shortfalls by means other than interim funding."

(3) Failure to meet fiscal requirement that development revenue provide sufficient funding for Fire and Police staff to serve growth.

For informational purposes because the Fiscal Analysis is related to the Phasing plan, *Ord 970, Development Agreement, Exhibit K Phasing Plan*, pg. 9-1 thru 9-8:

"The phasing plan includes 4 phases: 1A, 1B, 2, and 3....

Phase 1A includes approximately 130 acres containing approximately 850 dwelling units
...

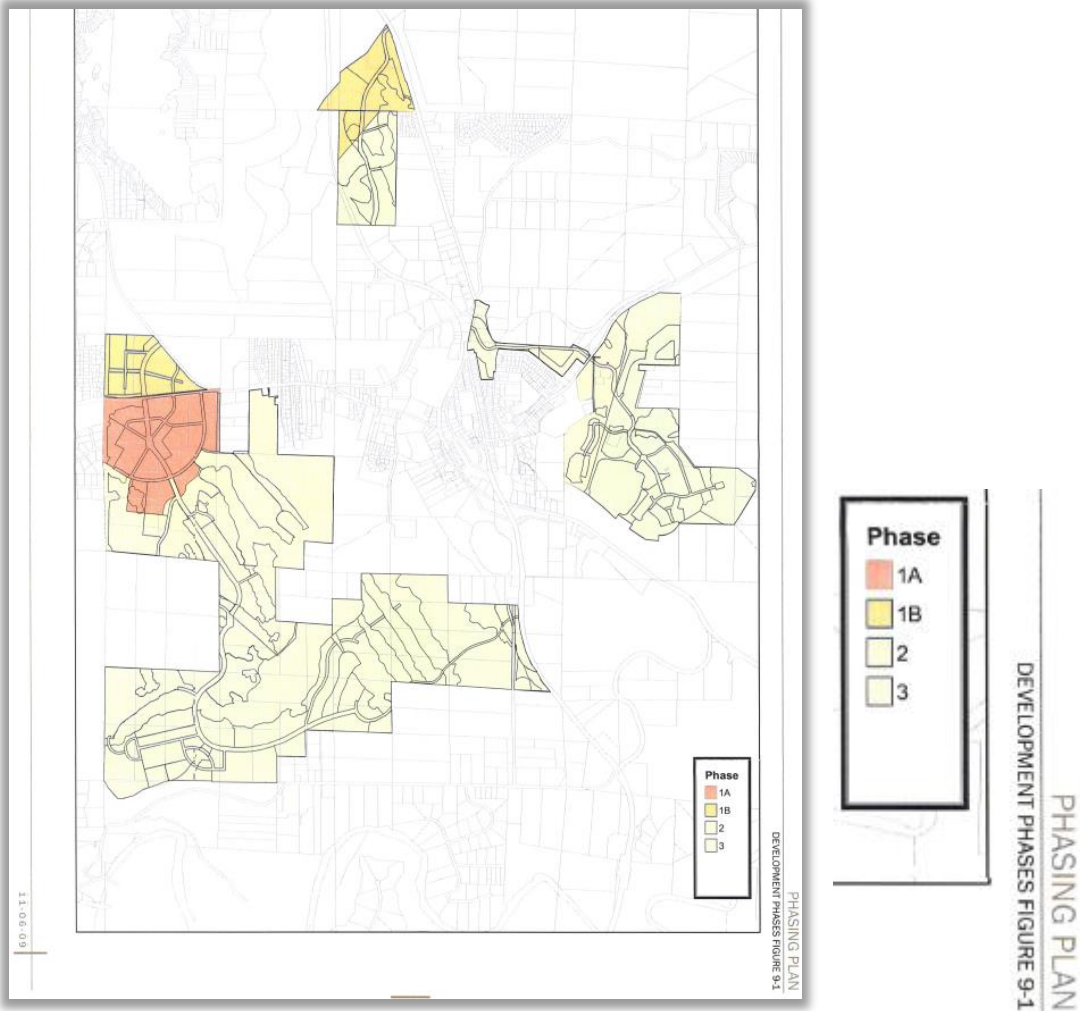
Phase 1B includes approximately 120 acres, 66 within the villages and 54 within Lawson hills and approximately 200 dwelling units...

Phase 2 consists of approximately 394 acres, 73 acres in the Lawson hills MPD and 321 acres in the villages MPD, with approximately 1500 total dwelling units. ...

Phase 3 consists of approximately 926 acres, 247 acres in the Lawson Hills MPD and 679 acres in the villages MPD, approximately 3500 total dwelling units."

(3) Failure to meet fiscal requirement that development revenue provide sufficient funding for Fire and Police staff to serve growth.

Ord 970, Development Agreement, Exhibit K Phasing Plan Figure 9-1:



(4) Failure to complete Master Planned Development (MPD) Fiscal Analysis every 5 years and ensure the MPD does not have adverse financial impact.

The Black Diamond Municipal Code and OakPointe Development Agreements require that the Master Planned Development (MPD or Ten Trails) not have an adverse financial impact on the city. To ensure this, a "Fiscal Analysis" must be updated for the MPD every five years and at the beginning of every phase. (BDMC 18.98.080.A.3 and Ord. 946 condition 156.a).

The Fiscal Analysis is a forecast of revenue and costs associated with MPD growth. City revenue from new development includes things like the city's share of annual property tax, one-time taxes such as when real estate is sold, and ongoing taxes such as sales tax from spending by new residents at both existing and new Black Diamond businesses. (For further detail see: Ordinance 970 exhibit N - Funding Agreement, and the latest fiscal analysis, available by doing a public records request to your city.)

The first OakPointe MPD Fiscal Analysis was accepted by the City in May 2014, so the next was due in 2019. The City Council approved a contract in 2020 for a financial consultant to review a draft Fiscal Analysis, but the analysis and acceptance were not complete until 2021. That means for two years, the developer was allowed to continue building while in violation of this development agreement requirement.

Why does violation of the requirement to have a Fiscal Analysis every 5 years matter? Here is why: Letting the analysis be two years late means that now, instead of getting a new analysis in 2024 (5 years after 2019), the city won't get one until 2026.

Unfortunately, the analysis completed in 2021 was almost immediately outdated. It forecast sales tax for 2022 from the still-empty Ten Trails retail area.

If we subtract this revenue we are not getting, is there now an adverse financial impact on the city?

Development Agreement Section 13.6 and Ord 945 Condition 156 require the developer to address any shortfall, which may include, "interim funding of necessary service and maintenance costs (staff and equipment) between the time of individual project entitlements and off-setting tax revenues." If we don't enforce this condition, then how will we pay for the new services to serve our growing population?

(4) Failure to complete Master Planned Development (MPD) Fiscal Analysis every 5 years and ensure the MPD does not have adverse financial impact.

MPD Fiscal Analysis Requirements:

Black Diamond Municipal Code (BDMC) [18.98.080](#) - MPD permit—Conditions of Approval.

"A. An MPD permit shall not be approved unless it is found to meet the intent of the following criteria or that appropriate conditions are imposed so that the objectives of the criteria are met: ...

3. The proposed project will have no adverse financial impact upon the city at each phase of development, as well as at full build-out. The fiscal analysis shall also include the operation and maintenance costs to the city for operating, maintaining and replacing public facilities required to be constructed as a condition of MPD approval or any implementing approvals related thereto. This shall include conditioning any approval so that the fiscal analysis is updated to show continued compliance with this criteria, in accordance with the following schedule:

- a. If any phase has not been completed within five years, a new fiscal analysis must be completed with regards to that phase before an extension can be granted; and
- b. Prior to commencing a new phase."

Ord. 946 The Villages MPD, Ex. C - Conditions of Approval, Condition 156, pg. 27 of 29:

"156. The proposed project shall have no adverse financial impact upon the city, as determined after each phase of development and at full build-out. The required fiscal analysis shall include the costs to the city for operating, maintaining and replacing public facilities required to be constructed as a condition of MPD approval or any implementing approvals related thereto. The fiscal analysis shall ensure that revenues from the project are sufficient to maintain the project's proportionate share of adopted City staffing levels of service. The fiscal analysis shall be updated to show continued compliance with this criterion, in accordance with the following schedule:

- a. Within five years, a new fiscal analysis shall be completed to determine the long- term fiscal impact to the City. If necessary, additional project conditions may be required.
- b. Prior to commencing a new phase, including the first phase of construction. The exact terms and process for performing the fiscal analysis and evaluating fiscal impacts shall be outlined in the Development Agreement, and shall include a specific "MPD Funding Agreement," which shall replace the existing City of Black Diamond Staff and Facilities Funding Agreement. The applicant

(4) Failure to complete Master Planned Development (MPD) Fiscal Analysis every 5 years and ensure the MPD does not have adverse financial impact.

shall be responsible for addressing any projected city fiscal shortfall that is identified in the fiscal projections required by this condition. This shall include provisions for interim funding of necessary service and maintenance costs (staff and equipment) between the time of individual project entitlements and off-setting tax revenues; provided, however, that in the event that the fiscal projection prepared prior to the commencement of Phase III indicates a likelihood of significant ongoing deficits in the city's general fund associated with operations or maintenance for properties within the MPD, the applicant must address the projected shortfalls by means other than interim funding."

(5) Fixes for failing SR 169 intersections at Ravensdale Rd. and Roberts Dr. not yet permitted, but City allowing further Ten Trails occupancy in violation of Development Agreement section 11.4.

According to our city's Comprehensive Plan, our state Growth Management Act, and our State Environmental Policy Act, traffic is far from the only consideration when approving and planning for development.

Transportation congestion is a problem that affects our daily lives, so it gets a lot of attention. City Ordinance 970, the Ten Trails Development Agreement, contains strong language to protect the public from unsafe and unreasonable delays at intersections.

Ord. 970 Section 11.4 (below) and its "Traffic Monitoring Plan," required a "Regional Infrastructure Improvements" schedule be created prior to the first phase of Ten Trails development. This schedule set the trigger of at 327 Ten Trails units for construction of Highway 169 fixes for Ravensdale Road and Roberts Drive.

The schedule also was created with awareness of the need to get permit materials early to the State Department of Transportation, or WashDOT. It said that complete "engineering, design and construction drawings, and related application materials necessary for permit issuance" must be submitted to WashDOT prior to the city's issuance of the first residential building permit in Ten Trails. The developer's compliance was questionable: they first submitted a traffic signal design, not the preferred roundabout, and the application was incomplete.

The schedule also requires:

"The Master Developer shall diligently pursue issuance of all permits for this interim improvement, by taking such actions including but not limited to promptly responding to requests for additional information and promptly submitting permit application revisions requested by the permitting agencies."

But wait, there's more. Ordinance 970 section 11.4 requires that occupancy of new houses is not allowed until after the "regional facility" has been permitted. The regional facilities in this case are the failing intersections on State Route 169. (Those are listed in the Table 11-5-1 as a master developer funding responsibility.)

The Traffic Monitoring Plan has additional fine print that allows occupancy beyond 327 units *only if* reasonably necessary due to events outside of the master developer's control. However, the master developer was slow to answer WSDOT's requests time and time again making the process take years longer than necessary. I have done regular records requests that prove OakPointe did not respond promptly to WSDOT and I can

(5) Highway 169 fixes delayed while Ravensdale Rd and Roberts Dr intersections failing

provide those records if you email me. Because these events were not outside the master developer's control, the 327-unit occupancy maximum should still apply.

When you drive through the city on highway 169, remember we're talking about delays at the side stop signs that can be up to 15 minutes, leading some drivers to make dangerous decisions. I have two kids and we have to use this intersection daily to get to and from work and school. Developer OakPointe now has over 1,000 occupied units ... If 327 units was the time construction was supposed to start, at what point might we finally decide this is unreasonable?

We've been told the fix for the intersections will take several years of construction. Road construction for the water line project currently on highway 169 causes this intersection to back up for 15 minutes most days... and we would consider allowing further occupancy of the master developer's project before and during this construction??

The City should not accept more applications for subdivisions governed by the Development Agreement while the Development Agreement is being violated.

Ord. 970, Development Agreement, Section 11.4, pgs. 99 - 106:

"11.4 PHASING AND CONSTRUCTION OF OFF-SITE REGIONAL INFRASTRUCTURE ...to serve The [OakPointe Ten Trails] Villages MPD during its initial Phases, construction is tied to thresholds as to transportation, documents that result of the Traffic Monitoring Plan (Exhibit "F"), shall be submitted to the Designated Official for approval.

Occupancy of an Implementing Project that exceeds the construction threshold is allowed after the necessary Regional Facility has been permitted. ...

B. Construction and Funding. ... the Master Developer shall design and Construct (or cause to be Constructed) the off- site Regional Facilities identified ... below. ...

Table 11-5-1. Transportation Intersection Improvements
Study

Intersection	Funding
Responsibility	
... SR 169/SE 288th Street	Master
Developer	
... SR 169/Roberts Drive	Master
Developer	
... SR 169/SE Black Diamond Ravensdale Road (Pipeline Road)	Master Developer

Table 11-5-2. Transportation Roadway Improvements

... Construct portion of North Connector from SR-169 south to boundary of Phase IB area
... Continue Construction of North Connector from end of Phase IB construction to Pipeline Road
... Construct Pipeline Road from SR-169 to Lake Sawyer Rd SE"

(5) Highway 169 fixes delayed while Ravensdale Rd and Roberts Dr intersections failing

August 25, 2012, Phase 1A Regional Infrastructure Improvements, page 6-7:

"SR 169/ Roberts Drive (Interim Improvement)

Completed engineering, design and construction drawings and related application materials necessary for permit issuance for this interim improvement will be submitted to WSDOT prior to the City of Black Diamond's issuance of the first residential or commercial building permit associated with Division 1A of Preliminary Plat 1 A. The Master Developer shall diligently pursue issuance of all permits for this interim improvement, by taking such actions including but not limited to promptly responding to requests for additional information and/or promptly submitting permit application revisions requested by the permitting agencies. Construction of this improvement will commence as soon as reasonably practicable following issuance of all necessary permits, but in any event prior to issuance of the building permit for the 327th Equivalent Residential Unit (ERU) within Preliminary Plat 1A plus any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside of the Master Developer's control.

Interim Improvement Details

This intersection will be improved by shifting Roberts Drive to the south to provide approximately 500 feet separation between it and SE Black Diamond - Ravensdale Road. The SR169 / Roberts Drive intersection will be reconfigured to form a tee intersection instead of the currently existing Y configuration to improve safety and operation. This intersection improvement will include installation of a signal to control the intersection. Intersection improvements will include construction of a right turn lane on southbound SR 169. Roberts Drive behind the stop bar location at SR 169 will be designed per City of Black Diamond standards. The ultimate design is a roundabout - this is only an interim improvement.

SR 169/SE Black Diamond - Ravensdale Road (Interim Improvement)

Completed engineering, design and construction drawings and related application materials necessary for permit issuance for this interim improvement will be submitted to WSDOT prior to the City of Black Diamond's issuance of the first residential or commercial building permit associated with Division 1A of Preliminary Plat 1 A. The Master Developer shall diligently pursue issuance of all permits for this interim improvement, by taking such actions including but not limited to promptly responding to requests for additional information and/or promptly submitting permit application revisions requested by the permitting agencies. Construction of this improvement will commence as soon as reasonably practicable following issuance of all necessary permits, but in any event prior to issuance of the building permit for the 327th Equivalent Residential Unit (ERU) within Preliminary Plat 1A plus any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside of the Master Developer's control.

Interim Improvement Details

(5) Highway 169 fixes delayed while Ravensdale Rd and Roberts Dr intersections failing

This intersection improvement includes **a four way signalized intersection** to maintain access to the Palmer Coking Coal property at this location. Black Diamond- Ravensdale Road SE behind the stop bar location at SR 169 will be designed per City of Black Diamond standards. The ultimate design is a roundabout - this is only an interim improvement."

(6) Failure to enforce Affordable Housing “balanced share” commitment in OakPointe Master Planned Developments (MPDs)

1. Our region has housing affordability needs. We empathize with the large number of people whose budget doesn’t stretch to afford decent housing.

Black Diamond is in the process of adding quadruple its previous 1,500 households with 6,000 dwelling units approved for developer OakPointe. Additional housing has been built or proposed in the city recently. Black Diamond is doing more than its share.

2. Affordable Housing requirement for the MPD is not being enforced.

OakPointe is required to provide a balanced share of affordable housing in Ten Trails. This means 20% of the units should be affordable for people making far less than the “area median income.” This was a condition of enlarging the city limits in the 1996 *Black Diamond Urban Growth Area Agreement (BDUGAA)* Section 6.4.1.

A balance of affordable housing is a requirement of city Ord. 946 Condition 138, Ord. 970 Recital B(e), Ord. 970 Section 11.8, and Section 13.6.4.h. These are not being met. As Phase 1B is a new phase, and Phase 1A and Phase 2 are well underway, there should be an affordable housing report and updated SEPA requirements.

What can we do to enforce the Ten Trails requirement to make sure that 20% of its units are affordable as defined by King County’s affordability metrics? We haven’t heard anything from the city staff about these requirements.

The city should not accept or approve any further subdivision applications while the Developer is in violation of the Development Agreement.

(6) Failure to enforce Affordable Housing "balanced share" commitment in OakPointe Master Planned Developments (MPDs)

1996 *Black Diamond Urban Growth Area Agreement (BDUGAA)*, page 1 below shows the contracting parties. Page 10 follows showing Section 6.4.1 on affordable housing.

BLACK DIAMOND URBAN GROWTH AREA AGREEMENT

THIS AGREEMENT is entered into by and between KING COUNTY, a Washington home rule charter county, the CITY OF BLACK DIAMOND, a Washington municipal corporation, PLUM CREEK TIMBER COMPANY, L.P. and PALMER COKING COAL COMPANY.

WHEREAS King County is a home rule charter county under the laws of the State of Washington with authority to enact laws and enter into agreements to promote the health, safety and general welfare of its citizens, including land use plans and development regulations, annexation agreements, and development agreements; and

WHEREAS the City of Black Diamond is a municipal corporation incorporated under the laws of the State of Washington with authority to enact laws and enter into agreements to promote the health, safety, and welfare of its citizens and thereby to control the use and development of property within its jurisdiction and to annex territory and specify zoning and development standards for annexed areas; and

WHEREAS Plum Creek Timber Company, L.P. and Palmer Coking Coal Company are owners of property within and in the vicinity of the Urban Growth Area for the City of Black Diamond; and

WHEREAS the King County Countywide Planning Policies ("CPPs") designated Joint Planning Areas for those cities, including Black Diamond, where agreement on the boundaries of each city's urban growth area had not been reached and required that they be designated by the end of 1995 or be subject to ratification; and

WHEREAS the CPPs designated a maximum 3000-acre Joint Planning Area (JPA) for the City of Black Diamond, within which a UGA could be designated by King County; and

WHEREAS in Ordinance 12065, adopted in December 1995, the King County Council designated a 1927-acre UGA for the City of Black Diamond, shown on the King County Comprehensive Plan Land Use Map as "New Rural City Urban Growth Area," which includes 1767 acres of the former JPA and 160 acres in the area known as Lake 12 Neighborhood; and

WHEREAS Ordinance 12065 also provided that by December 31, 1996 the following must occur or the New Rural City Urban Growth Area shall expire and automatically revert to a Rural designation: the King County Council must designate up to 915 acres of the lands within the New Rural City Urban Growth Area for future urban development and the remainder, excluding the Lake 12 Neighborhood, according to specified ratios, as Open Space or Natural Resource Use lands; and King County, the City of Black Diamond, and the affected property owners must address and resolve in a Potential Annexation Area and/or development agreement the issues delineated in Section 3 of the Ordinance; and

WHEREAS the CPPs establish policies for designating City potential annexation areas within the countywide urban growth boundary and require each City with a potential annexation area to enter into an interlocal agreement with the County for defining service delivery responsibilities; and

(6) Failure to enforce Affordable Housing “balanced share” commitment in OakPointe Master Planned Developments (MPDs)

1996 Black Diamond Urban Growth Area Agreement (BDUGAA) Section 6.4.1 on affordable housing.

5.7 Phasing Areas within West Annexation Area. The West Annexation Area may be annexed in three phases comprising the north area in Sections 2 and 3, the west area in Section 15, and the south area in Section 27 if approved by the City and County Councils; provided that for any such phasing the City and County Councils must determine the proportional provision of County, In-City and UGA Open Space required in Section 5.2(c) to fulfill the four to one requirements of open space to urban development; and provided further that infrastructure to the areas to be annexed must be provided consistent with Section 5.2(b).

6. URBAN DEVELOPMENT IN THE ANNEXED LANDS

6.1 Development Agreement. On or before annexation of the West and South Annexation Areas, the City shall enter into a development agreement with Plum Creek which shall establish land uses, zoning and development standards for the Urban Development Areas in the West and South Annexation Areas consistent with the standards and service levels set forth below.

6.2 Land Uses and Zoning. Upon annexation of the West and South Annexation Areas, the City shall adopt land use designations and zoning for the Urban Development Areas that will permit the land uses as shown on Appendix A, Map 7; provided that the City and Plum Creek may agree to such other mixes of urban land uses within the Urban Development Areas of the West and South Annexation Areas as may be necessary to respond to real estate market and finance conditions. Upon annexation of the East Annexation Area, the City shall adopt land use designations and zoning that will permit urban residential development in this area. Upon annexation of the Lake 12 Annexation Area, the City shall adopt land use designation and zoning that will permit urban residential development at one dwelling unit per acre in the Lake 12 Annexation Area.

6.3 Residential Density. Following annexation, the West, South and East Annexation Areas shall be developed at a minimum average residential density of four units per acre. Maximum densities shall be determined prior to annexation as part of a development agreement between the City and property owners. Innovative planning, zoning and design shall be used to provide a variety of housing types serving all market segments. The base residential densities shall be two dwelling units per acre. The additional zoned residential density shall be achieved through participation in the City's TDR Program.

In the event development rights cannot be purchased through the City's TDR Program from either a private party or the TDR bank, or it is demonstrated to the City that, despite commercially reasonable efforts, development rights cannot be purchased on terms and conditions that allow annexation or development approvals to proceed, In-City Open Space created through other mechanisms consistent with Section 7.3 of this Agreement may be used as a density credit in the subject receiving area.

6.4 Development Standards. Following annexation the West, East, South, and Lake 12 Annexation Areas shall be developed under the jurisdiction of the City and shall at a minimum comply with the following County standards:

6.4.1 Affordable Housing. The parties will work with other local governments and appropriate agencies to maintain Black Diamond's fair-share of affordable housing and in that regard will take into account the City's existing housing stock.

(6) Failure to enforce Affordable Housing "balanced share" commitment in OakPointe Master Planned Developments (MPDs)

King County Ordinance 12065. Pg. 1 for background:

December 15, 1995 g:\comp-pla\95Amend\bdordstk.doc	Introduced by: <u>Chris Vance</u>
December 19, 1995 clerk	Proposed No.: <u>95-791</u>
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44	<p>ORDINANCE NO. 12065</p> <p>AN ORDINANCE related to comprehensive planning, implementing recommendations relative to the joint planning area for the City of Black Diamond identified on the Growth Management Planning Council's Countywide Growth Pattern map; amending the King County Comprehensive Plan, King County Comprehensive Plan Land Use Map and Zoning Atlas.</p> <p>FINDINGS:</p> <ol style="list-style-type: none">1. Joint Planning Areas (JPA) were designated by the Growth Management Planning Council (GMPC) in Countywide Planning Policy (CPP) FW-1 Step 8b for those cities, including Black Diamond, where agreement on the boundaries of each city's urban growth areas (UGA) had not been reached. The GMPC determined that the UGA for each city should be finalized by the end of 1995 and that, subject to conditions, the urban growth area/open space for Black Diamond could be designated on up to 3000 acres maximum.2. Consistent with CPP FW-1 Step 8, King County Comprehensive Plan (KCCP) Policy I-206 states that the county will complete a joint planning process with the cities of North Bend, Issaquah, Redmond, Renton, Black Diamond and Snoqualmie to determine the final UGA boundaries for each city.3. This ordinance is required to amend the boundaries of the UGA for the city of Black Diamond in accordance with the recommendations of the Executive's 1995 KCCP Amendments. <p>BE IT ORDAINED BY THE COUNCIL OF KING COUNTY:</p> <p><u>SECTION 1.</u> The overlay designation for the Black Diamond Joint Planning Area (as shown on the attached map) shall be deleted from the Countywide Growth Pattern map.</p> <p><u>SECTION 2.</u> The King County Comprehensive Plan, King County Comprehensive Plan Land Use Map and Zoning Map shall be amended as follows:</p> <p>A. The 783 acres of land annexed to the City in 1994 shall be included within the permanent Urban Growth Area (UGA) for the City as shown on Attachment A and as specified in the 1994 King County Comprehensive Plan text shall be designated "Incorporated City".</p> <p>B. 1,927 acres, including 1,767 acres of the former JPA and 160 acres in the area known as Lake 12 Neighborhood shall be designated "New Rural City Urban Growth Area" on the King County Comprehensive Plan Land Use Map as shown on Attachment A provided that no more than 915 acres, which does not include the area known as the Lake 12 Neighborhood.</p>

(6) Failure to enforce Affordable Housing “balanced share” commitment in OakPointe Master Planned Developments (MPDs)

King County Ordinance 12065. Pg. 3 affordable housing requirement.

12065

1 G. No annexations or extension of utilities or commitments for extension of utilities
2 shall be allowed within the New Rural City Urban Growth Area until the proviso in
3 subsections B, C, D and E above and the requirements of Sections 3 and 4 below are satisfied
4 on or before December 31, 1996 in the Potential Annexation Area agreement and or
5 development agreement as described in Section 4.

6 SECTION 3. King County, the City of Black Diamond and the affected property
7 owners will address and resolve the following issues in the Potential Annexation Area
8 agreement and or development agreement as described in Section 4:

9 A. Affordable housing that meets or exceeds the goals established by the Countywide
10 Planning Policies and King County Comprehensive Plan. Market rate housing goals shall also
11 be established.

12 B. Completion and/or amendment of the Black Diamond Comprehensive Plan that is
13 consistent with the Countywide Planning Policies and includes:

14 1. The completion of the Natural Resource Management Plan, with input from King
15 County Surface Water Management Division;

16 2. The UGA, when combined with the existing City boundary, provides a future
17 job/housing mix sufficient for a fiscally viable city;

18 3. The net residential land within the New Rural City UGA (a portion of the 915
19 acres) will have a base density to be determined but will be developed at a minimum of 2
20 dwelling units per acre to a maximum of 18 dwelling units per acre through clustering.
21 Transfer of Development Rights and other methods as described in the City's Comprehensive
22 Plan; and

23 4. A Transfer of Development Rights program and residential densities that provide
24 sufficient value to meet the open space goals within the existing City Limits

25 C. Nature and location of open space uses including resource management and the
26 purposes described in the 1994 King County Comprehensive Plan found on pages 220-221.

27 D. Timing of open space and density transfers.

(6) Failure to enforce Affordable Housing “balanced share” commitment in OakPointe Master Planned Developments (MPDs)

Ord. 946 The Villages MPD, Ex. C - Conditions of Approval Condition 138:

“138. The project shall include a mix of housing types that contribute to the affordable housing goals of the City. The Development Agreement shall provide for a phase-by-phase analysis of affordable housing Citywide to ensure that housing is being provided at affordable prices. Specifications for affordable housing needs within the project shall be determined as a result of the phase-by-phase analysis.”

Ord. 970, Development Agreement, Recital B(e), pg. 1-2:

“...RCW 36.70B.170(3) defines "development standards" for a development agreement as including:

...(e) Affordable housing; ”

Ord. 970, Development Agreement, Section 11.8, pg. 107-108:

“11.8 HOUSING TYPES

Targets for housing types in each Phase of The Villages MPD are shown in Table 4-8-4. These are only targets not requirements. Pursuant to Condition of Approval No. 138 of the MPD

Permit Approval, after each Phase of The Villages MPD is completed, the City shall prepare an analysis of affordable housing City-wide. For purposes of this Agreement, Dwelling Units shall be deemed "affordable housing" if the upper median income limits as determined by King County are satisfied. That analysis may be used to set specifications for affordable housing in any on-going or future Phase of The Villages MPD. Specifications for affordable housing needs within the MPD shall be determined as a result of the Phase-by-Phase analysis and shall be applied to implementing Projects prospectively.”

Ord. 970, Development Agreement, Section 13.6 item 4.h, pg. 133:

h. Affordable units are provided through the diverse mix of product types for the Implementing Projects, subject to the review and other requirements set forth in the Condition of Approval Nos. 138 and 139, and Agreement section 11.8.

(7) SEPA Official should conduct more independent SEPA Review.

The SEPA Review process is flawed because the city's contracted senior planner from AHBL does the SEPA review, then submits a letter and draft DNS to the SEPA Official. This contracted planner doing the review does not have a reporting relationship to SEPA Official. This same contract planner also receives and processes the project application. The SEPA Official signs off but is not as fully involved and is not independent in their review. This can lead to a less-than-thorough SEPA review.

The city has the ability to be reimbursed by the developer for the SEPA Official's time and have a more independent SEPA review.

CONCLUSION

It's time to hold the developer to their agreement.

If the city does what it is obligated to do and stops allowing subdivisions or building permits, I think we will all be amazed at how quickly OakPointe will come into compliance. Right now, OakPointe is splitting their resources toward things like new subdivision applications, and trying to change their Lawson Hills development plan. OakPointe's time should be solely spent figuring out how to come into compliance and stop violating the agreement.

All the requirements listed above were in exchange for OakPointe getting a big development approval.

The Development Agreement was supposed to ensure that public services needed for growth are provided. For most people, the existence of these services is something that they take for granted. Our state's growth management laws and other regulations usually work so well that public services and infrastructure are something we no longer tend to worry about. Our environmental protection laws usually work well enough that we don't have development polluting streams or filling wetlands.

Most people in Black Diamond don't realize how precarious these public services have become. They're counting on their city government to make sure growth doesn't overwhelm services. Here in Black Diamond, many things are getting missed and these are going to cost the community.

RECOMMENDATION

The City should notify the developer that they must immediately comply, or submit an amendment application regarding each violation and prepare for the public hearing and City Council review in accordance with the Master Planned Development change process as defined by city ordinance.

Friends of Black Diamond and

Kristen Bryant

William Bryant

Gary Davis

Lisa Winters

Renee Mix

Angela Fettig

Gary Jones

Sherrie Jones

Alan Gangl

THE VILLAGES / TEN TRAILS MPD
PHASE 1B PLAT A – PRELIMINARY PLAT
PLN20-0107

EXHIBIT 4

TITLE: SEPA Mitigated Determination of Non-Significance
(MDNS) for the Ten Trails MPD Phase 1B Plat A Preliminary Plat

PREPARED BY: The City of Black Diamond

DATE: June 7, 2023



CITY OF BLACK DIAMOND

Physical Address: 24301 Roberts Drive
Mailing Address: PO Box 599
Black Diamond, WA 98010

Phone: (360) 851-4500
Fax: (360) 851-4501
www.blackdiamondwa.gov

State Environmental Policy Act (SEPA) Threshold Determination Mitigated Determination of Non-Significance (MDNS)

Date of issuance: June 7, 2023

Lead agency: City of Black Diamond Community Development

Agency Contact: Mona Davis, mdavis@blackdiamondwa.gov, 360-851-4528

Agency File Number(s): PLN20-0107 Preliminary Plat / PLN20-0108 SEPA Checklist

Project Name: Ten Trails MPD Phase 1 Plat B (Mountain View) Preliminary Plat

Description of proposal: Applicant requests Preliminary Plat approval to subdivide two parcels comprising 54.65 acres into 261 lots, which would provide a mix of 233 single-family lots, 25 multi-family lots, and 3 commercial lots. The plat will be constructed in phases. The 233 single-family residential lots will range in size from 1,040 SF to 6,930 SF, with an average lot size of 2,829 SF, providing for a variety of attached and detached units. The three commercial lots will comprise approximately 220,000 SF, with 180,000 SF of retail space and 40,000 SF of office space. A portion of the office space proposes a location for a new city campus. Approximately 3.61 acres of open space will be provided in tracts within the proposed subdivision, which will consist of a neighborhood park, open space trails, and landscape uses. There are no sensitive areas or sensitive area buffers located within the project site.

Location of proposal: Adjacent to the west side of Lake Sawyer Road and north of Roberts Drive along the western boundary of the City of Black Diamond; King County Tax Parcels 152106-9005 & 152106-9097; NW ¼ of Section 15, Township 21 N, Range 6E WM

Applicant(s): CCD Black Diamond Partners LLC / Oakpointe
3025 – 112th Ave NE, Suite 100, Bellevue, WA 98004

The City of Black Diamond (Lead Agency) has determined that this proposal will not have a probable significant adverse impact on the environment. Pursuant to WAC 197-11-350(3) and WAC 197-11-355(4), the proposal has been clarified, changed, and conditioned to include necessary mitigation measures to avoid, minimize or compensate for probable significant impacts. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(c).

This determination is based on the comments received during the Notice of Application comment period (December 16-31, 2020) and the following findings, conclusions, mitigation measures, and permit conditions are required to adequately address potential impacts from this project proposal. All relevant materials related to this file are available to the public by request to the city contact listed above.

Mitigation Measures: The following mitigation measures are hereby incorporated into this Mitigated Determination of Non-Significance (MDNS). These conditions are in addition to the mitigation required from development regulations and other conditions resulting from other government approvals.

1. Prior to the commencement of any site disturbance activities, an approved National Pollutant Discharge Elimination System (NPDES) General Stormwater Construction Permit issued by the Washington State Department of Ecology covering the proposed scope of work shall be submitted to the City's Master Development Review Team (MDRT).
2. Prior to the commencement of any site disturbing activities, a Spill Prevention Control and Countermeasures Plan (SPCCP) shall be submitted to, and approved by, the City's MDRT.
3. If any site disturbance activities are planned during the City's Winter Work period (October 1 through March 31), a Winterization Plan pursuant to Black Diamond Engineering Design and Construction Standards Section 2.2.05 shall be submitted to, and approved by, the City's MDRT prior to commencing construction.
4. Prior to commencement of construction, the Noise Mitigation Plan dated July 6, 2020 shall be followed throughout the development of the project.
5. Follow/implement preliminary design recommendations regarding site preparation, site grading, structural fill, new foundation designs, retaining walls, construction, drainage, paving, and infiltration feasibility of the Geotechnical Engineering Report dated April 6, 2023, and prepared by Associated Earth Sciences, Inc.

Signature: Mona Davis **Date:** 5-31-2023
Community Development Director/SEPA Responsible Official

Public Comment Period: This MDNS is issued under WAC 197-11-350. The Lead Agency will not act on this proposal for 14 days from the date of this decision. Written comments must be submitted no later than 5:00 pm on June 22, 2023 to the City of Black Diamond Community Development Department, 24301 Roberts Drive, Black Diamond, WA 98010.

SEPA Appeal Period: There is a 14-day appeal period regarding this agency decision. You may appeal this determination no later than 5:00 pm on June 22, 2023 by completing the proper appeal form and paying the City's appeal fee. You should be prepared to make specific factual objections in your appeal. Contact the Community Development Department at (360) 851-4447 to ask about the procedures for SEPA appeals.

**THE VILLAGES / TEN TRAILS MPD
PHASE 1B PLAT A – PRELIMINARY PLAT
PLN20-0107**

EXHIBIT 5

TITLE: Traffic Impact Study for Ten Trails MPD Phase 1B Plat A Preliminary Plat

PREPARED BY: TranspoGroup on behalf of Oakpointe LLC

DATE: July 1, 2022

TECHNICAL MEMORANDUM

Date:	July 1, 2022	TG:	16450.00
To:	Brian Ross and Justin Wortman – Oakpointe		
From:	Mike Swenson, P.E., PTOE and Maris Fry, P.E. – Transpo Group		
Subject:	Ten Trails MPD – Phase 1B Plat A Traffic Impact Study		

This memo serves as a Traffic Impact Study (TIS) for Plat A of Phase 1B of the Ten Trails Master Planned Development^{1,2} (MPD) and supplements the analyses conducted in the *Ten Trails and Lawson Hills MPDs – Phase 1B Traffic Monitoring Report* (the “Phase 1B TMR”) and the *Ten Trails and Lawson Hills MPDs – Phase 1A Mid-Point Traffic Monitoring Report* (the “Phase 1A MP TMR”). It provides a description of Plat A as well as estimates of weekday PM peak hour vehicle trip generation. It also determines the off-site improvements that would be triggered as part of Plat A, discloses potential impacts to traffic safety, addresses anticipated traffic impacts associated with construction activities, and describes the traffic calming measures internal to Plat A.

Exhibit F of The Villages MPD Development Agreement requires the preparation of a TMR for each phase of the combined Ten Trails and Lawson Hills MPDs prior to submittal of implementing project applications for such phase. The *Phase 1B TMR* was submitted to the City of Black Diamond for Phase 1B of the combined Ten Trails and Lawson Hills MPDs in conjunction prior to this TIS. As such, this Exhibit F requirement for Phase 1B implementing projects has been satisfied.

As required by Exhibit F, the *Phase 1B TMR* identified Phase 1B traffic impacts and the improvements triggered by such impacts along with their equivalent residential unit (ERU) thresholds necessary to maintain the City of Black Diamond, King County and Washington State Department of Transportation (WSDOT) adopted level of service (LOS) standards. That said, the *Phase 1A MP TMR* was completed more recently than the *Phase 1B TMR* and similarly analyzes the cumulative impacts of Phase 1A, 1B and 2 of the combined MPDs. The corresponding *Phase 1B Detailed Implementation Schedule*, which outlines the on-site and off-site regional infrastructure improvements and their necessary timing, was updated to incorporate findings from the *Phase 1A MP TMR*, as applicable. This TIS analyzes how the weekday PM peak hour vehicle trips generated by Phase 1B Plat A trigger any of the ERU thresholds for improvements set forth in the *Phase 1B Detailed Implementation Schedule*.

This study contemplates the cumulative development of Phases 1A, 1B and 2 of the Ten Trails and Lawson Hills MPDs at build-out of Phase 1B Plat A, which is expected to occur in 2027. Through 2027, the cumulative Ten Trails and Lawson Hills MPDs are projected to generate approximately 2,016 net new weekday PM peak hour trips, with approximately 571 of those peak hour trips resulting from Phase 1B Plat A.

¹ Ten Trails MPD was formerly known as The Villages MPD until September 2016.

² This TIS supersedes the previous Phase 1B Plat A TIS submitted in February 2021. It accounts for updates to the development program and absorption schedule of the MPDs, the newest edition of the Institute of Transportation Engineers’ *Trip Generation Manual*, the updated *Phase 1B Detailed Implementation Schedule* for off-site improvements, and updates to the construction impacts.

Project Description

The subject plat is located within Phase 1B of the Ten Trails MPD, north of Phases 1A and 2 of the Ten Trails MPD in the City of Black Diamond. Plat A is generally bound by Roberts Drive to the south, Lake Sawyer Road SE to the northeast, and existing parcels to the west.

Phase 1B Plat A would construct up to 145 single-family dwelling units, 125 multi-family dwelling units, 40,000 square feet of office space, and 180,000 square feet of retail space. Additionally, Plat A would include 10 to 20 park-and-ride parking spaces, per Condition No. 26 of The Villages MPD Development Agreement³. Vehicular access/egress will be via intersections along Roberts Drive and Lake Sawyer Road. The intersections of Roberts Drive/Ten Trails Parkway and Roberts Drive/Ten Trails Place have been constructed as part of Phase 1A and would provide access to Plat A through the construction of the north legs at both intersections. Ten Trails Parkway will be extended through the Plat A site and ultimately intersect with Lake Sawyer Road SE. Additionally, a right-in/right-out driveway will be constructed along Lake Sawyer Road SE to provide access to Plat A.

A site plan for Phase 1B Plat A is provided in Attachment 1.

Project Trip Generation

Weekday PM peak hour vehicle trip generation for Phase 1B Plat A was estimated based on the size and type of development and assumptions outlined in the *Trip Generation Manual* (Institute of Transportation Engineers (ITE), 11th Edition) and *Trip Generation Handbook* (ITE, 3rd Edition). This methodology was chosen as it is consistent with the approach used to estimate trips for *The Villages Transportation Technical Report (TTR)* (Parametrix, December 2009).

The *Trip Generation Manual* has been updated since *The Villages TTR* was published in December 2009. Weekday PM peak hour trip regression equations from the most recent edition of the *Trip Generation Manual* were used for all land uses in estimating vehicle trip generation, consistent with the approach and methodology used for *The Villages TTR*⁴. Since trip regression equations were used, the number of trips per dwelling unit generally decrease as the number of units increase; an effective trip rate for the trips per dwelling unit was back-calculated based on the trip regression equation.

³ Per Condition No. 26 of The Villages MPD Development Agreement, the final number of park-and-ride parking spaces will be reevaluated and finalized as part of the mode split analysis of the future transportation demand model (Condition No. 17 of the Villages MPD Conditions of Approval and Condition No. 16 of the Lawson Hills MPD Conditions of Approval).

⁴ In the *TTR* Land Use 770 (Business Park) was used for office and as part of this analysis, Land Use 710 (General Office Building) was used. The proposed plans are most consistently represented by Land Use 710. Land Use 710 (General Office Building) is described as "a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted. An office building or buildings may contain a mixture of tenants including professional services, insurance companies, investment brokers, and tenant services, such as a bank or savings and loan institution, a restaurant, or cafeteria and service retail facilities." Alternatively, Land Use 770 (Business Park) is described as "a group of flex-type or incubator one- or two-story buildings served by a common roadway system...The space may include offices, retail and wholesale stores, restaurants, recreational areas and warehousing, light industrial, or scientific research functions. The average mix is 20 to 30 percent office/commercial and 70 to 80 percent industrial/warehousing." While the office space as part of Phase 1B may include some industrial/warehousing space, the proposed plans are more consistently represented by Land Use 710. Additionally, while comparing ITE Land Uses for office space, it was found that the trip generation equations for Land Use 710 (General Office Building) were based off the largest sample size (66 studies), while trip generation equations for other office-related Land Uses were based off a much smaller sample size (less than 20 studies).

The land use assumptions and trip generation estimate for the Phase 1B Plat A land use proposal is summarized in Table 1⁵. As shown, Phase 1B Plat A is expected to generate a total of 571 weekday PM peak hour vehicle trips, approximately 571 ERUs⁶. The trip total does not include project traffic that will be internal to the site (linked trips between the residential, office, and retail uses of Plat A), nor does it include pass-by trips⁷. Detailed trip generation calculation worksheets are included in Attachment 2.

Table 1. PM Peak Hour Project Trip Generation Estimates – Phase 1B Plat A

Land Use	Unit ¹	Size	Gross Trips	Internal Trips	Pass-by Trips	Net New Trips
			Total (In/Out)	Total (In/Out)	Total (In/Out)	Total (In/Out)
Single-Family Residential	DUs	145	117 (74/43)	54 (34/20)	--	63 (40/23)
Multi-Family Residential	DUs	125	48 (29/19)	22 (14/8)	--	26 (15/11)
Office	KSF	40	78 (12/66)	20 (6/14)	--	58 (6/52)
Retail	KSF	180	610 (293/317)	90 (39/51)	96 (48/48)	424 (206/218)
Total			853 (408/445)	186 (93/93)	96 (48/48)	571 (267/304)

1. DUs= dwelling units; KSF=1,000 square feet

Timing of Off-Site Improvements

This section describes the timing of improvements based on the updated *Phase 1B Detailed Implementation Schedule*. The Implementation Schedule includes improvements at all intersections expected to operate below the applicable LOS standard by Phase 1B build-out, with the exception of improvements that have already been implemented or are planned to be complete prior to Phase 1B build-out⁸.

The Implementation Schedule describes the transportation-related improvements which the Master Developer is conditioned to construct at certain ERU thresholds. The ERU thresholds represent the cumulative ERUs for Phases 1A, 1B and 2 of the overall Ten Trails and Lawson Hills MPDs. To determine which improvements would be necessary by build-out of Phase 1B Plat A, the combined trip generation of Phases 1A, 1B and 2 was determined for the year in which Plat A is expected to be complete (2027). The same trip generation methodology and assumptions were used to determine the cumulative trip generation as described above for the Phase 1B Plat A trip generation. Detailed trip generation calculation worksheets are included in Attachment 2.

As shown in Table 2, Phases 1A, 1B and 2 at the build-out of Plat A would generate 2,016 net new weekday PM peak hour trips (2,016 ERUs). Based on the proposed implementation schedule, the

⁵ Parking allocated to the park-and-ride is not considered an additional use in the trip generation calculations. Vehicles expected to utilize the park-and-ride are likely to already be on the local roadway network. As such, no new trips are expected to be generated by the park-and-ride.

⁶ One ERU was assumed to be equal to one weekday PM peak hour trip, consistent with the rate used to identify the thresholds for the off-site intersection improvements in previous studies.

⁷ Pass-by trips represent vehicular trips that are already present on the roadway network and stop at the site on the way to or from another destination. Consistent with previous assumptions, this analysis assumes that 20 percent of retail trips will be pass-by trips. These trips are factored into the analysis as turning movements at the project driveways, but do not result in additional trips at other external intersections.

⁸ Improvements that have been implemented to-date include rechannelization of SE 288th Street/216th Avenue SE to provide a left-turn refuge/merge lane, a single-lane roundabout at Lake Sawyer Road SE/Roberts Drive, and two new site access intersections – a single-lane roundabout at Roberts Drive/Ten Trails Parkway and a stop-controlled intersection at Roberts Drive/Ten Trails Place. Improvements at SR 169/SE 288th Street (eastbound-to-northbound refuge/acceleration lane), SR 169/Roberts Drive (single-lane roundabout with turn lanes) and SR 169/Pipeline Road (single-lane roundabout with turn lanes) are also planned to be complete prior to build-out of Plat 2D.

following intersections would be triggered for improvement prior to build-out of Plat A. An overview of the proposed improvements and ERU triggers at these intersections is included in Table 3.

- SE 288th Street/216th Street
- SE Covington-Sawyer Road/216th Avenue SE
- SR 169/Baker Street
- SR 169/Lawson Street
- Roberts Drive/Ten Trails Place
- Lake Sawyer Road/Ten Trails Parkway SE
- Roberts Drive/Morgan Street⁹
- SR 169/SE 288th Street

Table 2. PM Peak Hour Cumulative Trip Generation Estimates – Phase 1A, 1B and 2

Land Use	Unit ¹	Size	Gross Trips	Internal Trips	Pass-by Trips	Net New Trips
			Total (In/Out)	Total (In/Out)	Total (In/Out)	Total (In/Out)
<u>Ten Trails MPD²</u>						
Single-Family Residential	DUs	1,159	994 (626/368)	215 (148/67)	-	779 (478/301)
Multi-Family Residential	DUs	387	151 (92/59)	28 (20/8)	-	123 (72/51)
Age-Qualified Residential	DUs	278	98 (60/38)	18 (13/5)	-	80 (47/33)
Elementary School ³	Students	600	96 (46/50)	29 (14/15)	-	67 (32/35)
Office	KSF	40	78 (12/66)	25 (11/14)	-	53 (1/52)
Retail	KSF	291	1,218 (585/633)	241 (72/169)	196 (98/98)	781 (415/366)
<u>Lawson Hills MPD⁴</u>						
Single-Family Residential	DUs	106	105 (66/39)	-	-	105 (66/39)
Multi-Family Residential	DUs	72	28 (17/11)	-	-	28 (17/11)
Total			2,768 (1,504/1,264)	556 (278/278)	196 (98/98)	2,016 (1,128/888)

1. DUs= dwelling units; KSF=1,000 square feet

2. The Ten Trails MPD would include development associated with Phase 1A, 2, and 1B at build-out of Plat A.

3. For school-related trips, it was assumed that 30 percent of trips are generated by residential uses within each of the respective Ten Trails and Lawson Hills MPDs.

4. The Lawson Hills MPD would include development associated with Phase 2 only at build-out of Plat A.

⁹ In the event that Pipeline Road is under construction prior to the 1,900th ERU, the improvement at Roberts Drive/Morgan Street will not be necessary.

Table 3. Summary of Intersection Improvements and Construction Timing

Intersection	Improvement	Commence construction prior to City's issuance of a certificate of occupancy for ¹
SE 288th St/216th Ave SE	Traffic Signal + NBR Turn Lane	827th ERU
SE Covington-Sawyer Rd/216th Ave SE	NBL Turn Lane	1,089th ERU
SR 169/Baker St (<i>First Phase</i>)	EB-to-NB Refuge/Merge Lane + NBL Turn Lane	1,089th ERU
SR 169/Lawson St (<i>First Phase</i>)	NBL/SBL Turn Lanes	1,089th ERU
Roberts Dr/Ten Trails PI SE	Traffic Signal	1,422nd ERU
SR 169/Baker St (<i>Final Phase</i>)	Traffic Signal	1,422nd ERU
SR 169/Lawson St (<i>Final Phase</i>)	Traffic Signal	1,422nd ERU
Lake Sawyer Rd/Ten Trails Pkwy SE	Roundabout	1,800th ERU
Roberts Drive/Morgan Street	Traffic Signal	1,900th ERU ²
SR 169/SE 288th St (<i>Final Phase</i>)	Traffic Signal	1,954th ERU

Note: ERU = equivalent residential unit; EBL = eastbound left; NBR = northbound right; NBL = northbound left; SBL = southbound left; SBR = southbound right; EBR = eastbound right

1. The number of ERUs reflects the combination of Phases 1A, 1B and 2 within the Ten Trails and Lawson Hills MPDs

2. In the event that Pipeline Road is under construction prior to the 1,900th ERU, the improvement at Roberts Drive/Morgan Street will not be necessary.

Additional Transportation Improvements

As it relates to the timeline of Plat A, Section 6.4.3 of *The Villages MPD Development Agreement* provides that the preliminary design and alignment of Pipeline Road shall be completed by the Master Developer and the right of way dedicated to the City prior to the City's approval of a building permit for the 1,200th building permit within the Ten Trails MPD. This section further provides that Pipeline Road shall be constructed by the Master Developer and open for traffic prior to the City's approval of a building permit for the 1,746th dwelling unit of the Ten Trails MPD or when the Traffic Monitoring Plan shows that construction is necessary to prevent a significantly adverse degradation of Level of Service on Roberts Drive.

Through build-out of Phase 1B Plat A, the Ten Trails MPD would total 1,824 dwelling units, surpassing this defined dwelling unit threshold. As such, dedication of right of way for and construction of Pipeline Road will be complete prior to build-out of Phase 1B Plat A.

Traffic Safety

Collision data for the most recent (pre-pandemic) three-year period were obtained from WSDOT and summarized at each intersection and along each roadway segment evaluated in the previous traffic studies for the Ten Trails and Lawson Hills MPDs.

Intersection Collision Analysis

Collisions at study intersections were determined using WSDOT's classification of the "Junction Relationship" of the collision as well as by reviewing collisions that were noted to occur within 200 feet of intersections. All collisions that were classified as "At Intersection and Related" or "Intersection Related but Not at Intersection" were included. Collisions adjacent to intersections were also reviewed to determine whether the cause was related to the intersection (e.g., rear-end

type collisions) or related to the roadway (e.g., fixed-object collisions) and included in the collision summaries. The number of collisions reported at these intersections are summarized in Table 4.

Table 4. Three-Year Collision Summary at Intersections – 2017 to 2019

Intersection	2017	2018	2019	Total	Annual Average	Collisions per MEV ¹
SE 288th St/216th Ave SE	0	1	2	3	1.00	0.26
SE 288th St/232nd Ave SE	0	0	0	0	0.00	0.00
SE Covington-Sawyer Rd/216th Ave SE	5	3	3	11	3.67	0.84
SE Auburn-Black Diamond Rd/218th Ave SE	1	0	0	1	0.33	0.12
Roberts Dr/Lake Sawyer Rd SE	0	1	0	1	0.33	0.14
Roberts Dr/Morgan St	0	0	1	1	0.33	0.20
SR 169/SE 288th St	4	4	6	14	4.67	0.97
SR 169/SE Black Diamond-Ravensdale Rd	4	2	2	8	2.67	0.55
SR 169/Roberts Dr	1	1	1	3	1.00	0.21
SR 169/Baker St	3	0	2	5	1.67	0.35
SR 169/Lawson Rd	4	0	0	4	1.33	0.34
SR 169/Jones Lake Rd	1	0	0	1	0.33	0.09
SR 169/SE Green Valley Rd	1	3	1	5	1.67	0.44
SE Kent-Kangley Rd/Landsburg Rd SE	8	2	6	16	5.33	1.63
SE Auburn-Black Diamond Rd/SE Green Valley Rd	1	0	0	1	0.33	0.08

Source: WSDOT, 2020.

Note: Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

1. Collisions per one million entering vehicles (No. of reported collisions x 1,000,000) / (Average daily traffic volumes x 365 x 3 years)

As shown in Table 4, the majority of intersections experienced an average of two collisions or fewer during this three-year period. Based on a review of collision severity of the 74 total collisions, 48 involved no injuries, 20 involved “possible injury,” four involved “suspected minor injury” and the remaining two involved “suspected serious injury.” There was one pedestrian collision and zero bicyclist collisions. The pedestrian collision occurred at the SR 169/Lawson Street intersection and resulted in a possible injury. There were no fatalities reported at study intersections.

The number of collisions per one million entering vehicles was also evaluated to provide a comparable rate between locations and determine if further evaluation of traffic safety is necessary. *The Transportation Impact Analyses for Site Development, An ITE Recommended Practice* (ITE, 2010) recommends the following procedure in evaluating traffic safety at intersections:

The initial review of existing data within a study area should include recent (within 3 years) collision experience. This review should identify locations where transportation safety should be given extra consideration. High-collision locations (based on number, rate and severity) on roadways serving the study site should be analyzed. Collision rates vary, but any intersection with more than one collision per million entering vehicles (MEV) may be worthy of additional analysis. (page 74)

Based on the data summarized in Table 4 above, only the SE Kent-Kangley Road/Landsburg Road SE intersection experienced a collision rate over 1.0 collisions per MEV, recording a collision rate of 1.63 collisions per MEV. Further evaluation of this intersection showed that all collisions were categorized as “entering at angle” and involved vehicles on both the stop-controlled north

and southbound approaches colliding with vehicles traveling eastbound or westbound on SE Kent-Kangley Road. With respect to severity at SE Kent-Kangley Road / Landsburg Road SE, 10 collisions involved no injuries and 6 were reported as “possible injuries.” Thus, just under two-thirds of all reported collisions resulted in no injuries. No pedestrians or bicyclists were involved in any of the collisions and no fatalities were reported as well.

To help address the elevated collision rate at this intersection, King County converted the intersection to all-way stop-controlled in the spring of 2021. The County is monitoring operations and safety at this intersection as a result of the change in intersection control, with intentions to install a permanent traffic calming safety improvement, such as a roundabout or traffic signal, in the future.

Roadway Collision Analysis

Collision data along roadway segments in the City of Black Diamond from 2017-2019 was also obtained from WSDOT and analyzed. A summary of collision data during the most recent three-year period is summarized in Table 5.

Table 5. Three-Year Collision Summary for Roadway Segment – 2017 to 2019

Roadway Segments	2017	2018	2019	Total	Annual Average	Collisions per MVM ¹
SE ABD Rd (218th Ave SE to Lake Sawyer Rd SE)	1	0	1	2	0.67	0.28
Roberts Dr (Lake Sawyer Rd SE to Morgan St)	1	1	1	3	1.00	1.03
Roberts Dr (Morgan St to SR 169)	0	0	0	0	0.00	0.00
Morgan St (Roberts Dr to Baker St)	0	0	0	0	0.00	0.00
216th Ave SE (SE 288th St to SE 304th St)	7	4	3	14	4.67	1.22
Lake Sawyer Rd SE (SE 304th St to Roberts Dr)	0	2	1	3	1.00	0.71
SR 169 (SE 288th St to Roberts Dr)	6	3	3	12	4.00	0.54
SR 169 (Roberts Dr to Lawson St)	4	2	6	12	4.00	1.58
SR 169 (Lawson St to Jones Lake Rd)	0	3	4	7	2.33	1.90
SR 169 (Jones Lake Rd to SE Green Valley Rd)	0	3	2	5	1.67	0.36

Source: WSDOT, 2020.

Note: ABD = Auburn-Black Diamond

Note: Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

1. Collisions per one million vehicle-miles traveled (No. of reported collisions x 1,000,000) / (Segment length x Average daily traffic volumes x 365 x 3 years)

As shown in Table 5, on average, approximately 5 collisions per year or less were reported along the roadway segments during the most recent three-year period. Based on a review of collision severity of the 58 total collisions, 41 involved no injuries, 12 involved “possible injury,” 3 involved “suspected minor injury” and 1 involved “suspected serious injury.” Thus, a majority of all reported collisions resulted in no or no apparent injuries. There was one fatality that occurred in July 2017 which involved a bicyclist and a truck (flatbed, van, etc.) on SR 169 approximately 0.6 miles south of SE 288th Street. The truck was reported to be traveling northbound; no other details are provided in the WSDOT collision report. There was also one pedestrian-related collision which occurred at a SR 169 intersection between Roberts Drive and Lawson Street. The vehicle was traveling westbound and failed to yield right of way to the pedestrian.

In addition to the annual collision data, the number of collisions occurring per one million vehicle miles (MVM) traveled was calculated for each segment and ranged from 0.00 to 1.90 collisions per MVM traveled. Four roadway segments experienced more than one collision per MVM traveled,

including 216th Avenue SE between SE 288th Street and SE 304th Street, Roberts Drive between Lake Sawyer Rd SE and Morgan Street, SR 169 between Roberts Drive and Lawson Street, and SR 169 between Lawson Street and Jones Lake Road. Common collision types for each roadway segment are as follows:

- 216th Avenue SE segment: there was not one cause/collision type that represented a significant portion of all collisions. The collision types varied significantly and ranged from left turns to fixed objects to right turns.
- Roberts Drive segment: all collisions were a result of vehicles colliding with fixed objects. These objects included a mailbox, tree and a fence.
- SR 169 segment between Roberts Drive and Lawson Street: the most common collision type was rear ends (4), followed by various other types such as approach turn, parked vehicle, right turn, and opposite direction.
- SR 169 segment between Lawson Street and Jones Lake Road: the most common collision type was rear ends and fixed object collisions (3).

By comparison, based on the rates presented in the *2015 Washington State Collision Data Summary*, the average collision rate was 2.48 collisions per MVM travelled in King County and 1.96 per MVM travelled in all of Washington State. Therefore, the collision history on these four segments of roadway are well below the Countywide and Statewide averages which capture collisions in urban, suburban and rural areas.

New traffic generated by the Ten Trails MPD would likely result in a proportionate increase in the probability of traffic collisions. It is unlikely, however, that this traffic would create a safety hazard or significantly increase the number of reported collisions. It is unlikely project traffic would exacerbate an existing traffic safety hazard because no roadway segments in and around Black Diamond experienced an unusually high collision rate during the most recent three-year period.

Construction Impacts

This section addresses the anticipated traffic impacts associated with the construction activities for Phase 1B Plat A.

Construction Phasing and Timing

Construction traffic associated with the development of Plat A would be affected by phasing and timing of construction. Based on the anticipated phasing of the Plat, construction traffic estimates have been broken down between the east and west portions of the site, and as necessary, between residential and commercial development. Initial construction activities would include earthwork followed by the installation of roads and utilities. This includes the grading of the site, installing roadways, and installation of necessary utilities such as power, water and sewer. Following the earthwork and installation of roads and utilities, the vertical construction of the residential dwelling units and commercial space will occur.

The schedule for the east and west portions of Plat A will vary based on the duration and type of work being completed. A summary of the tentative schedule for the east and west portions of the Plat are shown in Table 6. A more detailed analysis of the construction phasing and timing is included in a memorandum prepared by David Evans and Associates and included as Attachment 3.

Table 6. Planned Construction Schedule – Phase 1B Plat A

Location	<u>Earthwork</u>		<u>Road and Utilities</u>		<u>Vertical Construction</u>	
	Dates	Duration	Dates	Duration	Dates	Duration
West Portion (Residential)	Aug.–Oct. '22	3 months	Nov. '22–Apr. '23	6 months	May '23–Oct. '24	18 months
West Portion (Commercial)	Aug.–Oct. '22	3 months	Nov. '22–Apr. '23	6 months	Oct.–Dec. '27	3 months
East Portion	Aug.–Oct. '22	3 months	May–Oct. '23	6 months	Nov. '23–Dec. 27'	50 months

Source: David Evans and Associates

As shown in Table 6, it is anticipated the earthwork activities for Plat A would occur concurrently in mid- to late-2022, over a period of three months. Road and utility work for the west portion of Plat A would occur late 2022 through the spring of 2023, followed by road and utility work for the east portion of Plat A in the summer and fall of 2023. Vertical construction will take place from mid-2023 to the end of 2027, with residential construction completed early in the construction period. There would be a six-month period between May and October 2023 in which vertical construction of the west portion would occur concurrently with road and utility work for the east portion of Plat A. There would be a one-year period between November 2023 and October 2024 and a three-month period between October and December 2027 in which vertical construction would occur concurrently between the west portion and the east portion of Plat A.

Construction Trip Generation

The amount of construction traffic associated with each portion of Plat A was estimated for the number of truck trips as well as employee or crew trips. The construction timeline and schedule were also reviewed to understand the anticipated volume of daily construction traffic as well as during the weekday PM peak hour at adjacent street traffic (one-hour period of greatest demand between the hours of 4:00 p.m. and 6:00 p.m.).

The primary hours for construction are between 7:00 a.m. and 3:00 p.m. with most truck traffic avoiding delays associated with traffic congestion during the PM peak hour of adjacent street traffic; however, these calculations conservatively assume that some construction traffic would occur during the weekday PM peak hour as summarized below. In addition, it was assumed that each construction worker would arrive and depart in a single-occupant vehicle even though it is likely that some construction workers would carpool to/from the project site, effectively reducing the trip generation estimates identified in this memo.

A summary of the daily and weekday PM peak hour construction trips anticipated for Plat A is provided in Table 7. This data was derived from detailed trip generation calculations and construction assumptions provided in the construction memorandum provided by David Evans and Associates (Attachment 3). It should be noted that the data related to daily traffic from the David Evans Associates memorandum represents round trips, which were doubled in the table below to account for each entering and exiting trip end associated with daily trips.

Table 7. Construction Trip Generation Summary – Ten Trails MPD Phase 1B Plat A

Construction Type	<u>Weekday Daily Trips¹</u>			<u>Weekday PM Peak Hour Trips</u>		
	Crew	Truck	Total	Crew	Truck	Total
Earthwork ²	24	10	34	4	1	5
Road and Utilities						
West Portion	24	16	40	4	1	5
East Portion	24	8	32	4	1	5
Vertical						
West Portion (Residential)	178	12	190	30	1	31
West Portion (Commercial)	12	2	14	2	1	3
East Portion	10	2	12	2	1	3

1. Daily trips identified in the David Evans and Associates memorandum represent round trips / individual trip ends at the project site, and were doubled in this memorandum to account for each entering and exiting trip end associated with a daily trip.

2. Earthwork will occur for the entire Plat A site concurrently.

During earthwork construction, it is estimated that Plat A would generate approximately 24 daily crew trips and ten daily truck trips with up to four crew trips and one truck trip occurring during the weekday PM peak hour of adjacent street traffic.

During the roadwork and utility construction, it is estimated there would be approximately 24 daily crew trips and 16 daily truck trips for the west portion of Plat A with up to four crew trips and one truck trip occurring during the weekday PM peak hour. For the east portion, it is estimated there would be approximately 24 daily crew trips and eight daily truck trips with up to four crew trips and one truck trip occurring during the weekday PM peak hour.

During the vertical construction of the west portion's residential dwelling units, the project is estimated to generate approximately 178 daily crew trips and 12 daily truck trips with up to 30 crew trips and one truck trip occurring during the weekday PM peak hour. During the vertical construction of the west portion's commercial space, it is estimated that there would be approximately 12 daily crew trips and two daily truck trips with up to two crew trips and one truck trip during the weekday PM peak hour. During vertical construction of the east portion of Plat A, it is estimated that there would be approximately ten daily crew trips and two daily truck trips with two crew trips and one truck trip during the PM peak hour.

During the period in which vertical construction for the east portion and the west portion's residential dwelling units would occur concurrently, it is estimated that there would be a total of approximately 188 daily crew trips and 14 daily truck trips with 32 crew trips and two truck trips during the PM peak hour. During the period in which vertical construction for the west portion and road and utility work for the east portion would occur concurrently, it is estimated that there would be a total of 202 daily crew trips and 20 truck trips with 34 crew trips and two truck trips during the PM peak hour.

Construction Impacts

As shown in the previous sections, the highest weekday PM peak hour trip generation for Phase 1B Plat A would be during the period in which vertical construction for the west portion and road and utility work for the east portion would occur concurrently. During this time, the project is estimated to generate approximately 36 combined trips during the PM peak hour. As the impacts for the buildout have been identified and the trip generation estimated for the construction traffic is significantly lower, no additional off-site mitigation should be necessary to mitigate traffic operations during the construction of Phase 1B Plat A.

Construction Management Plan

A construction management plan will be developed by the Master Developer in coordination with the City of Black Diamond to provide for a safe and efficient construction site and minimize the impacts to traffic operations in the area as required by Section 1.17 of the City of Black Diamond Engineering Design and Construction Standards. This plan will minimize off-site construction impacts through containing equipment, materials and workers on-site as much as possible and accommodating staging, construction facilities and parking on-site. Specific transportation-related items anticipated to be addressed in a construction management plan include:

- **Truck Routes** – identifying specific haul routes for trucks, which will avoid impacts to local residential streets.
- **Noise** – minimizing noise impacts associated with construction on-site as well as from haul trucks on the roads.
- **Parking** – identifying parking areas for employees as well as staging areas for trucks and materials.
- **Access** – Identifying specific areas for access that would likely require safe controlled access for large trucks to and from the site.
- **Compute Trip Reduction** – encouraging carpooling and other ride sharing by employees to minimize the number of single occupant vehicle trips on site.

In addition, Sheet UA1 of the “Utility Availability” plan for Phase 1B Plat A includes preliminary haul route plans that have two plat notes that provide additional mitigation to minimize construction impacts to SE Green Valley Road and allow the City an opportunity to review and approve construction traffic control designs. The notes read as follows:

1. Master Developer shall include the following provision in clearing, grading and construction contracts: “Except for the westerly 1,000 feet of SE Green Valley Road, SE Green Valley Road shall not be used as a construction haul route by contractors or its agents.”
2. Construction traffic control design will be provided as part of final engineering plans for review and approval by the City of Black Diamond.

Traffic Calming Measures

As part of the Ten Trails MPD, a variety of traffic calming measures will be incorporated within Plat A to calm traffic and help minimize excessive vehicle speeds.

Curb bulb-outs are one traffic calming measure which would narrow the roadway width by providing a physical constraint requiring motorists to travel through intersections and along residential streets at slower speeds. Curb bulb-outs would be designed to provide ten-foot travel lanes and are typically located leading up to and at the intersection of two roadways (with the exception of intersections along Ten Trails Parkway), at the intersection of alleys and auto courts (access driveways) with roadways, and along small radius curves. Curb bulb-outs also increase

safety for people walking and bicycling as they provide increased visibility and shorter crossing distances of streets while narrowing the streets as vehicles approach the crossing location.

In addition to curb bulb-outs at intersections, on-street parking would be provided on most Plat A roadways, with the exception of Ten Trails Parkway. On-street parking has a measurable effect on vehicle speeds. For many reasons, motorists generally travel at slower speeds in the presence of on-street parking¹⁰. For example, parked vehicles present the possibility of motorists entering/exiting the flow of traffic which requires more attentive driving behavior and slower speeds. Parked vehicles also give the perception of narrower travel lanes which reduces vehicular speeds.

Narrower lanes will be employed along roadways that accommodate stormwater bioswales in particular. In these areas, roadway widths will be reduced to 20-feet (with no parking on either side) or 27-feet (with parking on one side).

¹⁰ This is supported in (1) Marshall, W., N. Garrick and G. Hansen. "Reassessing On-Street Parking." *Transportation Research Record*, No. 2046 (2008): 45-52 and (2) Morrison, B. "Residential Street Width, On-Street Parking and Accident Frequency." 22nd Conference Proceedings of the Australian Road Research Board, 2006. It is also worth noting that lower-speed streets with on-street parking also have some of the lowest collision rates with respect to serious accidents. Likewise, pedestrian safety is enhanced as on-street parking provides a buffer or barrier between pedestrian traffic and vehicular traffic. Therefore, facilities with on-street parking tend to be safer and more walkable than facilities without on-street parking.

Summary and Conclusions

- This traffic impact study analyzes the impacts of Phase 1B Plat A the Ten Trails MPD. Plat A would develop 145 single-family dwelling units, 125 multi-family dwelling units, 40,000 square feet of office space, and 180,000 square feet of retail space. Additionally, Plat A would include 10 to 20 park-and-ride parking spaces.
- With consideration to the previously approved land uses of Phase 1A and Phase 2, a total of 1,265 single-family residential dwelling units, 459 multifamily residential dwelling units, 278 senior adult detached dwelling units, a 600-student elementary school, 40,000 square feet of office space, and 291,000 square feet of retail would be constructed at build-out of Phase 1B Plat A. It is estimated these land uses would generate approximately 2,016 net new off-site weekday PM peak hour vehicle trips. This is equivalent to 2,016 ERUs.
- With the development of Plat A in addition to the previously approved Phase 1A and Phase 2 plats, off-site improvements would be triggered at eight intersections. This would include a traffic signal and northbound right turn lane at SE 288th Street/216th Street SE, channelization improvements at SR Covington-Sawyer Road/216th Avenue SE, channelization improvements and traffic signals at SR 169/Baker Street and SR 169/Lawson Street, a traffic signal at Roberts Drive/Ten Trails Place SE, a traffic signal at Roberts Drive/Morgan Street, a single-lane roundabout at Lake Sawyer Road/Ten Trails Parkway SE, and a traffic signal at SR 169/288th Street.
- Historical collision data at the study intersections and roadways was reviewed for the most recent three-year period. The SE Kent-Kangley Road / Landsburg Road SE intersection had the highest rate of collisions for the off-site study intersections with 1.63 collisions per million entering vehicles. All roadways had collision rates less than the average collision rate along roadways in both King County and Washington State.
- Construction of Plat A would occur between August 2022 and December 2027 in separate phases. The vertical construction, particularly when vertical construction of the west portion and road and utility work for the east portion occurs concurrently, is anticipated to generate the most weekday daily and PM peak hour trips. During this time, the project is estimated to generate approximately 36 combined trips during the PM peak hour, significantly less than the project build-out. As such, no construction mitigation measures are deemed necessary.
- Traffic calming measures would be implemented throughout Plat A. This will include providing curb bulb-outs, small radius curves, and on-street parking on the neighborhood roads to encourage lower vehicle speeds.

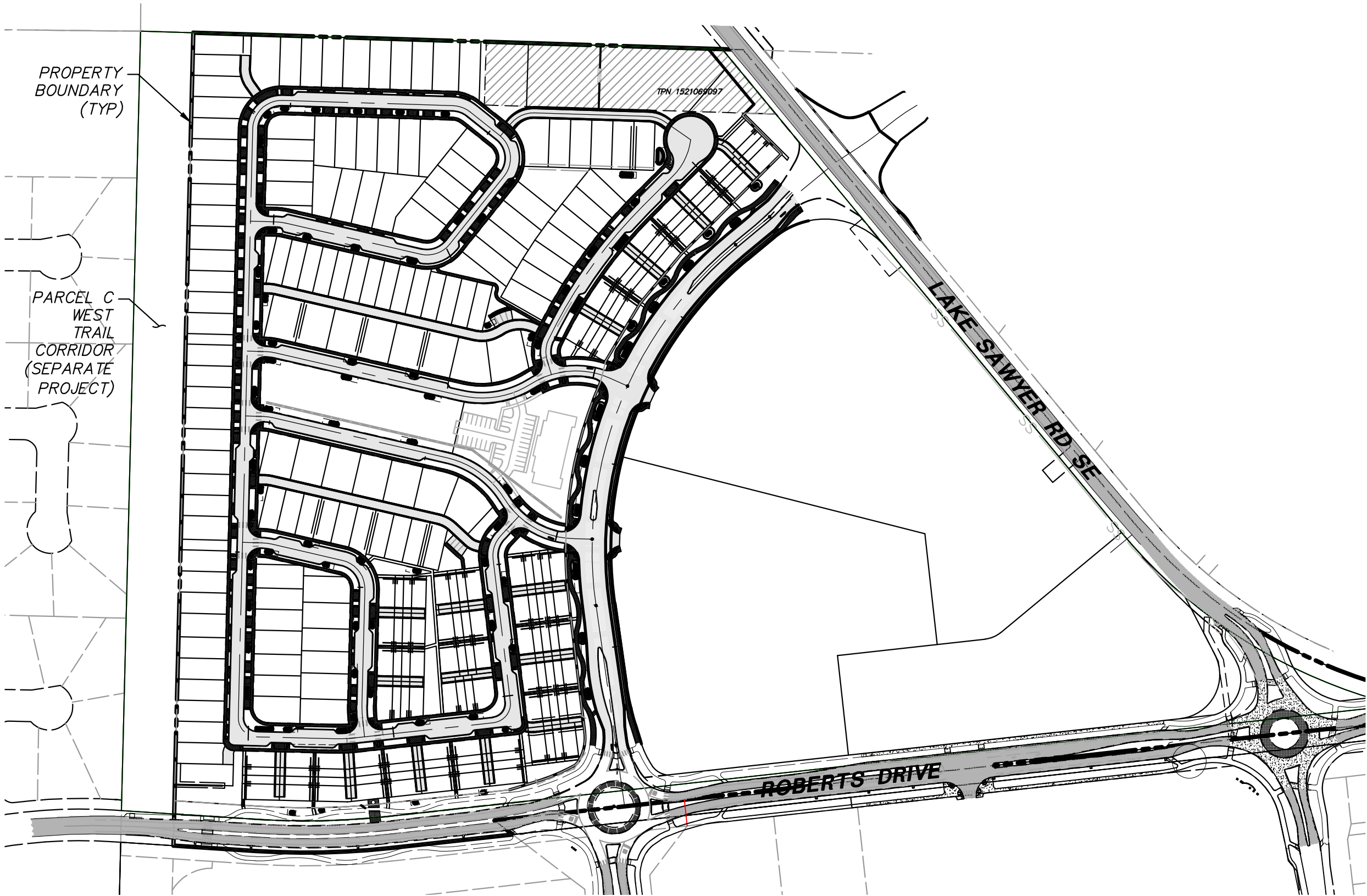
Attachments 1-3



Attachment 1: Conceptual and Preliminary Site Plans

Plot Date: 7/5/2022 10:24 AM
Save Date: 7/1/2020 1:06 PM
By: Danielle Pitcher
By: Dmpj File: P:\OAKPCBDP6001\04\00\CAD\EXHIBITS\Preliminary\Ten_Trails\Phase 1B\Parcel C\Drainage Report\Parcel C - Developed Areas Exhibit.dwg

SW 1/4 OF SECTION 15, TWP. 21N, RGE. 6E, W.M.




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SITE PLAN

TEN TRAILS
PHASE 1B PARCEL C
CITY OF BLACK DIAMOND

WASHINGTON

REVIEWED BY: DATE: BY: CK

NO. DATE REVISION

1 11/1/2020 1

CADD:

DESIGNED:

STAMP NOT VALID
UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE:
SCALE: HORIZ.: 1"=200' VERT.: N/A

PROJECT NO.
OAKPCBDP6001

SHEET NO.
1
OF 1

Attachment 2: Trip Generation Calculations

2027 PM Peak Hour Trip Generation – Ten Trails (Phase 1B, Plat A)

Weekday PM Peak Hour - Phase 1B			Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷	Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	145 DUs	117	63%	74	43	0%	34	20	54	0%	0	0	0	63	40	23
Multifamily	221	125 DUs	48	61%	29	19	46%	14	8	22	0%	0	0	0	26	15	11
Senior Adult Housing	251	DUs	0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	40,000 SF	78	16%	12	66	26%	6	14	20	0%	0	0	0	58	6	52
Retail	820	180,000 SF	610	48%	293	317	15%	39	51	90	20%	96	48	48	424	206	218
Total			853		408	445		93	93	186		96	48	48	571	267	304

2027 PM Peak Hour Trip Generation – Ten Trails (Phase 1A, 1B and 2 Combined)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,159 DUs	Eqn	0.86	994	63%	626	368	148	67	215	0%	0	0	0	779	478	301
Multifamily	221	387 DUs	Eqn	0.39	151	61%	92	59	20	8	28	0%	0	0	0	123	72	51
Senior Adult Housing	251	278 DUs	Eqn	0.35	98	61%	60	38	13	5	18	0%	0	0	0	80	47	33
Elementary School	520	600 Students	Ave	0.16	96	48%	46	50	14	15	29	0%	0	0	0	67	32	35
Office	710	40,000 SF	Eqn	1.94	78	16%	12	66	11	14	25	0%	0	0	0	53	1	52
Retail	820	291,000 SF	Eqn	4.18	1218	48%	585	633	72	169	241	20%	196	98	98	781	415	366
Total					2,635		1,421	1214	278	278	556		196	98	98	1,883	1045	838

2027 PM Peak Hour Trip Generation – Lawson Hills

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	0.99	105	63%	66	39	0	0	0	0%	0	0	0	105	66	39
Multifamily	221	72 DUs	Eqn	0.39	28	61%	17	11	0	0	0	0%	0	0	0	28	17	11
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.16	0	46%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	17%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					133		83	50	0	0	0		0	0	0	133	83	50

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (11th Edition, 2021).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE *Trip Generation Handbook* (3rd Edition, 2017).
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*.
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal T+B2:I34rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2027)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	7/1/2022
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				78	12	66
Retail				1218	585	633
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1243	778	465
Hotel				0	0	0
All Other Land Uses ²				96	46	50
Total				2635	1421	1214

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		13	0	0	1	0
Retail	4		0	0	165	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	7	59	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,635	1,421	1,214
Internal Capture Percentage	19%	18%	21%
External Vehicle-Trips ³	2,137	1,172	965
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	92%	21%
Retail	12%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	21%	14%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Project Name:	Ten Trails MPD (2027)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	12	12	1.00	66	66
Retail	1.00	585	585	1.00	633	633
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	778	778	1.00	465	465
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		13	3	0	1	0
Retail	13		184	25	165	32
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	98	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		47	0	0	31	0
Retail	4		0	0	358	0
Restaurant	4	293		0	124	0
Cinema/Entertainment	1	23	0		31	0
Residential	7	59	0	0		0
Hotel	0	12	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	11	1	12	1	0	0
Retail	72	513	585	513	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	166	612	778	612	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	46	46	46	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	14	52	66	52	0	0
Retail	169	464	633	464	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	66	399	465	399	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	50	50	50	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

Attachment 3: Construction Traffic Memorandum



**DAVID EVANS
AND ASSOCIATES INC.**

April 4, 2022

Andy Williamson, MDRT/Economic Development Director
City of Black Diamond – P.O. Box 599
24301 Roberts Drive
Black Diamond, WA 98010-0559

SUBJECT: Ten Trails Phase 1B Plat A Construction Trips

Dear Mr. Williamson,

At the request of CCD Black Diamond Partners LLC we have investigated opportunities for reducing the amount of construction traffic associated with Ten Trails Phase 1B Plat A.

The Villages MPD Condition of Approval No. 110 (set forth in Exhibit C of The Villages MPD Development Agreement on page 23 of 29) states: “Prior to approval of the first implementing plat or site development permit within a phase, the applicant shall submit an overall grading plan that will balance the cut or fill so that the amount of cut or fill does not exceed the other by more than 20%.” In compliance with this condition, DEA prepared a memorandum “Phase 1B Estimated Earthwork Quantities” dated August 6, 2020. We were tasked with coming up with implementable strategies to further reduce construction trips.

In reviewing Plat 1B Plat A’s site grades and typical construction methods, DEA is confident the following additional construction techniques and conditions will further limit construction traffic on the off-site adjoining street network:

- Adjust Phase 1B Plat A’s site grading to achieve an approximate earthwork balance.
- Screen Phase 1B Plat A’s strippings onsite to obtain topsoil for re-use onsite.
- Rocks obtained through the screening of topsoil on Phase 1B Plat A are to be used as fill or crushed for use as base material onsite.
- Sticks obtained through the screening of topsoil on Phase 1B Plat A are to be “chipped” and used for soft surface trails or erosion protection onsite.
- Import borrow/fill material including outwash soils for gravel base from within the Ten Trails MPD site.
- Stockpile any excess material generated through construction of Phase 1B Plat A within the Ten Trails MPD site for use on future phases.

Based on implementation of these strategies, DEA has estimated construction truck and vehicle trips associated with the build out of Phase 1B Plat A. The trip generation estimates have been broken down between crew trips and truck delivery trips as well as earthwork, utility and vertical construction (buildings) for west and east portions of the site. The attached spreadsheets show how assumptions and



calculations were used to generate trip estimates for Phase 1B Plat A. And, the attached graphs show the estimated trip distribution along the proposed construction timeline for Phase 1B Plat A.

Earthwork construction crews are estimated to generate 720 round trips. Earthwork truck deliveries are estimated to generate 258 round trips. Earthwork construction is anticipated to occur from August through October 2022. Road and utility construction for the western portion (west) is anticipated to occur between November 2022 and April 2023. Road and utility (west) construction crews are estimated to generate 1440 round trips. Road and utility (west) truck deliveries are estimated to generate 877 round trips. Road and utility construction for the eastern portion (east) is anticipated to occur between May and October 2023. Road and utility (east) construction crews are estimated to generate 1440 round trips. Road and utility (east) truck deliveries are estimated to generate 418 round trips. Vertical (building) construction crews (west res.) were estimated to generate 32,000 round trips. Vertical construction (west res.) truck deliveries were estimated to generate 2,134 round trips. Vertical construction (west res.) is currently anticipated to begin in May of 2023 and continue through October of 2024. Vertical (building) construction crews (west FDT) were estimated to generate 360 round trips. Vertical construction (west FDT) truck deliveries were estimated to generate 24 round trips. Vertical construction (west FDT) is currently anticipated to begin in October of 2027 and continue through December of 2027. Vertical (building) construction crews (east) were estimated to generate 4,920 round trips. Vertical construction (east) truck deliveries were estimated to generate 328 round trips. Vertical construction (east) is currently anticipated to begin in November of 2023 and continue through December of 2027. The vertical construction crew and truck trips have been averaged over these estimated construction periods.

These average crew and truck trips have been graphed based on average trips per day as well as by average PM peak hour trips (see attached graphs).

Please let me know if you have any follow-up questions regarding these construction trip generation calculations.

Sincerely,

DAVID EVANS AND ASSOCIATES, INC.

Thomas P. Matt, P.E.
Senior Project Engineer

Copies: Justin Wortman
Attachments/Enclosures: Trip calcs & graphs



4/4/22

Crew Trip Estimate for Construction of Ten Trails Phase 1B Plat A

Earthwork Construction Crew Trips

Earthwork =	3 months, 20 work days per month, 12 crew trucks per day average
-------------	--

Earthwork Crew Trips =	(3 months)*(20 work days/month)*(12 crew trucks/day) =	720 Trips
------------------------	--	-----------

Road and Utility Construction Crew Trips - West

Road and Utilities =	6 months, 20 work days per month, 12 crew trucks per day average
----------------------	--

Road and Utility Crew Trips Res. =	(6 months)*(20 work days/month)*(12 crew trucks/day) =	1,440 Trips
------------------------------------	--	-------------

Road and Utility Construction Crew Trips - East

Road and Utilities =	6 months, 20 work days per month, 12 crew trucks per day average
----------------------	--

Road and Utility Crew Trips Res. =	(6 months)*(20 work days/month)*(12 crew trucks/day) =	1,440 Trips
------------------------------------	--	-------------

Vertical Construction Crew Trips

Single Family Residence (SFR) construction - assumed 3 months, 20 work days per month, 2 crew trucks per day

SFR = 120 trips per SFR

Multi-Family Residential (MF) assumed at 2/3 of SFR, MF = 80 trips per unit

Commercial/Office/Retail (COR) assumed 5,000 SF = 1 SFR

FDT West (15,000 SF/5,000 SF) = 3 SFR

Vertical Construction Crew Trips - West Res.

	Units	Trips EA.	Trips
250 SFR	250	120	30,000
25 MF	25	80	2,000

Subtotal	32,000 Trips
----------	--------------

Vertical Construction Crew Trips - West FDT

	Units	Trips EA.	Trips
FDT West	3	120	360

Vertical Construction Crew Trips - East

205,000 SF
205,000/5,000 = 41

41 120 4,920 Trips

Construction Crew Trip Summary

Earthwork Crew Trips	720
Road & Utility Crew Trips West	1,440
Road & Utility Crew Trips East	1,440
Vertical Crew Trips West Res.	32,000
Vertical Crew Trips West FDT	360
Vertical Crew Trips East	4,920
40,880 Total Crew Trips	

Truck Trip Estimate for Ten Trails Phase 1B Plat A

Logging truck trips have been estimated at 250 Subtotal 250 Trips

Import for Wall Construction During Earthwork

Assumed 1 delivery truck per 100 Sq Ft of rockery face

Approx. 800 Sq Ft/100 Sq Ft = 8 Trips Subtotal 8 Trips

Import for Road & Alley Construction - West

	LF of Street	Avg Width	Avg Depth	CY	CY/Load	Trips
Ten Trails Parkway	1280	45	0.83	1771	20	89
Ten Trails Parkway Sidewalks	1280	14	0.33	219	10	22
Lake Sawyer 1/2 St. Improvement	1220	16	0.83	600	20	30
Lake Sawyer 1/2 St. Imp. Sidewalk	1410	6	0.33	103	10	10
Roads A- E	6100	36	0.50	4067	20	203
Alley, Drvwy & Autocourts	2360	20	0.50	874	20	44
Sidewalks	6100	10	0.42	949	10	95
Total =						493

Note: Assumed outwash material from on Ten Trails site meets requirements for gravel base.

Import for Road & Utility Construction - West

Other Import Items as Noted

Earthwork assumes grades can be adjusted to provide an earthwork balance
or that stockpiling of excess material or borrow as needed can be done on the Ten Trails MPD site.

Stripping the site assumed at 9" of stripping depth

$$(31 \text{ acres}) * (43,560 \text{ sf/acre}) * (.75 \text{ ft}) / 27 = 37,510 \text{ CY}$$

1/2 of stripping volume assumed to be sticks and rocks

Sticks to be chipped on site for use on trails

Rock assumed to be placed as fill or crushed and used on site

1/2 of stripping volume assumed to be topsoil that can be used on-site with 20% import volume for mixing

$$\text{Topsoil Import} = (.5) * (37,510 \text{ CY}) * (0.2) = 3,751 \text{ CY}$$

$$\text{Topsoil Import Trips} = 3751 \text{ CY} / (25 \text{ CY/trip}) = 150 \text{ Trips}$$

$$\text{Bioretention Cells Trips} = ((90 \text{ bc})(15' \text{ L})(12' \text{ W})(4.5' \text{ Dp}) / 27) / (20 \text{ CY/trip}) = 135 \text{ Trips}$$

Utility Trips - Deliveries of Pipe, Structures, and Bedding

Assume 1 truck trip per 100' of road and Autocourt construction

Alleys and driveways assumed at half of road construction

$$\text{Trips} = (1,280 \text{ LF} + 6,100 \text{ LF} + 1,375 \text{ LF}) / 100 \text{ LF/trip} + .5(1,220 \text{ LF} + 985 \text{ LF}) / 100 \text{ LF/trip} = 99 \text{ Trips}$$

Subtotal	384 Trips
----------	-----------

Import for Road & Utility Construction - East

Other Import Items as Noted

Earthwork assumes grades can be adjusted to provide an earthwork balance
or that stockpiling of excess material or borrow as needed can be done on the Ten Trails MPD site.
At this time there is no site plan available for the commercial site so quantities below are estimated.

Stripping the site assumed at 9" of stripping depth

$$(19 \text{ acres}) * (43,560 \text{ sf/acre}) * (.75 \text{ ft}) / 27 = 22,990 \text{ CY}$$

1/2 of stripping volume assumed to be sticks and rocks

Sticks to be chipped on site for use on trails

Rock assumed to be placed as fill or crushed and used on site

1/2 of stripping volume assumed to be topsoil that can be used on-site with 20% import volume for mixing

$$\text{Topsoil Import} = (.5) * (22,990 \text{ CY}) * (0.2) = 2,299 \text{ CY}$$

$$\text{Topsoil Import Trips} = 2,299 \text{ CY} / (25 \text{ CY/trip}) = 92 \text{ Trips}$$

Bioretention Cell and Infiltration Facility trips prorated based on site area

$$(19 \text{ Ac} / 31 \text{ Ac}) (135 \text{ trips}) = 83 \text{ Trips}$$

Utility Trips - Deliveries of Pipe, Structures, and Bedding

This is estimated to be a third of the trips of the west.

$$(99 \text{ trips})/3 = 33 \text{ Trips}$$

Road and parking lot west construction truck trips prorated on area with TTP & L.S. road trips subtracted

$$(342 \text{ trips})(19 \text{ Ac}/31 \text{ Ac}) = 210 \text{ Trips}$$

Subtotal	418 Trips
----------	-----------

Vertical Construction Delivery Truck Trips for Construction of Ten Trails Phase 1B Plat A - West Res.

Single Family Residential (SFR) Construction = 8 trips per unit

Multi-Family Residential (MF) assumed at 2/3 of SFR

FDT West(15,000 SF) assumed to be equivalent to 3 SFR

$$(250 \text{ SFR})(8 \text{ trips}) + (2/3)(25 \text{ MF})(8 \text{ trips}) = 2,134 \text{ Trips}$$

Vertical Construction Delivery Truck Trips for Construction of Ten Trails Phase 1B Plat A - West FDT

Single Family Residential (SFR) Construction = 8 trips per unit

Multi-Family Residential (MF) assumed at 2/3 of SFR

FDT West(15,000 SF) assumed to be equivalent to 3 SFR

$$(3 \text{ SFR})(8 \text{ trips}) = 24 \text{ Trips}$$

Vertical Construction Delivery Truck Trips for Construction of Ten Trails Phase 1B Plat A - East

Single Family Residential (SFR) Construction = 8 trips per unit

Multi-Family Residential (MF) assumed at 2/3 of SFR

Commercial/Office/Retail (COR) assumed 5,000 SF = 1 SFR

$$(205,000 \text{ sf}/5,000 \text{ sf})(8 \text{ trips}) = 328 \text{ Trips}$$

Ten Trails Phase 1B Plat A Construction Trip Estimate

Construction Phase	Crew Trips	Truck Trips	Total Trips
Earthwork Trips	720	258	978
Road and Utility Trips - West	1,440	877	2,317
Road and Utility Trips - East	1,440	418	1,858
Vertical Construction -West Res	32,000	2,134	34,134
Vertical Construction -West FDT	360	24	384
Vertical Construction -East	4,920	328	5,248
	40,880	4,039	

EW

EW to occur over 3 months, 20 weekdays/month

(estimated to occur August through October 2022)

Crew Vehicle Trips total 720
 $720/(3*20) = 12$ Trips/day

Allowable Work Hours 7AM to 7PM
Assume 1/3 leave before 4PM
Assume 1/3 leave after 6PM
Assume 1/3 leaving between 4PM and 6PM $12/3 = 4$ trips
Hourly Peak Crew Trips = $4/2\text{hrs} = 2$ trips/hr

Truck Trips
 $258/(3*20) = 4.3$ trips/day
Deliveries occur throughout the work day 7Am to 7PM
Assume 10% of truck trips occur between 4PM and 6PM $(4.3)(0.1) = 0.43$ trips
Hourly Peak Truck Trips = $0.43 \text{ trips}/2\text{hrs} = 0.2$ trips/hr

Road and Utility Construction - West
Road and Utility construction to occur over 6 months, 20 weekdays/month
(estimated to occur November 2022 through April 2023)

Crew Vehicle Trips total 1440
 $1440/(6*20) = 12$ Trips/day

Allowable Work Hours 7AM to 7PM
Assume 1/3 leave before 4PM
Assume 1/3 leave after 6PM
Assume 1/3 leaving between 4PM and 6PM $12/3 = 4$ trips
Hourly Peak Crew Trips = $4/2\text{hrs} = 2$ trips/hr

Truck Trips
 $877/(6*20) = 7.3$ trips/day
Deliveries occur throughout the work day 7Am to 7PM
Assume 10% of truck trips occur between 4PM and 6PM $(7.3)(0.1) = 0.73$ trips
Hourly Peak Truck Trips = $0.73 \text{ trips}/2\text{hrs} = 0.37$ trips/hr

Road and Utility Construction - East
Road and Utility construction to occur over 6 months, 20 weekdays/month
(estimated to occur May through October 2023)

Crew Vehicle Trips total 1440
 $1440/(6*20) = 12$ Trips/day

Allowable Work Hours 7AM to 7PM
Assume 1/3 leave before 4PM
Assume 1/3 leave after 6PM
Assume 1/3 leaving between 4PM and 6PM $12/3 = 4$ trips
Hourly Peak Crew Trips = $4/2\text{hrs} = 2$ trips/hr

Truck Trips

$$418/(6*20) = 3.5 \text{ trips/day}$$

Deliveries occur throughout the work day 7AM to 7PM

$$\text{Assume 10\% of truck trips occur between 4PM and 6PM } (3.5)(0.1) = 0.35 \text{ trips}$$

$$\text{Hourly Peak Truck Trips} = 0.35 \text{ trips/2hrs} = 0.18 \text{ trips/hr}$$

Vertical Construction -West Res.

Vertical Construction to occur over 18 months, 20 weekdays/month

(estimated to occur May 2023 through October 2024)

Crew Vehicle Trips total 32,000 trips

$$32,000/(18*20) = 88.9 \text{ trips/day}$$

Allowable Work Hours 7AM to 7PM

Assume 1/3 leave before 4PM

Assume 1/3 leave after 6PM

$$\text{Assume 1/3 leaving between 4PM and 6PM } 88.9/3 = 29.6 \text{ trips}$$

$$\text{Hourly Peak Crew Trips} = 29.6/2\text{hrs} = 14.8 \text{ trips/hr}$$

Truck Trips

$$2,134/(18*20) = 5.9 \text{ trips/day}$$

Delivers occur throughout the work day 7AM to 7PM

$$\text{Assume 10\% of truck trips occur between 4PM and 6PM } (5.9)(0.1) = 0.59 \text{ trips}$$

$$\text{Hourly Peak Truck Trips} = 0.59 \text{ trips/2 hrs} = 0.3 \text{ trips/hr}$$

Vertical Construction -West FDT

Vertical Construction to occur over 3 months, 20 weekdays/month

(estimated to occur October 2027 through December 2027)

Crew Vehicle Trips total 360 trips

$$360/(3*20) = 6 \text{ trips/day}$$

Allowable Work Hours 7AM to 7PM

Assume 1/3 leave before 4PM

Assume 1/3 leave after 6PM

$$\text{Assume 1/3 leaving between 4PM and 6PM } 6/3 = 2 \text{ trips}$$

$$\text{Hourly Peak Crew Trips} = 2/2\text{hrs} = 1 \text{ trips/hr}$$

Truck Trips

$$24/(3*20) = 0.4 \text{ trips/day}$$

Delivers occur throughout the work day 7AM to 7PM

$$\text{Assume 10\% of truck trips occur between 4PM and 6PM } (0.4)(0.1) = 0.04 \text{ trips}$$

$$\text{Hourly Peak Truck Trips} = 0.04 \text{ trips/2 hrs} = 0.02 \text{ trips/hr}$$

Vertical Construction -East

Vertical Construction to occur over 50 months, 20 weekdays/month

(estimated to occur November 2023 through December 2027)

Crew Vehicle Trips total 4,920 trips

$4,920 / (50 * 20) = 4.9$ trips/day

Allowable Work Hours 7AM to 7PM

Assume 1/3 leave before 4PM

Assume 1/3 leave after 6PM

Assume 1/3 leaving between 4PM and 6PM $4.9 / 3 = 1.6$ trips

Hourly Peak Crew Trips = $1.6 / 2\text{hrs} = 0.8$ trips/hr

Truck Trips

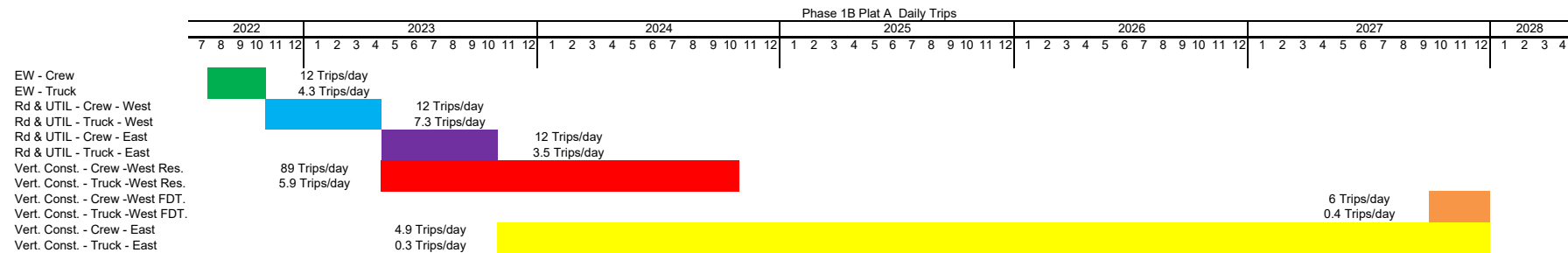
$328 / (50 * 20) = 0.33$ trips/day

Delivers occur throughout the work day 7AM to 7PM

Assume 10% of truck trips occur between 4PM and 6PM $(0.33)(0.1) = 0.03$ trips

Hourly Peak Truck Trips = $0.03 \text{ trips} / 2 \text{ hrs} = 0.02$ trips/hr

Note the calculated trips were conservatively assumed to all occur on weekdays, Monday through Friday



Phase 1B Plat A Peak Hour Trips

[illegible]

THE VILLAGES / TEN TRAILS MPD
PHASE 1B PLAT A – PRELIMINARY PLAT
PLN20-0107

EXHIBIT 6

TITLE: Ten Trails MPD Phase 1B Traffic Monitoring Report

PREPARED BY: TranspoGroup on behalf of Oakpointe LLC

DATE: February 2021

Traffic Monitoring Report

TEN TRAILS AND LAWSON HILLS MASTER PLANNED DEVELOPMENTS – PHASE 1B

Prepared for:

CCD Black Diamond Partners LLC

February 2021

Prepared by:

transpogroup 
WHAT TRANSPORTATION CAN BE.

12131 113th Avenue NE, Suite 203
Kirkland, WA 98034-7120
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16450.00



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Executive Summary

This Traffic Monitoring Report (TMR) was prepared in accordance with the requirements described in Exhibit F of The Villages and Lawson Hills Master Planned Development (MPD) Agreements. It outlines the anticipated traffic impacts of Phase 1B, determines what improvements will be necessary to ensure compliance with the City of Black Diamond's transportation concurrency requirements and other applicable operations standards, and identifies when construction of said improvements should commence. This report also evaluates the internal road network of both MPDs, vehicle queues at study intersections, and addresses Pipeline Road as required in The Villages and Lawson Hills MPD Development Agreements, respectively.

Phase 1B of the Ten Trails MPD¹ includes approximately 150 single-family dwelling units, 125 multi-family dwelling units, 40,000 square feet of office space and 180,000 square feet of retail space within Plat A². Additionally, a portion of the Ten Trails MPD is located within the North Triangle³ and includes approximately 103,000 square feet of office space. Phase 1B of the Lawson Hills MPD includes approximately 200,000 square feet of office space and 190,000 square feet of retail space. This portion of the Lawson Hills MPD is also located within the North Triangle. This phase of development will be constructed over an approximate eleven-year period with build-out anticipated by the end of 2032.

This report determined that without improvements at Phase 1B build-out, five existing intersections will not meet the level of service (LOS) standard or transportation concurrency requirement set by the City of Black Diamond and nine additional existing intersections will not meet the LOS standard set by King County or the Washington State Department of Transportation (WSDOT). These fourteen intersections include:

1. SE 288th Street/216th Avenue SE (*City of Black Diamond*)
2. SE Covington-Sawyer Road/216th Avenue SE (*City of Black Diamond*)
3. Roberts Drive/Ten Trails Place SE (*City of Black Diamond*)
4. Lake Sawyer Road SE/Ten Trails Parkway SE (*City of Black Diamond*)
5. Roberts Drive/Morgan Street (*City of Black Diamond*)
6. SE Auburn-Black Diamond Road/218th Avenue SE (*King County*)
7. SE Kent-Kangley Road/Landsburg Road SE (*King County*)
8. SE Auburn-Black Diamond Road/SE Green Valley Road (*King County*)
9. SR 169/SE 288th Street (*WSDOT*)
10. SR 169/Roberts Drive (*WSDOT*)
11. SR 169/Baker Street (*WSDOT*)
12. SR 169/Lawson Street (*WSDOT*)
13. SR 169/SE Green Valley Road (*WSDOT*)
14. SR 169/North Connector (*WSDOT*)

The following table addresses each of the above intersections, describing the recommended improvement and identifying when construction should commence.

¹ The Ten Trails MPD was formerly known as The Villages MPD until September 2016.

² Plat A is located north of Phase 1A and bounded by Roberts Drive to the south, Lake Sawyer Road SE to the northeast and existing parcels to the west.

³ The North Triangle is located north of the primary Ten Trails and Lawson Hills MPD areas along the west side of SR 169. The North Triangle includes portions of both the Ten Trails and Lawson Hills MPDs.

Table 1. Summary of Intersection Improvements and Construction Timing

Intersection	Improvement	Commence construction prior to City's issuance of a certificate of occupancy for ¹ (Projected year)
SR 169/SE 288th St (<i>First Phase</i>)	EB-to-NB Refuge/Acceleration Lane	646th ERU (~2021)
SE 288th St/216th Ave SE	Traffic Signal + NBR Turn Lane	827th ERU (~2022)
SE Covington-Sawyer Rd/216th Ave SE	NBL Turn Lane	827th ERU (~2022)
SE Kent-Kangley Rd/Landsburg Rd SE	Traffic Signal or Pro-Rata Share Contribution to Functionally Equivalent Improvement	827th ERU (~2022)
SR 169/Baker St (<i>First Phase</i>)	EB-to-NB Refuge/Merge Lane + NBL Turn Lane	827th ERU (~2022)
SR 169/Lawson St (<i>First Phase</i>)	NBL/SBL Turn Lanes	827th ERU (~2022)
Roberts Dr/Ten Trails Pl SE	Traffic Signal	1,594th ERU (~2024)
SR 169/Baker St (<i>Final Phase</i>)	Traffic Signal	1,594th ERU (~2024)
SR 169/Lawson St (<i>Final Phase</i>)	Traffic Signal	1,594th ERU (~2024)
Roberts Drive/Morgan Street	Traffic Signal	1,900th ERU ² (~2025)
Lake Sawyer Rd/Ten Trails Pkwy SE	Roundabout	1,900th ERU (~2025)
SR 169/SE 288th St (<i>Final Phase</i>)	Traffic Signal	2,043rd ERU (~2026)
SR 169/Roberts Drive	EBR/SBR Turn Lanes	2,123rd ERU ³ (~2027)
SR 169/North Connector (<i>First Phase</i>)	Roundabout	2,123rd ERU (~2027)
SE Auburn-Black Diamond Rd/SE Green Valley Rd	NB-to-WB Refuge/Merge Lane	2,438th ERU (~2028)
SR 169/North Connector (<i>Final Phase</i>)	EBR Turn Lane	2,700th ERU (~2029)
SE Auburn-Black Diamond Rd/218th St SE	NB-to-WB Refuge/Merge Lane	2,916th ERU (~2030)
SR 169/SE Green Valley Rd	Two-Way Left Turn Lane	2,965th ERU (~2031)

Note: ERU = equivalent residential unit; NBR = northbound right; NBL = northbound left; SBL = southbound left; EBR = eastbound right

1. The number of ERUs reflects the combination of Phases 1A, 1B and 2 within the Ten Trails and Lawson Hills MPDs

2. In the event that Pipeline Road is under construction prior to the 1,900th ERU, the improvement at Roberts Drive/Morgan Street will not be necessary.

3. In the event that Pipeline Road is under construction prior to the 2,123rd ERU, the improvement at SR 169/Roberts Drive will not be necessary.

This report also determined that (1) roadway capacity within each MPD will accommodate the anticipated traffic demand; (2) available storage will accommodate maximum vehicle queues at each study intersection with the proposed improvement; and (3) construction of Pipeline Road will not be triggered as part of Phase 1B development.

Introduction

This Traffic Monitoring Report (TMR) was prepared in response to Exhibit F of The Villages Master Planned Development (MPD) Development Agreement dated December 12, 2011 and Exhibit F of the Lawson Hills MPD Development Agreement dated December 12, 2011, both of which require the preparation of a “traffic monitoring report” to disclose anticipated traffic impacts of Phase 1B and determine what improvements and/or strategies will be necessary to ensure compliance with the City of Black Diamond’s transportation concurrency requirements and/or King County or Washington State Department of Transportation (WSDOT) level of service (LOS) standards. Construction of these improvements and/or implementation of these strategies will assure that the transportation mitigation measures imposed on the MPDs keep pace with MPD development and appropriate improvements are constructed at the appropriate time.

Exhibit F requires that a “traffic monitoring report” be prepared for each phase of the combined MPDs as well as at the point at which occupancy has been granted for the mid-point equivalent residential units (ERUs) for each phase of the MPDs. Based on the number of ERUs associated with Phase 1B, a second monitoring report will be prepared when the City of Black Diamond has issued a certificate of occupancy for the 739th ERU (the mid-point) of the Phase 1B development.

Project Description

Figure 1 illustrates Phase 1B and the surrounding vicinity. The Ten Trails portion of Phase 1B is comprised of two distinct areas: one located north of Ten Trails Phase 1A on the opposite side of Roberts Drive (Plat A) and the other located just west of SR 169 and north of an existing residential community at SR 169/Summit Drive (an area referred to as the “North Triangle” throughout this report). Plat A will include approximately 150 single-family residential units, 125 multi-family residential units, 40,000 square feet of office space, and 180,000 square feet of retail space. Additionally, Plat A will include 10 to 20 park-and-ride parking spaces, per Condition No. 26 of the Villages MPD Development Agreement⁴. The portion of Ten Trails within the North Triangle will include 103,000 square feet of office space.

Phase 1B of the Lawson Hills MPD is located in the North Triangle. Phase 1B of the Lawson Hills MPD will include approximately 200,000 square feet of office space and 190,000 square feet of retail space.

Phase 1B will be constructed over an approximate eleven-year period with build-out anticipated by the end of 2032. Table 2 provides a year-by-year breakdown of anticipated development by land use and MPD.

⁴ Per Condition No. 26 of the Villages MPD Development Agreement, the final number of park-and-ride parking spaces will be reevaluated and finalized as part of the mode split analysis of the future transportation demand model (Condition No. 17 of the Villages MPD Conditions of Approval and Condition No. 16 of the Lawson Hills MPD Conditions of Approval).

Table 2. Year-by-Year Development Plan for Phase 1B

Land Use ¹ (Unit ²)	Yr. 1 (~2022)	Yr. 2 (~2023)	Yr. 3 (~2024)	Yr. 4 (~2025)	Yr. 5 (~2026)	Yr. 6 (~2027)	Yr. 7 (~2028)	Yr. 8 (~2029)	Yr. 9 (~2030)	Yr. 10 (~2031)	Yr. 11 (~2032)	Total
Ten Trails MPD												
SFR (DUs)	150	-	-	-	-	-	-	-	-	-	-	150
MFR (DUs)	65	60	-	-	-	-	-	-	-	-	-	125
Office (KSF)	-	-	-	-	40	-	-	-	-	53 ³	50 ³	143
Retail (KSF)	45	45	45	45	-	-	-	-	-	-	-	180
Lawson Hills MPD												
Office (KSF)	-	-	-	-	-	-	70	65	65	-	-	200
Retail (KSF)	-	-	-	-	-	65	65	60	-	-	-	190

1. SFR=Single Family Residential; MFR=Multi Family Residential

2. DUs= dwelling units; KSF= 1,000 square feet

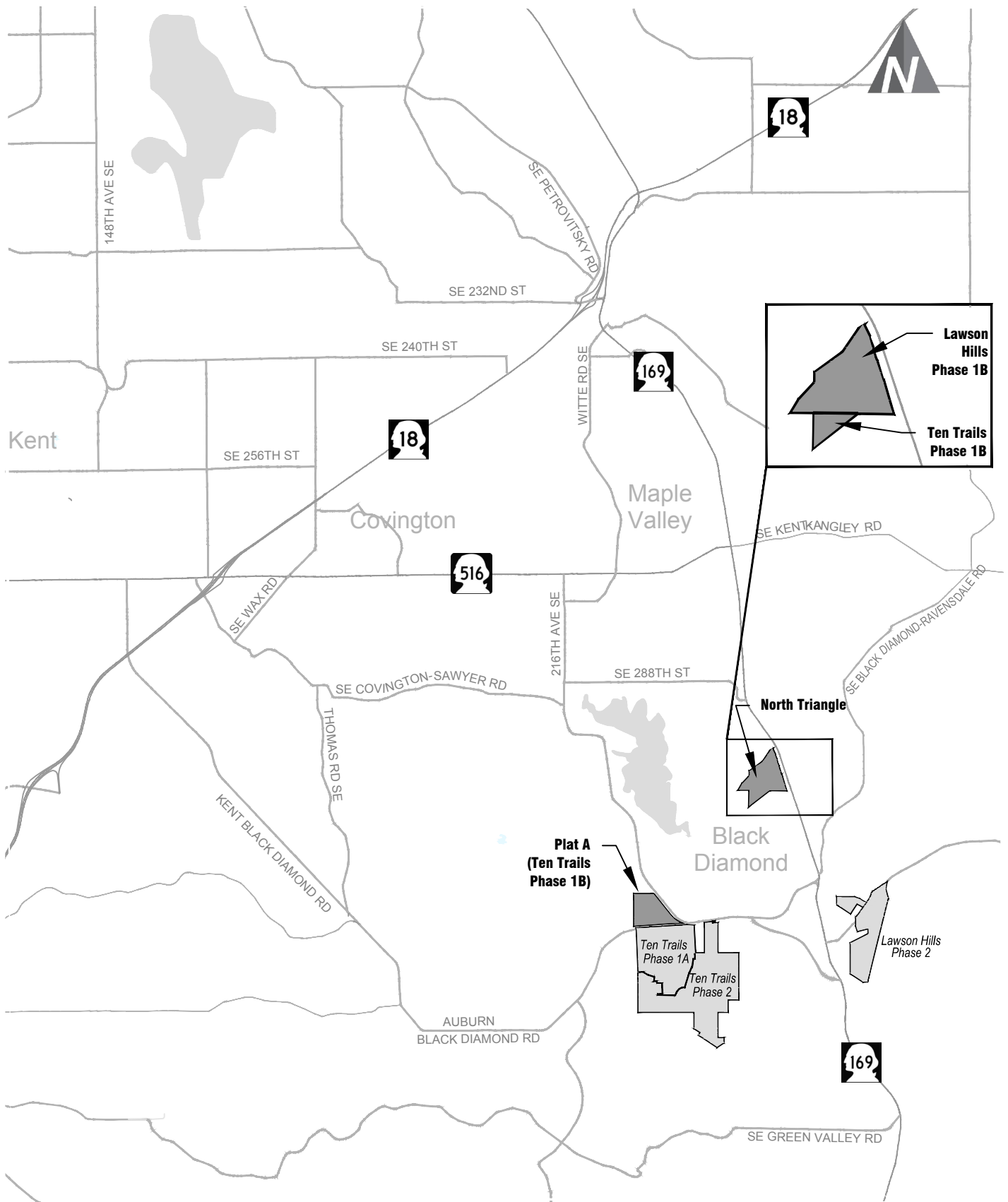
3. This portion of the Ten Trails MPD is adjacent to Phase 1B of the Lawson Hills MPD. For trip generation and trip distribution purposes, this portion of the Ten Trails MPD is combined with Phase 1B of the Lawson Hills MPD and collectively referred to as the "North Triangle."

Figure 2 illustrates the project site plan for Plat A (a portion of Ten Trails). Figure 3 illustrates the project site plan for the North Triangle (the remainder of Ten Trails and Lawson Hills).

For Plat A, site access/egress will be via intersections along Roberts Drive and Lake Sawyer Road SE. The intersections of Roberts Drive/Ten Trails Parkway SE and Roberts Drive/Ten Trails Place SE have been constructed as part of Phase 1A and will provide access to Plat A through the construction of the north legs at both intersections. Ten Trails Parkway will be extended through the site and ultimately intersect with Lake Sawyer Road SE.

For the North Triangle, access/egress will be via a proposed intersection along SR 169. The access road that intersects SR 169 is referred to as the North Connector within this report.

Per Condition No. 17 of the Villages MPD Conditions of Approval and Condition No. 16 of the Lawson Hills MPD Conditions of Approval, "at the point where building permits have been issued for 850 dwelling units at the Villages and Lawson Hills together, . . . the City shall validate and calibrate . . ." a new regional transportation demand model. This 850 building permit threshold will likely be triggered prior to the completion of Phase 1B, but has not yet been reached at the time of this study. Pursuant to Exhibit F of The Villages and Lawson Hills MPD Development Agreements, when the City has completed (including validation and calibration) its regional transportation model, all of the applicants' subsequent traffic modeling and monitoring shall be done with that regional model, including the Phase 1B Traffic Monitoring Plan mid-point review.

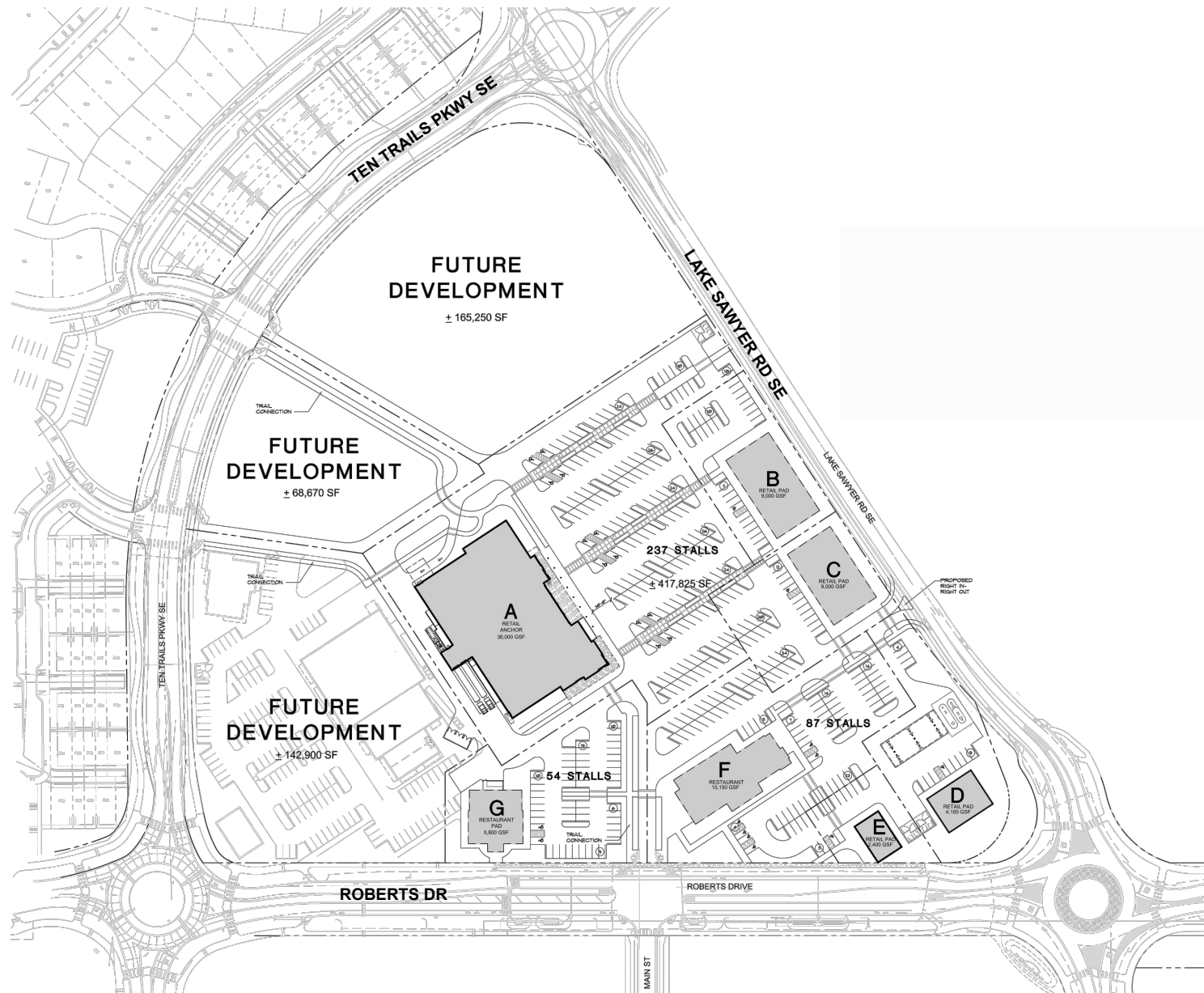


Site Vicinity

Ten Trails and Lawson Hills MPDs - Phase 1B

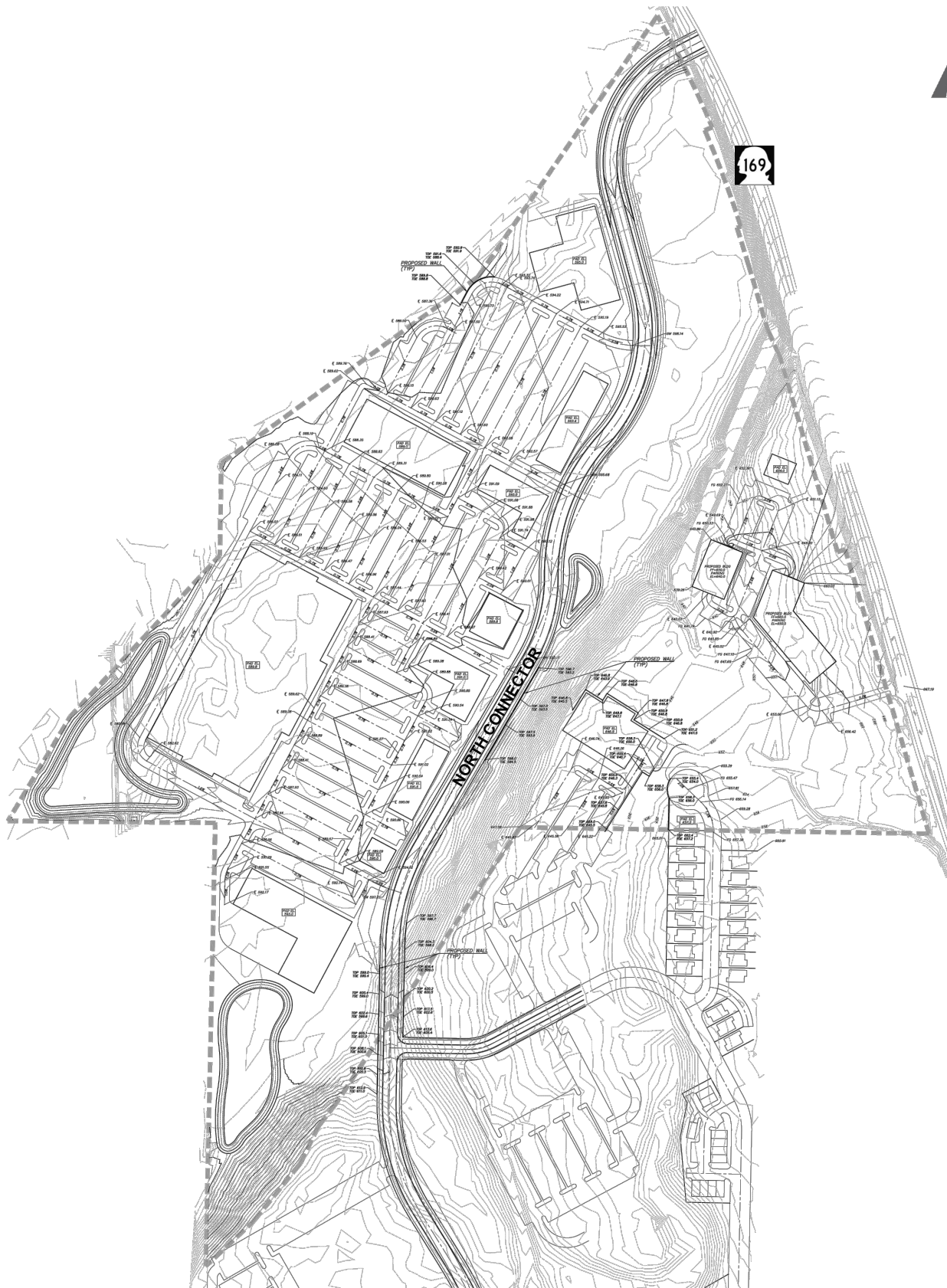
FIGURE

1



Site Plan for Plat A (Ten Trails)

Ten Trails and Lawson Hills MPDs - Phase 1B



Site Plan for the North Triangle (Ten Trails/Lawson Hills)

FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B

transpogroup 

3

Study Area and Scope

The Villages MPD Final Environmental Impact Statement (FEIS) and *Lawson Hills MPD FEIS* determined that at build-out, 25 existing intersections will likely operate below standard with the addition of traffic from the two MPDs. These intersections are identified in Condition No. 15 of The Villages MPD Conditions of Approval and Condition No. 14 of the Lawson Hills MPD Conditions of Approval. Ten of these intersections are located in the Cities of Covington or Maple Valley and per Condition No. 15 of The Villages MPD Conditions of Approval and Condition No. 14 of the Lawson Hills MPD Conditions of Approval, these intersections are not evaluated as part of this report. This report evaluates traffic operations at the remaining 15 existing intersections, all of which are identified in Table 11-5-1 of The Villages and Lawson Hills MPD Development Agreements and located in the City of Black Diamond or unincorporated King County, as well as seven future intersections providing access to Roberts Drive (No. 5 and No. 6 below), Lawson Street (No. 18 below), SR 169 (No. 19 and No. 20 below), and Lake Sawyer Road SE (No. 21 and No. 22 below). Study intersections are listed below.

1. SE 288th Street/216th Avenue SE
2. SE 288th Street/232nd Avenue SE
3. SE Covington-Sawyer Road/216th Avenue SE
4. SE Auburn-Black Diamond Road/218th Avenue SE
5. Roberts Drive/Ten Trails Parkway SE
6. Roberts Drive/Ten Trails Place SE
7. Roberts Drive/Lake Sawyer Road SE
8. Roberts Drive/Morgan Street
9. SR 169/SE 288th Street
10. SR 169/SE Black Diamond-Ravensdale Road
11. SR 169/Roberts Drive
12. SR 169/Baker Street
13. SR 169/Lawson Street
14. SR 169/Jones Lake Road
15. SR 169/SE Green Valley Road
16. SE Kent-Kangley Road/Landsburg Road SE
17. SE Auburn-Black Diamond Road/SE Green Valley Road
18. Lawson Street/Lawson Parkway
19. SR 169/Pipeline Road
20. SR 169/North Connector
21. Lake Sawyer Road SE/Ten Trails Parkway SE
22. Lake Sawyer Road SE/Plat A Driveway

Intersections No. 5, No. 20, and No. 21 are also identified in Condition No. 15 of The Villages MPD Conditions of Approval and Condition No. 14 of the Lawson Hills MPD Conditions of Approval. One additional future intersection (SR 169/South Connector) described in these conditions was not evaluated as part of this report because this intersection will be constructed in conjunction with a subsequent development phase.

Traffic operations were evaluated at study intersections during average weekday PM peak hour conditions. The PM peak hour reflects the highest hourly traffic volumes throughout an average day and typically occurs between 4:00 and 6:00 p.m.

The report begins by describing existing and future without-project PM peak hour traffic volumes and traffic operations. Future with-project traffic volumes and traffic operations are then described along with an assessment of the internal road network of both MPDs. Any intersection projected to operate below standard is further evaluated to estimate when this operation will first occur and what improvement(s) will be necessary to ensure acceptable operations with project traffic. Next, maximum vehicle queues at study intersections are

compared to the available storage. The report concludes by evaluating the construction and improvement triggers of Pipeline Road, and addresses Phase 1B development with respect to the City of Black Diamond's transportation concurrency requirements.

Existing Conditions

This section describes the existing traffic volumes and traffic operations at study area intersections. This section also outlines the Ten Trails and Lawson Hills MPD improvements that were completed at the time of data collection.

Existing Traffic Volumes

Existing weekday PM peak hour traffic volumes were collected at study intersections in November 2019 and are illustrated in Figure 4 and Figure 5. These volumes were collected on representative weekdays with public schools in session. The timeframe for these traffic counts—late autumn—corresponds with the traffic counts collected in preparing *The Villages MPD – Phase 1A Traffic Impact Study* (Traffic Monitoring Report) (“Phase 1A TMR”) dated February 2011 and *The Villages and Lawson Hills MPDs – Phase 2 Traffic Monitoring Report* (“Phase 2 TMR”) dated December 2013, as recommended in Exhibit F of The Villages and Lawson Hills MPD Development Agreements.

Existing Traffic Operations

The operational characteristics of an intersection are determined by calculating the intersection’s level of service (LOS). An intersection as a whole and its individual turning movements can be described alphabetically with a range of levels of service (A through F), with LOS A indicating free-flow traffic and LOS F indicating congestion and long vehicle delays. Level of service is measured in average delay per vehicle and is typically reported for the intersection as a whole at signalized intersections and for the approach or turning movement that experiences the most delay at unsignalized intersections. Appendix A provides a more detailed explanation of intersection level of service.

Existing PM peak hour levels of service, delays and as applicable, volume-to-capacity (v/c) ratios were calculated at study intersections based on existing peak hour factors (PHFs) and methodologies contained in the *Highway Capacity Manual, 6th Edition* (Transportation Research Board). These are the same methodologies used in evaluating intersection operations in *The Villages Transportation Technical Report (TTR)* (Parametrix, December 2009) and *Lawson Hills TTR* (Parametrix, December 2009)⁵ as well as the City’s Comprehensive Plan (2019). With the exception of two study intersections, existing traffic control and channelization was consistent with the existing conditions previously studied as part of *The Villages* and *Lawson Hills TTRs* as well as the *Phase 1A* and *Phase 2 TMRs*. The following two intersections have been improved per Conditions of Approval described below:

- The south leg of SE 288th Street/216th Avenue SE was rechannelized to provide a refuge/merge area for westbound left-turning vehicles (per Conditions No. 5 and 62 of The Villages MPD Preliminary Plat 1A Conditions of Approval).
- Lake Sawyer Road SE was shifted west and a single-lane roundabout was constructed at Roberts Drive/Lake Sawyer Road SE (per Conditions No. 17 and 62 of The Villages MPD Preliminary Plat 1A Conditions of Approval).

Existing conditions are summarized in Table 3. Appendix B contains detailed LOS worksheets for all study intersections.

⁵ The Villages TTR was included in Technical Appendix B of *The Villages MPD Final Environmental Impact Statement (FEIS)* and the Lawson Hills TTR was included in Technical Appendix B of the *Lawson Hills MPD FEIS*.

The City of Black Diamond's adopted LOS standard is LOS C or better for intersections not located along SR 169. This standard applies to five existing study intersections. For SR 169 intersections, the City's LOS standard is LOS D or better, consistent with the standard set by the WSDOT. This standard applies to seven existing study intersections. The LOS standard for intersections in unincorporated King County is LOS E or better and this standard applies to three existing study intersections. Of the seven future study intersections, five are subject to City of Black Diamond LOS standards and two are subject to WSDOT LOS standards.

As illustrated in Table 3, the majority of existing study intersections meet the applicable LOS standard with the exception of three intersections: (1) SR 169/SE 288th Street, (2) SR 169/SE Black Diamond-Ravensdale Road, and (3) SR 169/Roberts Drive. These intersections are subject to LOS D or better standards and operate at LOS E, LOS F, and LOS E, respectively, under existing conditions. Planned or recommended improvements at these intersections are addressed in later sections of this report.

Table 3. Existing PM Peak Hour Level of Service Summary

ID #	Intersection	LOS			
		Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
1	SE 288th St/216th Ave SE	C	C	18.6	WB
2	SE 288th St/232nd Ave SE	C	B	10.6	NB
3	SE Covington-Sawyer Rd/216th Ave SE	C	B	10.5	-
4	SE Auburn-Black Diamond Rd/218th Ave SE	E	B	14.6	NB
7	Roberts Dr/Lake Sawyer Rd SE	C	A	5.6	0.18
8	Roberts Dr/Morgan St	C	B	10.6	NB
9	SR 169/SE 288th St	D	E	38.2	EBL
10	SR 169/SE Black Diamond-Ravensdale Rd	D	F	>120	WB
11	SR 169/Roberts Dr	D	E	40.5	EBL
12	SR 169/Baker St	D	D	27.3	EB
13	SR 169/Lawson St	D	C	20.3	EB
14	SR 169/Jones Lake Rd	D	B	14.2	EB
15	SR 169/SE Green Valley Rd	D	C	19.4	EB
16	SE Kent-Kangley Rd/Landsburg Rd SE	E	E	41.2	SB
17	SE Auburn-Black Diamond Rd/SE Green Valley Rd	E	C	24.9	NBL

Source: HCM 6th Edition and Transpo Group, 2020

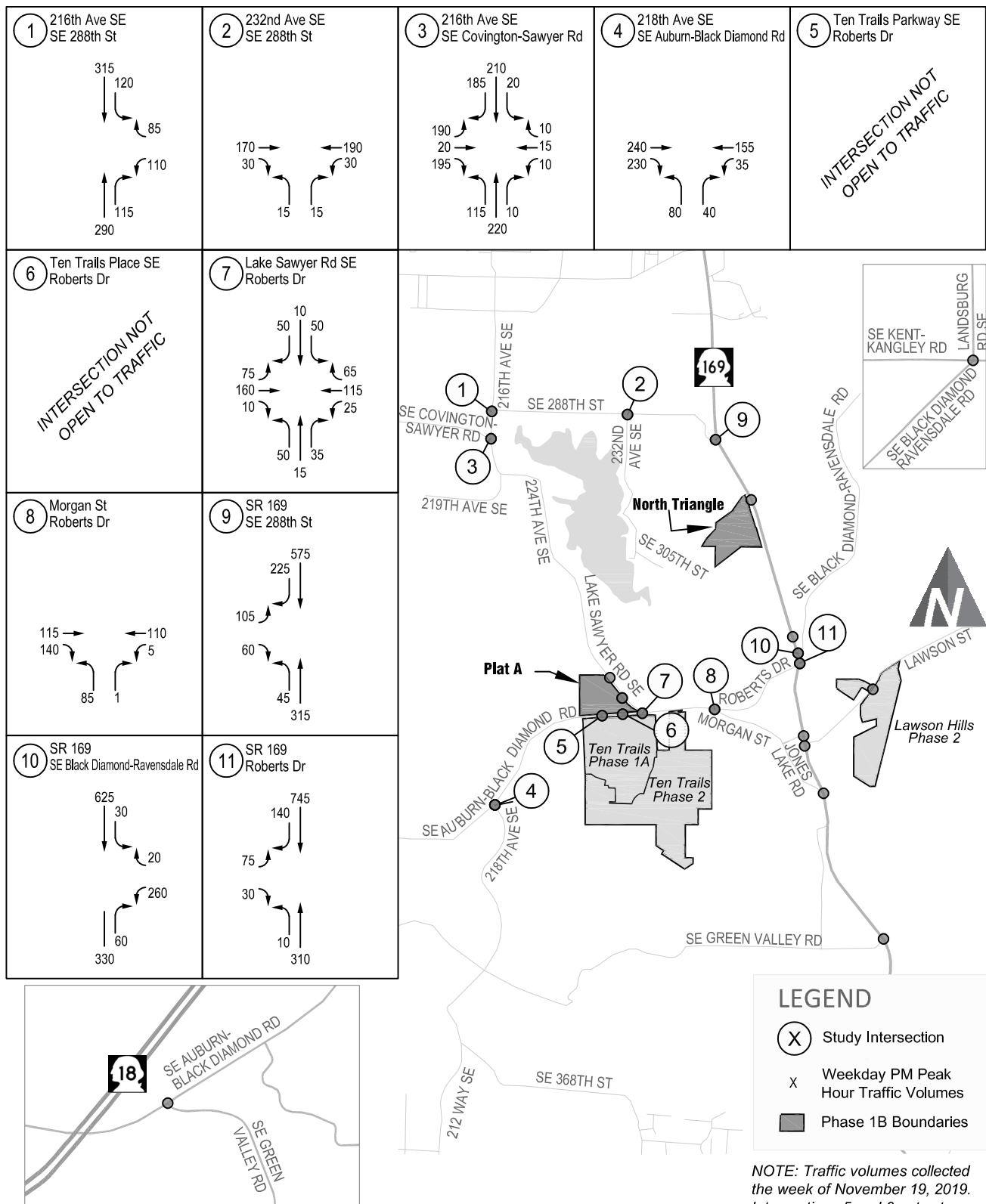
Note: NB = northbound approach; NBL = northbound left-turning movement; SB = southbound approach; EB = eastbound approach; EBL = eastbound left-turning movement; WB = westbound approach; WBL = westbound left-turning movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

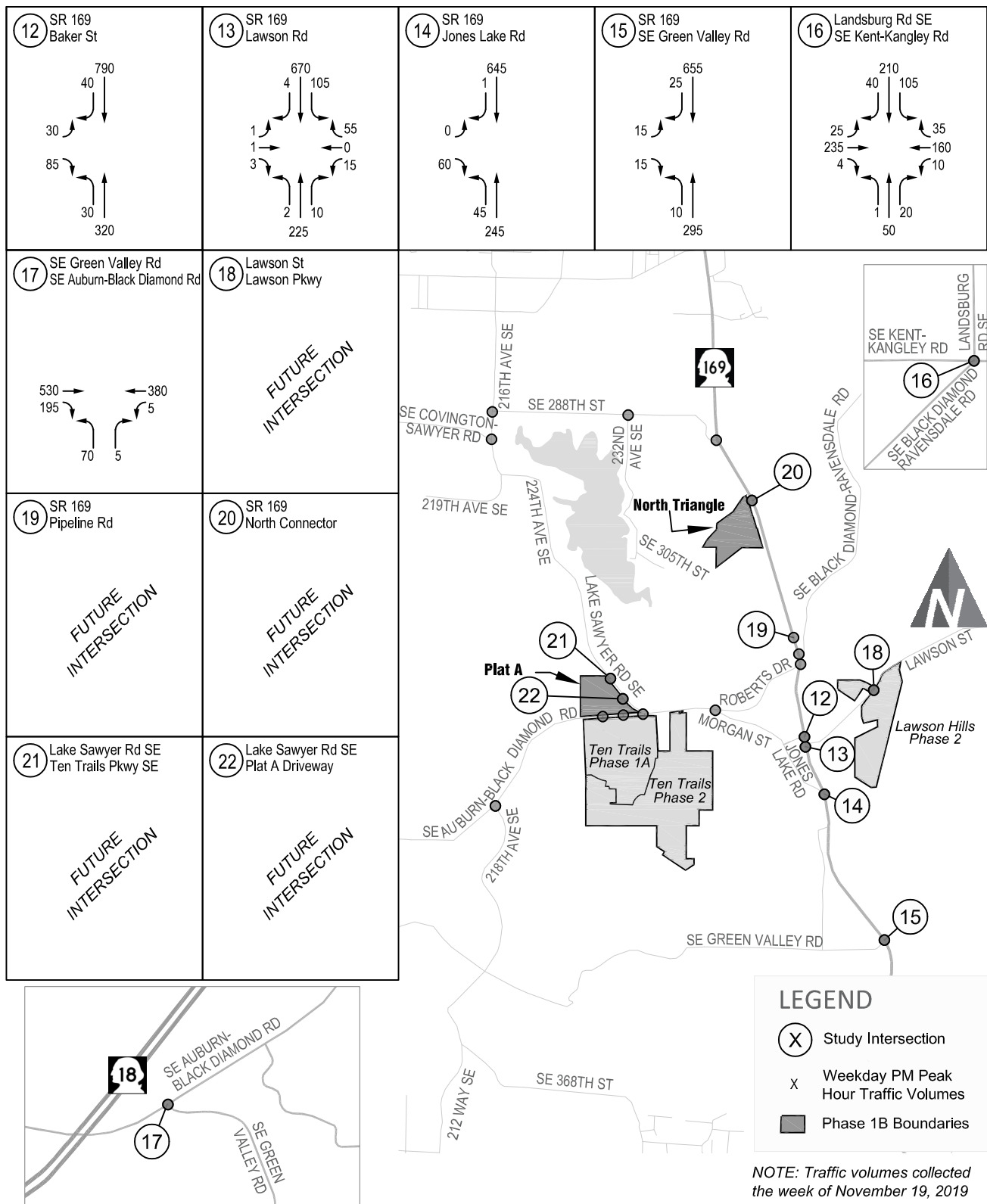
3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control



Existing PM Peak Hour Traffic Volumes (Intersections 1-11) FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B



Existing PM Peak Hour Traffic Volumes (Intersections 12-22) FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B

Future Without-Project Conditions

This section describes the future without-project traffic volumes and traffic operations at study intersections as of 2032, the anticipated build-out year of Phase 1B. It also summarizes updated trip generation for Phases 1A and 2 of the overall Ten Trails and Lawson Hills MPDs, updated trip distribution and assignment, and planned improvements that are expected to be complete prior to 2032.

Future Without-Project Trip Generation

Weekday PM peak hour trip generation for Phases 1A and 2 was estimated based on the size and type of development and assumptions outlined in the *Trip Generation Manual* (Institute of Transportation Engineers (ITE), 10th Edition) and the *Trip Generation Handbook* (ITE, 3rd Edition). This methodology is primarily consistent with that used in *The Villages* and *Lawson Hills TTRs*, but incorporates updates to the *Trip Generation Manual* that have occurred since the *TTRs* were published and reevaluates the appropriate land use codes⁶. Weekday PM peak hour trip regression equations from the most recent edition of the *Trip Generation Manual* were used for all land uses in estimating vehicle trip generation, consistent with the approach and methodology used in the *TTRs*. Since trip regression equations were used, the number of trips per dwelling unit generally decreases as the number of units increase; an effective trip rate⁷ for the trips per dwelling unit was back-calculated based on the trip regression equation. A summary of the current Phase 1A and Phase 2 development programs of the Ten Trails and Lawson Hills MPDs through build-out of Phase 1B (~2032) and updated trip generation estimates are summarized in Table 4. Detailed trip generation calculation worksheets are included in Appendix C.

⁶ In the *TTRs*, ITE Land Use 770 (Business Park) was used for office trip generation and as part of this analysis, Land Use 710 (General Office Building) was used. Land Use 710 (General Office Building) is described as "a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted. An office building or buildings may contain a mixture of tenants including professional services, insurance companies, investment brokers, and tenant services, such as a bank or savings and loan institution, a restaurant, or cafeteria and service retail facilities." Alternatively, Land Use 770 (Business Park) is described as "a group of flex-type or incubator one- or two-story buildings served by a common roadway system...The space may include offices, retail and wholesale stores, restaurants, recreational areas and warehousing, light industrial, or scientific research functions. The average mix is 20 to 30 percent office/commercial and 70 to 80 percent industrial/warehousing." While the office space as part of Phase 1B may include some industrial/warehousing space, the proposed plans are more consistently represented by Land Use 710. Additionally, while comparing ITE Land Uses for office space, it was found that the trip generation equations for Land Use 710 (General Office Building) were based off the largest sample size (66 studies), while trip generation equations for other office-related Land Uses were based off a much smaller sample size (less than 20 studies).

⁷ Section 6.2 of The Villages MPD Development Agreement (November 2011) identifies trip rates that are different than the effective trip rates used to estimate project trip generation but the trip rates in the Development Agreement were never intended to be used for off-site impact analysis and instead, only apply to internal public and private streets within the MPD.

Table 4. PM Peak Hour Project Trip Generation Estimates – Phases 1A and 2

Land Use	Unit ¹	Size	Gross Trips	Internal Trips	Pass-by Trips	Net New Trips
			Total (In/Out)	Total (In/Out)	Total (In/Out)	Total (In/Out)
Ten Trails MPD						
Single-Family Residential	DUs	884	823 (518/305)	138 (93/45)	--	685 (425/260)
Multi-Family Residential	DUs	271	115 (70/45)	15 (11/4)	--	100 (59/41)
Age-Qualified Residential	DUs	311	116 (71/45)	15 (10/5)	--	101 (61/40)
Elementary School ²	Students	600	102 (49/53)	31 (15/16)	--	71 (34/37)
Office	KSF	45	53 (8/45)	17 (7/10)	--	36 (1/35)
Retail	KSF	145	715 (343/372)	142 (43/99)	114 (57/57)	459 (243/216)
Ten Trails MPD Total			1,924 (1,059/865)	358 (179/179)	114 (57/57)	1,452 (823/629)
Lawson Hills MPD						
Single-Family Residential	DUs	106	107 (67/40)	31 (16/15)	--	76 (51/25)
Multi-Family Residential	DUs	72	32 (20/12)	--	--	32 (20/12)
Elementary School ²	Students	600	102 (49/53)	31 (15/16)	--	71 (34/37)
Lawson Hills MPD Total			241 (136/105)	62 (31/31)	--	179 (105/74)
Total (Phases 1A and 2)			2,165 (1,195/970)	420 (210/210)	114 (57/57)	1,631 (928/703)

1. DUs= dwelling units; KSF=1,000 square feet

2. For school-related trips, it was assumed that 30 percent of trips are generated by residential uses within each of the respective Ten Trails and Lawson Hills MPDs.

Future Without-Project Intersection Improvements

With the exception of five study intersections, existing traffic control and channelization were assumed at study intersections. Improvements at these five intersections have been either implemented following existing traffic counts (two intersections) or are planned improvements with an expected completion date prior to the build-out of Phase 1B (three intersections). All improvements in the planning phase are tied to Phase 1A of the Ten Trails MPD. In evaluating future without-project conditions, the following improvements were assumed at these intersections:

- **Roberts Drive/Ten Trails Parkway SE**

A single-lane roundabout was proposed at this location as part of Phase 1A development. This roundabout has been constructed and opened to traffic since traffic counts were collected in November 2019.

- **Roberts Drive/Ten Trails Place SE**

A traffic signal was proposed at this location as part of Phase 1A development. The intersection has been constructed as a side-street stop-controlled intersection and has opened to traffic since traffic counts were collected in November 2019.

- **SR 169/Roberts Drive**

Two phases of improvements will be implemented at this intersection. First phase improvements include the realignment of the existing “Y” intersection. As part of the first phase improvement, the southern portion of the “Y” intersection will be realigned to intersect SR 169 at a right angle, and the northern portion will function as a southbound right turn slip lane. The intersection will remain side-street stop-controlled. First phase improvements will be implemented in 2020.

Final phase improvements include conversion to a single-lane roundabout. Access management will also be implemented along SR 169 between Roberts Drive and the

future Pipeline Road roundabout to improve safety conditions by eliminating left-turning maneuvers. While left-turning maneuvers will be eliminated, the proposed roundabouts at Roberts Drive and Pipeline Road will facilitate turnarounds such that overall travel patterns are maintained. Final phase improvements will be constructed and open to traffic in 2023.

- **SR 169/Pipeline Road**

In coordination with the above improvements, and to serve future Pipeline Road, a single-lane roundabout with a southbound right-turn lane will be constructed where Pipeline Road is expected to intersect with SR 169 (Summit Drive under existing conditions). While the southbound right-turn lane will only serve a few existing businesses upon initial construction, the right-turn will be pivotal when Pipeline Road is ultimately constructed. As discussed above, this roundabout along with the Roberts Drive roundabout will also facilitate turnarounds. This improvement will be constructed and open to traffic in 2023.

- **SR 169/Black Diamond-Ravensdale Road**

As discussed above, access management will be implemented between Roberts Drive and Pipeline Road. As a result, at SR 169/Black Diamond-Ravensdale Road, northbound rights onto Black Diamond-Ravensdale Road and westbound rights onto SR 169 will continue, with southbound lefts onto Black Diamond-Ravensdale Road and westbound lefts onto SR 169 facilitated through the proposed roundabouts. This improvement will be implemented in 2023.

Improvements at the following five intersections were identified in the Phase 1A and Phase 2 TMRs, and subsequently included in the corresponding Implementation Schedules; however, given the amount of time that has passed since completion of the most recent TMR and adjustments to the overall project schedule, the timing and scope of these improvements have been reevaluated as part of this analysis.

- Roberts Drive/Ten Trails Place SE
- Roberts Drive/Morgan Street
- SR 169/SE 288th Street
- SE 288th Street/216th Avenue SE
- SE Auburn-Black Diamond Road/SE Green Valley Road

An improvement at Roberts Drive/Lake Sawyer Road SE was also identified as part of the Phase 2 TMR; however, this analysis found that improvement at this intersection is no longer necessary in conjunction with Phase 1B. Under future without-project conditions, this intersection meets the applicable v/c standard. Further, Phase 1B includes the extension of Ten Trails Parkway from Roberts Drive to Lake Sawyer Road SE which results in a shift of vehicular traffic from Roberts Drive. Future with-project results are included in the following section and show that this intersection operates at acceptable conditions upon full build-out of Phase 1B assuming existing traffic control and channelization.

Future Without-Project Traffic Volumes

Future PM peak hour traffic volumes without Phase 1B were estimated at study intersections by applying annual growth at study area intersections and adding future trips generated by the Ten Trails MPD Phases 1A and 2⁸, and the Lawson Hills MPD Phase 2⁹, as outlined in Table 4.

Due to the amount of time that has passed since the most recent TMR, growth rates were reevaluated based on recent (pre-pandemic) traffic data. Recent traffic counts showed an increase in traffic throughout the study area consistent with the previously applied annual growth rate of 1.5 percent, with slightly lower growth along SR 169. As such, a growth rate of 1.0 percent per year along SR 169 and 1.5 percent per year at all other intersections was applied to the existing conditions for thirteen years¹⁰. This growth rate accounts for traffic generated by infill development within the City of Black Diamond as well as traffic generated by other new development located outside of Black Diamond.

Trip distribution patterns for without-project conditions were based on the assumptions outlined in *The Villages TTR* and *Lawson Hills TTR* and generally consistent with the distribution and assignment used as part of the Phase 1A and Phase 2 TMRs. Some refinements were made based on the improvements along SR 169 between Roberts Drive and future Pipeline Road¹¹. Trip distribution percentages/patterns for the Ten Trails and Lawson Hills MPDs are illustrated in Figure 6 and Figure 7 and trip assignment is illustrated in Figure 8 and Figure 9. Total future without-project traffic volumes are illustrated in Figure 10 and Figure 11.

⁸ Phase 1A of The Ten Trails MPD includes 429 single-family dwelling units, 271 multi-family dwelling units, 45,000 square feet (sf) of office space, 145,000 sf of retail space, and a 600-student elementary school. Phase 2 of the Ten Trails MPD includes 455 single family dwelling units and 311 age-qualified dwelling units. This mix of development will generate approximately 1,452 net new trips during the weekday PM peak hour. Of note, Phases 1A and 2 of the Ten Trails MPD are currently under construction and thus a small portion of Phase 1A and Phase 2 was accounted for as part of the existing counts. However, much of the traffic entering and exiting the site at the time of counts consisted of construction vehicle traffic. While this traffic was included in the existing conditions to analyze the traffic conditions at the time of counts, project traffic was removed prior to projecting without-project traffic volumes and all projected trips associated with Phases 1A and 2 were then distributed through the study area intersections. Traffic was removed from the roadway network based on the anticipated trip distribution and assignment for the Ten Trails MPD.

⁹ This phase of the Lawson Hills MPD includes 106 single-family dwelling units, 72 multi-family dwelling units and a 600-student elementary school. This mix of development will generate approximately 179 net new trips during the weekday PM peak hour.

¹⁰ With the proposed access management along SR 169 between Roberts Drive and Pipeline Road it is expected that some traffic that makes a westbound left onto SR 169 from Black Diamond-Ravensdale Road under the existing configuration may choose an alternative route. As such, no growth was assumed at this approach, but project trips were still routed through the intersection.

¹¹ It is assumed that a portion of traffic traveling to the MPDs from the north via Landsburg Road will turn right onto SE Kent-Kangley Road instead of continuing straight onto Black Diamond-Ravensdale Road, due to the access management implemented along SR 169. Drivers may be more inclined to travel south along SR 169 instead of turning right on Black Diamond-Ravensdale Road and making a u-turn at SR 169/Pipeline Road. Additionally, a portion of vehicles that currently turn left onto SR 169 from Black Diamond-Ravensdale road were rerouted to turn right on SE Kent-Kangley Road and left onto SR 169. All remaining vehicles that currently turn left onto Black Diamond-Ravensdale Road from SR 169 or turn left onto SR 169 from Black Diamond-Ravensdale Road were rerouted to use the proposed roundabouts as turnarounds.

Future Without-Project Traffic Operations

Like existing conditions, future (~2032) without-project PM peak hour levels of service, average delays and as applicable, v/c ratios were calculated at study intersections based on existing PHFs¹² and methodologies contained in the *Highway Capacity Manual, 6th Edition*. These are the same methodologies used in *The Villages TTR* and *Lawson Hills TTR*.

Results for the future without-project conditions are summarized in Table 5. Appendix B contains detailed LOS worksheets for all study intersections. As illustrated in the table below, six intersections exceed the applicable LOS standard in the future without-project conditions. Improvements at these intersections will be addressed in later sections of this report.

Table 5. Future Without-Project PM Peak Hour Level of Service Summary

ID #	Intersection	LOS			
		Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
1	SE 288th St/216th Ave SE	C	F	58.3	WBL
2	SE 288th St/232nd Ave SE	C	B	11.7	NB
3	SE Covington-Sawyer Rd/216th Ave SE	C	F	107.7	-
4	SE Auburn-Black Diamond Rd/218th Ave SE	E	D	27.5	NB
5	Roberts Dr/Ten Trails Pkwy SE ⁵	C	A	5.9	0.42
6	Roberts Dr/Ten Trails Pl SE	C	F	58.7	NB
7	Roberts Dr/Lake Sawyer Rd SE	C	A	8.5	0.60
8	Roberts Dr/Morgan St	C	C	23.9	NB
9	SR 169/SE 288th St	D	F	>120	EBL
10	SR 169/SE Black Diamond-Ravensdale Rd ⁶	D	D	30.0	WB
11	SR 169/Roberts Dr ⁷	D	B	18.6	0.99
12	SR 169/Baker St	D	F	>120	EB
13	SR 169/Lawson St	D	F	97.3	WB
14	SR 169/Jones Lake Rd	D	C	17.6	EB
15	SR 169/SE Green Valley Rd	D	D	29.5	EB
16	SE Kent-Kangley Rd/Landsburg Rd SE ⁸	E	A	5.7	0.40
17	SE Auburn-Black Diamond Rd/SE Green Valley Rd	E	E	49.4	NBL
18	Lawson St/Lawson Pkwy	C	B	11.3	NB
19	SR 169/Pipeline Rd ⁹	D	A	8.4	0.74

Source: HCM 6th Edition and Transpo Group, 2020

Note: NB = northbound approach; NBL = northbound left-turning movement; SB = southbound approach; EB = eastbound approach; EBL = eastbound left-turning movement; WBL = westbound left-turning movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a single lane roundabout (construction has been completed)

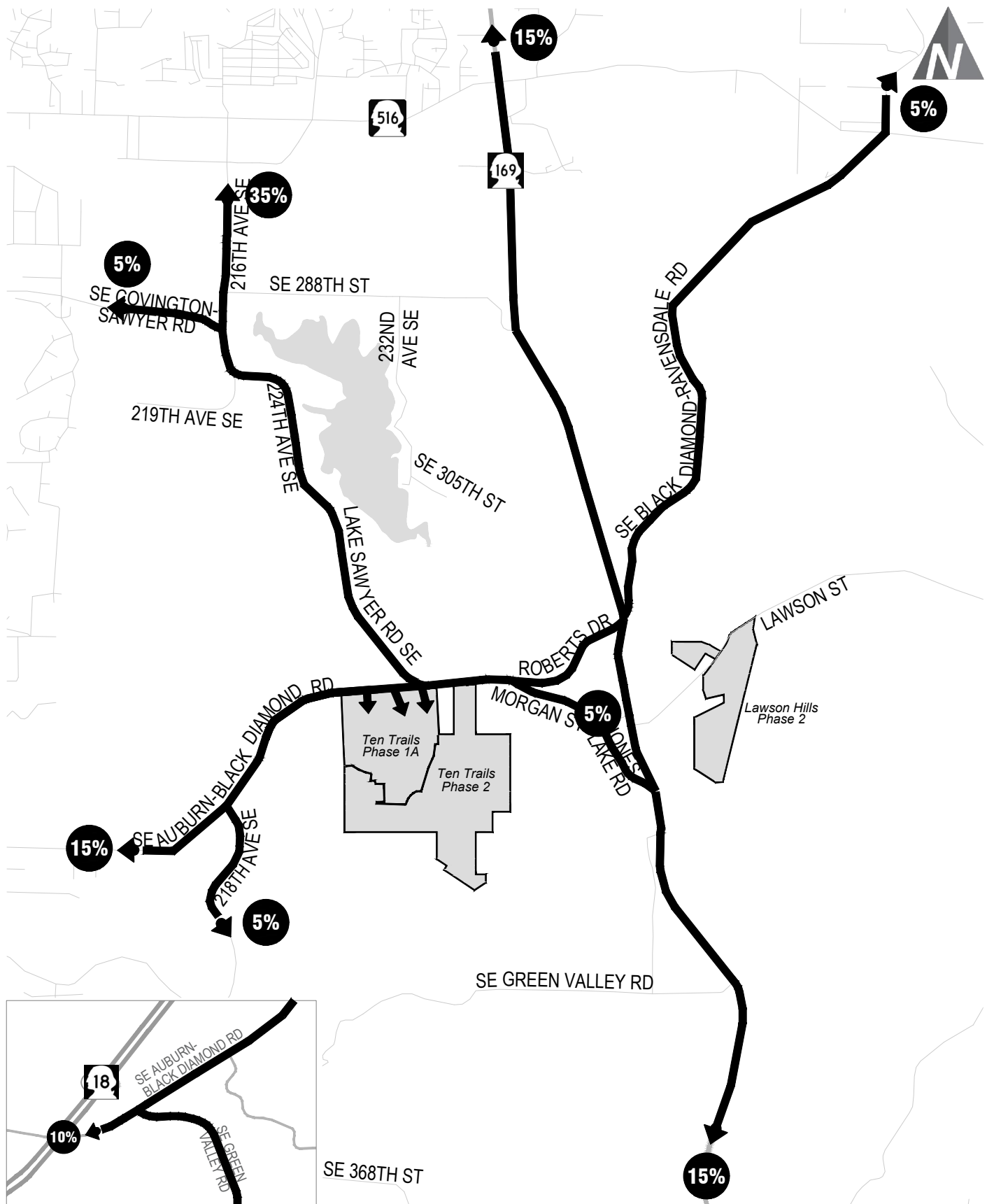
6. Improvement includes access management along SR 169 between Roberts Drive and Pipeline Road

7. Improvement includes installing a single-lane roundabout

8. Improvement includes installing a single-lane roundabout

9. Improvement includes installing a single-lane roundabout and southbound right-turn lane

¹² Existing peak hour factors (PHFs) were used in evaluating future without-project traffic operations at most study intersections but not all. Based on future without-project traffic volumes and recommendations presented in National Cooperative Highway Research Program (NCHRP) Report 599, existing PHFs were increased in evaluating future traffic operations at five study intersections, including SR 169/SE 288th Street, SR 169/SE Black Diamond-Ravensdale Road, SR 169/Roberts Drive, SR 169/SE Green Valley Road, and SE Green Valley Road/SE Auburn-Black Diamond Road. Additionally, NCHRP recommendations were used in estimating PHFs at new intersections, including SR 169/Pipeline Road, Roberts Drive/Ten Trails Parkway SE, and Roberts Drive/Ten Trails Place SE.



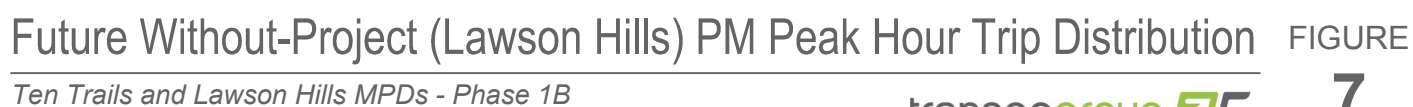
Future Without-Project (Ten Trails) PM Peak Hour Trip Distribution

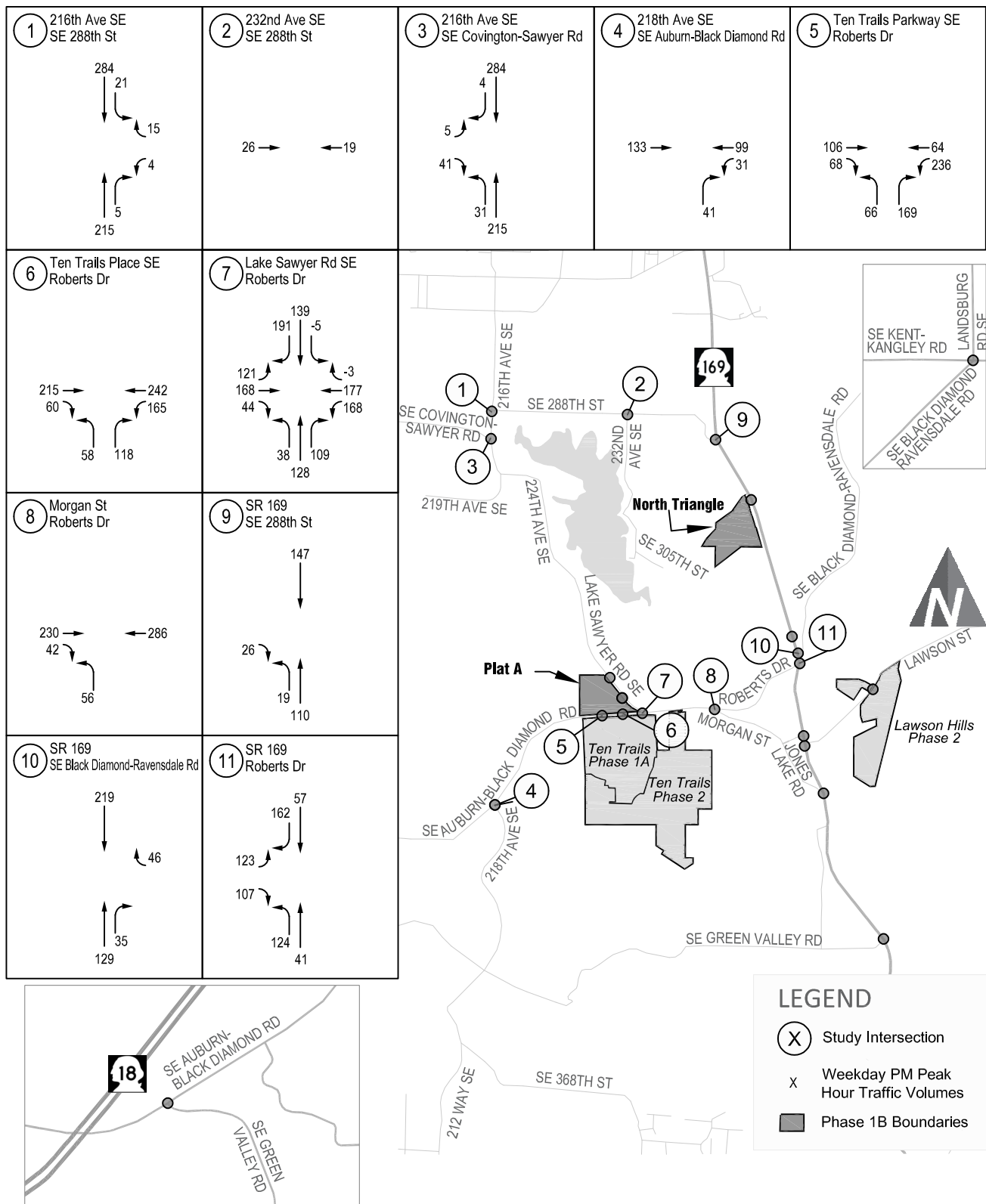
FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B

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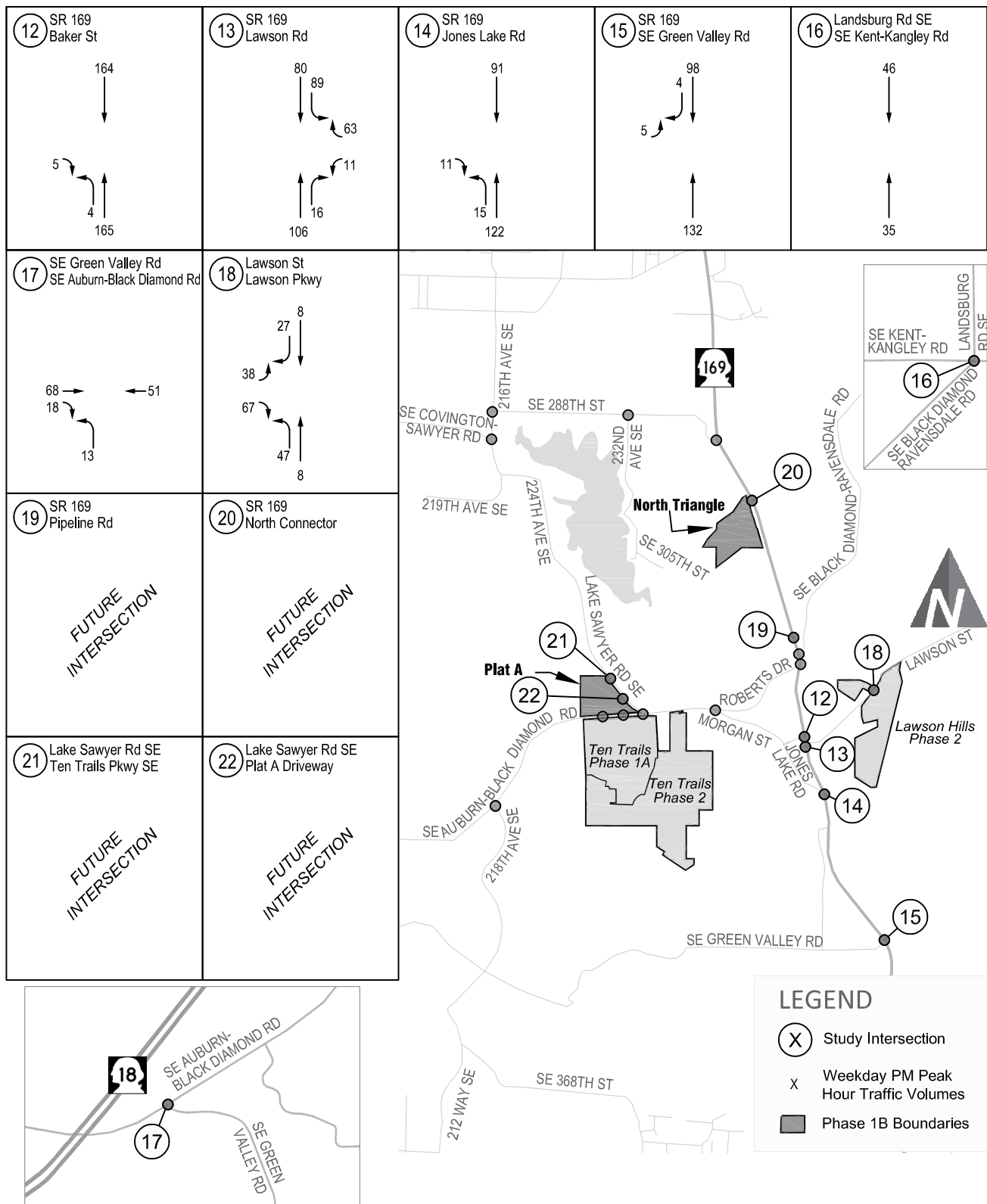




Future Without-Project PM Peak Hour Trip Assignment (Intersections 1-11)

FIGURE

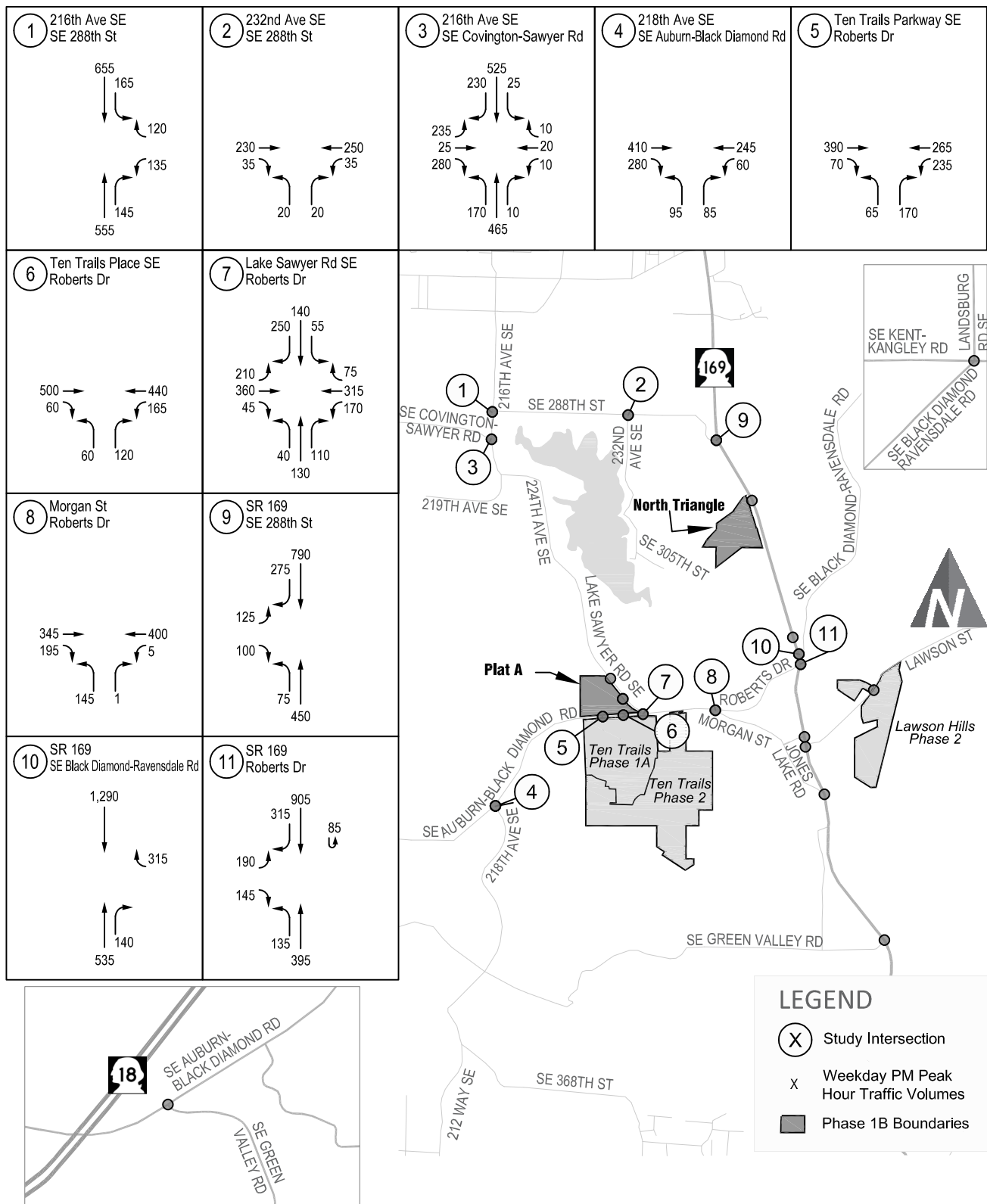
Ten Trails and Lawson Hills MPDs - Phase 1B



Future Without-Project PM Peak Hour Trip Assignment (Intersections 12-22)

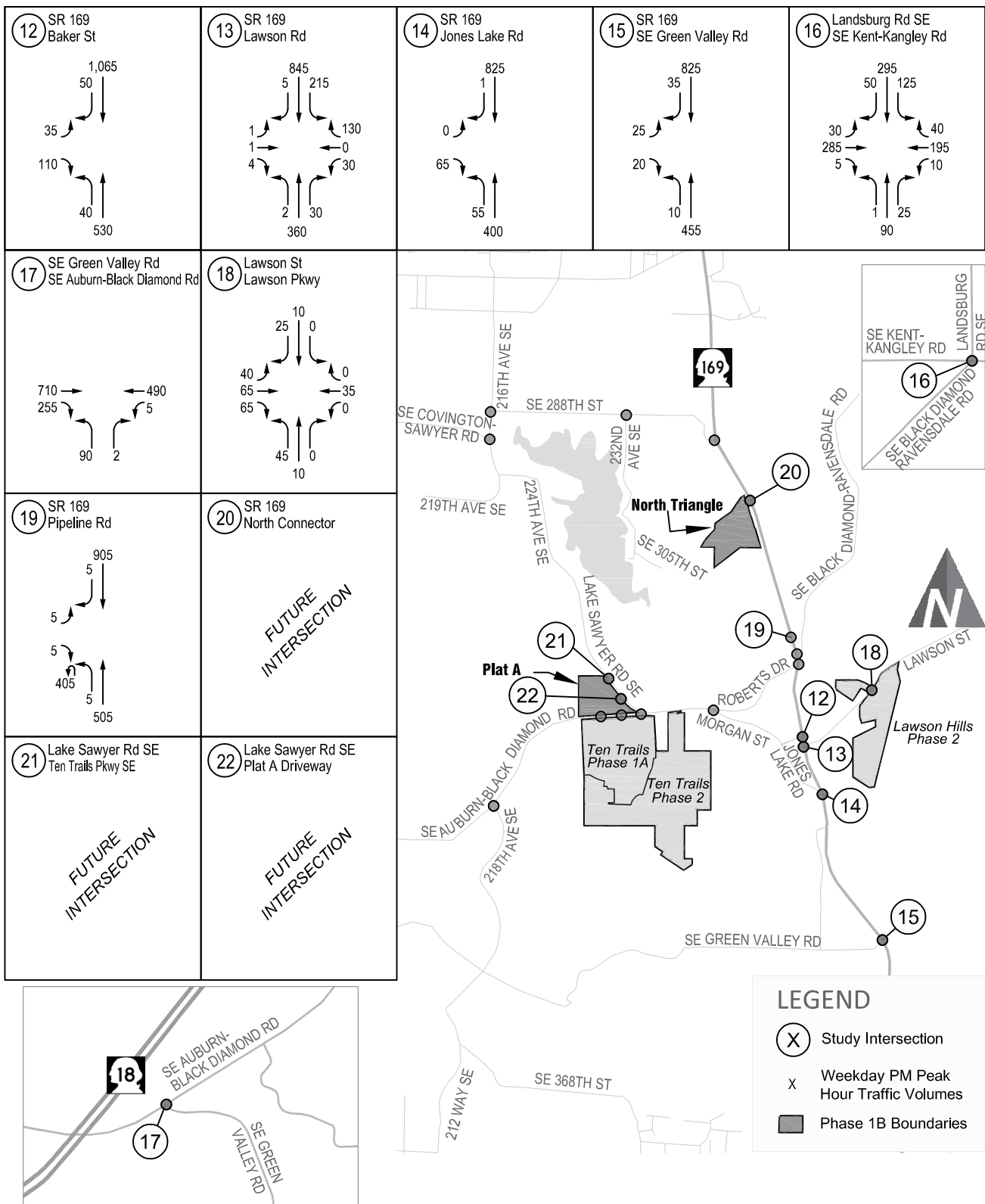
FIGURE

9



Future Without-Project PM Peak Hour Traffic Volumes (Intersections 1-11) FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B



Future Without-Project PM Peak Hour Traffic Volumes (Intersections 12-22) FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B

Future With-Project Conditions

This section describes future with-project traffic volumes and traffic operations at study intersections through build-out year of Phase 1B. It also summarizes project trip generation, trip distribution and assignment, and identifies which intersections are projected to operate below standard by Phase 1B build-out. The section concludes by addressing the internal road network of both MPDs (in response to Section 6.2 of The Villages and Lawson Hills MPD Development Agreements).

Trip Generation

Weekday PM peak hour trip generation for Phase 1B was estimated based on the size of development and analysis assumptions outlined in *The Villages TTR* and *Lawson Hills TTR*¹³, consistent with the methodology used to update trip generation estimates for Phases 1A and 2. These assumptions include the use of information from the *Trip Generation Manual* and the *Trip Generation Handbook* to estimate project-generated traffic.

To develop appropriate trip regression equations and properly account for internalized trips, trip generation estimates for Phase 1B were based on two areas of development: Plat A (a portion of Ten Trails) and the North Triangle (the remainder of Ten Trails and Lawson Hills). Trip generation estimates for the North Triangle were developed based on the methodology described above. Consistent with methodologies used in the Phase 2 TMR, Plat A trip generation was estimated by calculating the combined trip generation for Ten Trails Phase 1A, Phase 2 and Plat A and subtracting trips associated with Phases 1A and 2¹⁴. Table 6 summarizes weekday PM peak hour trip generation estimates for Phase 1B¹⁵. More detailed trip generation calculations are included in Appendix C.

As shown, Plat A is estimated to generate approximately 531 net new PM peak hour trips. The trip total does not include project traffic that will be internal to the site (linked trips between the residential, office and retail uses of Phase 1B), nor does it include pass-by trips¹⁶. The total number of net new trips is representative of approximately 531 equivalent residential units (ERUs)¹⁷.

¹³ The *Trip Generation Manual* has been updated since *The Villages* and *Lawson Hills TTRs* were published in December 2009. Weekday PM peak hour trip regression equations from the most recent edition of the *Trip Generation Manual* were used for all land uses in estimating vehicle trip generation consistent with the approach and methodology used for *The Villages* and *Lawson Hills TTRs*.

¹⁴ For trip generation purposes it is expected that Phases 1A and 2 of the Ten Trails MPD will include 884 single-family dwelling units, 271 multi-family dwelling units, 311 age-qualified dwelling units, 45,000 square feet of retail, 145,000 square feet of office, and a 600-student elementary school. Phase 2 of the Lawson Hills MPD will include 106 single-family dwelling units, 72 multi-family dwelling units, and a 600-student elementary school. The Lawson Hills MPD does not include any development as part of Phase 1A. This amount of development represents the full build-out of Phases 1A and 2 which is anticipated prior to the completion of Phase 1B.

¹⁵ Parking allocated to the park-and-ride is not considered as an additional use in the trip generation calculations. Vehicles expected to utilize the park-and-ride are likely to already be on the local roadway network. As such, no new trips are expected to be generated by the park and ride.

¹⁶ Pass-by trips represent vehicular trips that are already present on the roadway network and stop at the site on the way to or from another destination. Consistent with previous assumptions, this analysis assumes that 20 percent of retail trips will be pass-by trips. These trips are factored into the analysis as turning movements at the project driveways, but do not result in additional trips at other external intersections.

¹⁷ Based on the anticipated net new trip generation of the Ten Trails MPD Phases 1A, 1B and 2 combined, one ERU is equivalent to, on average, approximately 1.4 single-family dwelling units.

The North Triangle is estimated to generate approximately 948 net new PM peak hour trips. This trip total does not include project traffic that will be internal to the North Triangle (linked trips between the office and retail uses), nor does it include pass-by trips. The total number of net new trips is representative of approximately 948 ERUs.

At build-out, it is estimated that Phase 1B will collectively generate approximately 1,479 net new PM peak hour trips, representative of approximately 1,479 ERUs¹⁸.

Table 6. PM Peak Hour Project Trip Generation Estimates – Phase 1B Build-Out

Land Use	Unit ¹	Size	Gross Trips	Internal Trips	Pass-by Trips	Net New Trips
			Total (In/Out)	Total (In/Out)	Total (In/Out)	Total (In/Out)
Plat A ²						
Single-Family Residential	DUs	150	134 (84/50)	61 (39/22)	--	73 (45/28)
Multi-Family Residential	DUs	125	51 (31/20)	24 (15/9)	--	27 (16/11)
Office	KSF	40	45 (7/38)	14 (5/9)	--	31 (2/29)
Retail	KSF	180	585 (281/304)	91 (36/55)	94 (47/47)	400 (198/202)
Plat A Total			815 (403/412)	190 (95/95)	94 (47/47)	531 (261/270)
North Triangle ³						
Office	KSF	303	326 (52/274)	43 (9/34)	--	283 (43/240)
Retail	KSF	190	874 (420/454)	43 (34/9)	166 (83/83)	665 (303/362)
North Triangle Total			1,200 (472/728)	86 (43/43)	166 (83/83)	948 (346/602)
Phase 1B Total			2,015 (875/1,140)	276 (138/138)	260 (130/130)	1,479 (607/872)

1. DUs= dwelling units; KSF=1,000 square feet

2. Represents the portion of Ten Trails Phase 1B that is located directly north of Roberts Drive

3. Represents Phase 1B of the Lawson Hills MPD and the immediately adjacent portion of the Ten Trails MPD

With-Project Intersection and Roadway Improvements

The traffic control and channelization assumptions for future without-project conditions were used for these calculations, with the following additions and adjustments due to the addition of Phase 1B site access points:

- Roberts Drive/Ten Trails Parkway SE**
 The intersection of Roberts Drive/Ten Trails Parkway SE was constructed as a single-lane roundabout as part of Phase 1A. Ten Trails Parkway will extend through Plat A and thus a north leg will be added to this intersection to provide access to Plat A.
- Roberts Drive/Ten Trails Place SE**
 The intersection of Roberts Drive/Ten Trails Place SE was constructed as a side-street stop-controlled intersection as part of Phase 1A. A north leg will be added to this intersection to provide access to Plat A.
- SR 169/North Connector**
 A new roadway (North Connector) will be constructed to provide access to the North Triangle, resulting in a new intersection with SR 169. As part of the future with-project conditions this intersection is evaluated as side-street stop-controlled.

¹⁸ Phases 1A and 2 of the Ten Trails and Lawson Hills MPDs is representative of approximately 1,631 ERUs. Therefore, the two MPDs collectively represent approximately 3,110 ERUs at build-out of Phase 1A, Phase 1B and Phase 2.

- **Lake Sawyer Road SE/Ten Trails Parkway SE**
Ten Trails Parkway will be extended through Plat A and ultimately intersect with Lake Sawyer Road SE as a side-street stop-controlled intersection. As part of the future with-project conditions this intersection is evaluated as side-street stop-controlled.
- **Lake Sawyer Road SE/Plat A Driveway**
A right-in/right-out driveway will be constructed along Lake Sawyer Road SE to provide access to Plat A. As part of the future with-project conditions this intersection is evaluated as side-street stop-controlled.

Trip Distribution and Assignment

Future with-project trip distribution patterns were based on the future without-project assumptions and assumptions outlined within the *Villages* and *Lawson Hills TTRs*. Refinements were made closer to each area of Phase 1B development to account for details regarding access. The added opportunity for linked trips between different areas of the overall Ten Trails and Lawson Hills MPDs¹⁹ results in slight adjustments to the trip distribution and assignment assumed as part of the future without-project conditions. Accounting for this change, trip distribution percentages/patterns and trip assignment for Ten Trails²⁰, Lawson Hills, and the North Triangle under future with-project conditions are illustrated in Figure 12, Figure 13, and Figure 14, respectively.

PM peak hour trips were assigned at study intersections by multiplying the trip generation estimates for Phase 1B in Table 6 and trip generation estimates for Phases 1A and 2 shown in Table 4 by the percentages in Figure 12 (Ten Trails/Plat A), Figure 13 (Lawson Hills), and Figure 14 (North Triangle). The updated trip assignment for Phases 1A and 2 is illustrated in Figure 15 and Figure 16 and the trip assignment for Phase 1B is illustrated in Figure 17 and Figure 18. Of note, volumes shown in Figure 15 and Figure 16 include linked trips between the various areas of the MPDs (e.g. Lawson Hills residential trips to and from the North Triangle).

Traffic generated by Plat A will access/egress the site via intersections along Roberts Drive and Lake Sawyer Road SE. The intersections of Roberts Drive/Ten Trails Parkway SE and Roberts Drive/Ten Trails Place SE have been constructed as part of Phase 1A and will provide access to Plat A through the construction of north legs at both intersections. Ten Trails Parkway will be extended through Plat A and ultimately intersect with Lake Sawyer Road SE.

Plat A project traffic was assigned to these intersections based on (1) the proximity of development to the nearest site access intersection and (2) the anticipated travel patterns shown in Figure 12. For example, vehicles traveling to and from the north would most likely access the site at Lake Sawyer Road SE/Ten Trails Parkway SE, while vehicles traveling to and from the west and south would most likely access the site via Roberts Drive. It was

¹⁹ Of traffic generated by the Lawson Hills MPD, it was assumed that 15 percent would travel to/from the North Triangle, 10 percent would travel to/from Plat A, and 10 percent would travel to/from Phases 1A and 2 of the Ten Trails MPD. Of traffic generated by Phases 1A and 2 of the Ten Trails MPD, it was assumed that 5 percent would travel to/from the North Triangle and 2 percent would travel to/from Plat A. Of traffic generated by Plat A, it was assumed that 5 percent would travel to/from the North Triangle and 2 percent would travel to/from Phases 1A and 2 of the Ten Trails MPD. This is generally consistent with the methodology outlined in the *Villages* and *Lawson Hills TTRs*, as well as the *Phase 2 TMR*, but refined to reflect the current stage of overall development through build-out of Phase 1B.

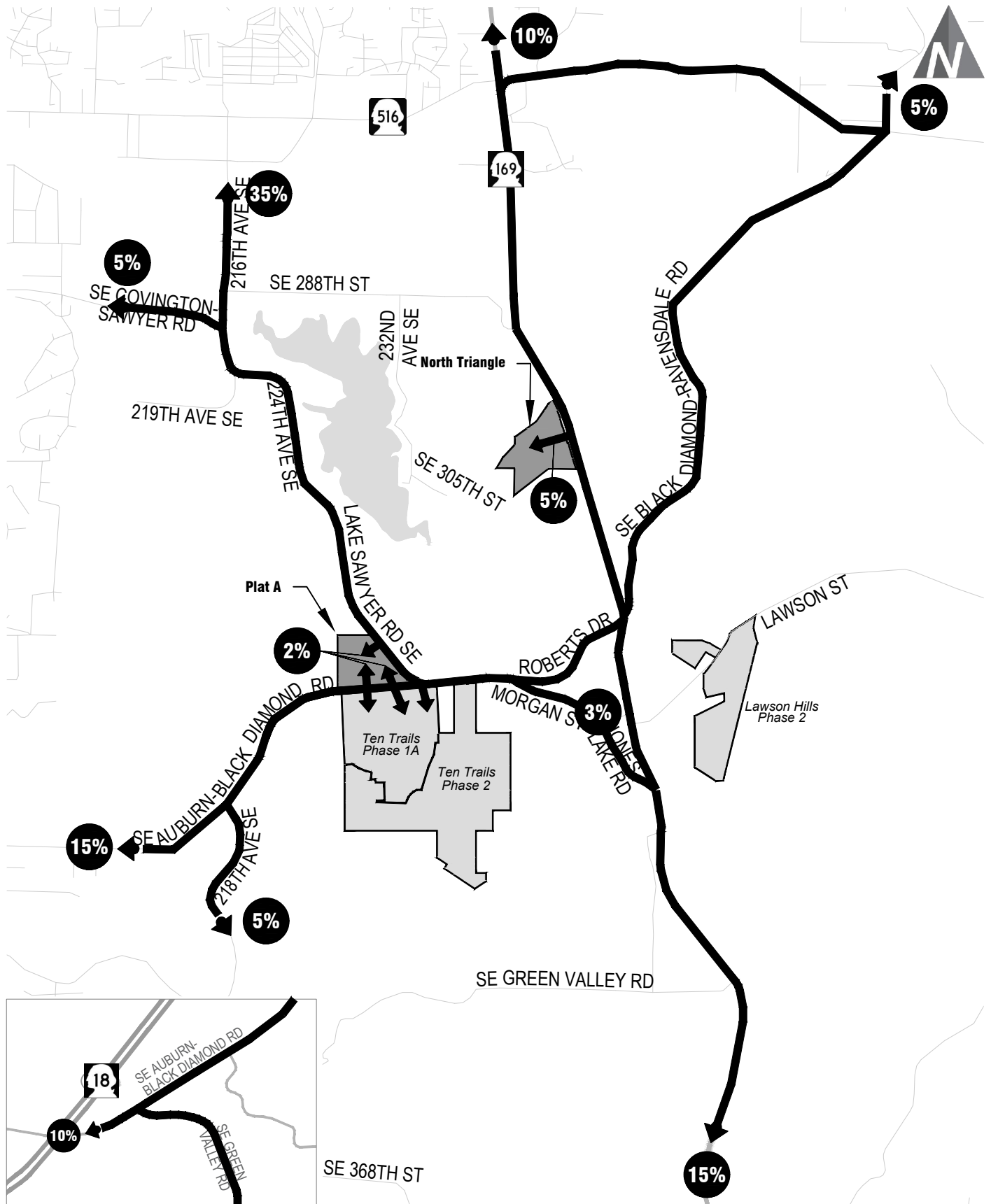
²⁰ The Ten Trails trip distribution encompasses Ten Trails Phases 1A and 2, in addition to Phase 1B Plat A. Separate trip distribution assumptions are presented for the portion of Ten Trails within the North Triangle.

assumed that the majority of vehicles accessing the site from Roberts Drive would use the roundabout at Roberts Drive/Ten Trails Parkway SE.

Traffic generated by the North Triangle will access/egress the site via a proposed intersection along SR 169. The access road that intersects SR 169 is referred to as the North Connector within this report.

Future With-Project Traffic Volumes

Future with-project PM peak hour traffic volumes were estimated at study intersections by applying annual growth at study area intersections and adding future trips generated by Phase 1A, Phase 1B and Phase 2 of the Ten Trails and Lawson Hills MPDs. The resulting traffic volumes reflecting the future with-project PM peak hour conditions through build-out of Phase 1B are illustrated in Figure 19 and Figure 20.



Future With-Project (Ten Trails/Plat A) PM Peak Hour Trip Distribution

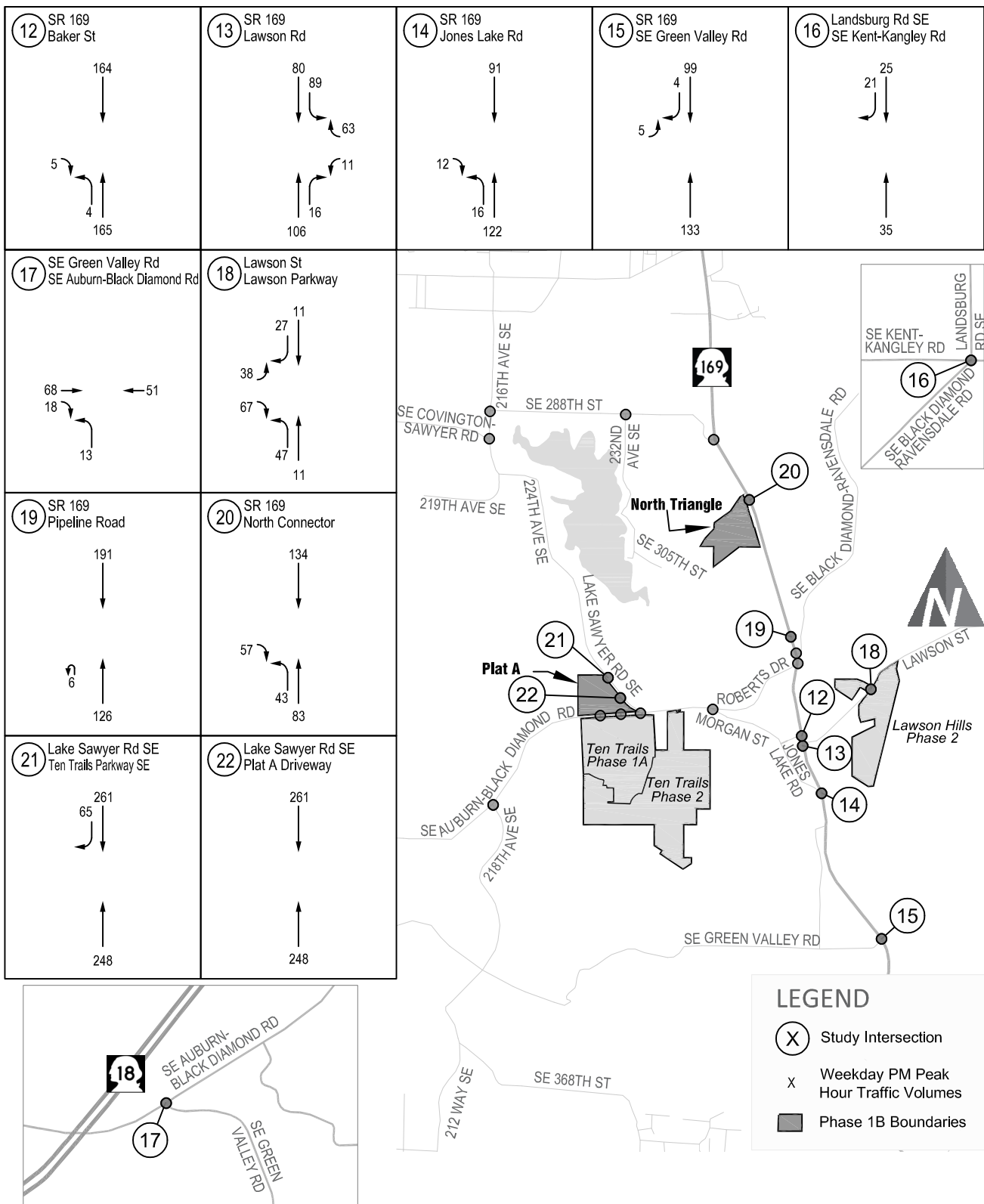
Ten Trails and Lawson Hills MPDs - Phase 1B

FIGURE

12



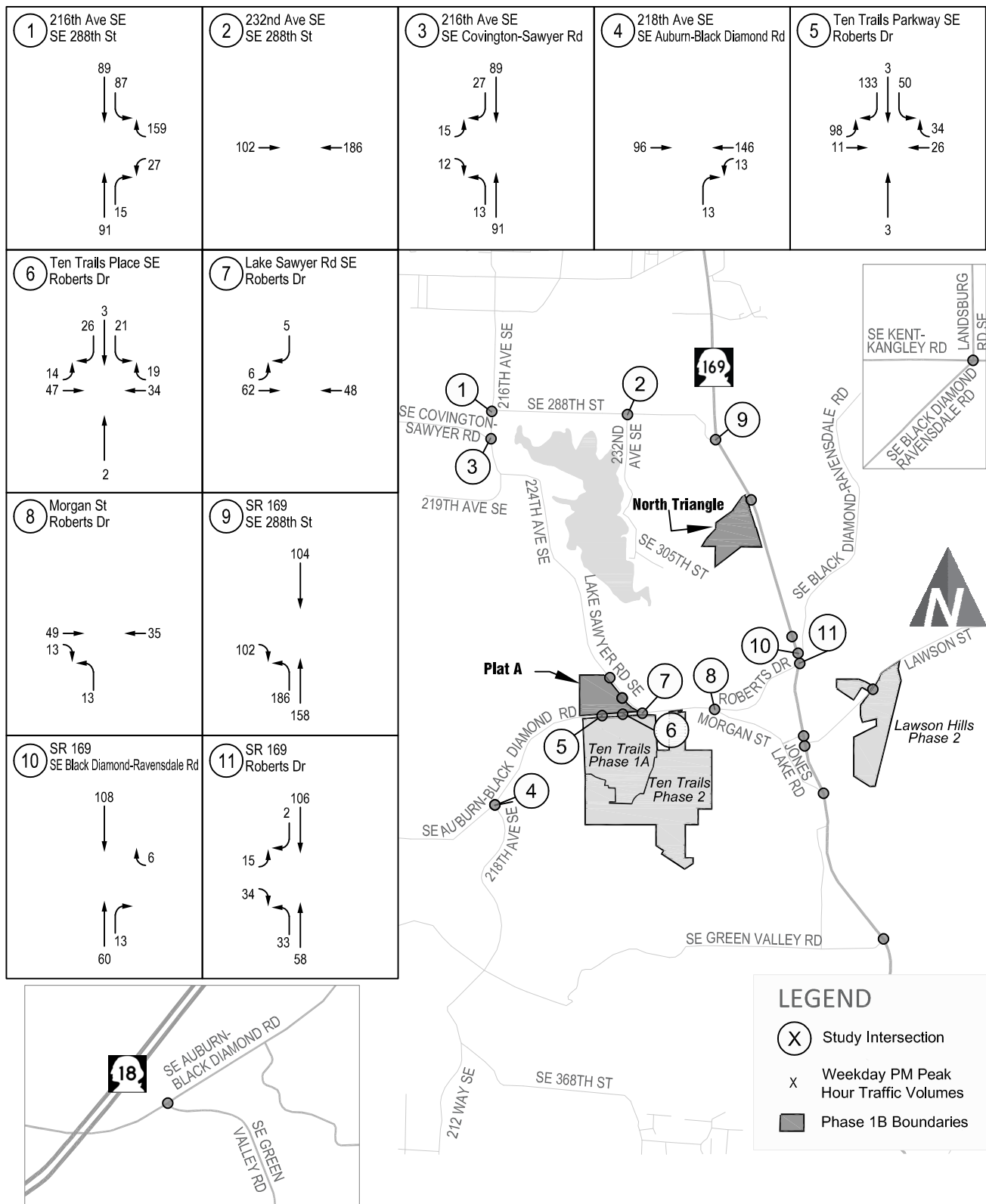




Future With-Project (Ph. 1A/2) PM Peak Hour Trip Assignment (Int. 12-22)

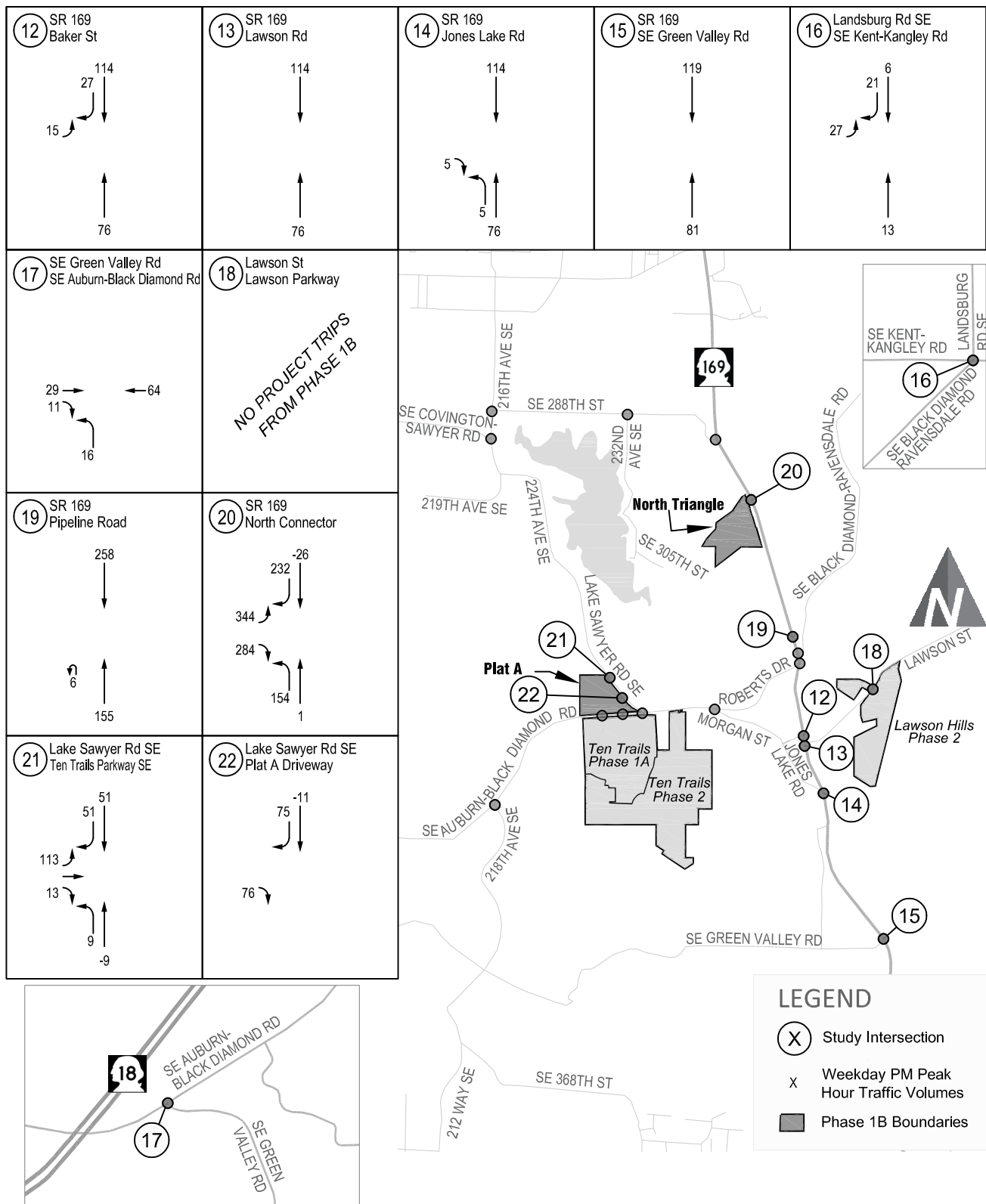
FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B



Future With-Project (Ph. 1B) PM Peak Hour Trip Assignment (Int. 1-11) FIGURE

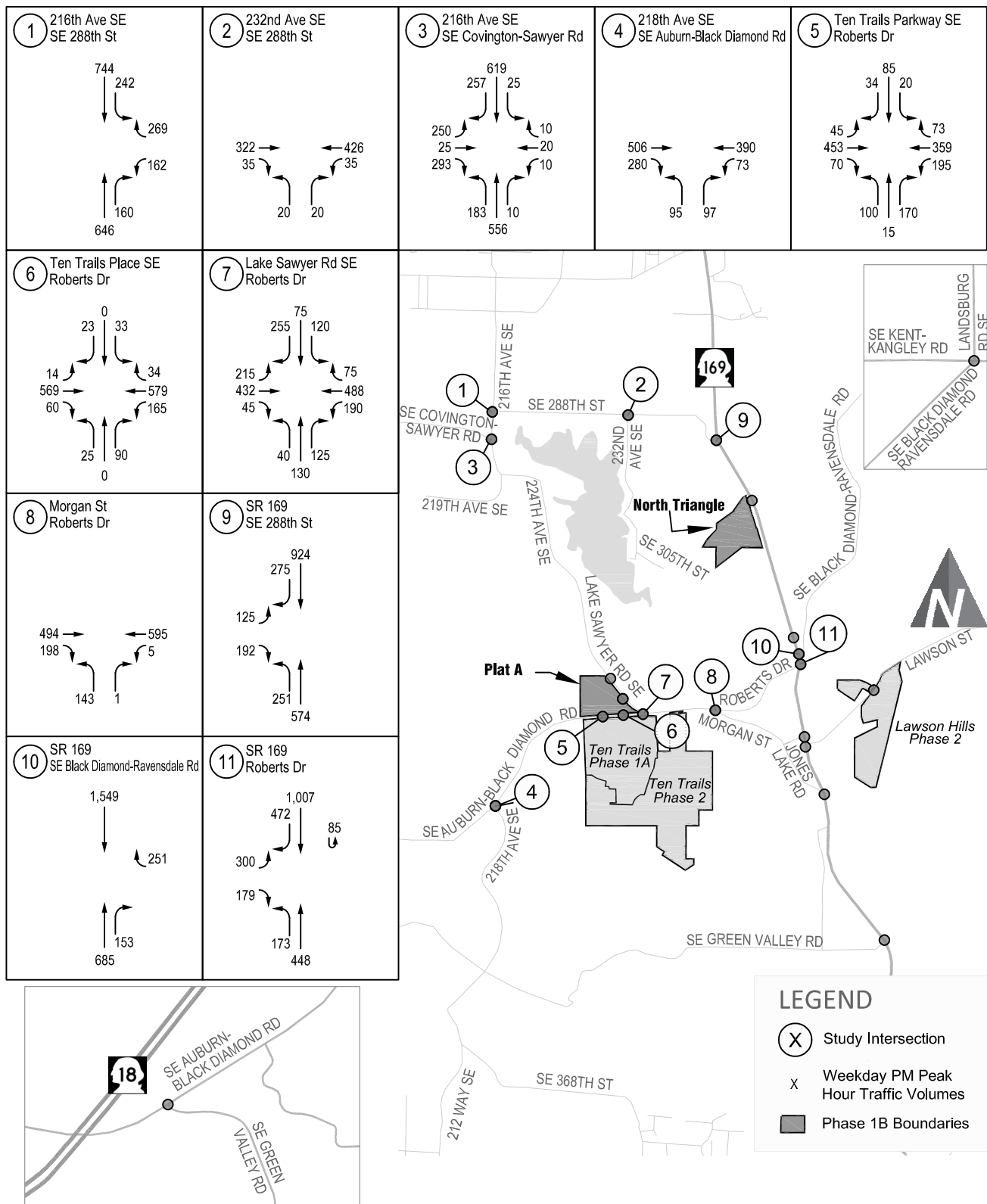
Ten Trails and Lawson Hills MPDs - Phase 1B



Future With-Project (Ph. 1B) PM Peak Hour Trip Assignment (Int. 12-22)

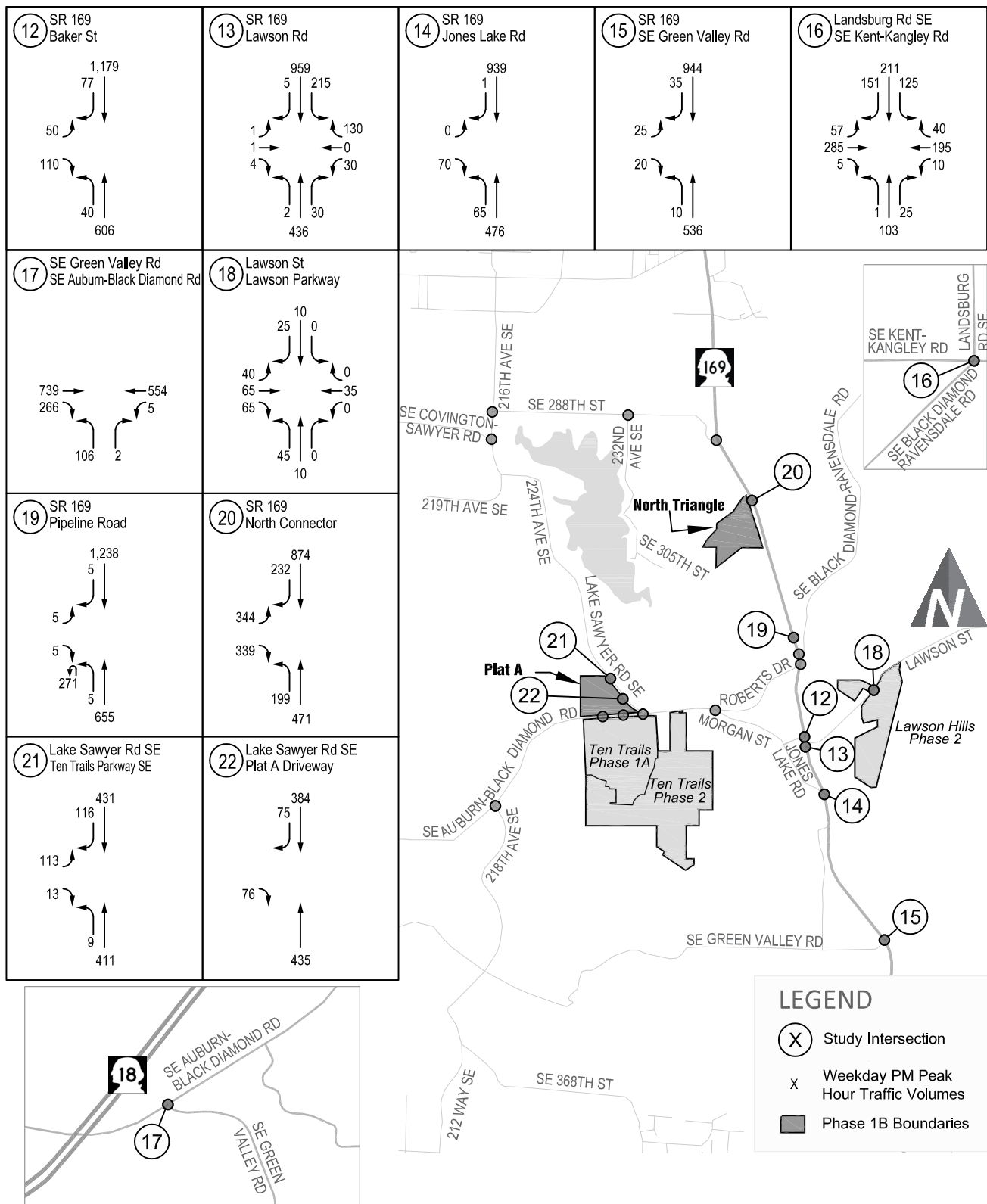
FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B



Future With-Project PM Peak Hour Traffic Volumes (Intersections 1-11) FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B



Future With-Project PM Peak Hour Traffic Volumes (Intersections 12-22)

FIGURE

Ten Trails and Lawson Hills MPDs - Phase 1B

Future With-Project Traffic Operations

Future with-project PM peak hour levels of service, average delays and as applicable, v/c ratios were calculated at study intersections based on existing PHFs²¹ and methodologies contained in the *Highway Capacity Manual*. These are the same methodologies used in *The Villages TTR* and *Lawson Hills TTR*.

Table 7 summarizes future traffic operations at each study intersection and demonstrates that fourteen of the 21 study intersections are projected to operate below the applicable LOS standard by build-out of Phase 1B²², including:

- SE 288th Street/216th Avenue SE – LOS F
- SE Covington-Sawyer Road/216th Avenue SE – LOS F
- SE Auburn-Black Diamond Road/218th Avenue SE – LOS F
- Roberts Drive/Ten Trails Place SE – LOS F
- Roberts Drive/Morgan Street – LOS F
- SR 169/SE 288th Street – LOS F
- SR 169/Roberts Drive – LOS F
- SR 169/Baker Street – LOS F
- SR 169/Lawson Street – LOS F
- SR 169/SE Green Valley Road – LOS E
- SE Kent-Kangley Road/Landsburg Road SE – LOS F
- SE Auburn-Black Diamond Road/SE Green Valley Road – LOS F
- SR 169/North Connector – LOS F
- Lake Sawyer Road SE/Ten Trails Parkway SE – LOS F

All other study intersections are projected to meet the applicable LOS standard in the future with the addition of Phase 1B traffic, and assuming all planned improvements outlined in the future without-project and future with-project conditions. Roundabout-controlled intersections that meet applicable LOS standards are projected to operate with a v/c ratio²³ under 1.0, with the majority of intersections projected to operate with a v/c ratio under 0.70. The 95th-percentile queues at these intersections are projected to be accommodated within the available storage space. Appendix B contains detailed LOS worksheets.

²¹ Existing peak hour factors (PHFs) were used in evaluating future with-project traffic operations at most study intersections but not all. Based on future with-project traffic volumes and recommendations presented in National Cooperative Highway Research Program (NCHRP) Report 599, existing PHFs were increased in evaluating future traffic operations at five study intersections, including SR 169/SE 288th Street, SR 169/SE Black Diamond-Ravensdale Road, SR 169/Roberts Drive, SR 169/SE Green Valley Road, and SE Green Valley Road/SE Auburn-Black Diamond Road. Additionally, NCHRP recommendations were used in estimating PHFs at new intersections, including SR 169/Pipeline Road, SR 169/North Connector, Lake Sawyer Road SE/Ten Trails Parkway SE, Lake Sawyer Road SE/Plat A Driveway, Roberts Drive/Ten Trails Parkway SE, and Roberts Drive/Ten Trails Place SE.

²² Six of the fourteen intersections projected to operate below their applicable LOS standard were identified in the Phase 1A TMR or the Phase 2 TMR, including SE 288th Street/216th Avenue SE, Roberts Drive/Ten Trails Place SE, Roberts Drive/Morgan Street, SR 169/SE 288th Street, SE Auburn-Black Diamond Road/SE Green Valley Road, and SE Kent-Kangley/Landsburg Road SE. The timing and scope of improvements at these locations are reevaluated as part of this study.

²³ Reported v/c ratios at roundabout-controlled intersections represent the v/c ratio for the worst movement.

Table 7. Future With-Project PM Peak Hour Level of Service Summary

ID #	Intersection	LOS			
		Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
1	SE 288th St/216th Ave SE	C	F	>120	WBL
2	SE 288th St/232nd Ave SE	C	B	14.3	NB
3	SE Covington-Sawyer Rd/216th Ave SE	C	F	>120	-
4	SE Auburn-Black Diamond Rd/218th Ave SE	E	F	58.7	NB
5	Roberts Dr/Ten Trails Pkwy SE ⁵	C	A	6.7	0.54
6	Roberts Dr/Ten Trails PI SE ⁶	C	F	>120	NB
7	Roberts Dr/Lake Sawyer Rd SE	C	B	11.8	0.75
8	Roberts Dr/Morgan St	C	F	62.0	NB
9	SR 169/SE 288th St	D	F	>120	EBL
10	SR 169/SE Black Diamond-Ravensdale Rd ⁷	D	D	33.8	WB
11	SR 169/Roberts Dr ⁸	D	F	78.9	1.23
12	SR 169/Baker St	D	F	>120	EB
13	SR 169/Lawson St	D	F	>120	WB
14	SR 169/Jones Lake Rd	D	C	20.7	EB
15	SR 169/SE Green Valley Rd	D	E	39.5	EB
16	SE Kent-Kangley Rd/Landsburg Rd SE	E	F	>120	SB
17	SE Auburn-Black Diamond Rd/SE Green Valley Rd	E	F	80.5	NBL
18	Lawson St/Lawson Pkwy	C	B	11.3	NB
19	SR 169/Pipeline Rd ⁹	D	B	10.3	0.93
20	SR 169/North Connector ¹⁰	D	F	>120	EB
21	Lake Sawyer Rd SE/Ten Trails Pkwy SE ¹¹	C	D	30.3	EB
22	Lake Sawyer Rd SE/Plat A Driveway ¹²	C	B	12.1	EBR

Source: HCM 6th Edition and Transpo Group, 2020

Note: NB = northbound approach; NBL = northbound left-turning movement; SB = southbound approach; EB = eastbound approach; EBL = eastbound left-turning movement; WBL = westbound left-turning movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a single-lane roundabout (construction has been completed) and construction of north leg to serve Plat A

6. Construction of north leg to serve Plat A assumed.

7. Improvement includes access management along SR 169 between Roberts Drive and Pipeline Road

8. Improvement includes installing a single-lane roundabout

9. Improvement includes installing a single-lane roundabout and a southbound right-turn lane

10. Construction of side-street stop-controlled intersection assumed to provide access to the North Triangle

11. Construction of side-street stop-controlled intersection assumed to provide access to Plat A

12. Construction of right-in/right-out only, side-street stop-controlled intersection assumed to provide access to Plat A

Internal Road Network

As described in Section 6.2 of The Villages and Lawson Hills MPD Development Agreements, “adequate roadway capacity shall be provided by the Master Developer within the Project Site...” and each travel lane internal to the MPDs is assumed to provide a capacity for 600 vehicle trips per hour. This equates to 1,200 vehicle trips per hour for a two-lane road (one lane in each direction).

As proposed, traffic generated by Plat A will access the site from a two-lane roadway that will serve as an extension of Ten Trails Parkway between Roberts Drive and Lake Sawyer Road SE. As such, Plat A will be served by an internal roadway capacity of 1,200 vehicles per hour.

Based on the trip generation estimates presented in Table 4 and Table 6, and the trip distribution and assignment presented in Figure 12, Figure 13, and Figure 14, it is estimated that Plat A, in addition to rerouted traffic from Phases 1A and 2 will generate up to 730 weekday PM peak hour vehicle trips along Ten Trails Parkway within Plat A. This is sufficiently less than the 1,200 vehicle per hour capacity along this roadway. Therefore, the proposed internal road network of the Ten Trails MPD will meet the requirement described in Section 6.2 of The Villages MPD Development Agreement.

Traffic generated by the North Triangle will access SR 169 via the North Connector – a two-lane roadway which would accommodate a capacity of 1,200 vehicles trips per hour. Based on the trip generation and trip distribution referenced above, the North Connector will carry up to 1,060 PM peak hour trips, less than the 1,200-vehicle capacity. Therefore, the proposed internal road network of the North Triangle will meet the requirement described in Section 6.2 of The Villages and Lawson Hills MPD Development Agreements.

Timing of Improvements

This section of the report addresses the fourteen study intersections projected to operate below standard by Phase 1B build-out and estimates when and what improvements will be necessary to ensure acceptable operations through Phase 1B build-out. The fourteen intersections include:

- SE 288th Street/216th Avenue SE
- SE Covington-Sawyer Road/216th Avenue SE
- SE Auburn-Black Diamond Road/218th Avenue SE
- Roberts Drive/Ten Trails Place SE
- Roberts Drive/Morgan Street
- SR 169/SE 288th Street
- SR 169/Roberts Drive
- SR 169/Baker Street
- SR 169/Lawson Street
- SR 169/SE Green Valley Road
- SE Kent-Kangley Road/Landsburg Road SE
- SE Auburn-Black Diamond Road/SE Green Valley Road
- SR 169/North Connector
- Lake Sawyer Road SE/Ten Trails Parkway SE

This section summarizes project trip generation for each year of Phase 1B development leading up to full build-out (~2022-2031). Full build-out (~2032) trip generation is discussed previously with trip generation projections summarized in Table 6. Project trips are distributed and assigned to the intersections listed above. Future traffic volumes are projected and traffic operations are evaluated at these intersections. Maximum future vehicle queue lengths are also presented in this section and compared to the available storage at study intersections.

Trip Generation

Weekday PM peak hour trip generation was estimated for the first year through the tenth year of Phase 1B development based on the size of development (see Table 2) and trip generation assumptions outlined previously in this report. Trip generation estimates for Phase 1B build-out are summarized previously in Table 6. Trip generation estimates for years 1-5 of development are summarized in Table 8 and trip generation estimates for years 6-10 are summarized in Table 9. The yearly trip generation tables also include the cumulative trip generation per year for the cumulative Ten Trails and Lawson Hills MPDs, including Phase 1A, Phase 1B and Phase 2. More detailed trip generation calculations are included in Appendix C.

Table 8. PM Peak Hour Trip Generation Estimates by Year (Years 1-5)

		Year 1 (~2022)		Year 2 (~2023)		Year 3 (~2024)		Year 4 (~2025)		Year 5 (~2026)	
Land Use ¹	Unit ²	Size	Total (In/Out)	Size	Total (In/Out)	Size	Total (In/Out)	Size	Total (In/Out)	Size	Total (In/Out)
Plat A ³											
SF Resi	DUs	150	103 (61/42)	150	88 (50/38)	150	79 (46/33)	150	76 (46/30)	150	73 (45/28)
MF Resi	DUs	65	20 (11/9)	125	33 (18/15)	125	30 (16/14)	125	28 (16/12)	125	27 (16/11)
Office	KSF	-	-	-	-	-	-	-	-	40	31 (2/29)
Retail	KSF	45	135 (72/63)	90	223 (120/103)	135	316 (164/152)	180	408 (205/203)	180	400 (198/202)
Total (Phase 1B)			258 (144/114)	344 (188/156)	425 (226/199)	512 (267/245)	531 (261/270)				
Total (Ph 1A, 1B & 2)			1,391 (833/558)	1,593 (933/660)	1,899 (1,101/798)	2,042 (1,168/874)	2,122 (1,173/949)				

1. SF Resi = Single-Family Residential; MF Resi = Multi-Family Residential

2. DUs= dwelling units; KSF= 1,000 square feet

3. Represents the portion of the Ten Trails Phase 1B that is located directly north of Roberts Drive.

As shown in Table 8, the first year of Phase 1B development is estimated to generate approximately 258 net new PM peak hour trips, increasing to 344 trips by the second year, 425 trips by the third year, 512 trips by the fourth year, and 531 trips by the fifth year. The cumulative Ten Trails and Lawson Hills MPDs are estimated to generate approximately 1,391 net PM peak hour trips during the first year of Phase 1B development, increasing to 1,593 trips by the second year, 1,899 trips by the third year, 2,042 trips by the fourth year, and 2,122 trips by the fifth year.

Table 9. PM Peak Hour Trip Generation Estimates by Year (Years 6-10)

		Year 6 (~2027)		Year 7 (~2028)		Year 8 (~2029)		Year 9 (~2030)		Year 10 (~2031)	
Land Use ¹	Unit ²	Size	Total (In/Out)	Size	Total (In/Out)	Size	Total (In/Out)	Size	Total (In/Out)	Size	Total (In/Out)
Plat A ³											
SF Resi	DUs	150	73 (45/28)	150	73 (45/28)	150	73 (45/28)	150	73 (45/28)	150	73 (45/28)
MF Resi	DUs	125	27 (16/11)	125	27 (16/11)	125	27 (16/11)	125	27 (16/11)	125	27 (16/11)
Office	KSF	40	31 (2/29)	40	31 (2/29)	40	31 (2/29)	40	31 (2/29)	40	31 (2/29)
Retail	KSF	180	400 (198/202)	180	400 (198/202)	180	400 (198/202)	180	400 (198/202)	180	400 (198/202)
Plat A Total			531 (261/270)		531 (261/270)		531 (261/270)		531 (261/270)		531 (261/270)
North Triangle ⁴											
Office	KSF	-	-	70	63 (9/54)	135	119 (17/102)	200	177 (26/151)	253	232 (35/197)
Retail	KSF	65	315 (150/165)	130	514 (239/275)	190	674 (311/363)	190	665 (303/362)	190	665 (303/362)
N. Triangle Total			315 (150/165)		577 (248/329)		793 (328/465)		842 (329/513)		897 (338/559)
Total (Phase 1B)			846 (411/435)		1,108 (509/599)		1,324 (589/735)		1,373 (590/783)		1,428 (599/829)
Total (Ph 1A, 1B & 2)			2,437 (1,323/1,114)		2,699 (1,421/1,278)		2,915 (1,501/1,414)		2,964 (1,502/1,462)		3,059 (1,529/1,530)

1. SF Resi = Single-Family Residential; MF Resi = Multi-Family Residential

2. DUs= dwelling units; KSF= 1,000 square feet

3. Represents the portion of the Ten Trails Phase 1B that is located directly north of Roberts Drive.

4. Represents Phase 1B of the Lawson Hills MPD and the immediately adjacent portion of the Ten Trails MPD.

As shown in Table 9, the sixth year of Phase 1B development is estimated to generate approximately 846 net new PM peak hour trips, increasing to 1,108 trips by the seventh year, 1,324 trips by the eighth year, 1,373 trips by the ninth year, and 1,428 trips by the tenth year. The cumulative Ten Trails and Lawson Hills MPDs are estimated to generate approximately 2,437 net PM peak hour trips during the sixth year of Phase 1B development, increasing to 2,699 trips by the seventh year, 2,915 trips by the eighth year, 2,964 trips by the ninth year, and 3,059 trips by the tenth year.

By build-out, Phase 1B is estimated to generate approximately 1,479 net new PM peak hour trips (see Table 6) and the cumulative Ten Trails and Lawson Hills MPDs are estimated to generate approximately 3,110 PM peak hour trips.

Trip Distribution and Assignment

Trip distribution patterns for the year-by-year analysis were based on the assumptions outlined previously in this report and updated as necessary based on the development timeline of the North Triangle, which results in measurable shifts in trip distribution and assignment. This results in two individual trip distribution and assignment conditions throughout the Phase 1B development timeline:

- **Years 1-5 (~2026 and earlier).** This represents conditions prior to development within the North Triangle. Trip distribution and assignment for this condition is shown in Figure 21 and Figure 22, for Ten Trails/Plat A and Lawson Hills, respectively.

- **Years 6-10 (~2027-2031).** This represents conditions after development within the North Triangle commences. Trip distribution and assignment for this condition is shown in Figure 23, Figure 24, and Figure 25, for Ten Trails/Plat A, Lawson Hills and the North Triangle, respectively.

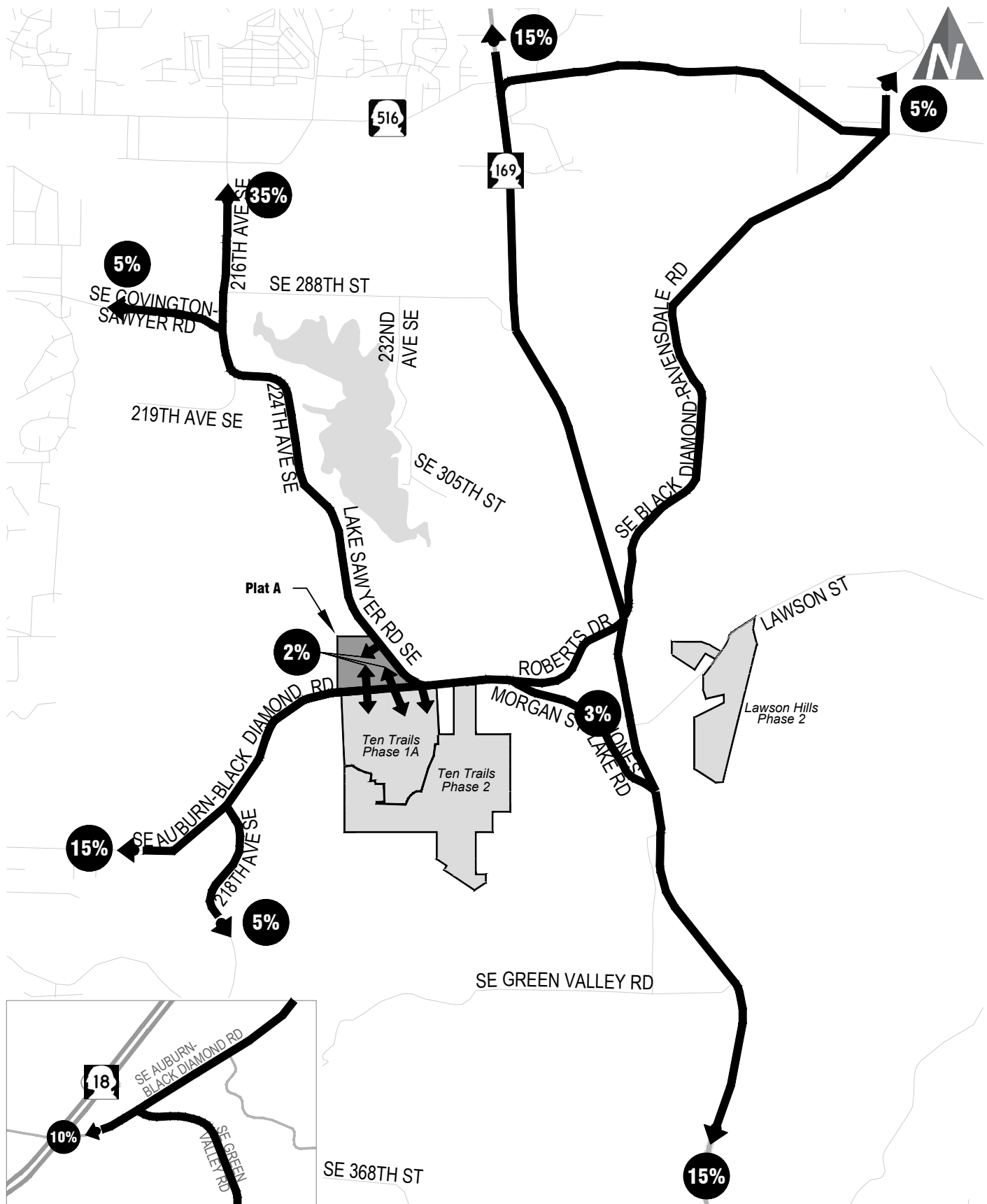
PM peak hour project trips were assigned at the fourteen study intersections impacted by Phase 1B by multiplying the trip generation estimates by the appropriate trip distribution percentages.

Future Traffic Volumes

Future traffic volumes associated with the first ten years of Phase 1B development were estimated at the fourteen impacted study intersections by increasing existing PM peak hour traffic volumes by the previously described annual growth rates²⁴, adding future traffic associated with Phases 1A and 2 of the Ten Trails and Lawson Hills MPDs, and adding future traffic associated with Phase 1B traffic. The proposed growth rates account for traffic generated by infill development within the City of Black Diamond as well as traffic generated by other new development located outside of Black Diamond.

Yearly Phase 1B project trips are illustrated in Figure 26 and total future traffic volumes are shown on Figure 27 for the fourteen intersections impacted by Phase 1B. These figures only include traffic volumes for the year that improvement is necessary/implemented and the year prior to improvement implementation, consistent with the LOS result tables included in the following section. As such, for each of the fourteen study intersections the traffic volumes shown illustrate the point at which the applicable LOS standard would no longer be met.

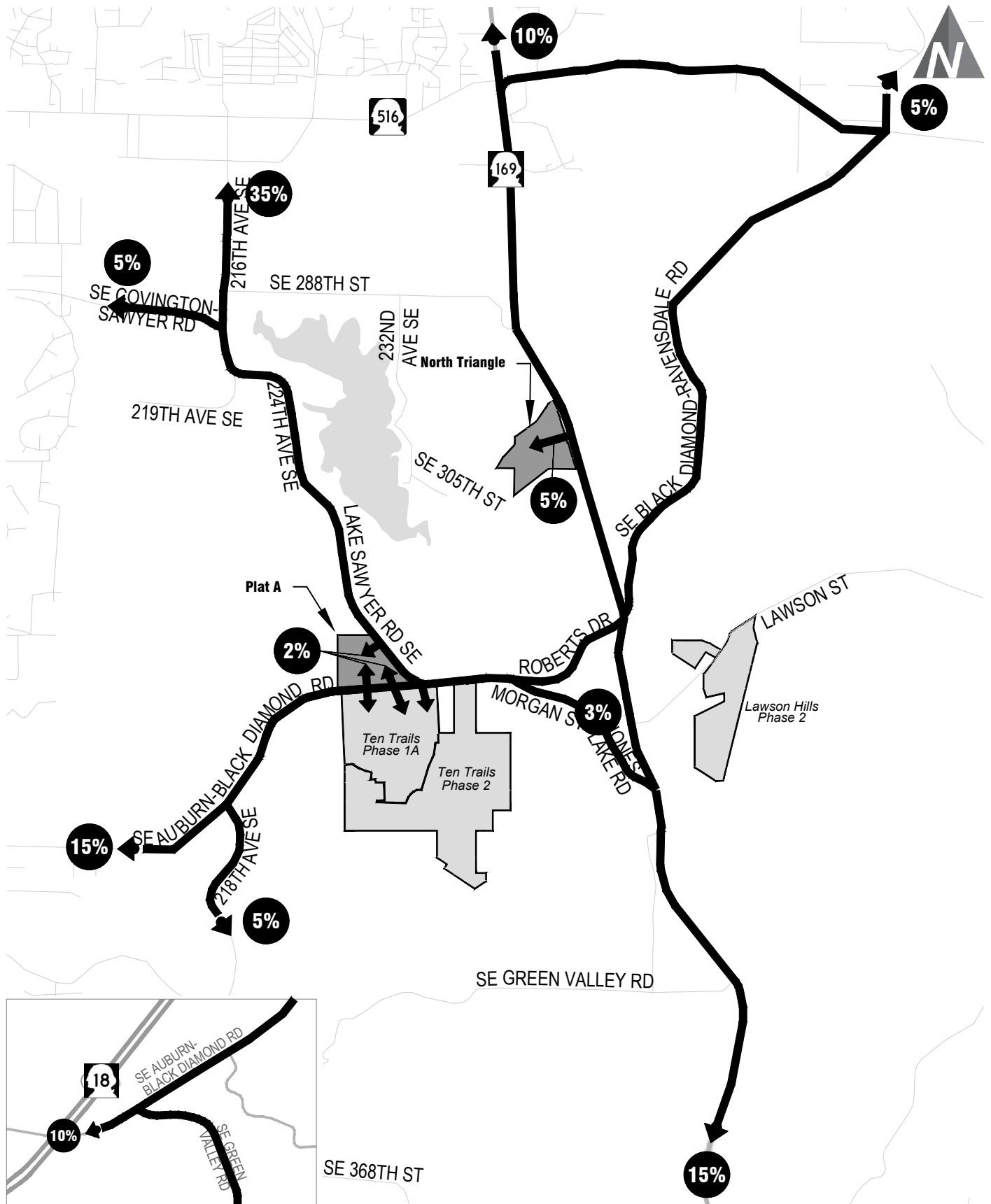
²⁴ This analysis assumes a 1.0 percent annual growth of mainline traffic along SR 169 and a 1.5 percent annual growth at all other locations, with the exception of Black Diamond-Ravensdale Road at SR 169. With the proposed access management along SR 169 between Roberts Drive and Pipeline Road it is expected that some traffic that would make a westbound left onto SR 169 from Black Diamond-Ravensdale Road under the existing configuration may choose an alternative route. As such, no growth was assumed at this approach, but project trips were still routed through the intersection.



Future With-Project (Ten Trails/Plat A) PM Peak Hour Trip Dist. (Yrs. 1-5) **FIGURE**

Ten Trails and Lawson Hills MPDs - Phase 1B





Future With-Project (Ten Trails/Plat A) PM Peak Hour Trip Dist. (Yrs. 6-10)

FIGURE

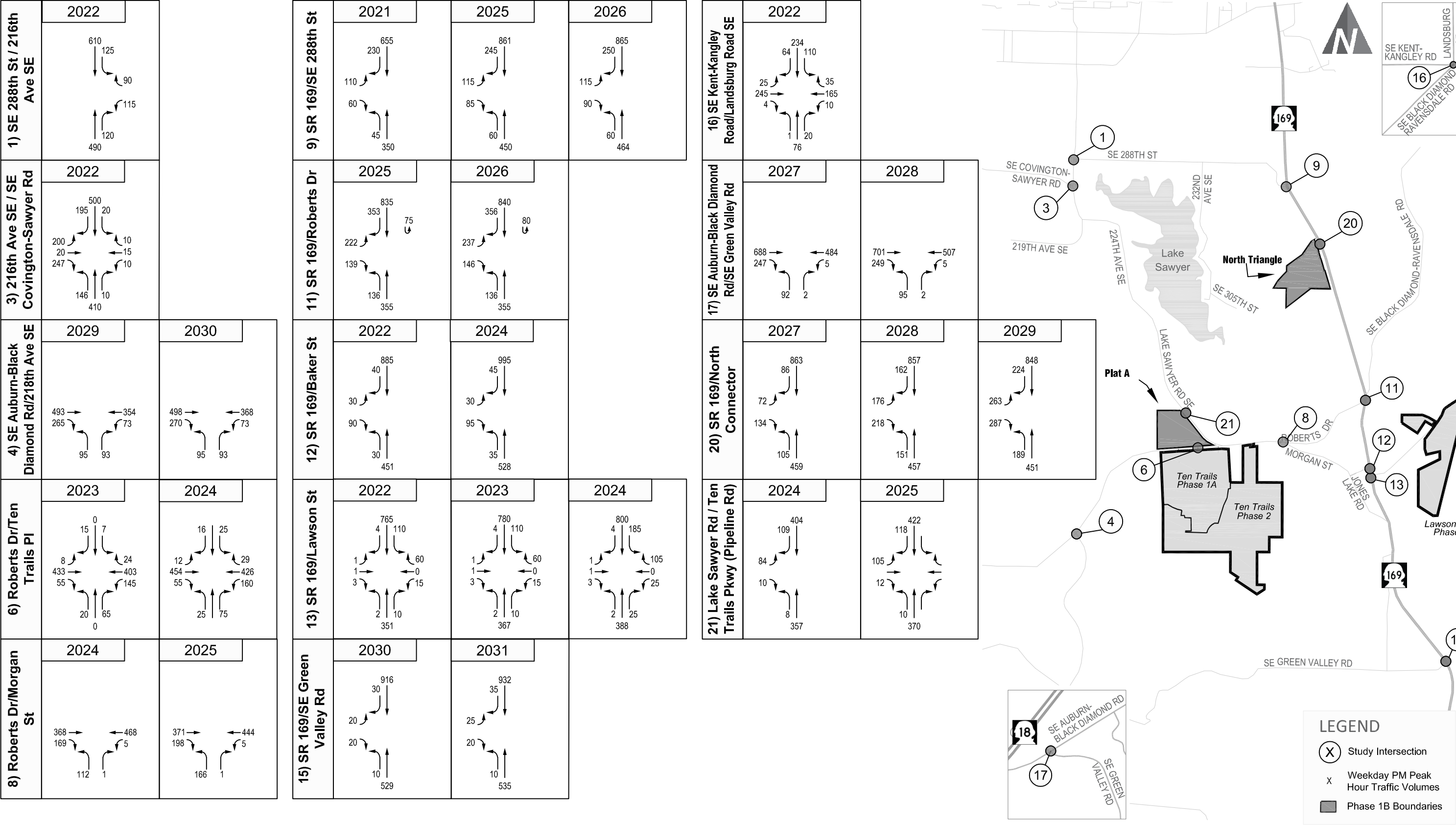
Ten Trails and Lawson Hills MPDs - Phase 1B

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23







Timing of Improvements – Future PM Peak Hour Traffic Volumes

Ten Trails and Lawson Hills MPDs - Phase 1B

FIGURE 27

Future Traffic Operations

Future levels of service and average delays for the first ten years of Phase 1B development were calculated at the fourteen study intersections impacted by Phase 1B consistent with the methodology outlined previously in this report based on the yearly traffic volumes discussed above. This section details each of the fourteen intersections to determine when improvements should be implemented as a basis for the Phase 1B implementation schedule. This section also details what improvement is proposed and how it is expected to meet the applicable LOS standard through build-out of Phase 1B.

SE 288th Street/216th Avenue SE

Existing traffic control and channelization²⁵ was assumed at this intersection in evaluating future with-project PM peak hour traffic operations. Results are summarized in Table 10. Appendix B contains detailed LOS worksheets.

Table 10. SE 288th St/216th Ave SE – Intersection LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	C	C	18.6	WBL
<u>Future – Without Improvement</u>				
Year 1 (~2022)	C	D	33.0	WBL
Build-Out (~2032)	C	F	>120	WBL
<u>Future – With Improvement⁵</u>				
Year 1 (~2022)	C	A	4.6	-
Build-Out (~2032)	C	B	12.2	-

Source: HCM 6th Edition and Transpo Group, 2020

Note: WBL = westbound left-turning movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a traffic signal and a northbound right turn lane

As highlighted above, an improvement will be necessary at SE 288th Street/216th Avenue SE by the first year of Phase 1B development. A roundabout was initially considered as mitigation at this location as it is the City's preferred method of intersection control but it was determined to be infeasible. The intersection is constrained by existing utilities, utility poles, grades and access to the Sawyer Lake Veterinary Hospital to the west. The surrounding utilities and properties would be impacted by the necessary grading to flatten the intersection for roundabout construction.

As an alternative, a traffic signal and a northbound right-turn lane is recommended at this location. By installing a traffic signal and a turn lane, this intersection will operate in the LOS A-B range through Phase 1B build-out and meet the City's LOS C or better standard. Construction of this traffic signal should commence prior to the City's issuance of a certificate of occupancy for the 827th ERU²⁶ (Phases 1A, 1B and 2 combined) provided that at least one *Manual on Uniform Traffic Control Devices* (MUTCD) signal warrant is met and that at least one ERU is located within by Phase 1B. Other intersection improvements to control traffic may be proposed as acceptable to the City's Master Development Review Team (MDRT).

²⁵ The existing conditions at this intersection include an improvement identified in Conditions No. 5 and 62 of The Villages MPD Preliminary Plat 1A Conditions of Approval as mitigation for impacts generated by Phase 1A. The implemented improvement includes rechannelization of the south leg of the intersection to provide a refuge/merge area for westbound-to-southbound left turns.

²⁶ 827 ERUs is representative of the projected number of ERUs generated by Phases 1A and 2 through the end of 2021 prior to construction of Phase 1B (826 ERUs) plus the first ERU generated by Phase 1B.

SE Covington-Sawyer Road/216th Avenue SE

Existing traffic control and channelization was assumed at this intersection in evaluating future PM peak hour traffic operations. Results are summarized in Table 11. Appendix B contains detailed LOS worksheets.

Table 11. SE Covington-Sawyer Rd/216th Ave SE – Intersection LOS Summary

Condition	LOS Standard	LOS¹	Delay²	V/C³ or WM⁴
Existing	C	B	10.5	-
<u>Future – Without Improvement</u>				
Year 1 (~2022)	C	D	39.5	-
Build-Out (~2032)	C	F	>120	-
<u>Future – With Improvement⁵</u>				
Year 1 (~2022)	C	B	17.8	-
Build-Out (~2032)	C	C	31.2	-

Source: HCM 6th Edition and Transpo Group, 2020

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a northbound left-turn lane

As highlighted above, an improvement will be necessary at SE Covington-Sawyer Road/216th Avenue SE by the end of the first year of Phase 1B development. By adding a northbound left-turn lane, this intersection will operate in the LOS B-C range through Phase 1B build-out and meet the City of Black Diamond's LOS C or better standard. Construction of this improvement should commence prior to the City's issuance of a certificate of occupancy for the 827th ERU²⁷ (Phases 1A, 1B and 2 combined) provided that at least one ERU is located within Phase 1B. Other intersection improvements to control traffic may be proposed as acceptable to the City's MDRT.

²⁷ 827 ERUs is representative of the projected number of ERUs generated by Phases 1A and 2 through the end of 2021 prior to construction of Phase 1B (826 ERUs) plus the first ERU generated by Phase 1B.

SE Auburn-Black Diamond Road/218th Avenue SE

Existing traffic control and channelization was assumed at this intersection in evaluating future PM peak hour traffic operations. Results are summarized in Table 12. Appendix B contains detailed LOS worksheets.

Table 12. SE Auburn-Black Diamond Rd/218th Ave SE – Intersection LOS Summary

Condition	LOS Standard	LOS¹	Delay²	V/C³ or WM⁴
Existing	E	B	14.6	NB
<u>Future – Without Improvement</u>				
Year 8 (~2029)	E	E	48.2	NB
Year 9 (~2030)	E	F	52.0	NB
Build-Out (~2032)	E	F	59.3	NB
<u>Future – With Improvement⁵</u>				
Year 9 (~2030)	E	C	24.0	NB
Build-Out (~2032)	E	D	25.3	NB

Source: HCM 6th Edition and Transpo Group, 2020

Note: NB = northbound movement, SB = southbound movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a northbound left-turn refuge lane

As highlighted above, an improvement will be necessary at SE Auburn-Black Diamond Road/218th Avenue SE by the ninth year of Phase 1B development (after approximately 2,915 ERUs combined (Phases 1A, 1B and 2)). By rechannelizing the west leg of the intersection to provide a refuge/merge area for northbound-to-westbound left turning vehicles, this intersection will operate in the LOS C-D range through Phase 1B build-out and meet King County's LOS E or better standard. Construction of this refuge/merge lane should commence prior to the City's issuance of a certificate of occupancy for the 2,916th ERU (Phases 1A, 1B and 2 combined) to ensure the improvement is completed before the northbound approach would otherwise exceed the County's applicable operations standard. Other intersection improvements to control traffic may be proposed as acceptable to King County.

Roberts Drive/Ten Trails Place SE

In evaluating future PM peak hour traffic operations at this intersection, a north leg was assumed to be constructed, providing access to Plat A. Results are summarized in Table 13. Appendix B contains detailed LOS worksheets.

Table 13. Roberts Drive/Ten Trails Place SE – Intersection LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	C	-	-	-
<u>Future – Without Improvement</u>				
Year 2 (~2023)	C	C	22.3	NB
Year 3 (~2024)	C	E	49.2	SB
Build-Out (~2032)	C	F	>120	NB
<u>Future – With Improvement⁵</u>				
Year 3 (~2024)	C	B	10.5	-
Build-Out (~2032)	C	B	12.5	-

Source: HCM 6th Edition and Transpo Group, 2020

Note: NB = northbound movement, SB = southbound movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a traffic signal

As highlighted above, an improvement will be necessary at Roberts Drive/Ten Trails Place SE by the third year of Phase 1B development (after approximately 1,593 ERUs combined (Phases 1A, 1B and 2)). By installing a traffic signal²⁸, this intersection will operate at LOS B through Phase 1B build-out and meet the City's LOS C or better standard.

Construction of this traffic signal should commence prior to the City's issuance of a certificate of occupancy for the 1,594th ERU (Phases 1A, 1B and 2 combined) provided that at least one MUTCD signal warrant is met. Other intersection improvements to control traffic may be proposed as acceptable to the City's MDRT.

²⁸ A traffic signal was determined to be the appropriate improvement at this location as part of the Phase 1A TMR and additional follow-up analyses.

Roberts Drive/Morgan Street

Existing traffic control and channelization was assumed at this intersection in evaluating future PM peak hour traffic operations. Results are summarized in Table 15. Appendix B contains detailed LOS worksheets.

Table 14. Roberts Drive/Morgan Street– Intersection LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	C	B	10.6	NB
<u>Future – Without Improvement</u>				
Year 3 (~2024)	C	C	24.9	NB
Year 4 (~2025)	C	D	31.4	NB
Build-Out (~2032)	C	F	62.0	NB
<u>Future – With Improvement⁵</u>				
Year 5 (~2025)	C	A	5.9	-
Build-Out (~2032)	C	A	5.8	-

Source: HCM 6th Edition and Transpo Group, 2020

Note: EBL = eastbound left-turning movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a traffic signal

As highlighted above, an improvement will be necessary at Roberts Drive/Morgan Street by the fourth year of Phase 1B development (after approximately 1,899 ERUs combined (Phases 1A, 1B and 2)). A roundabout was initially considered as mitigation at this location as it is the City's preferred method of intersection control, but it was determined to be infeasible. The intersection is constrained in the north direction by an existing wetland and in the south direction by grades not conducive to roundabout construction.

As an alternative, a traffic signal is recommended at this location. By installing a traffic signal, this intersection will operate at LOS A through Phase 1B build-out and meet the City's LOS C or better standard. Construction of this traffic signal should commence prior to the City's issuance of a certificate of occupancy for the 1,900th ERU (Phases 1A, B and 2 combined) provided that at least one MUTCD signal warrant is met. Other intersection improvements to control traffic may be proposed as acceptable to the City's MDRT. The proposed improvement would not be necessary in the event that Pipeline Road is under construction prior to the 1,900th ERU.

SR 169/SE 288th Street

Existing traffic control and channelization was assumed at this intersection in evaluating future PM peak hour traffic operations. Results are summarized in Table 15. Appendix B contains detailed LOS worksheets.

Table 15. SR 169/SE 288th Street – Intersection LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	D	E	38.2	EBL
<u>Future – With First Phase Improvement⁵</u>				
~2021	D	C	22.4	EBL
Year 4 (~2025)	D	D	34.8	EBL
Year 5 (~2026)	D	E	35.5	EBL
<u>Future – With Final Phase Improvement⁶</u>				
Year 5 (~2026)	D	A	5.8	-
Build-Out (~2032)	D	C	28.4	-

Source: HCM 6th Edition and Transpo Group, 2020

Note: EBL = eastbound left-turning movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing an eastbound left-turn refuge lane

6. Improvement includes installing a traffic signal

As highlighted above, SR 169/SE 288th Street does not meet WSDOT's LOS D standard under existing conditions. As such, a first phase improvement is proposed at SR 169/SE 288th Street that can be implemented near-term. A final phase improvement is proposed that will allow the intersection to meet WSDOT's LOS D or better standard through Phase 1B build-out.

The first phase improvement includes rechannelizing the north leg of the intersection to provide a refuge/merge area for eastbound-to-northbound left turning vehicles. With this improvement the intersection will operate at a LOS D or better through the fourth year of Phase 1B development (after approximately 2,042 ERUs combined (Phases 1A, 1B and 2)). Construction of the first phase improvement should commence prior to the City's issuance of a certificate of occupancy for the 646th ERU (Phases 1A, 1B and 2 combined). An ERU threshold of 646 ERUs equates to Q2 2021, which is estimated to be the earliest reasonable timeline to obtain necessary approvals and begin construction.

The final phase improvement includes installing a traffic signal at the intersection. This improvement will be necessary by the fifth year of Phase 1B development (after approximately 2,042 ERUs combined (Phases 1A, 1B and 2)). By installing a traffic signal, this intersection will operate in the LOS A-C range through Phase 1B build-out and meet WSDOT's LOS D or better standard. Construction of the traffic signal should commence prior to the City's issuance of a certificate of occupancy for the 2,043rd ERU (Phases 1A, 1B and 2 combined) provided that at least one MUTCD signal warrant is met. Other intersection improvements to control traffic may be proposed as acceptable to WSDOT.

SR 169/Roberts Drive

Near-term and mid-term improvements are proposed at this intersection resulting in amended traffic control and/or channelization from existing conditions in evaluating future PM peak hour operations. First phase improvements include rechannelization of the intersection and will be implemented in 2020. Second phase improvements include conversion to a single-lane roundabout and will be implemented in 2023. Based on these improvements, results are summarized in Table 15. Appendix B contains detailed LOS worksheets.

Table 16. SR 169/Roberts Drive – Intersection LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	D	E	40.5	EBL
<u>Future – Without Improvement</u>				
Year 5 (~2026)	D	B	16.5	0.97
Year 6 (~2027)	D	C	30.8	1.04
Build-Out (~2032)	D	F	78.9	1.23
<u>Future – With Improvement⁵</u>				
Year 6 (~2027)	D	A	7.4	0.66
Build-Out (~2032)	D	A	9.2	0.76

Source: HCM 6th Edition and Transpo Group, 2020

Note: EBL = eastbound left-turning movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing an eastbound right-turn lane and a southbound right-turn lane

As highlighted above, SR 169/Roberts Drive does not meet WSDOT's LOS D standard under existing conditions. As such, and as described previously, improvements will be implemented at this intersection under two phases.

With the single-lane roundabout the intersection will operate at a V/C under 1.0 through the fifth year of Phase 1B development (after approximately 2,122 ERUs combined (Phases 1A, 1B and 2)). By constructing a southbound right turn lane and an eastbound right turn lane within the roundabout, this intersection will operate at LOS A and with a V/C under 0.80 through Phase 1B build-out and meet WSDOT's LOS D or better standard. Construction of the turn lanes should commence prior to the City's issuance of a certificate of occupancy for the 2,123rd ERU (Phases 1A, 1B and 2 combined). Other intersection improvements to control traffic may be proposed as acceptable to WSDOT. The proposed improvement would not be necessary in the event that Pipeline Road is under construction prior to the 2,123rd ERU.

SR 169/Baker Street and SR 169/Lawson Street

Existing traffic control and channelization was assumed at the intersections of SR 169/Baker Street and SR 169/Lawson Street in evaluating future PM peak hour traffic operations. Results are summarized in Table 17 and Table 18, respectively. Appendix B contains detailed LOS worksheets. While these intersections are analyzed separately, the intersection proximity leads to improvements at one intersection influencing operations at the other intersection.

Table 17. SR 169/Baker Street – Intersection LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	D	D	27.3	EB
<u>Future – Without Improvement</u>				
Year 1 (~2022)	D	E	40.1	EB
Build-Out (~2032)	D	F	>120	EB
<u>Future – With Phase 1 Improvement⁵</u>				
Year 1 (~2022)	D	D	26.3	EB
Year 3 (~2024)	D	D	34.4	EB
<u>Future – With Phase 2 Improvement⁶</u>				
Year 3 (~2024)	D	B	10.3	-
Build-Out (~2032)	D	B	17.5	-

Source: HCM 6th Edition and Transpo Group, 2020

Note: EB = eastbound movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing an eastbound left-turn refuge lane and a northbound left-turn lane

6. Improvement includes installing a traffic signal

Table 18. SR 169/Lawson Street – Intersection LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	D	C	20.3	EB
<u>Future – Without Improvement</u>				
Year 1 (~2022)	D	D	26.5	EB
Build-Out (~2032)	D	F	>120	WB
<u>Future – With Phase 1 Improvement⁵</u>				
Year 1 (~2022)	D	D	25.3	EB
Year 2 (~2023)	D	D	27.5	EB
Year 3 (~2024)	D	E	39.7	WB
<u>Future – With Phase 2 Improvement⁶</u>				
Year 3 (~2024)	D	A	6.3	-
Build-Out (~2032)	D	A	7.0	-

Source: HCM 6th Edition and Transpo Group, 2020

Note: EB = eastbound movement; WB = westbound movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing northbound and southbound left-turn lanes

6. Improvement includes installing a traffic signal

As highlighted above, an improvement will be necessary at SR 169/Baker Street by the end of the first year of Phase 1B development. Rechannelization to provide a two-way left-turn lane is proposed. While an improvement at SR 169/Lawson Street is not necessary at this

point in time, the proximity of SR 169/Lawson Street and SR 169/Baker Street is such that the two-way left-turn lane would naturally extend to Lawson Street. To accommodate the necessary tapers north and south of the two-way left-turn lane between Baker Street and Lawson Street, the two-way left-turn lane will extend north of Baker Street (allowing for an eastbound-to-northbound left-turn refuge lane) and a northbound left-turn lane will be provided at Lawson Street.

An additional improvement will be necessary by the third year of Phase 1B development (after approximately 1,593 ERUs combined (Phases 1A, 1B and 2)) when SR 169/Lawson Street no longer meets WSDOT's LOS D or better standard. Installation of a traffic signal is proposed to address the LOS deficiency. Similar to above, while an improvement at SR 169/Baker Street is not necessary at this point in time, it is advisable to install traffic signals at both intersections simultaneously such that the signals can be immediately coordinated. Roundabouts were considered at these intersections, but insufficient right-of-way is available to accommodate roundabouts. By installing traffic signals, SR 169/Baker Street will operate at LOS B through Phase 1B build-out and SR 169/Lawson Street will operate at LOS A through Phase 1B build-out, meeting WSDOT's LOS D or better standard.

Construction of the first phase improvement should commence prior to the City's issuance of a certificate of occupancy for the 827th ERU²⁹ (Phases 1A, 1B and 2 combined) provided that at least one ERU is located within Phase 1B. Construction of the final phase improvements should commence prior to the City's issuance of a certificate of occupancy for the 1,594th ERU (Phases 1A, 1B and 2 combined) provided that at least one MUTCD signal warrant is met at both intersections. Other intersection improvements to control traffic may be proposed as acceptable to WSDOT and the City's MDRT.

²⁹ A traffic signal was determined to be the appropriate improvement at this location as part of the Phase 1A TMR and additional follow-up analyses.

SR 169/SE Green Valley Road

Existing traffic control and channelization was assumed at this intersection in evaluating future PM peak hour traffic operations. Results are summarized in Table 19. Appendix B contains detailed LOS worksheets.

Table 19. SR 169/SE Green Valley Rd – Intersection LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	D	C	19.4	EB
<u>Future – Without Improvement</u>				
Year 9 (~2030)	D	D	34.0	EB
Year 10 (~2031)	D	E	38.9	EB
Build-Out (~2032)	D	E	39.5	EB
<u>Future – With Improvement⁵</u>				
Year 10 (~2031)	D	C	21.9	EB
Build-Out (~2032)	D	C	22.1	EB

Source: HCM 6th Edition and Transpo Group, 2020

Note: EB = eastbound movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a two-way left-turn lane

As highlighted above, an improvement will be necessary at SR 169/SE Green Valley Road by the tenth year of Phase 1B development (after approximately 2,964 ERUs combined (Phases 1A, 1B and 2)). By restriping SR 169 through and leading up to the intersection to include a two-way left-turn lane, this intersection will operate at LOS C through Phase 1B build-out and meet WSDOT's LOS D or better standard. Implementation of this two-way left-turn lane should commence prior to the City's issuance of a certificate of occupancy for the 2,965th ERU (Phases 1A, 1B and 2 combined) to ensure the improvement is completed before the eastbound approach would otherwise exceed WSDOT's applicable operations standard. Other intersection improvements to control traffic may be proposed as acceptable to WSDOT.

SE Kent-Kangley Road/Landsburg Road SE

Existing traffic control and channelization was assumed at this intersection in evaluating future PM peak hour traffic operations. Results are summarized in Table 20. Appendix B contains detailed LOS worksheets.

Table 20. SE Kent-Kangley Road/Landsburg Road SE – Intersection LOS Summary

Condition	LOS Standard	LOS¹	Delay²	V/C³ or WM⁴
Existing	E	E	41.2	SB
<u>Future – Without Improvement</u>				
Year 1 (~2022)	E	F	67.4	SB
Build-Out (~2032)	E	F	223	SB
<u>Future – With Improvement⁵</u>				
Year 1 (~2022)	E	A	6.8	-
Build-Out (~2032)	E	A	8.1	-

Source: HCM 6th Edition and Transpo Group, 2020

Note: EB = eastbound movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing traffic signal

As highlighted above, an improvement will be necessary at SE Kent-Kangley/Landsburg Road SE by the end of the first year of Phase 1B development. By installing a traffic signal, this intersection will operate at LOS A through Phase 1B build-out and meet King County's LOS E or better standard. Construction of this improvement, or a pro rata share contribution to a functionally equivalent improvement should commence prior to the City's issuance of a certificate of occupancy for the 827th ERU³⁰ (Phases 1A, 1B and 2 combined) provided that at least one ERU is located within Phase 1B. Other intersection improvements to control traffic may be proposed as acceptable to King County.

³⁰ 827 ERUs is representative of the projected number of ERUs generated by Phases 1A and 2 through the end of 2021 prior to construction of Phase 1B (826 ERUs) plus the first ERU generated by Phase 1B.

SE Auburn-Black Diamond Road/SE Green Valley Road

Existing traffic control and channelization was assumed at this intersection in evaluating future PM peak hour traffic operations. Results are summarized in Table 21. Appendix B contains detailed LOS worksheets.

Table 21. SE Auburn-Black Diamond Rd/SE Green Valley Rd – Inter. LOS Summary

Condition	LOS Standard	LOS¹	Delay²	V/C³ or WM⁴
Existing	E	C	24.9	NBL
<u>Future – Without Improvement</u>				
Year 6 (~2027)	E	E	46.6	NBL
Year 7 (~2028)	E	F	53.2	NBL
Build-Out (~2032)	E	F	80.5	NBL
<u>Future – With Improvement⁵</u>				
Year 7 (~2028)	E	C	22.3	NBL
Build-Out (~2032)	E	D	25.4	NBL

Source: HCM 6th Edition and Transpo Group, 2020

Note: NBL = northbound left-turning movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a northbound left-turn refuge lane

As highlighted above, an improvement will be necessary at SE Auburn-Black Diamond Road/SE Green Valley Road by the seventh year of Phase 1B development (after approximately 2,437 ERUs combined (Phases 1A, 1B and 2)). By rechannelizing the west leg of the intersection to provide a refuge/merge area for northbound-to-westbound left turning vehicles, this intersection will operate at LOS C through Phase 1B build-out and meet King County's LOS E or better standard. Construction of this refuge/merge lane should commence prior to the City's issuance of a certificate of occupancy for the 2,438th ERU (Phases 1A, 1B and 2 combined) to ensure the improvement is completed before the northbound approach would otherwise exceed the County's applicable operations standard. Other intersection improvements to control traffic may be proposed as acceptable to King County.

SR 169/North Connector

This intersection does not exist under existing conditions. As discussed within this report, SR 169/North Connector will be constructed in conjunction with development in the North Triangle with baseline operations assumed as side-street stop-controlled. This intersection will only be constructed at the time in which development begins in the North Triangle.

Table 22. SR 169/North Connector – Intersection LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	D	-	-	-
<u>Future – Without Improvement</u>				
Year 6 (~2027)	D	F	>120	EB
Build-Out (~2032)	D	F	>120	EB
<u>Future – With First Phase Improvement⁵</u>				
Year 6 (~2027)	D	A	5.9	0.71
Year 7 (~2028)	D	A	9.4	0.80
Year 8 (~2029)	D	C	30.2	1.13
<u>Future – With Final Phase Improvement⁶</u>				
Year 8 (~2029)	D	B	10.4	0.89
Build-Out (~2032)	D	B	15.0	0.93

Source: HCM 6th Edition and Transpo Group, 2020

Note: EB = eastbound movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing a single lane roundabout

6. Improvement includes constructing an eastbound right-turn lane within the single-lane roundabout

As highlighted in Table 22, SR 169/North Connector does not meet WSDOT's LOS D standard within the first year of North Triangle development (sixth year of overall Phase 1B development). As such, it is proposed that the intersection be constructed as a single-lane roundabout at the outset. A final phase improvement is proposed three years later to address operational issues along the eastbound approach of the roundabout.

The first phase improvement includes construction of a single-lane roundabout. This improvement will be necessary by the first year of North Triangle development (after approximately 2,122 ERUs combined (Phases 1A, 1B and 2)). By constructing a single-lane roundabout, this intersection will operate in the LOS A-C range and with a V/C ratio under 1.0 for two years, through the seventh year of Phase 1B development (after approximately 2,699 ERUs combined (Phases 1A, 1B and 2)). Construction of the single-lane roundabout should commence prior to the City's issuance of a certificate of occupancy for the 2,123rd ERU (Phases 1A, 1B and 2 combined).

The final phase improvement includes constructing an eastbound right-turn lane within the roundabout. This improvement will be necessary approximately two years later (after approximately 2,699 ERUs combined (Phases 1A, 1B and 2)). With this improvement SR 169/North Connector will operate in the LOS A-B range and with a V/C ratio under 0.9 through Phase 1B build-out and meet WSDOT's LOS D or better standard. Construction of the eastbound right-turn lane should commence prior to the City's issuance of a certificate of occupancy for the 2,700th ERU (Phases 1A, 1B and 2 combined).

Construction of this intersection and all associated improvements shall only be required if development has commenced within the North Triangle. Other intersection improvements to control traffic may be proposed as acceptable to WSDOT.

Lake Sawyer Road SE/Ten Trails Parkway SE

This intersection does not exist under existing conditions. As discussed within this report, the intersection of Lake Sawyer Road SE/Ten Trails Parkway SE will be constructed in conjunction with Plat A. This intersection will be a three-leg intersection with the extension of Ten Trails Parkway intersecting with Lake Sawyer Road SE. The intersection was evaluated as side-street stop-controlled under future with-project conditions.

Table 23. Lk. Sawyer Rd SE/Ten Trails Pkwy SE – Inter. LOS Summary

Condition	LOS Standard	LOS ¹	Delay ²	V/C ³ or WM ⁴
Existing	C	-	-	-
<u>Future – Without Improvement</u>				
Year 3 (~2024)	C	C	22.8	EB
Year 4 (~2025)	C	D	26.2	EB
Build-Out (~2032)	C	D	30.3	EB
<u>Future – With Improvement⁵</u>				
Year 4 (~2025)	C	A	4.9	0.35
Build-Out (~2032)	C	A	4.9	0.36

Source: HCM 6th Edition and Transpo Group, 2020

Note: WB = westbound movement, EB = eastbound movement

1. Level of service (A – F) as defined by the Highway Capacity Manual (HCM) 6th Edition, Transportation Research Board

2. Average delay per vehicle in seconds

3. Volume-to-capacity (V/C) ratio reported for worst movement of roundabout traffic control

4. Worst movement (WM) reported for two-way stop sign traffic control

5. Improvement includes installing single-lane roundabout

As highlighted in Table 23, an improvement will be necessary at Lake Sawyer Road SE/Ten Trails Parkway SE by the fourth year of Phase 1B development (after approximately 1,899 ERUs combined (Phases 1A, 2, and 1B)). By constructing a single-lane roundabout, this intersection will operate at LOS A and with a V/C ratio under 0.6 through Phase 1B build-out and meet the City of Black Diamond's LOS C or better standard. Construction of this roundabout should commence prior to the City's issuance of a certificate of occupancy for the 1,900th ERU (Phases 1A, 1B and 2 combined) to ensure the improvement is completed before the eastbound approach would otherwise exceed the City's applicable operations standard. Other intersection improvements to control traffic may be proposed as acceptable to the City's MRDT.

Queue Lengths

Future maximum (95th-percentile) vehicle queue lengths were compared to available storage to determine if the storage would be sufficient to accommodate such queues. Future queue lengths were estimated based on methodologies in the *Highway Capacity Manual*, 6th Edition and 2032 with-project weekday PM peak hour traffic volumes at study intersections. Improvements identified and discussed in this report (including those outlined for implementation in the future without-project and future with-project conditions) were assumed to be completed. As demonstrated in Appendix D, available storage is anticipated to accommodate the maximum vehicle queue at each study intersection and therefore, vehicle queues are not anticipated to interfere with the peak hour operations at study intersections or adjacent intersections.

Pipeline Road

Section 6.4.3 of The Villages MPD Development Agreement provides that “the preliminary design and alignment of the Pipeline Road shall be completed by the Master Developer and the right of way dedicated to the City prior to the City’s approval of a building permit for the 1,200th dwelling unit of The Villages MPD.” With Phase 1A including a total of 700 dwelling units and Phase 2 including 766 dwelling units, this requirement will be triggered with the building permit for the 500th dwelling unit of the Ten Trails MPD Phase 2.

As it relates to Phase 1B, Section 6.4.3 of The Villages MPD Development Agreement provides that “Pipeline Road shall be constructed by the Master Developer and open for traffic prior to the earlier of (i) the City’s approval of a building permit for the 1,746th dwelling unit of The Villages MPD; or (ii) when the Traffic Monitoring Plan (Exhibit “F”) shows that construction is necessary to prevent a significantly adverse degradation of Level of Service on Roberts Drive.” Through build-out of Phase 1B, the Ten Trails MPD would total 1,741 dwelling units, below the defined dwelling unit threshold, and all Roberts Drive intersections will meet the applicable level of service standard with the improvements identified in the Phase 1B TMR. As such, Pipeline Road is not required to be constructed as part of Phase 1B.

Transportation Concurrency

Based on the findings of *The Villages MPD Final Environmental Impact Statement (FEIS)* and the *Lawson Hills MPD FEIS* and provided the intersection improvements identified in this report are constructed, all City intersections will operate at LOS C or better and SR 169 intersections located within Black Diamond will operate at LOS D or better during the weekday PM peak hour at Phase 1B build-out. This finding demonstrates compliance with Black Diamond's transportation concurrency requirements as described in the City's Comprehensive Plan (2019).

Highway Capacity Manual 2010

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* (Transportation Research Board, 2010).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F ¹	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop and two-way stop control. All-way stop control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.






Table 2. Level of Service Criteria for Unsignalized Intersections




Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F ¹	>50

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

Existing Conditions

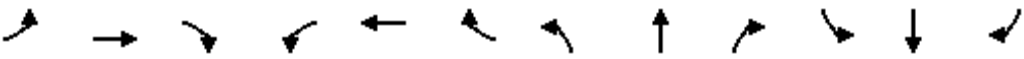
Intersection						
Int Delay, s/veh	3.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	110	85	290	115	120	315
Future Vol, veh/h	110	85	290	115	120	315
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	100	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	3	3	0	0	1	1
Mvmt Flow	115	89	302	120	125	328
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	940	-	0	0	422	0
Stage 1	362	-	-	-	-	-
Stage 2	578	-	-	-	-	-
Critical Hdwy	6.43	-	-	-	4.11	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	-	-	-	2.209	-
Pot Cap-1 Maneuver	291	0	-	-	1143	-
Stage 1	702	0	-	-	-	-
Stage 2	559	0	-	-	-	-
Platoon blocked, %		-	-	-	-	-
Mov Cap-1 Maneuver	259	-	-	-	1143	-
Mov Cap-2 Maneuver	378	-	-	-	-	-
Stage 1	702	-	-	-	-	-
Stage 2	498	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	18.6	0	2.4			
HCM LOS	C					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 378	-	1143	-	
HCM Lane V/C Ratio	-	- 0.303	-	0.109	-	
HCM Control Delay (s)	-	- 18.6	0	8.5	-	
HCM Lane LOS	-	- C	A	A	-	
HCM 95th %tile Q(veh)	-	- 1.3	-	0.4	-	




Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	170	30	30	190	15	15
Future Vol, veh/h	170	30	30	190	15	15
Conflicting Peds, #/hr	0	1	1	0	1	1
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	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	177	31	31	198	16	16
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	209	0	455	195
Stage 1	-	-	-	-	194	-
Stage 2	-	-	-	-	261	-
Critical Hdwy	-	-	4.11	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.209	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1368	-	567	851
Stage 1	-	-	-	-	844	-
Stage 2	-	-	-	-	787	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1367	-	552	850
Mov Cap-2 Maneuver	-	-	-	-	552	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	767	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	1		10.6		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	669	-	-	1367	-	
HCM Lane V/C Ratio	0.047	-	-	0.023	-	
HCM Control Delay (s)	10.6	-	-	7.7	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-	

HCM Signalized Intersection Capacity Analysis Ten Trails and Lawson Hills MPDs - Phase 1B

3: 216th Ave SE & SE Covington-Sawyer Rd

Existing PM Peak Hour

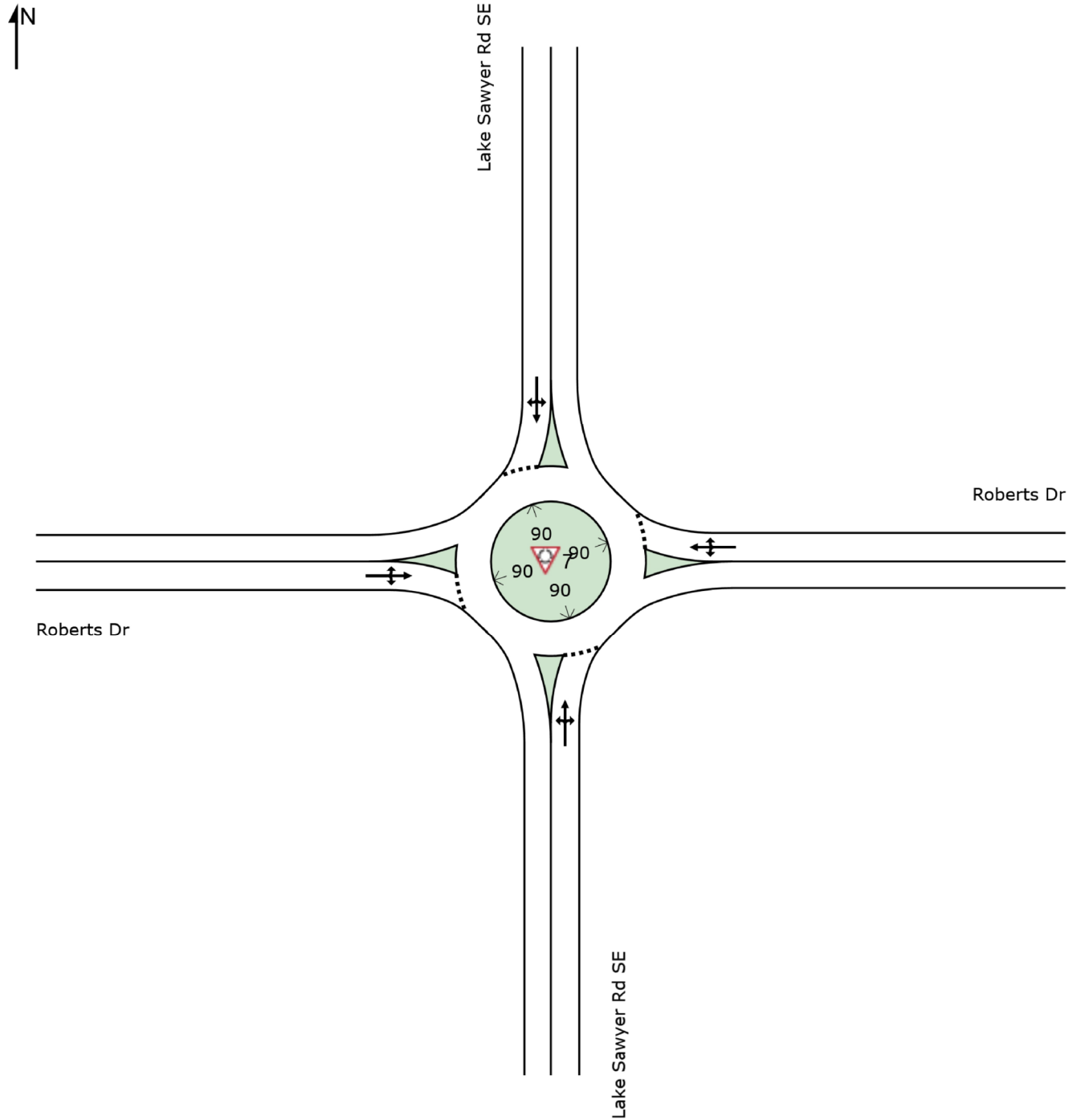
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↔			↔			↖	↗
Traffic Volume (vph)	190	20	195	10	15	10	115	220	10	20	210	185
Future Volume (vph)	190	20	195	10	15	10	115	220	10	20	210	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0		4.0			4.0			4.0	5.0
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98		0.99			1.00			1.00	0.98
Flpb, ped/bikes		0.99	1.00		1.00			1.00			1.00	1.00
Frt		1.00	0.85		0.96			1.00			1.00	0.85
Flt Protected		0.96	1.00		0.99			0.98			1.00	1.00
Satd. Flow (prot)		1789	1574		1785			1859			1873	1562
Flt Permitted		0.72	1.00		0.89			0.80			0.95	1.00
Satd. Flow (perm)		1345	1574		1603			1504			1784	1562
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	204	22	210	11	16	11	124	237	11	22	226	199
RTOR Reduction (vph)	0	0	143	0	8	0	0	2	0	0	0	133
Lane Group Flow (vph)	0	226	67	0	30	0	0	370	0	0	248	66
Confl. Peds. (#/hr)	7		1	1		7	3		1	1		3
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		8	5		4		5	2			6	
Permitted Phases	8		8	4			2			6		6
Actuated Green, G (s)		10.0	13.5		10.0			22.5			14.0	14.0
Effective Green, g (s)		11.0	13.5		11.0			23.5			15.0	14.0
Actuated g/C Ratio		0.26	0.32		0.26			0.55			0.35	0.33
Clearance Time (s)		5.0	5.0		5.0			5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		348	685		414			869			629	514
v/s Ratio Prot			0.01					c0.05				
v/s Ratio Perm		c0.17	0.03		0.02			c0.19			0.14	0.04
v/c Ratio		0.65	0.10		0.07			0.43			0.39	0.13
Uniform Delay, d1		14.0	10.2		11.9			5.6			10.3	10.0
Progression Factor		1.00	1.00		1.00			1.00			1.00	1.00
Incremental Delay, d2		4.1	0.1		0.1			0.3			0.4	0.1
Delay (s)		18.2	10.3		12.0			5.9			10.7	10.1
Level of Service		B	B		B			A			B	B
Approach Delay (s)		14.4			12.0			5.9			10.5	
Approach LOS		B			B			A			B	
Intersection Summary												
HCM 2000 Control Delay			10.5									
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			42.5									
Intersection Capacity Utilization			59.3%									
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	2.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	240	230	35	155	80	40
Future Vol, veh/h	240	230	35	155	80	40
Conflicting Peds, #/hr	0	1	1	0	1	1
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	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	250	240	36	161	83	42
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	491	0	605	372
Stage 1	-	-	-	-	371	-
Stage 2	-	-	-	-	234	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.209	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	1078	-	462	676
Stage 1	-	-	-	-	700	-
Stage 2	-	-	-	-	807	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1077	-	444	675
Mov Cap-2 Maneuver	-	-	-	-	444	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	776	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.6		14.6	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	501	-	-	1077	-	
HCM Lane V/C Ratio	0.25	-	-	0.034	-	
HCM Control Delay (s)	14.6	-	-	8.5	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	1	-	-	0.1	-	

SITE LAYOUT

Site: 7 [Existing Lake Sawyer/Roberts Drive]

Roberts Dr/Lake Sawyer Rd SE
Existing 2020 PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 7 [Existing Lake Sawyer/Roberts Drive]

Roberts Dr/Lake Sawyer Rd SE
Existing 2020 PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Lake Sawyer Rd SE												
3	L2	53	6.0	0.095	11.0	LOS B	0.5	12.3	0.42	0.62	0.42	35.1
8	T1	16	6.0	0.095	5.3	LOS A	0.5	12.3	0.42	0.62	0.42	35.2
18	R2	37	6.0	0.095	5.3	LOS A	0.5	12.3	0.42	0.62	0.42	34.2
Approach		105	6.0	0.095	8.2	LOS A	0.5	12.3	0.42	0.62	0.42	34.8
East: Roberts Dr												
1	L2	26	2.0	0.166	10.3	LOS B	0.9	21.8	0.31	0.45	0.31	34.9
6	T1	121	2.0	0.166	3.6	LOS A	0.9	21.8	0.31	0.45	0.31	33.4
16	R2	68	2.0	0.166	3.8	LOS A	0.9	21.8	0.31	0.45	0.31	32.4
Approach		216	2.0	0.166	4.5	LOS A	0.9	21.8	0.31	0.45	0.31	33.2
North: Lake Sawyer Rd SE												
7	L2	53	1.0	0.093	9.3	LOS A	0.5	11.5	0.35	0.55	0.35	32.7
4	T1	11	1.0	0.093	4.8	LOS A	0.5	11.5	0.35	0.55	0.35	34.0
14	R2	53	1.0	0.093	4.0	LOS A	0.5	11.5	0.35	0.55	0.35	31.6
Approach		116	1.0	0.093	6.4	LOS A	0.5	11.5	0.35	0.55	0.35	32.3
West: Roberts Dr												
5	L2	79	1.0	0.182	8.8	LOS A	1.0	24.4	0.24	0.46	0.24	33.2
2	T1	168	1.0	0.182	3.3	LOS A	1.0	24.4	0.24	0.46	0.24	33.0
12	R2	11	1.0	0.182	4.3	LOS A	1.0	24.4	0.24	0.46	0.24	33.6
Approach		258	1.0	0.182	5.0	LOS A	1.0	24.4	0.24	0.46	0.24	33.1
All Vehicles		695	2.1	0.182	5.6	LOS A	1.0	24.4	0.31	0.50	0.31	33.2

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.




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Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Sidra\Phase 1B TMR (March 2020)\Existing\Existing PM Peak Hour - Only.sip8

HCM 6th TWSC
8: Morgan St & Roberts Drive/Roberts Dr




Ten Trails and Lawson Hills MPDs - Phase 1B
Existing PM Peak Hour

Intersection						
Int Delay, s/veh	3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	115	140	5	110	85	1
Future Vol, veh/h	115	140	5	110	85	1
Conflicting Peds, #/hr	0	1	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	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, %	1	1	2	2	0	0
Mvmt Flow	125	152	5	120	92	1
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	-	125	0	256	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	131	-
Critical Hdwy	-	-	4.12	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.218	-	3.5	3.3
Pot Cap-1 Maneuver	-	0	1462	-	737	931
Stage 1	-	0	-	-	906	-
Stage 2	-	0	-	-	900	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1462	-	733	931
Mov Cap-2 Maneuver	-	-	-	-	733	-
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	896	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.3		10.6		
HCM LOS				B		
Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT		
Capacity (veh/h)	735	-	1462	-		
HCM Lane V/C Ratio	0.127	-	0.004	-		
HCM Control Delay (s)	10.6	-	7.5	0		
HCM Lane LOS	B	-	A	A		
HCM 95th %tile Q(veh)	0.4	-	0	-		

Intersection						
Int Delay, s/veh	4.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	105	60	45	315	575	225
Future Vol, veh/h	105	60	45	315	575	225
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	0	175	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	0	0	2	2
Mvmt Flow	118	67	51	354	646	253
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1102	646	646	0	-	0
Stage 1	646	-	-	-	-	-
Stage 2	456	-	-	-	-	-
Critical Hdwy	6.41	6.21	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.2	-	-	-
Pot Cap-1 Maneuver	235	473	949	-	-	0
Stage 1	524	-	-	-	-	0
Stage 2	640	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	222	473	949	-	-	-
Mov Cap-2 Maneuver	222	-	-	-	-	-
Stage 1	496	-	-	-	-	-
Stage 2	640	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	29.4	1.1		0		
HCM LOS	D					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	949	-	222	473	-	
HCM Lane V/C Ratio	0.053	-	0.531	0.143	-	
HCM Control Delay (s)	9	-	38.2	13.9	-	
HCM Lane LOS	A	-	E	B	-	
HCM 95th %tile Q(veh)	0.2	-	2.8	0.5	-	

HCM 6th TWSC
10: SR 169 & SE Black Diamond-Ravensdale Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Existing PM Peak Hour





Intersection						
Int Delay, s/veh	59.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	260	20	330	60	30	625
Future Vol, veh/h	260	20	330	60	30	625
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	1	1	2	2	1	1
Mvmt Flow	292	22	371	67	34	702




Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1175	405	0	0	438
Stage 1	405	-	-	-	-
Stage 2	770	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209
Pot Cap-1 Maneuver	~ 213	648	-	-	1127
Stage 1	676	-	-	-	-
Stage 2	459	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	~ 203	648	-	-	1127
Mov Cap-2 Maneuver	~ 203	-	-	-	-
Stage 1	676	-	-	-	-
Stage 2	437	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	280.1	0	0.4
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	213	1127
HCM Lane V/C Ratio	-	-	1.477	0.03
HCM Control Delay (s)	-	-	280.1	8.3
HCM Lane LOS	-	-	F	A
HCM 95th %tile Q(veh)	-	-	18.9	0.1

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection						
Int Delay, s/veh	2.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	75	30	10	310	745	140
Future Vol, veh/h	75	30	10	310	745	140
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	1	1	2	2	1	1
Mvmt Flow	83	33	11	344	828	156
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1272	906	984	0	-	0
Stage 1	906	-	-	-	-	-
Stage 2	366	-	-	-	-	-
Critical Hdwy	6.41	6.21	4.12	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.218	-	-	-
Pot Cap-1 Maneuver	186	336	702	-	-	-
Stage 1	396	-	-	-	-	-
Stage 2	704	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	182	336	702	-	-	-
Mov Cap-2 Maneuver	182	-	-	-	-	-
Stage 1	388	-	-	-	-	-
Stage 2	704	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	33.8	0.3		0		
HCM LOS	D					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	702	-	182	336	-	-
HCM Lane V/C Ratio	0.016	-	0.458	0.099	-	-
HCM Control Delay (s)	10.2	0	40.5	16.9	-	-
HCM Lane LOS	B	A	E	C	-	-
HCM 95th %tile Q(veh)	0	-	2.2	0.3	-	-

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	85	30	320	790	40
Future Vol, veh/h	30	85	30	320	790	40
Conflicting Peds, #/hr	3	0	0	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	32	90	32	340	840	43

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1272	865	886	0	-	0
Stage 1	865	-	-	-	-	-
Stage 2	407	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	187	356	760	-	-	-
Stage 1	416	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	177	355	758	-	-	-
Mov Cap-2 Maneuver	177	-	-	-	-	-
Stage 1	394	-	-	-	-	-
Stage 2	675	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27.3	0.9	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	758	-	281	-	-
HCM Lane V/C Ratio	0.042	-	0.435	-	-
HCM Control Delay (s)	10	0	27.3	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0.1	-	2.1	-	-




HCM 6th TWSC
13: SR 169 & Lawson Rd




Ten Trails and Lawson Hills MPDs - Phase 1B
Existing PM Peak Hour

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	1	3	15	0	55	2	225	10	105	670	4
Future Vol, veh/h	1	1	3	15	0	55	2	225	10	105	670	4
Conflicting Peds, #/hr	3	0	3	5	0	5	3	0	5	5	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	3	3	3	2	2	2
Mvmt Flow	1	1	3	16	0	58	2	237	11	111	705	4
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1213	1189	715	1188	1186	253	712	0	0	253	0	0
Stage 1	932	932	-	252	252	-	-	-	-	-	-	-
Stage 2	281	257	-	936	934	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	160	190	434	167	190	791	883	-	-	1312	-	-
Stage 1	322	348	-	757	702	-	-	-	-	-	-	-
Stage 2	730	699	-	321	347	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	131	162	431	146	162	784	881	-	-	1307	-	-
Mov Cap-2 Maneuver	131	162	-	146	162	-	-	-	-	-	-	-
Stage 1	320	299	-	752	697	-	-	-	-	-	-	-
Stage 2	671	694	-	272	298	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	20.3		15.9		0.1		1.1					
HCM LOS	C		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	881	-	-	241	405	1307	-	-				
HCM Lane V/C Ratio	0.002	-	-	0.022	0.182	0.085	-	-				
HCM Control Delay (s)	9.1	0	-	20.3	15.9	8	0	-				
HCM Lane LOS	A	A	-	C	C	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.1	0.7	0.3	-	-				

HCM 6th TWSC
14: SR 169 & Jones Lake Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Existing PM Peak Hour

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	60	45	245	645	1
Future Vol, veh/h	0	60	45	245	645	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	2	2	3	3
Mvmt Flow	0	63	47	258	679	1
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1032	680	680	0	-	0
Stage 1	680	-	-	-	-	-
Stage 2	352	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	260	454	912	-	-	-
Stage 1	507	-	-	-	-	-
Stage 2	716	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	244	454	912	-	-	-
Mov Cap-2 Maneuver	244	-	-	-	-	-
Stage 1	477	-	-	-	-	-
Stage 2	716	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	14.2	1.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	912	-	454	-	-	
HCM Lane V/C Ratio	0.052	-	0.139	-	-	
HCM Control Delay (s)	9.2	0	14.2	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0.2	-	0.5	-	-	

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	15	15	10	295	655	25
Future Vol, veh/h	15	15	10	295	655	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	18	18	12	347	771	29
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1142	771	771	0	-	0
Stage 1	771	-	-	-	-	-
Stage 2	371	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	224	403	844	-	-	0
Stage 1	460	-	-	-	-	0
Stage 2	702	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	220	403	844	-	-	-
Mov Cap-2 Maneuver	220	-	-	-	-	-
Stage 1	452	-	-	-	-	-
Stage 2	702	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	19.4	0.3		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT		
Capacity (veh/h)	844	-	285	-		
HCM Lane V/C Ratio	0.014	-	0.124	-		
HCM Control Delay (s)	9.3	0	19.4	-		
HCM Lane LOS	A	A	C	-		
HCM 95th %tile Q(veh)	0	-	0.4	-		






HCM 6th TWSC
16: Landsburg Rd SE & SE Kent-Kangley Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Existing PM Peak Hour






Intersection												
Int Delay, s/veh	17.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	25	235	4	10	160	35	1	50	20	105	210	40
Future Vol, veh/h	25	235	4	10	160	35	1	50	20	105	210	40
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	1	1	1	2	2	2	1	1	1	3	3	3
Mvmt Flow	26	247	4	11	168	37	1	53	21	111	221	42
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	205	0	0	251	0	0	641	528	249	547	512	187
Stage 1	-	-	-	-	-	-	301	301	-	209	209	-
Stage 2	-	-	-	-	-	-	340	227	-	338	303	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.11	6.51	6.21	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.13	5.53	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.509	4.009	3.309	3.527	4.027	3.327
Pot Cap-1 Maneuver	1372	-	-	1314	-	-	389	457	792	446	464	852
Stage 1	-	-	-	-	-	-	710	667	-	791	727	-
Stage 2	-	-	-	-	-	-	677	718	-	674	662	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1372	-	-	1314	-	-	222	443	792	385	450	852
Mov Cap-2 Maneuver	-	-	-	-	-	-	222	443	-	385	450	-
Stage 1	-	-	-	-	-	-	694	652	-	774	720	-
Stage 2	-	-	-	-	-	-	442	712	-	590	647	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.4			13.5			41.2		
HCM LOS							B			E		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	498	1372	-	-	1314	-	-	451				
HCM Lane V/C Ratio	0.15	0.019	-	-	0.008	-	-	0.829				
HCM Control Delay (s)	13.5	7.7	0	-	7.8	0	-	41.2				
HCM Lane LOS	B	A	A	-	A	A	-	E				
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0	-	-	8				




HCM 6th TWSC
17: SE Green Valley Rd & SE Auburn-Black Diamond Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Existing PM Peak Hour

Intersection						
Int Delay, s/veh	1.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	530	195	5	380	70	5
Future Vol, veh/h	530	195	5	380	70	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Stop
Storage Length	-	-	125	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	1	1	0	0	3	3
Mvmt Flow	589	217	6	422	78	6
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	589	0	1023	589
Stage 1	-	-	-	-	589	-
Stage 2	-	-	-	-	434	-
Critical Hdwy	-	-	4.1	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.2	-	3.527	3.327
Pot Cap-1 Maneuver	-	0	996	-	260	506
Stage 1	-	0	-	-	553	-
Stage 2	-	0	-	-	651	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	996	-	258	506
Mov Cap-2 Maneuver	-	-	-	-	258	-
Stage 1	-	-	-	-	553	-
Stage 2	-	-	-	-	647	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.1		24.1	
HCM LOS	C					
Minor Lane/Major Mvmt	NBLn1		NBLn2	EBT	WBL	WBT
Capacity (veh/h)	258		506	-	996	-
HCM Lane V/C Ratio	0.301		0.011	-	0.006	-
HCM Control Delay (s)	24.9		12.2	-	8.6	-
HCM Lane LOS	C		B	-	A	-
HCM 95th %tile Q(veh)	1.2		0	-	0	-

2032 Future Without-Project Conditions



















Intersection						
Int Delay, s/veh	5.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	135	120	555	145	165	655
Future Vol, veh/h	135	120	555	145	165	655
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	100	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	3	3	0	0	1	1
Mvmt Flow	141	125	578	151	172	682
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	1680	-	0	0	729	0
Stage 1	654	-	-	-	-	-
Stage 2	1026	-	-	-	-	-
Critical Hdwy	6.43	-	-	-	4.11	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	-	-	-	2.209	-
Pot Cap-1 Maneuver	~ 104	0	-	-	879	-
Stage 1	515	0	-	-	-	-
Stage 2	344	0	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 84	-	-	-	879	-
Mov Cap-2 Maneuver	198	-	-	-	-	-
Stage 1	515	-	-	-	-	-
Stage 2	277	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	58.3	0		2		
HCM LOS	F					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	198	-	879	-
HCM Lane V/C Ratio	-	-	0.71	-	0.196	-
HCM Control Delay (s)	-	-	58.3	0	10.1	-
HCM Lane LOS	-	-	F	A	B	-
HCM 95th %tile Q(veh)	-	-	4.5	-	0.7	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon




Intersection						
Int Delay, s/veh	1.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	230	35	35	250	20	20
Future Vol, veh/h	230	35	35	250	20	20
Conflicting Peds, #/hr	0	1	1	0	1	1
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	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	240	36	36	260	21	21
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	277	0	592	260
Stage 1	-	-	-	-	259	-
Stage 2	-	-	-	-	333	-
Critical Hdwy	-	-	4.11	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.209	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1292	-	472	784
Stage 1	-	-	-	-	789	-
Stage 2	-	-	-	-	731	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1291	-	455	783
Mov Cap-2 Maneuver	-	-	-	-	455	-
Stage 1	-	-	-	-	788	-
Stage 2	-	-	-	-	706	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1		11.7	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	576	-	-	1291	-	
HCM Lane V/C Ratio	0.072	-	-	0.028	-	
HCM Control Delay (s)	11.7	-	-	7.9	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-	

HCM Signalized Intersection Capacity Analysis Ten Trails and Lawson Hills MPDs - Phase 1B

3: 216th Ave SE & SE Covington-Sawyer Rd

Future (2032) Without-Project PM Peak Hour

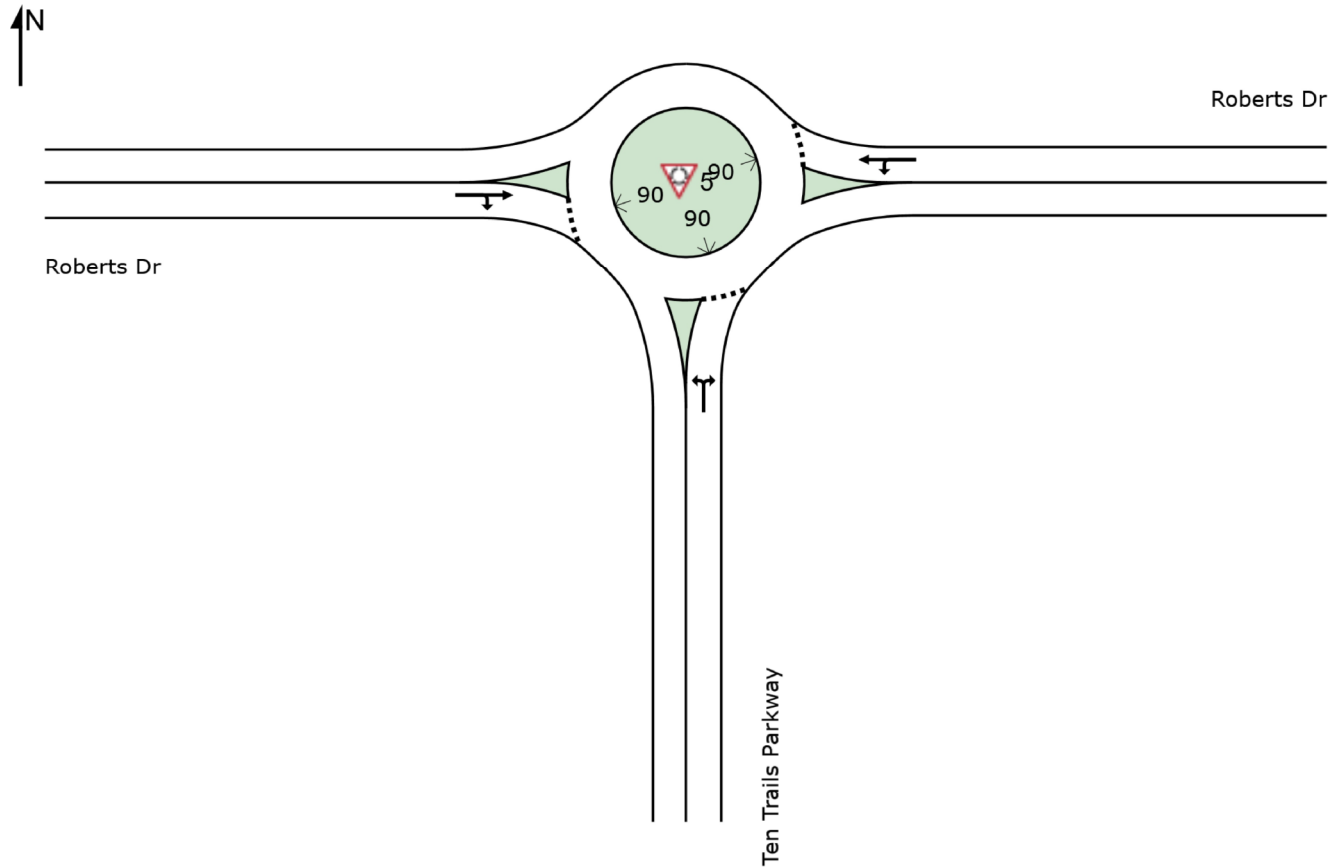
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	25	280	10	20	10	170	465	10	25	525	230
Future Volume (vph)	235	25	280	10	20	10	170	465	10	25	525	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0		4.0			4.0			4.0	5.0
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98		0.99			1.00			1.00	0.98
Flpb, ped/bikes		0.99	1.00		1.00			1.00			1.00	1.00
Frt		1.00	0.85		0.97			1.00			1.00	0.85
Flt Protected		0.96	1.00		0.99			0.99			1.00	1.00
Satd. Flow (prot)		1786	1573		1800			1871			1877	1560
Flt Permitted		0.71	1.00		0.91			0.28			0.95	1.00
Satd. Flow (perm)		1334	1573		1655			529			1794	1560
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	253	27	301	11	22	11	183	500	11	27	565	247
RTOR Reduction (vph)	0	0	70	0	8	0	0	1	0	0	0	96
Lane Group Flow (vph)	0	280	231	0	36	0	0	693	0	0	592	151
Confl. Peds. (#/hr)	7		1	1		7	3		1	1		3
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		8	5		4		5	2			6	
Permitted Phases	8		8	4			2			6		6
Actuated Green, G (s)		15.8	20.8		15.8			29.2			19.2	19.2
Effective Green, g (s)		16.8	20.8		16.8			30.2			20.2	19.2
Actuated g/C Ratio		0.31	0.38		0.31			0.55			0.37	0.35
Clearance Time (s)		5.0	5.0		5.0			5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		407	737		505			436			658	544
v/s Ratio Prot			0.03					c0.17				
v/s Ratio Perm		c0.21	0.12		0.02			c0.70			0.33	0.10
v/c Ratio		0.69	0.31		0.07			1.59			0.90	0.28
Uniform Delay, d1		16.8	12.1		13.6			12.4			16.4	12.9
Progression Factor		1.00	1.00		1.00			1.00			1.00	1.00
Incremental Delay, d2		4.8	0.2		0.1			276.1			15.1	0.3
Delay (s)		21.6	12.3		13.6			288.5			31.6	13.2
Level of Service		C	B		B			F			C	B
Approach Delay (s)		16.8			13.6			288.5			26.2	
Approach LOS		B			B			F			C	
Intersection Summary												
HCM 2000 Control Delay			107.7				HCM 2000 Level of Service				F	
HCM 2000 Volume to Capacity ratio			1.37									
Actuated Cycle Length (s)			55.0				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			94.5%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection						
Int Delay, s/veh	4.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	410	280	60	245	95	85
Future Vol, veh/h	410	280	60	245	95	85
Conflicting Peds, #/hr	0	1	1	0	1	1
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	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	427	292	63	255	99	89
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	720	0	956	575
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	382	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.209	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	886	-	287	519
Stage 1	-	-	-	-	565	-
Stage 2	-	-	-	-	692	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	885	-	263	518
Mov Cap-2 Maneuver	-	-	-	-	263	-
Stage 1	-	-	-	-	564	-
Stage 2	-	-	-	-	634	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.8		27.5	
HCM LOS	D					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	343	-	-	885	-	
HCM Lane V/C Ratio	0.547	-	-	0.071	-	
HCM Control Delay (s)	27.5	-	-	9.4	0	
HCM Lane LOS	D	-	-	A	A	
HCM 95th %tile Q(veh)	3.1	-	-	0.2	-	

SITE LAYOUT

Site: 5 [WP Roberts Drive/Ten Trails Parkway]

Roberts Dr/Ten Trails Parkway SE
Future (2032) Without-Project PM Peak
Site Category: (None)
Roundabout



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MOVEMENT SUMMARY

Site: 5 [5] Roberts Drive/Ten Trails Parkway]

Roberts Dr/Ten Trails Parkway SE
Future (2032) Without-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Ten Trails Parkway												
3	L2	71	2.0	0.253	11.8	LOS B	1.6	39.7	0.60	0.69	0.60	35.5
18	R2	187	2.0	0.253	6.1	LOS A	1.6	39.7	0.60	0.69	0.60	34.5
Approach		258	2.0	0.253	7.7	LOS A	1.6	39.7	0.60	0.69	0.60	34.8
East: Roberts Dr												
1	L2	258	2.0	0.375	10.0	LOS A	2.8	69.9	0.29	0.50	0.29	34.7
6	T1	291	2.0	0.375	3.3	LOS A	2.8	69.9	0.29	0.50	0.29	33.2
Approach		549	2.0	0.375	6.4	LOS A	2.8	69.9	0.29	0.50	0.29	33.9
West: Roberts Dr												
2	T1	429	1.0	0.416	4.4	LOS A	2.8	70.0	0.52	0.51	0.52	33.1
12	R2	77	1.0	0.416	5.4	LOS A	2.8	70.0	0.52	0.51	0.52	33.7
Approach		505	1.0	0.416	4.5	LOS A	2.8	70.0	0.52	0.51	0.52	33.2
All Vehicles		1313	1.6	0.416	5.9	LOS A	2.8	70.0	0.44	0.54	0.44	33.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.






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HCM 6th TWSC
6: Ten Trails Place & Roberts Drive

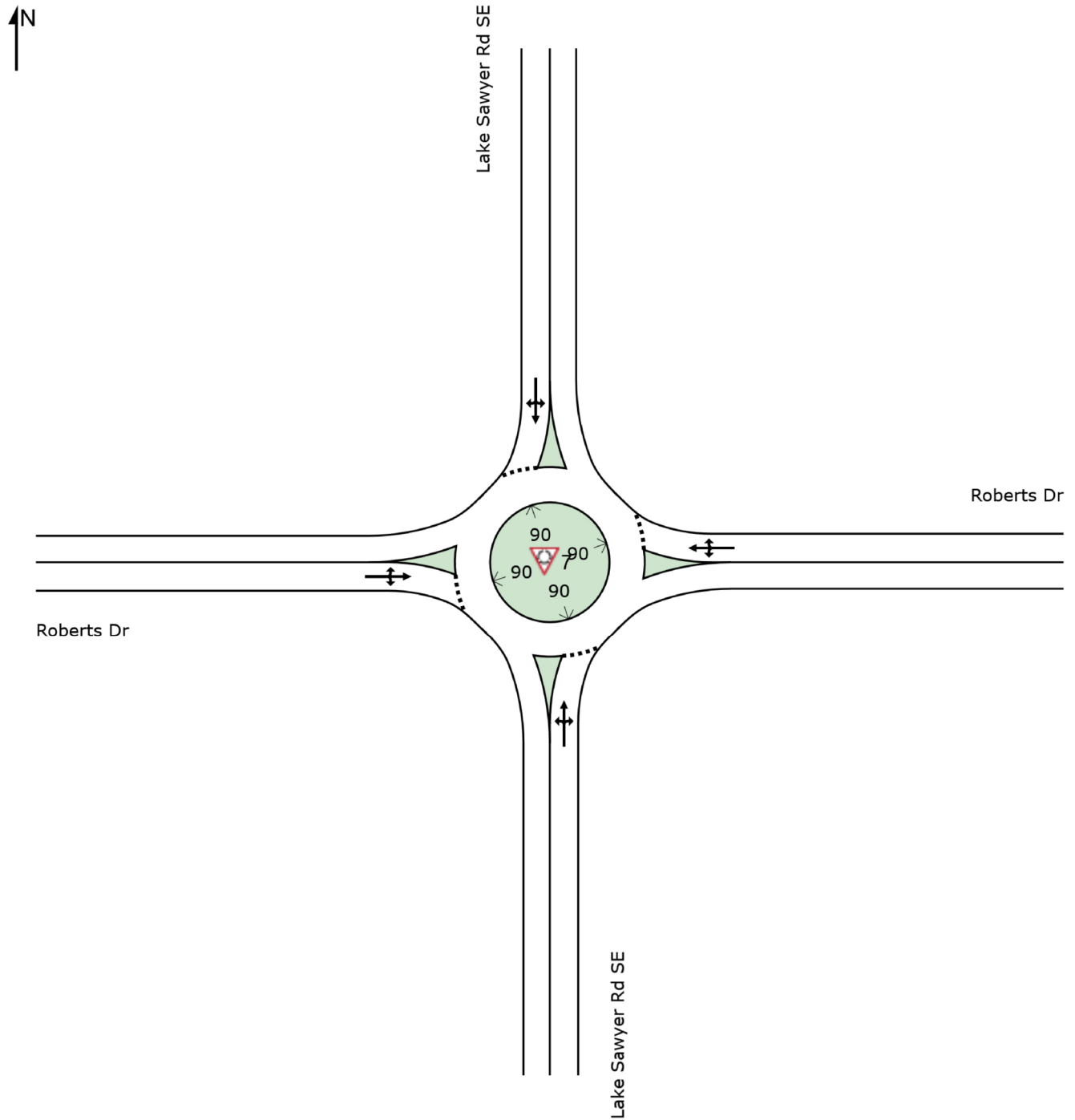
Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) Without-Project PM Peak Hour

Intersection						
Int Delay, s/veh	9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	500	60	165	440	60	120
Future Vol, veh/h	500	60	165	440	60	120
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	150	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	1	2	2	0	0
Mvmt Flow	549	66	181	484	66	132
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	615	0	1428	582
Stage 1	-	-	-	-	582	-
Stage 2	-	-	-	-	846	-
Critical Hdwy	-	-	4.12	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.218	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	965	-	150	517
Stage 1	-	-	-	-	563	-
Stage 2	-	-	-	-	424	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	965	-	122	517
Mov Cap-2 Maneuver	-	-	-	-	122	-
Stage 1	-	-	-	-	563	-
Stage 2	-	-	-	-	344	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		2.6		58.7	
HCM LOS	F					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	249	-	-	965	-	
HCM Lane V/C Ratio	0.794	-	-	0.188	-	
HCM Control Delay (s)	58.7	-	-	9.6	-	
HCM Lane LOS	F	-	-	A	-	
HCM 95th %tile Q(veh)	6	-	-	0.7	-	

SITE LAYOUT

Site: 7 [WP Lake Sawyer/Roberts Drive]

Roberts Dr/Lake Sawyer Rd SE
Future (2032) Without-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 7 [7) Lake Sawyer/Roberts Drive]

Roberts Dr/Lake Sawyer Rd SE
Future (2032) Without-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Lake Sawyer Rd SE												
3	L2	42	6.0	0.390	13.9	LOS B	2.8	72.6	0.82	0.83	0.82	34.6
8	T1	137	6.0	0.390	8.3	LOS A	2.8	72.6	0.82	0.83	0.82	34.7
18	R2	116	6.0	0.390	8.3	LOS A	2.8	72.6	0.82	0.83	0.82	33.7
Approach		295	6.0	0.390	9.1	LOS A	2.8	72.6	0.82	0.83	0.82	34.3
East: Roberts Dr												
1	L2	179	2.0	0.561	13.0	LOS B	4.7	120.1	0.73	0.76	0.78	33.5
6	T1	332	2.0	0.561	6.3	LOS A	4.7	120.1	0.73	0.76	0.78	32.1
16	R2	79	2.0	0.561	6.5	LOS A	4.7	120.1	0.73	0.76	0.78	31.2
Approach		589	2.0	0.561	8.3	LOS A	4.7	120.1	0.73	0.76	0.78	32.4
North: Lake Sawyer Rd SE												
7	L2	58	1.0	0.521	12.8	LOS B	4.5	112.4	0.82	0.85	0.91	32.4
4	T1	147	1.0	0.521	8.3	LOS A	4.5	112.4	0.82	0.85	0.91	33.7
14	R2	263	1.0	0.521	7.5	LOS A	4.5	112.4	0.82	0.85	0.91	31.3
Approach		468	1.0	0.521	8.4	LOS A	4.5	112.4	0.82	0.85	0.91	32.2
West: Roberts Dr												
5	L2	221	2.0	0.602	12.0	LOS B	5.5	140.7	0.74	0.78	0.82	31.8
2	T1	379	2.0	0.602	6.5	LOS A	5.5	140.7	0.74	0.78	0.82	31.6
12	R2	47	2.0	0.602	7.5	LOS A	5.5	140.7	0.74	0.78	0.82	32.1
Approach		647	2.0	0.602	8.4	LOS A	5.5	140.7	0.74	0.78	0.82	31.7
All Vehicles		2000	2.4	0.602	8.5	LOS A	5.5	140.7	0.77	0.80	0.83	32.4

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.




SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.







Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

HCM 6th TWSC
8: Morgan St & Roberts Drive/Roberts Dr




Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) Without-Project PM Peak Hour

Intersection						
Int Delay, s/veh	3.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	345	195	5	400	145	1
Future Vol, veh/h	345	195	5	400	145	1
Conflicting Peds, #/hr	0	1	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	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, %	1	1	2	2	0	0
Mvmt Flow	375	212	5	435	158	1
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	375	0	821	375
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	446	-
Critical Hdwy	-	-	4.12	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.218	-	3.5	3.3
Pot Cap-1 Maneuver	-	0	1183	-	347	676
Stage 1	-	0	-	-	699	-
Stage 2	-	0	-	-	649	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1183	-	345	676
Mov Cap-2 Maneuver	-	-	-	-	345	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	644	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.1		23.9	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT		
Capacity (veh/h)	346	-	1183	-		
HCM Lane V/C Ratio	0.459	-	0.005	-		
HCM Control Delay (s)	23.9	-	8.1	0		
HCM Lane LOS	C	-	A	A		
HCM 95th %tile Q(veh)	2.3	-	0	-		

Intersection						
Int Delay, s/veh	17.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	125	100	75	450	790	275
Future Vol, veh/h	125	100	75	450	790	275
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	0	175	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	0	0	2	2
Mvmt Flow	136	109	82	489	859	299
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1512	859	859	0	-	0
Stage 1	859	-	-	-	-	-
Stage 2	653	-	-	-	-	-
Critical Hdwy	6.41	6.21	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.2	-	-	-
Pot Cap-1 Maneuver	~ 133	358	791	-	-	0
Stage 1	417	-	-	-	-	0
Stage 2	520	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 119	358	791	-	-	-
Mov Cap-2 Maneuver	~ 119	-	-	-	-	-
Stage 1	374	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	117.4	1.4		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	791	-	119	358	-	
HCM Lane V/C Ratio	0.103	-	1.142	0.304	-	
HCM Control Delay (s)	10.1	-	195.8	19.4	-	
HCM Lane LOS	B	-	F	C	-	
HCM 95th %tile Q(veh)	0.3	-	8.3	1.3	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

HCM 6th TWSC
10: SR 169 & SE Black Diamond-Ravensdale Rd

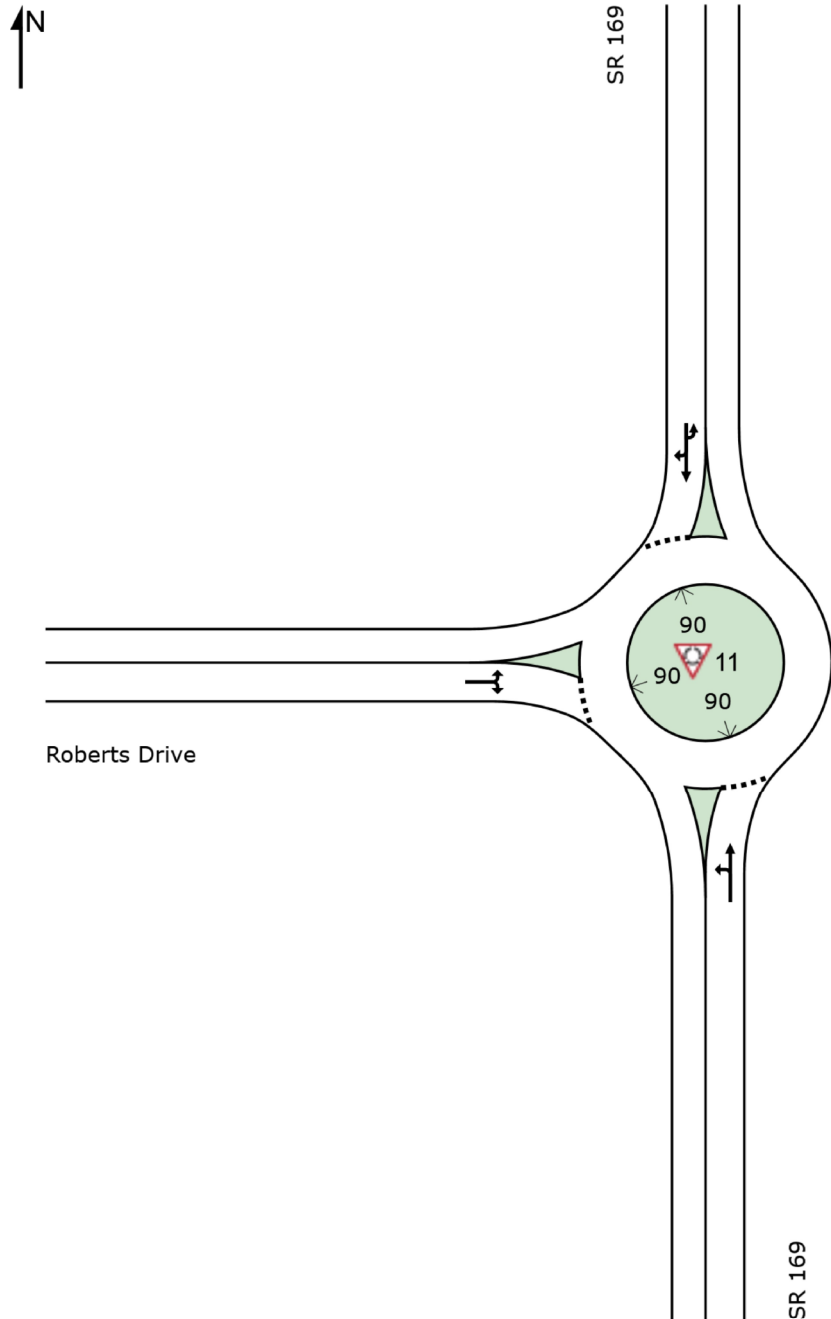
Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) Without-Project PM Peak Hour

Intersection						
Int Delay, s/veh	4.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	315	535	140	0	1290
Future Vol, veh/h	0	315	535	140	0	1290
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	1	1	2	2	1	1
Mvmt Flow	0	339	575	151	0	1387
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	2038	651	0	0	726	0
Stage 1	651	-	-	-	-	-
Stage 2	1387	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	63	470	-	-	882	-
Stage 1	521	-	-	-	-	-
Stage 2	233	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	63	470	-	-	882	-
Mov Cap-2 Maneuver	63	-	-	-	-	-
Stage 1	521	-	-	-	-	-
Stage 2	233	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	30	0	0			
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	470	882	-	
HCM Lane V/C Ratio	-	-	0.721	-	-	
HCM Control Delay (s)	-	-	30	0	-	
HCM Lane LOS	-	-	D	A	-	
HCM 95th %tile Q(veh)	-	-	5.7	0	-	

SITE LAYOUT

Site: 11 [WP SR 169/Roberts Drive]

SR 169/Roberts Drive
Future (2032) Without-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

 **Site: 11 [11) SR 169/Roberts Drive]**

SR 169/Roberts Drive
Future (2032) Without-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	145	2.0	0.493	11.3	LOS B	3.7	93.1	0.61	0.61	0.61	35.2
8	T1	425	2.0	0.493	5.6	LOS A	3.7	93.1	0.61	0.61	0.61	35.2
Approach		570	2.0	0.493	7.1	LOS A	3.7	93.1	0.61	0.61	0.61	35.2
North: SR 169												
7u	U	91	1.0	0.992	23.6	LOS E	42.6	1074.5	1.00	0.82	1.31	31.8
4	T1	973	1.0	0.992	15.7	LOS E	42.6	1074.5	1.00	0.82	1.31	31.1
14	R2	339	1.0	0.992	14.9	LOS E	42.6	1074.5	1.00	0.82	1.31	29.1
Approach		1403	1.0	0.992	16.0	LOS B	42.6	1074.5	1.00	0.82	1.31	30.7
West: Roberts Drive												
5	L2	204	1.0	0.883	49.1	LOS D	14.1	355.7	1.00	1.42	2.07	21.0
12	R2	156	1.0	0.883	44.6	LOS D	14.1	355.7	1.00	1.42	2.07	21.2
Approach		360	1.0	0.883	47.2	LOS D	14.1	355.7	1.00	1.42	2.07	21.1
All Vehicles		2333	1.2	0.992	18.6	LOS B	42.6	1074.5	0.91	0.86	1.26	29.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.




Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Intersection						
Int Delay, s/veh	10					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	110	40	530	1065	50
Future Vol, veh/h	35	110	40	530	1065	50
Conflicting Peds, #/hr	3	0	0	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	37	117	43	564	1133	53
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1816	1163	1189	0	-	0
Stage 1	1163	-	-	-	-	-
Stage 2	653	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	87	239	584	-	-	-
Stage 1	300	-	-	-	-	-
Stage 2	522	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	77	238	583	-	-	-
Mov Cap-2 Maneuver	77	-	-	-	-	-
Stage 1	267	-	-	-	-	-
Stage 2	521	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	122.6	0.8		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	583	-	158	-	-	
HCM Lane V/C Ratio	0.073	-	0.976	-	-	
HCM Control Delay (s)	11.7	0	122.6	-	-	
HCM Lane LOS	B	A	F	-	-	
HCM 95th %tile Q(veh)	0.2	-	7.4	-	-	




HCM 6th TWSC
13: SR 169 & Lawson Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) Without-Project PM Peak Hour

Intersection												
Int Delay, s/veh	11											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	1	4	30	0	130	2	360	30	215	845	5
Future Vol, veh/h	1	1	4	30	0	130	2	360	30	215	845	5
Conflicting Peds, #/hr	3	0	3	5	0	5	3	0	5	5	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	3	3	3	2	2	2
Mvmt Flow	1	1	4	32	0	137	2	379	32	226	889	5
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1820	1767	900	1755	1753	405	897	0	0	416	0	0
Stage 1	1347	1347	-	404	404	-	-	-	-	-	-	-
Stage 2	473	420	-	1351	1349	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	61	85	340	67	86	650	753	-	-	1143	-	-
Stage 1	188	222	-	627	603	-	-	-	-	-	-	-
Stage 2	576	593	-	187	221	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	33	51	338	45	52	645	751	-	-	1138	-	-
Mov Cap-2 Maneuver	33	51	-	45	52	-	-	-	-	-	-	-
Stage 1	187	134	-	623	599	-	-	-	-	-	-	-
Stage 2	451	589	-	110	133	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	44.7		97.3		0.1		1.8					
HCM LOS	E		F									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	751	-	-	97	184	1138	-	-				
HCM Lane V/C Ratio	0.003	-	-	0.065	0.915	0.199	-	-				
HCM Control Delay (s)	9.8	0	-	44.7	97.3	8.9	0	-				
HCM Lane LOS	A	A	-	E	F	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.2	7	0.7	-	-				




HCM 6th TWSC
14: SR 169 & Jones Lake Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) Without-Project PM Peak Hour

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	65	55	400	825	1
Future Vol, veh/h	0	65	55	400	825	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	2	2	3	3
Mvmt Flow	0	68	58	421	868	1
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1406	869	869	0	-	0
Stage 1	869	-	-	-	-	-
Stage 2	537	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	155	354	775	-	-	-
Stage 1	414	-	-	-	-	-
Stage 2	590	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	140	354	775	-	-	-
Mov Cap-2 Maneuver	140	-	-	-	-	-
Stage 1	373	-	-	-	-	-
Stage 2	590	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	17.6	1.2		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	775	-	354	-	-	
HCM Lane V/C Ratio	0.075	-	0.193	-	-	
HCM Control Delay (s)	10	0	17.6	-	-	
HCM Lane LOS	B	A	C	-	-	
HCM 95th %tile Q(veh)	0.2	-	0.7	-	-	

HCM 6th TWSC
15: SR 169 & SE Green Valley Rd

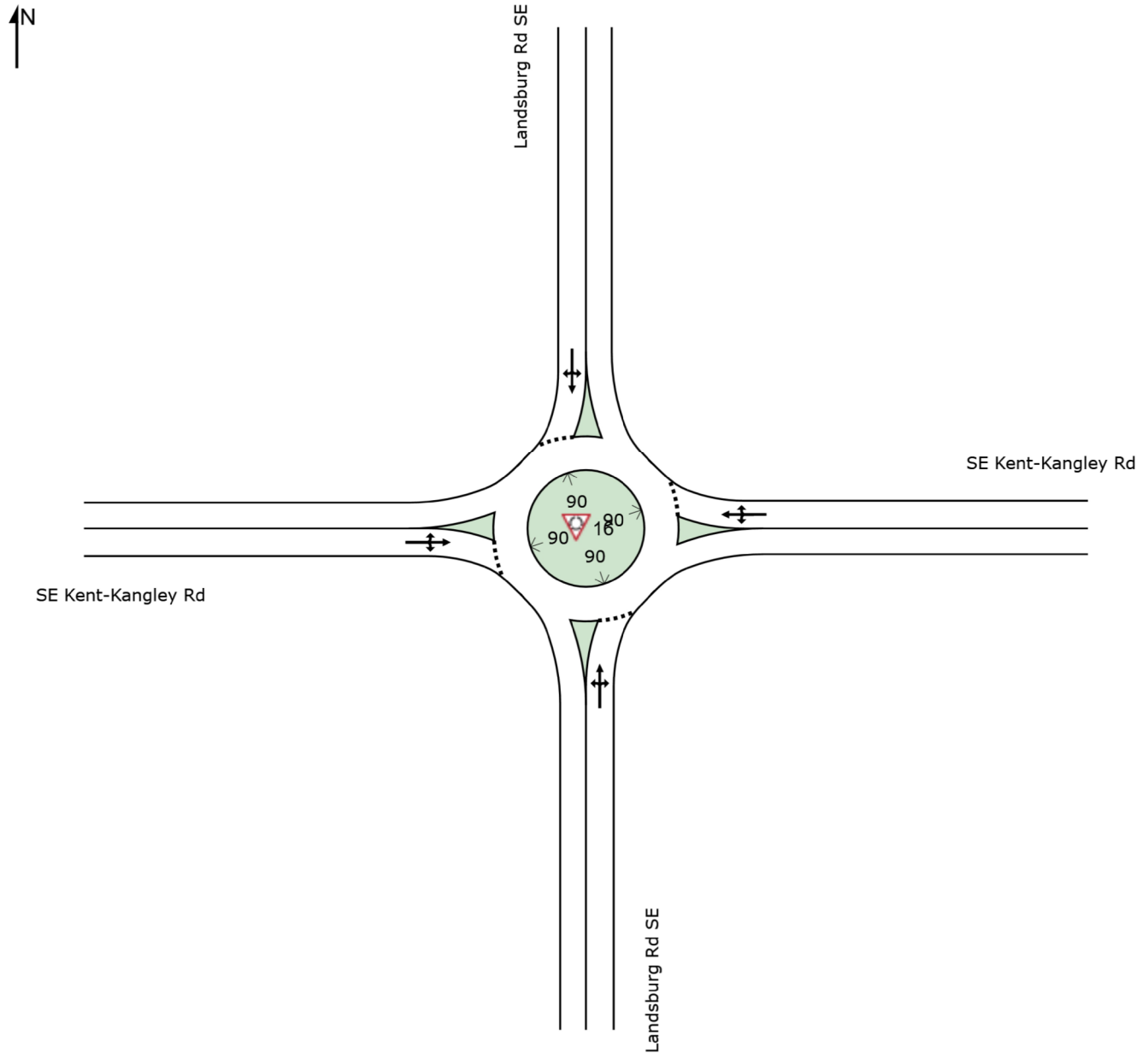
Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) Without-Project PM Peak Hour

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	20	10	455	825	35
Future Vol, veh/h	25	20	10	455	825	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	27	22	11	500	907	38
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1429	907	907	0	-	0
Stage 1	907	-	-	-	-	-
Stage 2	522	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	150	337	750	-	-	0
Stage 1	397	-	-	-	-	0
Stage 2	599	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	147	337	750	-	-	-
Mov Cap-2 Maneuver	147	-	-	-	-	-
Stage 1	389	-	-	-	-	-
Stage 2	599	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	29.5	0.2		0		
HCM LOS	D					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT		
Capacity (veh/h)	750	-	196	-		
HCM Lane V/C Ratio	0.015	-	0.252	-		
HCM Control Delay (s)	9.9	0	29.5	-		
HCM Lane LOS	A	A	D	-		
HCM 95th %tile Q(veh)	0	-	1	-		

SITE LAYOUT

Site: 16 [16] SE Kent-Kangley Rd/Landsburg Rd SE

SE Kent-Kangley Rd/Landsburg Rd SE
Future (2032) Without-Project PM Peak
Site Category: (None)
Roundabout



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MOVEMENT SUMMARY

Site: 16 [16] SE Kent-Kangley Rd/Landsburg Rd SE]

SE Kent-Kangley Rd/Landsburg Rd SE
Future (2032) Without-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Landsburg Rd SE												
3	L2	1	1.0	0.120	11.7	LOS B	0.7	17.2	0.57	0.60	0.57	36.0
8	T1	95	1.0	0.120	6.0	LOS A	0.7	17.2	0.57	0.60	0.57	36.0
18	R2	26	1.0	0.120	6.0	LOS A	0.7	17.2	0.57	0.60	0.57	34.9
Approach		122	1.0	0.120	6.1	LOS A	0.7	17.2	0.57	0.60	0.57	35.7
East: SE Kent-Kangley Rd												
1	L2	11	2.0	0.194	10.2	LOS B	1.1	27.8	0.31	0.41	0.31	35.0
6	T1	205	2.0	0.194	3.5	LOS A	1.1	27.8	0.31	0.41	0.31	33.4
16	R2	42	2.0	0.194	3.7	LOS A	1.1	27.8	0.31	0.41	0.31	32.5
Approach		258	2.0	0.194	3.8	LOS A	1.1	27.8	0.31	0.41	0.31	33.3
North: Landsburg Rd SE												
7	L2	132	3.0	0.400	9.7	LOS A	2.6	67.8	0.48	0.57	0.48	33.6
4	T1	311	3.0	0.400	5.2	LOS A	2.6	67.8	0.48	0.57	0.48	34.9
14	R2	53	3.0	0.400	4.4	LOS A	2.6	67.8	0.48	0.57	0.48	32.5
Approach		495	3.0	0.400	6.3	LOS A	2.6	67.8	0.48	0.57	0.48	34.3
West: SE Kent-Kangley Rd												
5	L2	32	1.0	0.331	10.9	LOS B	2.2	54.4	0.65	0.62	0.65	32.4
2	T1	300	1.0	0.331	5.4	LOS A	2.2	54.4	0.65	0.62	0.65	32.3
12	R2	5	1.0	0.331	6.4	LOS A	2.2	54.4	0.65	0.62	0.65	32.9
Approach		337	1.0	0.331	6.0	LOS A	2.2	54.4	0.65	0.62	0.65	32.3
All Vehicles		1212	2.0	0.400	5.7	LOS A	2.6	67.8	0.50	0.55	0.50	33.6

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.






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Intersection

Int Delay, s/veh 3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	710	255	5	490	90	2
Future Vol, veh/h	710	255	5	490	90	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Stop
Storage Length	-	-	125	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	3	3	1	1
Mvmt Flow	772	277	5	533	98	2

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	-	772
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.13
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.227
Pot Cap-1 Maneuver	-	0	839
Stage 1	-	0	-
Stage 2	-	0	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	839
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	48.6
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBL	WBT
Capacity (veh/h)	174	401	-	839	-
HCM Lane V/C Ratio	0.562	0.005	-	0.006	-
HCM Control Delay (s)	49.4	14	-	9.3	-
HCM Lane LOS	E	B	-	A	-
HCM 95th %tile Q(veh)	2.9	0	-	0	-

HCM 6th TWSC
18: Lawson Pkwy & Lawson Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) Without-Project PM Peak Hour

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	40	65	65	0	35	0	45	10	0	0	10	25
Future Vol, veh/h	40	65	65	0	35	0	45	10	0	0	10	25
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	7	7	7	0	0	0	0	0	0
Mvmt Flow	47	76	76	0	41	0	53	12	0	0	12	29

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	41	0	0	152	0	0	270	249	114	255	287	41
Stage 1	-	-	-	-	-	-	208	208	-	41	41	-
Stage 2	-	-	-	-	-	-	62	41	-	214	246	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1581	-	-	1399	-	-	687	657	944	702	626	1036
Stage 1	-	-	-	-	-	-	799	734	-	979	865	-
Stage 2	-	-	-	-	-	-	954	865	-	793	706	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1581	-	-	1399	-	-	641	635	944	675	605	1036
Mov Cap-2 Maneuver	-	-	-	-	-	-	641	635	-	675	605	-
Stage 1	-	-	-	-	-	-	773	710	-	947	865	-
Stage 2	-	-	-	-	-	-	914	865	-	754	683	-

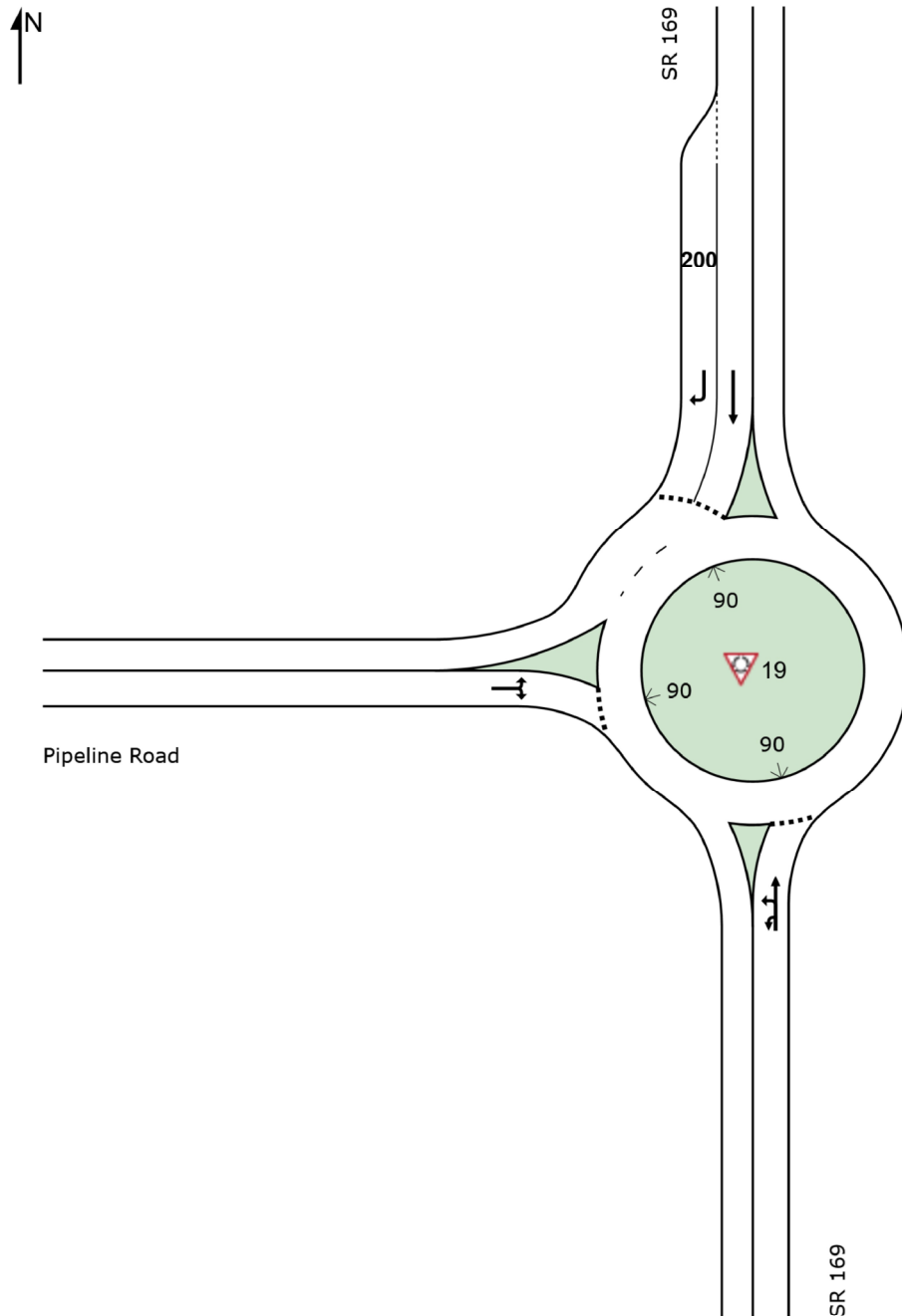
Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	0	11.3	9.4
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	640	1581	-	-	1399	-	-	861
HCM Lane V/C Ratio	0.101	0.03	-	-	-	-	-	0.048
HCM Control Delay (s)	11.3	7.3	0	-	0	-	-	9.4
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	0.1

SITE LAYOUT

Site: 19 [WP SR 169/Pipeline Road - SBR]

SR 169/Pipeline Road
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY



Site: 19 [WP SR 169/Pipeline Road - SBR]

SR 169/Pipeline Road
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3u	U	440	2.0	0.694	12.0	LOS B	10.4	264.3	0.13	0.54	0.13	36.3
3	L2	5	2.0	0.694	9.7	LOS A	10.4	264.3	0.13	0.54	0.13	35.6
8	T1	549	2.0	0.694	4.0	LOS A	10.4	264.3	0.13	0.54	0.13	35.5
Approach		995	2.0	0.694	7.6	LOS A	10.4	264.3	0.13	0.54	0.13	35.9
North: SR 169												
4	T1	984	2.0	0.743	9.0	LOS A	9.3	237.2	0.79	0.84	1.00	35.0
14	R2	5	2.0	0.006	6.2	LOS A	0.0	0.7	0.47	0.53	0.47	35.3
Approach		989	2.0	0.743	9.0	LOS A	9.3	237.2	0.79	0.84	1.00	35.0
West: Pipeline Road												
5	L2	5	2.0	0.041	30.6	LOS C	0.3	8.0	1.00	0.81	1.00	27.1
12	R2	5	2.0	0.041	25.0	LOS C	0.3	8.0	1.00	0.81	1.00	26.5
Approach		11	2.0	0.041	27.8	LOS C	0.3	8.0	1.00	0.81	1.00	26.8
All Vehicles		1995	2.0	0.743	8.4	LOS A	10.4	264.3	0.46	0.69	0.57	35.4

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).






HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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2032 Future With-Project Conditions

Intersection						
Int Delay, s/veh	20.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	162	269	646	160	242	744
Future Vol, veh/h	162	269	646	160	242	744
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	100	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	3	3	0	0	1	1
Mvmt Flow	169	280	673	167	252	775

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	2036	-	0	0	840
Stage 1	757	-	-	-	-
Stage 2	1279	-	-	-	-
Critical Hdwy	6.43	-	-	-	4.11
Critical Hdwy Stg 1	5.43	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-
Follow-up Hdwy	3.527	-	-	-	2.209
Pot Cap-1 Maneuver	~ 62	0	-	-	799
Stage 1	461	0	-	-	-
Stage 2	260	0	-	-	-
Platoon blocked, %		-	-	-	-
Mov Cap-1 Maneuver	~ 42	-	-	-	799
Mov Cap-2 Maneuver	~ 132	-	-	-	-
Stage 1	461	-	-	-	-
Stage 2	178	-	-	-	-




Approach	WB	NB	SB
HCM Control Delay, s	235	0	2.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	- 132	-	799
HCM Lane V/C Ratio	-	- 1.278	-	0.315
HCM Control Delay (s)	-	- 235	0	11.6
HCM Lane LOS	-	- F	A	B
HCM 95th %tile Q(veh)	-	- 10.6	-	1.4

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

HCM 6th TWSC
2: 232nd Ave SE & SE 288th St



















Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	322	35	35	426	20	20
Future Vol, veh/h	322	35	35	426	20	20
Conflicting Peds, #/hr	0	1	1	0	1	1
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	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	335	36	36	444	21	21
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	372	0	871	355
Stage 1	-	-	-	-	354	-
Stage 2	-	-	-	-	517	-
Critical Hdwy	-	-	4.11	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.209	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1192	-	324	693
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	603	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1191	-	310	692
Mov Cap-2 Maneuver	-	-	-	-	310	-
Stage 1	-	-	-	-	714	-
Stage 2	-	-	-	-	578	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.6		14.3	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	428	-	-	1191	-	
HCM Lane V/C Ratio	0.097	-	-	0.031	-	
HCM Control Delay (s)	14.3	-	-	8.1	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-	

HCM Signalized Intersection Capacity Analysis Ten Trails and Lawson Hills MPDs - Phase 1B




3: 216th Ave SE & SE Covington-Sawyer Rd

Future (2032) With-Project PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	25	293	10	20	10	183	556	10	25	619	257
Future Volume (vph)	250	25	293	10	20	10	183	556	10	25	619	257
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0		4.0			4.0			4.0	5.0
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98		0.99			1.00			1.00	0.98
Flpb, ped/bikes		0.99	1.00		1.00			1.00			1.00	1.00
Frt		1.00	0.85		0.97			1.00			1.00	0.85
Flt Protected		0.96	1.00		0.99			0.99			1.00	1.00
Satd. Flow (prot)		1785	1572		1800			1873			1877	1560
Flt Permitted		0.71	1.00		0.91			0.11			0.95	1.00
Satd. Flow (perm)		1332	1572		1652			207			1793	1560
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	269	27	315	11	22	11	197	598	11	27	666	276
RTOR Reduction (vph)	0	0	46	0	8	0	0	1	0	0	0	92
Lane Group Flow (vph)	0	296	269	0	36	0	0	805	0	0	693	184
Confl. Peds. (#/hr)	7		1	1		7	3		1	1		3
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		8	5		4		5	2			6	
Permitted Phases	8		8	4			2			6		6
Actuated Green, G (s)		16.3	21.3		16.3			29.2			19.2	19.2
Effective Green, g (s)		17.3	21.3		17.3			30.2			20.2	19.2
Actuated g/C Ratio		0.31	0.38		0.31			0.54			0.36	0.35
Clearance Time (s)		5.0	5.0		5.0			5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		415	744		514			292			652	539
v/s Ratio Prot			0.03					c0.30				
v/s Ratio Perm		c0.22	0.14		0.02			c1.20			0.39	0.12
v/c Ratio		0.71	0.36		0.07			2.76			1.06	0.34
Uniform Delay, d1		16.9	12.2		13.4			12.7			17.6	13.5
Progression Factor		1.00	1.00		1.00			1.00			1.00	1.00
Incremental Delay, d2		5.7	0.3		0.1			800.3			53.1	0.4
Delay (s)		22.6	12.5		13.5			812.9			70.8	13.8
Level of Service		C	B		B			F			E	B
Approach Delay (s)		17.4			13.5			812.9			54.6	
Approach LOS		B			B			F			D	
Intersection Summary												
HCM 2000 Control Delay			296.0				HCM 2000 Level of Service				F	
HCM 2000 Volume to Capacity ratio			2.16									
Actuated Cycle Length (s)			55.5				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			105.8%				ICU Level of Service			G		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection

Int Delay, s/veh 8.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	506	280	73	390	95	97
Future Vol, veh/h	506	280	73	390	95	97
Conflicting Peds, #/hr	0	1	1	0	1	1
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	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	527	292	76	406	99	101

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	820
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.11
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.209
Pot Cap-1 Maneuver	-	-	813
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	812
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

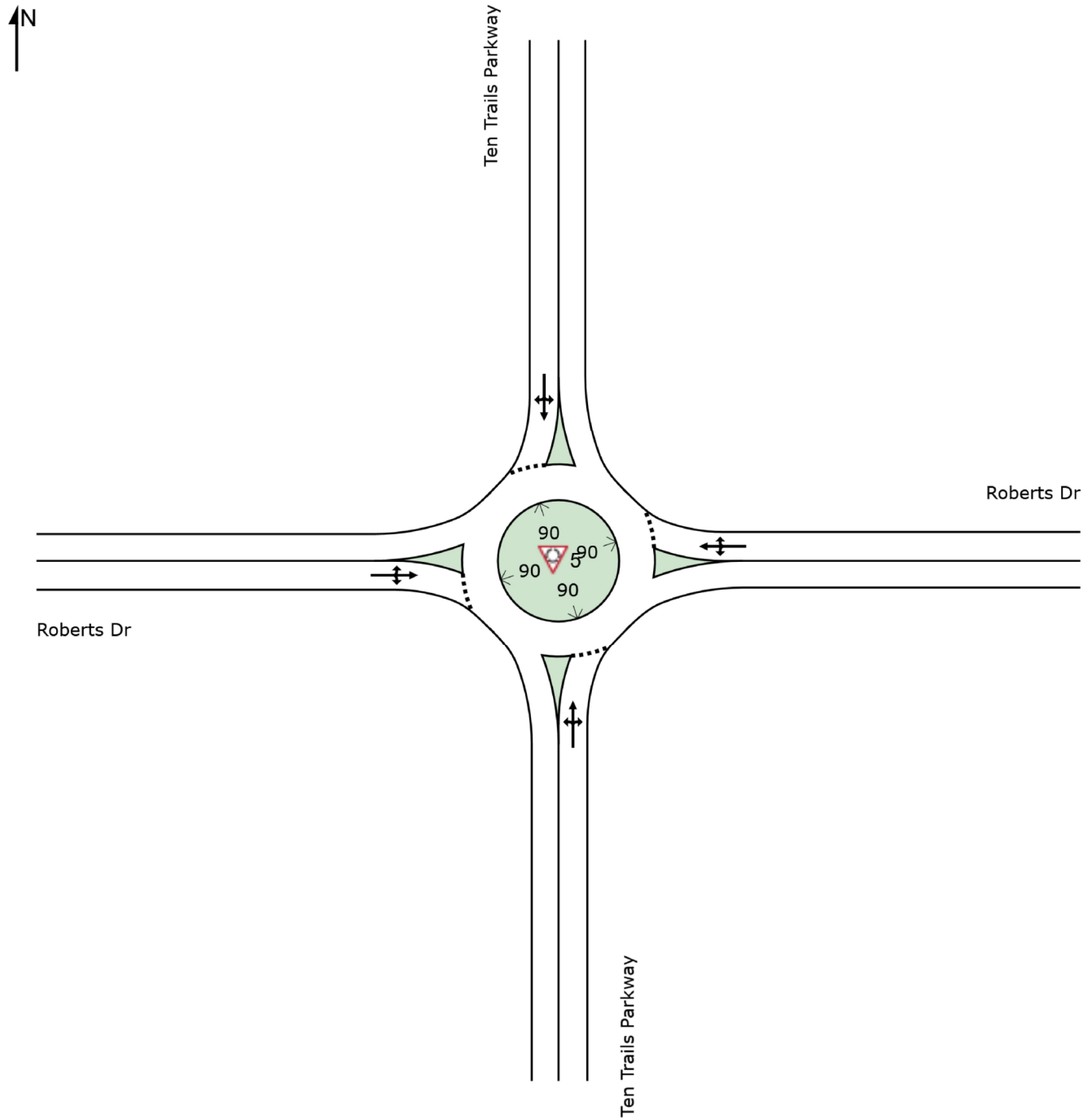
Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	58.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	251	-	-	812	-
HCM Lane V/C Ratio	0.797	-	-	0.094	-
HCM Control Delay (s)	58.7	-	-	9.9	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	6	-	-	0.3	-

SITE LAYOUT

Site: 5 [WP Roberts Drive/Ten Trails Parkway]

Roberts Dr/Ten Trails Parkway SE
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 5 [WP Roberts Drive/Ten Trails Parkway]

Roberts Dr/Ten Trails Parkway SE
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Ten Trails Parkway												
3	L2	109	2.0	0.346	12.8	LOS B	2.4	60.6	0.74	0.78	0.74	34.9
8	T1	16	2.0	0.346	7.1	LOS A	2.4	60.6	0.74	0.78	0.74	34.9
18	R2	185	2.0	0.346	7.2	LOS A	2.4	60.6	0.74	0.78	0.74	33.9
Approach		310	2.0	0.346	9.1	LOS A	2.4	60.6	0.74	0.78	0.74	34.3
East: Roberts Dr												
1	L2	212	2.0	0.523	10.7	LOS B	4.3	108.4	0.52	0.54	0.52	34.2
6	T1	390	2.0	0.523	4.1	LOS A	4.3	108.4	0.52	0.54	0.52	32.7
16	R2	79	2.0	0.523	4.3	LOS A	4.3	108.4	0.52	0.54	0.52	31.8
Approach		682	2.0	0.523	6.2	LOS A	4.3	108.4	0.52	0.54	0.52	33.1
North: Ten Trails Parkway												
7	L2	22	2.0	0.188	12.4	LOS B	1.2	30.3	0.74	0.75	0.74	32.9
4	T1	92	2.0	0.188	8.0	LOS A	1.2	30.3	0.74	0.75	0.74	34.2
14	R2	37	2.0	0.188	7.2	LOS A	1.2	30.3	0.74	0.75	0.74	31.8
Approach		151	2.0	0.188	8.4	LOS A	1.2	30.3	0.74	0.75	0.74	33.4
West: Roberts Dr												
5	L2	50	1.0	0.538	10.6	LOS B	4.1	102.5	0.65	0.60	0.65	32.7
2	T1	492	1.0	0.538	5.0	LOS A	4.1	102.5	0.65	0.60	0.65	32.5
12	R2	76	1.0	0.538	6.1	LOS A	4.1	102.5	0.65	0.60	0.65	33.1
Approach		618	1.0	0.538	5.6	LOS A	4.1	102.5	0.65	0.60	0.65	32.6
All Vehicles		1761	1.6	0.538	6.7	LOS A	4.3	108.4	0.62	0.62	0.62	33.1

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.







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Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Sidra\Phase 1B TMR (March 2020)\WP\1.5 % Growth Rate\2032 No Mitigation - NO PIPELINE\Future PM Peak Hour -.sip8

HCM 6th TWSC
6: Ten Trails Place & Roberts Drive

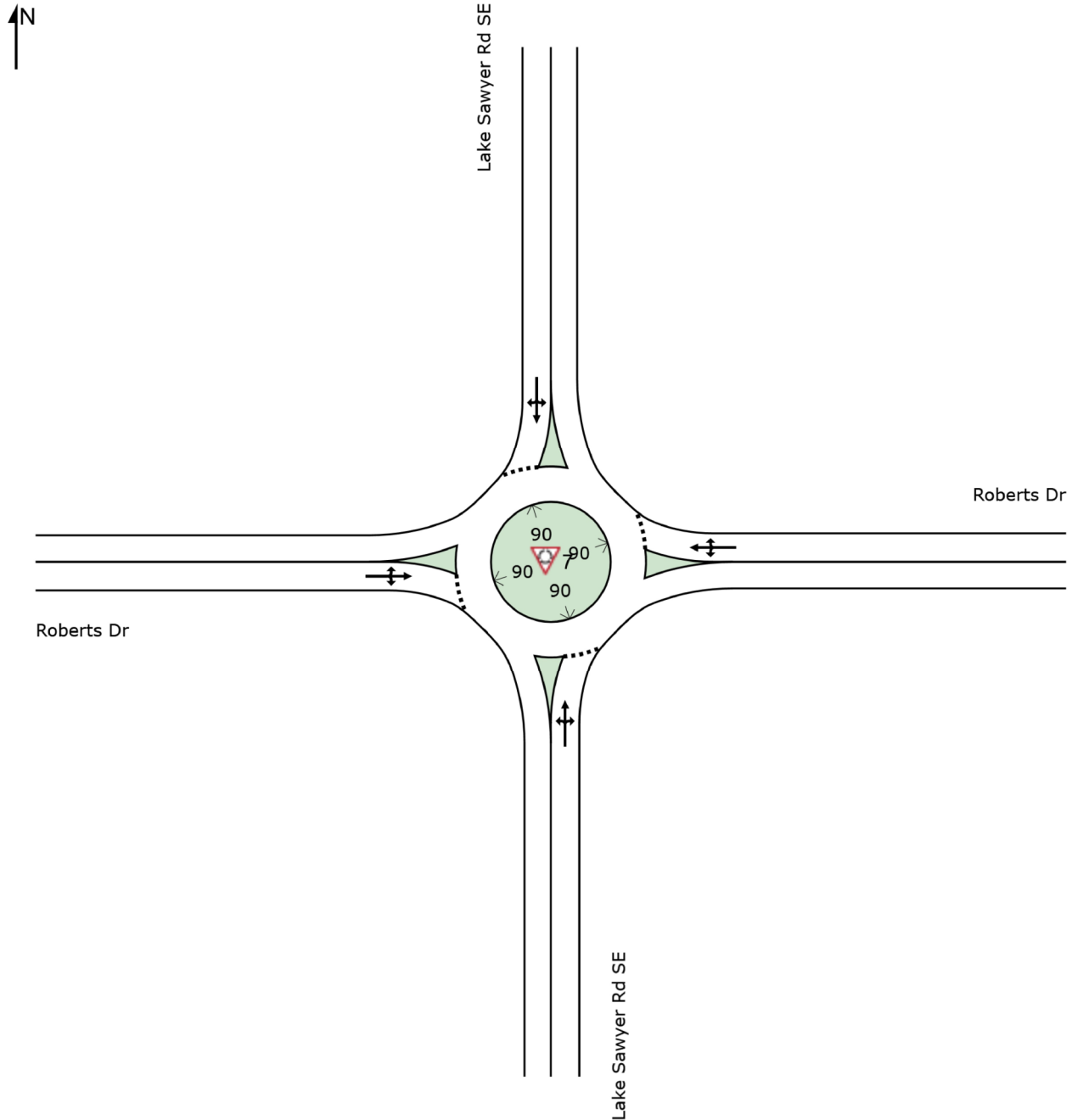
Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection												
Int Delay, s/veh	10.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	569	60	165	579	34	25	0	90	33	0	23
Future Vol, veh/h	14	569	60	165	579	34	25	0	90	33	0	23
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	150	-	-	150	-	-	-	-	-	-	-	-
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, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	15	618	65	179	629	37	27	0	98	36	0	25
Major/Minor	Major1		Major2			Minor1			Minor2			
Conflicting Flow All	666	0	0	683	0	0	1699	1705	651	1736	1719	648
Stage 1	-	-	-	-	-	-	681	681	-	1006	1006	-
Stage 2	-	-	-	-	-	-	1018	1024	-	730	713	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	928	-	-	910	-	-	74	92	472	69	91	474
Stage 1	-	-	-	-	-	-	444	453	-	293	321	-
Stage 2	-	-	-	-	-	-	289	315	-	417	438	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	928	-	-	910	-	-	59	73	472	46	72	474
Mov Cap-2 Maneuver	-	-	-	-	-	-	59	73	-	46	72	-
Stage 1	-	-	-	-	-	-	437	446	-	288	258	-
Stage 2	-	-	-	-	-	-	220	253	-	325	431	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	0.2		2.1			56.2			158			
HCM LOS						F			F			
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	187	928	-	-	910	-	-	73				
HCM Lane V/C Ratio	0.668	0.016	-	-	0.197	-	-	0.834				
HCM Control Delay (s)	56.2	8.9	-	-	9.9	-	-	158				
HCM Lane LOS	F	A	-	-	A	-	-	F				
HCM 95th %tile Q(veh)	4	0.1	-	-	0.7	-	-	4.1				

SITE LAYOUT

Site: 7 [WP Lake Sawyer/Roberts Drive]

Roberts Dr/Lake Sawyer Rd SE
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 7 [WP Lake Sawyer/Roberts Drive]

Roberts Dr/Lake Sawyer Rd SE
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Lake Sawyer Rd SE												
3	L2	42	6.0	0.492	17.3	LOS B	4.2	110.5	0.93	1.00	1.08	33.1
8	T1	137	6.0	0.492	11.6	LOS B	4.2	110.5	0.93	1.00	1.08	33.1
18	R2	132	6.0	0.492	11.6	LOS B	4.2	110.5	0.93	1.00	1.08	32.2
Approach		311	6.0	0.492	12.4	LOS B	4.2	110.5	0.93	1.00	1.08	32.7
East: Roberts Dr												
1	L2	200	2.0	0.752	16.1	LOS B	10.0	254.1	0.89	0.94	1.14	32.4
6	T1	514	2.0	0.752	9.4	LOS A	10.0	254.1	0.89	0.94	1.14	31.0
16	R2	79	2.0	0.752	9.6	LOS A	10.0	254.1	0.89	0.94	1.14	30.2
Approach		793	2.0	0.752	11.1	LOS B	10.0	254.1	0.89	0.94	1.14	31.3
North: Lake Sawyer Rd SE												
7	L2	126	1.0	0.690	19.5	LOS B	8.2	207.3	1.00	1.14	1.38	29.1
4	T1	79	1.0	0.690	15.0	LOS B	8.2	207.3	1.00	1.14	1.38	30.2
14	R2	268	1.0	0.690	14.2	LOS B	8.2	207.3	1.00	1.14	1.38	28.3
Approach		474	1.0	0.690	15.8	LOS B	8.2	207.3	1.00	1.14	1.38	28.8
West: Roberts Dr												
5	L2	226	2.0	0.690	13.5	LOS B	7.9	200.4	0.84	0.87	1.00	31.4
2	T1	454	2.0	0.690	8.0	LOS A	7.9	200.4	0.84	0.87	1.00	31.2
12	R2	47	2.0	0.690	9.0	LOS A	7.9	200.4	0.84	0.87	1.00	31.8
Approach		727	2.0	0.690	9.8	LOS A	7.9	200.4	0.84	0.87	1.00	31.3
All Vehicles		2304	2.3	0.752	11.8	LOS B	10.0	254.1	0.90	0.97	1.14	30.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.




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HCM 6th TWSC
8: Morgan St & Roberts Drive/Roberts Dr




Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	7.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	494	198	5	595	143	1
Future Vol, veh/h	494	198	5	595	143	1
Conflicting Peds, #/hr	0	1	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	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, %	1	1	2	2	0	0
Mvmt Flow	537	215	5	647	155	1
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	537	0	1195	537
Stage 1	-	-	-	-	537	-
Stage 2	-	-	-	-	658	-
Critical Hdwy	-	-	4.12	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.218	-	3.5	3.3
Pot Cap-1 Maneuver	-	0	1031	-	208	548
Stage 1	-	0	-	-	590	-
Stage 2	-	0	-	-	519	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1031	-	206	548
Mov Cap-2 Maneuver	-	-	-	-	206	-
Stage 1	-	-	-	-	590	-
Stage 2	-	-	-	-	514	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.1		62	
HCM LOS					F	
Minor Lane/Major Mvmt	NBLn1		EBT	WBL	WBT	
Capacity (veh/h)	207		-	1031	-	
HCM Lane V/C Ratio	0.756		-	0.005	-	
HCM Control Delay (s)	62		-	8.5	0	
HCM Lane LOS	F		-	A	A	
HCM 95th %tile Q(veh)	5.1		-	0	-	

Intersection						
Int Delay, s/veh	103.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	125	192	251	574	924	275
Future Vol, veh/h	125	192	251	574	924	275
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	0	175	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	1	1	0	0	2	2
Mvmt Flow	134	206	270	617	994	296
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	2151	994	994	0	-	0
Stage 1	994	-	-	-	-	-
Stage 2	1157	-	-	-	-	-
Critical Hdwy	6.41	6.21	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.2	-	-	-
Pot Cap-1 Maneuver	~ 53	299	704	-	-	0
Stage 1	360	-	-	-	-	0
Stage 2	301	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 33	299	704	-	-	-
Mov Cap-2 Maneuver	~ 33	-	-	-	-	-
Stage 1	222	-	-	-	-	-
Stage 2	301	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	666.6	4	0			
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	704	-	33	299	-	
HCM Lane V/C Ratio	0.383	-	4.073	0.69	-	
HCM Control Delay (s)	13.3	\$	1628.9	40.1	-	
HCM Lane LOS	B	-	F	E	-	
HCM 95th %tile Q(veh)	1.8	-	15.9	4.7	-	
Notes						
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon						

HCM 6th TWSC
10: SR 169 & SE Black Diamond-Ravensdale Rd

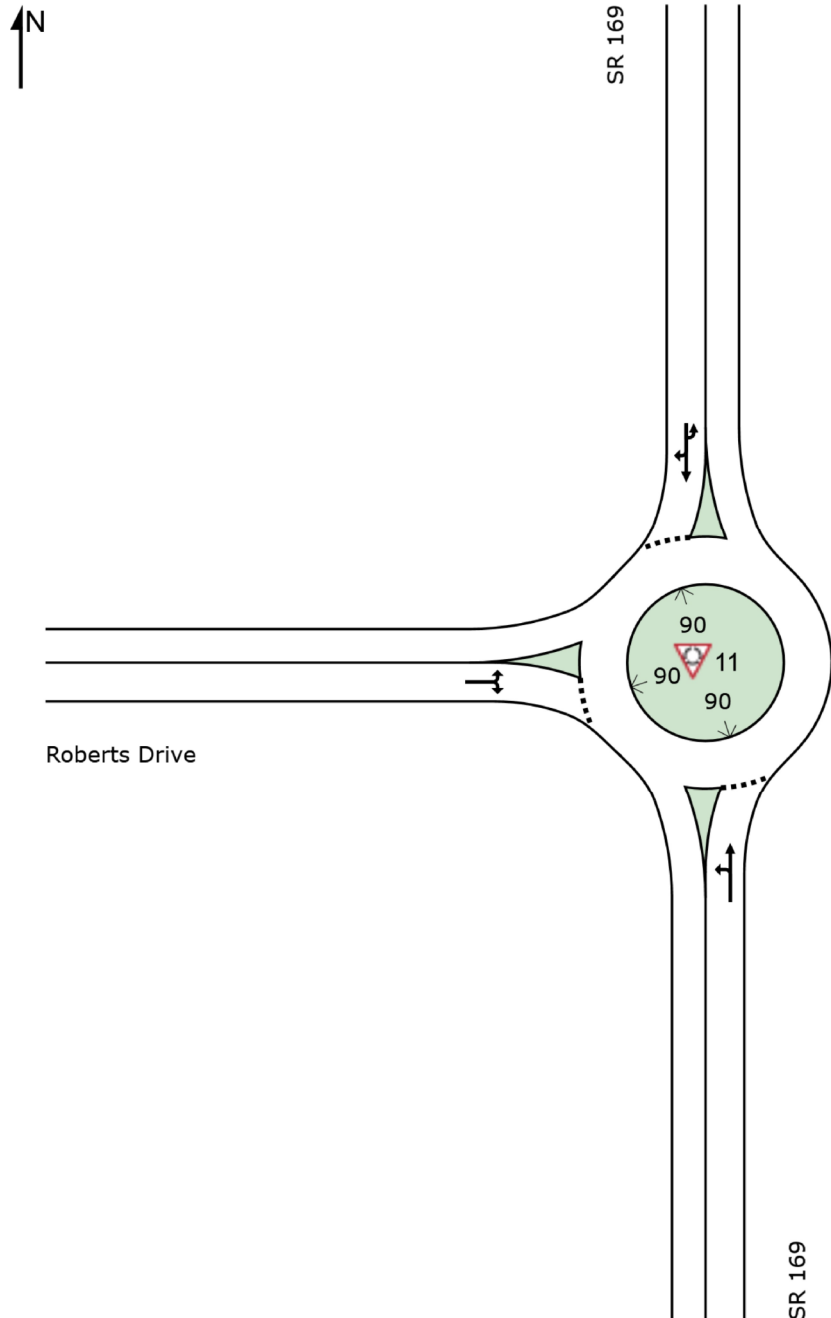
Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	3.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	251	685	153	0	1549
Future Vol, veh/h	0	251	685	153	0	1549
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	2	2	1	1
Mvmt Flow	0	267	729	163	0	1648
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	2459	811	0	0	892	0
Stage 1	811	-	-	-	-	-
Stage 2	1648	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	34	381	-	-	764	-
Stage 1	439	-	-	-	-	-
Stage 2	173	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	34	381	-	-	764	-
Mov Cap-2 Maneuver	34	-	-	-	-	-
Stage 1	439	-	-	-	-	-
Stage 2	173	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	33.8	0		0		
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	-	381	764	-	-
HCM Lane V/C Ratio	-	-	0.701	-	-	-
HCM Control Delay (s)	-	-	33.8	0	-	-
HCM Lane LOS	-	-	D	A	-	-
HCM 95th %tile Q(veh)	-	-	5.2	0	-	-

SITE LAYOUT

Site: 11 [WP SR 169/Roberts Drive]

SR 169/Roberts Drive
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

 **Site: 11 [WP SR 169/Roberts Drive]**

SR 169/Roberts Drive
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	184	2.0	0.626	13.0	LOS B	6.1	155.8	0.79	0.80	0.87	34.5
8	T1	477	2.0	0.626	7.4	LOS A	6.1	155.8	0.79	0.80	0.87	34.5
Approach		661	2.0	0.626	9.0	LOS A	6.1	155.8	0.79	0.80	0.87	34.5
North: SR 169												
7u	U	90	1.0	1.225	118.1	LOS F	130.9	3298.5	1.00	2.64	4.12	13.6
4	T1	1071	1.0	1.225	110.1	LOS F	130.9	3298.5	1.00	2.64	4.12	13.5
14	R2	502	1.0	1.225	109.3	LOS F	130.9	3298.5	1.00	2.64	4.12	13.1
Approach		1664	1.0	1.225	110.3	LOS F	130.9	3298.5	1.00	2.64	4.12	13.3
West: Roberts Drive												
5	L2	319	1.0	1.025	68.7	LOS F	26.6	669.3	1.00	1.83	3.05	17.7
12	R2	190	1.0	1.025	64.2	LOS F	26.6	669.3	1.00	1.83	3.05	17.8
Approach		510	1.0	1.025	67.0	LOS E	26.6	669.3	1.00	1.83	3.05	17.8
All Vehicles		2834	1.2	1.225	78.9	LOS E	130.9	3298.5	0.95	2.07	3.17	16.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Organisation: THE TRANSPO GROUP | Processed: Wednesday, September 2, 2020 3:10:59 PM

Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Sidra\Phase 1B TMR (March 2020)\WP\1.5 %

Growth Rate\2032 No Mitigation - NO PIPELINE\Future PM Peak Hour -.sip8

HCM 6th TWSC
12: SR 169 & Baker St

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	27.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	50	110	40	606	1179	77
Future Vol, veh/h	50	110	40	606	1179	77
Conflicting Peds, #/hr	3	0	0	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	53	117	43	645	1254	82
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	2032	1298	1339	0	-	0
Stage 1	1298	-	-	-	-	-
Stage 2	734	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	64	200	512	-	-	-
Stage 1	258	-	-	-	-	-
Stage 2	478	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	55	200	511	-	-	-
Mov Cap-2 Maneuver	55	-	-	-	-	-
Stage 1	224	-	-	-	-	-
Stage 2	477	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s\$	355.7	0.8		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	511	-	110	-	-	
HCM Lane V/C Ratio	0.083	-	1.547	-	-	
HCM Control Delay (s)	12.7	0\$	355.7	-	-	
HCM Lane LOS	B	A	F	-	-	
HCM 95th %tile Q(veh)	0.3	-	12.6	-	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon




HCM 6th TWSC
13: SR 169 & Lawson Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection												
Int Delay, s/veh	23.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	1	4	30	0	130	2	436	30	215	959	5
Future Vol, veh/h	1	1	4	30	0	130	2	436	30	215	959	5
Conflicting Peds, #/hr	3	0	3	5	0	5	3	0	5	5	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	3	3	3	2	2	2
Mvmt Flow	1	1	4	32	0	137	2	459	32	226	1009	5
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	2020	1967	1020	1955	1953	485	1017	0	0	496	0	0
Stage 1	1467	1467	-	484	484	-	-	-	-	-	-	-
Stage 2	553	500	-	1471	1469	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	44	64	290	49	65	586	678	-	-	1068	-	-
Stage 1	161	194	-	568	555	-	-	-	-	-	-	-
Stage 2	521	546	-	160	194	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	21	32	288	~ 29	33	581	676	-	-	1064	-	-
Mov Cap-2 Maneuver	21	32	-	~ 29	33	-	-	-	-	-	-	-
Stage 1	160	99	-	563	551	-	-	-	-	-	-	-
Stage 2	395	542	-	80	99	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	66.3		256.1			0			1.7			
HCM LOS	F		F									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	676	-	-	65	127	1064	-	-				
HCM Lane V/C Ratio	0.003	-	-	0.097	1.326	0.213	-	-				
HCM Control Delay (s)	10.3	0	-	66.3	256.1	9.3	0	-				
HCM Lane LOS	B	A	-	F	F	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.3	10.9	0.8	-	-				
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s			+: Computation Not Defined			*: All major volume in platoon				




HCM 6th TWSC
14: SR 169 & Jones Lake Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	70	65	476	939	1
Future Vol, veh/h	0	70	65	476	939	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	2	2	3	3
Mvmt Flow	0	74	68	501	988	1
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1626	989	989	0	-	0
Stage 1	989	-	-	-	-	-
Stage 2	637	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	114	302	699	-	-	-
Stage 1	363	-	-	-	-	-
Stage 2	531	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	99	302	699	-	-	-
Mov Cap-2 Maneuver	99	-	-	-	-	-
Stage 1	314	-	-	-	-	-
Stage 2	531	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	20.7	1.3		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	699	-	302	-	-	
HCM Lane V/C Ratio	0.098	-	0.244	-	-	
HCM Control Delay (s)	10.7	0	20.7	-	-	
HCM Lane LOS	B	A	C	-	-	
HCM 95th %tile Q(veh)	0.3	-	0.9	-	-	

HCM 6th TWSC
15: SR 169 & SE Green Valley Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	20	10	536	944	35
Future Vol, veh/h	25	20	10	536	944	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
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, %	0	0	2	2	1	1
Mvmt Flow	27	22	11	583	1026	38
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1631	1026	1026	0	-	0
Stage 1	1026	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	113	288	677	-	-	0
Stage 1	349	-	-	-	-	0
Stage 2	549	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	110	288	677	-	-	-
Mov Cap-2 Maneuver	110	-	-	-	-	-
Stage 1	341	-	-	-	-	-
Stage 2	549	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	39.5	0.2		0		
HCM LOS	E					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT		
Capacity (veh/h)	677	-	152	-		
HCM Lane V/C Ratio	0.016	-	0.322	-		
HCM Control Delay (s)	10.4	0	39.5	-		
HCM Lane LOS	B	A	E	-		
HCM 95th %tile Q(veh)	0	-	1.3	-		






HCM 6th TWSC
16: Landsburg Rd SE & SE Kent-Kangley Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection												
Int Delay, s/veh	92.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	57	285	5	10	195	40	1	103	25	125	211	151
Future Vol, veh/h	57	285	5	10	195	40	1	103	25	125	211	151
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	1	1	1	2	2	2	1	1	1	3	3	3
Mvmt Flow	60	300	5	11	205	42	1	108	26	132	222	159
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	247	0	0	305	0	0	862	692	303	738	673	226
Stage 1	-	-	-	-	-	-	423	423	-	248	248	-
Stage 2	-	-	-	-	-	-	439	269	-	490	425	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.11	6.51	6.21	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.13	5.53	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.509	4.009	3.309	3.527	4.027	3.327
Pot Cap-1 Maneuver	1325	-	-	1256	-	-	276	369	739	332	375	811
Stage 1	-	-	-	-	-	-	611	589	-	754	699	-
Stage 2	-	-	-	-	-	-	599	688	-	558	585	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1325	-	-	1256	-	-	105	345	739	231	351	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	105	345	-	231	351	-
Stage 1	-	-	-	-	-	-	577	557	-	713	692	-
Stage 2	-	-	-	-	-	-	324	681	-	410	553	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.3			0.3			19.8			223		
HCM LOS							C			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	377	1325	-	-	1256	-	-	367				
HCM Lane V/C Ratio	0.36	0.045	-	-	0.008	-	-	1.397				
HCM Control Delay (s)	19.8	7.8	0	-	7.9	0	-	223				
HCM Lane LOS	C	A	A	-	A	A	-	F				
HCM 95th %tile Q(veh)	1.6	0.1	-	-	0	-	-	25.7				

Intersection

Int Delay, s/veh 6.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	739	266	5	554	106	2
Future Vol, veh/h	739	266	5	554	106	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Stop
Storage Length	-	-	125	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	3	3	1	1
Mvmt Flow	803	289	5	602	115	2





Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	-	803
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.13
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.227
Pot Cap-1 Maneuver	-	0	816
Stage 1	-	0	-
Stage 2	-	0	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	816
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	79.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBL	WBT
Capacity (veh/h)	151	385	-	816	-
HCM Lane V/C Ratio	0.763	0.006	-	0.007	-
HCM Control Delay (s)	80.5	14.4	-	9.4	-
HCM Lane LOS	F	B	-	A	-
HCM 95th %tile Q(veh)	4.7	0	-	0	-

HCM 6th TWSC
18: Lawson Pkwy & Lawson Rd

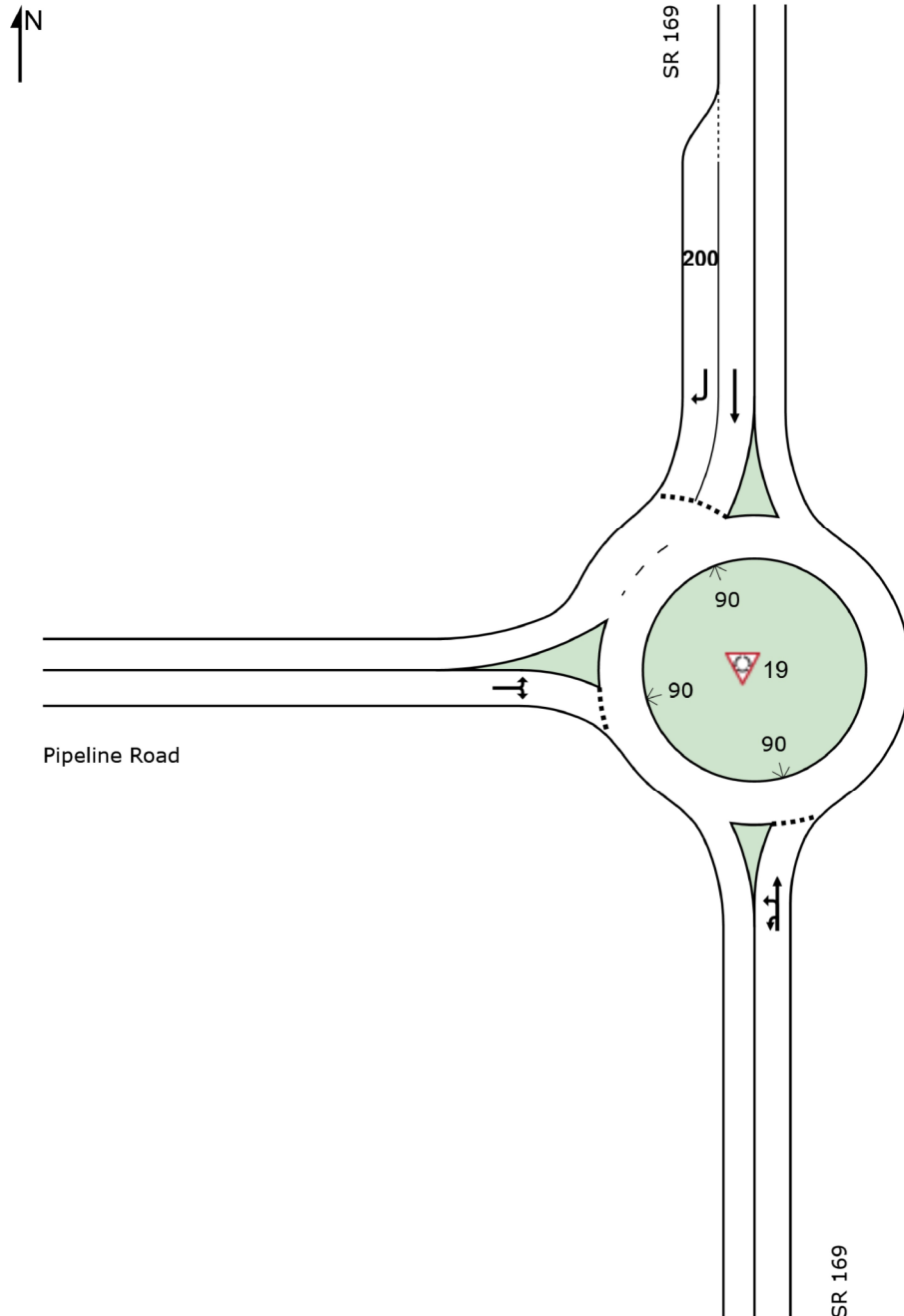
Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	65	65	0	35	0	45	10	0	0	10	25
Future Vol, veh/h	40	65	65	0	35	0	45	10	0	0	10	25
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	0	0	0	7	7	7	0	0	0	0	0	0
Mvmt Flow	47	76	76	0	41	0	53	12	0	0	12	29
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	41	0	0	152	0	0	270	249	114	255	287	41
Stage 1	-	-	-	-	-	-	208	208	-	41	41	-
Stage 2	-	-	-	-	-	-	62	41	-	214	246	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1581	-	-	1399	-	-	687	657	944	702	626	1036
Stage 1	-	-	-	-	-	-	799	734	-	979	865	-
Stage 2	-	-	-	-	-	-	954	865	-	793	706	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1581	-	-	1399	-	-	641	635	944	675	605	1036
Mov Cap-2 Maneuver	-	-	-	-	-	-	641	635	-	675	605	-
Stage 1	-	-	-	-	-	-	773	710	-	947	865	-
Stage 2	-	-	-	-	-	-	914	865	-	754	683	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.7			0			11.3			9.4		
HCM LOS							B			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	640	1581	-	-	1399	-	-	861				
HCM Lane V/C Ratio	0.101	0.03	-	-	-	-	-	0.048				
HCM Control Delay (s)	11.3	7.3	0	-	0	-	-	9.4				
HCM Lane LOS	B	A	A	-	A	-	-	A				
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	0.1				

SITE LAYOUT

Site: 19 [WP SR 169/Pipeline Road - SBR]

SR 169/Pipeline Road
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY



Site: 19 [WP SR 169/Pipeline Road - SBR]

SR 169/Pipeline Road
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3u	U	291	2.0	0.697	12.0	LOS B	10.4	265.1	0.13	0.49	0.13	37.0
3	L2	5	2.0	0.697	9.7	LOS A	10.4	265.1	0.13	0.49	0.13	36.2
8	T1	703	2.0	0.697	4.0	LOS A	10.4	265.1	0.13	0.49	0.13	36.2
Approach		1000	2.0	0.697	6.4	LOS A	10.4	265.1	0.13	0.49	0.13	36.4
North: SR 169												
4	T1	1331	2.0	0.928	13.0	LOS D	23.4	594.5	0.97	0.97	1.38	32.9
14	R2	5	2.0	0.005	5.5	LOS A	0.0	0.6	0.39	0.50	0.39	35.5
Approach		1337	2.0	0.928	13.0	LOS B	23.4	594.5	0.97	0.96	1.38	32.9
West: Pipeline Road												
5	L2	5	2.0	0.112	38.8	LOS D	0.5	11.7	0.96	0.98	0.96	24.7
12	R2	5	2.0	0.112	33.2	LOS C	0.5	11.7	0.96	0.98	0.96	24.2
Approach		11	2.0	0.112	36.0	LOS D	0.5	11.7	0.96	0.98	0.96	24.5
All Vehicles		2347	2.0	0.928	10.3	LOS B	23.4	594.5	0.61	0.76	0.84	34.3

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).




HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Sidra\Phase 1B TMR (March 2020)\WP\1.5 %

Growth Rate\2032 No Mitigation - NO PIPELINE\Future PM Peak Hour -.sip8

Intersection						
Int Delay, s/veh	1495.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	344	339	199	471	874	232
Future Vol, veh/h	344	339	199	471	874	232
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	370	365	214	506	940	249
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1999	1065	1189	0	-	0
Stage 1	1065	-	-	-	-	-
Stage 2	934	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	~ 66	~ 270	587	-	-	-
Stage 1	~ 331	-	-	-	-	-
Stage 2	382	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 33	~ 270	587	-	-	-
Mov Cap-2 Maneuver	~ 33	-	-	-	-	-
Stage 1	~ 163	-	-	-	-	-
Stage 2	382	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, \$	5381.6	4.3		0		
HCM LOS	F					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	587	-	58	-	-	
HCM Lane V/C Ratio	0.365	- 12.662		-	-	
HCM Control Delay (s)	14.6	\$ 5381.6		-	-	
HCM Lane LOS	B	A	F	-	-	
HCM 95th %tile Q(veh)	1.7	-	87.7	-	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon




HCM 6th TWSC
21: Lake Sawyer Rd SE & Ten Trails Parkway SE

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	3.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	113	13	9	411	431	116
Future Vol, veh/h	113	13	9	411	431	116
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	124	14	10	452	474	127
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1010	538	601	0	-	0
Stage 1	538	-	-	-	-	-
Stage 2	472	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	266	543	976	-	-	-
Stage 1	585	-	-	-	-	-
Stage 2	628	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	262	543	976	-	-	-
Mov Cap-2 Maneuver	262	-	-	-	-	-
Stage 1	577	-	-	-	-	-
Stage 2	628	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	30.3	0.2		0		
HCM LOS	D					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	976	-	277	-	-	
HCM Lane V/C Ratio	0.01	-	0.5	-	-	
HCM Control Delay (s)	8.7	0	30.3	-	-	
HCM Lane LOS	A	A	D	-	-	
HCM 95th %tile Q(veh)	0	-	2.6	-	-	






HCM 6th TWSC
22: Lake Sawyer Rd SE & RIRO Driveway

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	76	0	435	384	75
Future Vol, veh/h	0	76	0	435	384	75
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	85	0	489	431	84
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	-	473	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	-	-
Pot Cap-1 Maneuver	0	591	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	591	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12.1	0		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT EBLn1		SBT	SBR		
Capacity (veh/h)	- 591		-	-		
HCM Lane V/C Ratio	- 0.144		-	-		
HCM Control Delay (s)	- 12.1		-	-		
HCM Lane LOS	- B		-	-		
HCM 95th %tile Q(veh)	- 0.5		-	-		

Timing of Improvements Results

SE 288th Street / 216th Avenue SE













Intersection						
Int Delay, s/veh	3.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	115	90	490	120	125	610
Future Vol, veh/h	115	90	490	120	125	610
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	100	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	3	3	0	0	1	1
Mvmt Flow	120	94	510	125	130	635
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	1468	-	0	0	635	0
Stage 1	573	-	-	-	-	-
Stage 2	895	-	-	-	-	-
Critical Hdwy	6.43	-	-	-	4.11	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	-	-	-	2.209	-
Pot Cap-1 Maneuver	140	0	-	-	953	-
Stage 1	562	0	-	-	-	-
Stage 2	397	0	-	-	-	-
Platoon blocked, %		-	-	-	-	-
Mov Cap-1 Maneuver	121	-	-	-	953	-
Mov Cap-2 Maneuver	245	-	-	-	-	-
Stage 1	562	-	-	-	-	-
Stage 2	343	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	33	0		1.6		
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT	
Capacity (veh/h)	-	-	245	-	953	-
HCM Lane V/C Ratio	-	-	0.489	-	0.137	-
HCM Control Delay (s)	-	-	33	0	9.4	-
HCM Lane LOS	-	-	D	A	A	-
HCM 95th %tile Q(veh)	-	-	2.5	-	0.5	-

HCM 6th Signalized Intersection Summary

1: 216th Ave SE & SE 288th St

Ten Trails Phase 1B













Future (2022) With-Project PM Peak Hour - With Mitigation

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	115	90	490	120	125	610
Future Volume (veh/h)	115	90	490	120	125	610
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1856	1856	1900	1900	1885	1885
Adj Flow Rate, veh/h	120	94	510	125	130	635
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	0	0	1	1
Cap, veh/h	225	200	1097	1067	607	1088
Arrive On Green	0.13	0.13	0.58	0.54	0.54	0.58
Sat Flow, veh/h	1767	1572	1900	1610	799	1885
Grp Volume(v), veh/h	120	94	510	125	130	635
Grp Sat Flow(s),veh/h/ln	1767	1572	1900	1610	799	1885
Q Serve(g_s), s	1.5	1.3	3.7	0.7	2.9	5.1
Cycle Q Clear(g_c), s	1.5	1.3	3.7	0.7	6.5	5.1
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	225	200	1097	1067	607	1088
V/C Ratio(X)	0.53	0.47	0.46	0.12	0.21	0.58
Avail Cap(c_a), veh/h	745	663	3445	3057	1594	3418
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	9.7	9.6	2.9	1.5	5.4	3.2
Incr Delay (d2), s/veh	2.0	1.7	0.3	0.0	0.2	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.4	0.1	0.0	0.2	0.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	11.6	11.3	3.2	1.5	5.6	3.7
LnGrp LOS	B	B	A	A	A	A
Approach Vol, veh/h	214		635			765
Approach Delay, s/veh	11.5		2.9			4.0
Approach LOS	B		A			A
Timer - Assigned Phs	2		6		8	
Phs Duration (G+Y+Rc), s	16.7		16.7		7.0	
Change Period (Y+Rc), s	4.0		4.0		4.0	
Max Green Setting (Gmax), s	42.0		42.0		10.0	
Max Q Clear Time (g_c+l1), s	5.7		8.5		3.5	
Green Ext Time (p_c), s	2.8		4.2		0.4	
Intersection Summary						
HCM 6th Ctrl Delay			4.6			
HCM 6th LOS			A			

HCM 6th Signalized Intersection Summary

1: 216th Ave SE & SE 288th St

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour - With Mitigation - No Pipeline



















						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	162	269	646	160	242	744
Future Volume (veh/h)	162	269	646	160	242	744
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1856	1856	1900	1900	1885	1885
Adj Flow Rate, veh/h	169	280	673	167	252	775
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	0	0	1	1
Cap, veh/h	343	305	1273	1360	450	1263
Arrive On Green	0.19	0.19	0.67	0.65	0.65	0.67
Sat Flow, veh/h	1767	1572	1900	1610	660	1885
Grp Volume(v), veh/h	169	280	673	167	252	775
Grp Sat Flow(s),veh/h/ln	1767	1572	1900	1610	660	1885
Q Serve(g_s), s	4.4	9.0	9.3	0.9	16.9	11.9
Cycle Q Clear(g_c), s	4.4	9.0	9.3	0.9	26.2	11.9
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	343	305	1273	1360	450	1263
V/C Ratio(X)	0.49	0.92	0.53	0.12	0.56	0.61
Avail Cap(c_a), veh/h	343	305	1585	1625	558	1573
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	18.5	20.4	4.3	0.7	11.7	4.8
Incr Delay (d2), s/veh	1.1	31.1	0.3	0.0	1.1	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	5.5	1.8	0.4	2.0	2.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	19.6	51.5	4.7	0.7	12.8	5.2
LnGrp LOS	B	D	A	A	B	A
Approach Vol, veh/h	449		840			1027
Approach Delay, s/veh	39.5		3.9			7.1
Approach LOS	D		A			A
Timer - Assigned Phs	2		6		8	
Phs Duration (G+Y+Rc), s	37.5		37.5		14.0	
Change Period (Y+Rc), s	4.0		4.0		4.0	
Max Green Setting (Gmax), s	42.0		42.0		10.0	
Max Q Clear Time (g_c+I1), s	11.3		28.2		11.0	
Green Ext Time (p_c), s	4.0		5.3		0.0	
Intersection Summary						
HCM 6th Ctrl Delay			12.2			
HCM 6th LOS			B			

SE Covington-Sawyer Road / 216th Avenue SE

HCM Signalized Intersection Capacity Analysis Ten Trails and Lawson Hills MPDs - Phase 1B

3: 216th Ave SE & SE Covington-Sawyer Rd



















Future (2022) With-Project PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	200	20	247	10	15	10	146	410	10	20	500	195
Future Volume (vph)	200	20	247	10	15	10	146	410	10	20	500	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	5.0		4.0			4.0			4.0	5.0
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98		0.99			1.00			1.00	0.98
Flpb, ped/bikes		0.99	1.00		1.00			1.00			1.00	1.00
Frt		1.00	0.85		0.96			1.00			1.00	0.85
Flt Protected		0.96	1.00		0.99			0.99			1.00	1.00
Satd. Flow (prot)		1786	1573		1784			1870			1877	1560
Flt Permitted		0.72	1.00		0.90			0.39			0.97	1.00
Satd. Flow (perm)		1341	1573		1628			741			1819	1560
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	215	22	266	11	16	11	157	441	11	22	538	210
RTOR Reduction (vph)	0	0	81	0	8	0	0	1	0	0	0	85
Lane Group Flow (vph)	0	237	185	0	30	0	0	608	0	0	560	125
Confl. Peds. (#/hr)	7		1	1		7	3		1	1		3
Heavy Vehicles (%)	1%	1%	1%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type	Perm	NA	pm+ov	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		8	5		4		5	2			6	
Permitted Phases	8		8	4			2			6		6
Actuated Green, G (s)		14.2	19.2		14.2			29.2			19.2	19.2
Effective Green, g (s)		15.2	19.2		15.2			30.2			20.2	19.2
Actuated g/C Ratio		0.28	0.36		0.28			0.57			0.38	0.36
Clearance Time (s)		5.0	5.0		5.0			5.0			5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		381	712		463			545			688	560
v/s Ratio Prot			0.02					c0.13				
v/s Ratio Perm		c0.18	0.09		0.02			c0.50			0.31	0.08
v/c Ratio		0.62	0.26		0.07			1.12			0.81	0.22
Uniform Delay, d1		16.6	12.1		13.9			11.6			14.9	11.9
Progression Factor		1.00	1.00		1.00			1.00			1.00	1.00
Incremental Delay, d2		3.1	0.2		0.1			74.4			7.3	0.2
Delay (s)		19.7	12.3		14.0			86.0			22.2	12.1
Level of Service		B	B		B			F			C	B
Approach Delay (s)		15.8			14.0			86.0			19.5	
Approach LOS		B			B			F			B	
Intersection Summary												
HCM 2000 Control Delay			39.5				HCM 2000 Level of Service				D	
HCM 2000 Volume to Capacity ratio			1.04									
Actuated Cycle Length (s)			53.4				Sum of lost time (s)			13.0		
Intersection Capacity Utilization			86.5%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM 6th Signalized Intersection Summary

3: 216th Ave SE & SE Covington-Sawyer Rd

Ten Trails Phase 1B
Future (2022) With-Project PM Peak Hour - With Mitigation

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	200	20	247	10	15	10	146	410	10	20	500	195
Future Volume (veh/h)	200	20	247	10	15	10	146	410	10	20	500	195
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	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	1885	1885	1885	1900	1900	1900	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	215	22	266	11	16	11	157	441	11	22	538	210
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	0	0	0	0	0	0	1	1	1
Cap, veh/h	313	39	301	202	284	167	288	909	23	73	657	549
Arrive On Green	0.38	0.38	0.36	0.38	0.38	0.36	0.07	0.49	0.48	0.36	0.36	0.34
Sat Flow, veh/h	609	103	799	334	754	443	1810	1846	46	34	1818	1591
Grp Volume(v), veh/h	503	0	0	38	0	0	157	0	452	560	0	210
Grp Sat Flow(s),veh/h/ln	1511	0	0	1531	0	0	1810	0	1892	1852	0	1591
Q Serve(g_s), s	17.8	0.0	0.0	0.0	0.0	0.0	3.2	0.0	9.7	5.1	0.0	6.1
Cycle Q Clear(g_c), s	19.0	0.0	0.0	0.8	0.0	0.0	3.2	0.0	9.7	16.7	0.0	6.1
Prop In Lane	0.43		0.53	0.29		0.29	1.00		0.02	0.04		1.00
Lane Grp Cap(c), veh/h	653	0	0	653	0	0	288	0	932	730	0	549
V/C Ratio(X)	0.77	0.00	0.00	0.06	0.00	0.00	0.55	0.00	0.49	0.77	0.00	0.38
Avail Cap(c_a), veh/h	727	0	0	727	0	0	288	0	1116	907	0	704
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	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.0	0.0	0.0	12.2	0.0	0.0	14.0	0.0	10.3	17.7	0.0	15.1
Incr Delay (d2), s/veh	4.6	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.4	3.1	0.0	0.4
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	6.9	0.0	0.0	0.3	0.0	0.0	1.3	0.0	3.4	6.8	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.5	0.0	0.0	12.2	0.0	0.0	16.1	0.0	10.7	20.9	0.0	15.5
LnGrp LOS	C	A	A	B	A	A	B	A	B	C	A	B
Approach Vol, veh/h		503			38			609			770	
Approach Delay, s/veh		22.5			12.2			12.1			19.4	
Approach LOS		C			B			B			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		34.0		27.0	8.0	26.0		27.0				
Change Period (Y+Rc), s		5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s		35.0		25.0	4.0	27.0		25.0				
Max Q Clear Time (g_c+I1), s		11.7		2.8	5.2	18.7		21.0				
Green Ext Time (p_c), s		1.8		0.1	0.0	2.3		1.0				
Intersection Summary												
HCM 6th Ctrl Delay				17.8								
HCM 6th LOS				B								
Notes												
User approved pedestrian interval to be less than phase max green.												




HCM 6th Signalized Intersection Summary Ten Trails and Lawson Hills MPDs - Phase 1B




3: 216th Ave SE & SE Covington-Sawyer Rd Future (2032) With-Project PM Peak Hour - With Mitigation - No Pipeline











Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕			↕	↕
Traffic Volume (veh/h)	250	25	293	10	20	10	183	556	10	25	619	257
Future Volume (veh/h)	250	25	293	10	20	10	183	556	10	25	619	257
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	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	1885	1885	1885	1900	1900	1900	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	269	27	315	11	22	11	197	598	11	27	666	276
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	0	0	0	0	0	0	1	1	1
Cap, veh/h	318	27	289	170	325	143	221	956	18	68	721	614
Arrive On Green	0.37	0.37	0.36	0.37	0.37	0.36	0.06	0.51	0.50	0.40	0.40	0.39
Sat Flow, veh/h	658	72	777	284	874	386	1810	1860	34	36	1802	1591
Grp Volume(v), veh/h	611	0	0	44	0	0	197	0	609	693	0	276
Grp Sat Flow(s),veh/h/ln	1507	0	0	1544	0	0	1810	0	1894	1838	0	1591
Q Serve(g_s), s	24.9	0.0	0.0	0.0	0.0	0.0	4.0	0.0	16.1	11.8	0.0	9.0
Cycle Q Clear(g_c), s	26.0	0.0	0.0	1.1	0.0	0.0	4.0	0.0	16.1	25.3	0.0	9.0
Prop In Lane	0.44		0.52	0.25		0.25	1.00		0.02	0.04		1.00
Lane Grp Cap(c), veh/h	634	0	0	638	0	0	221	0	974	789	0	614
V/C Ratio(X)	0.96	0.00	0.00	0.07	0.00	0.00	0.89	0.00	0.63	0.88	0.00	0.45
Avail Cap(c_a), veh/h	634	0	0	638	0	0	221	0	974	789	0	614
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	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.2	0.0	0.0	14.3	0.0	0.0	18.7	0.0	12.2	20.0	0.0	16.0
Incr Delay (d2), s/veh	26.9	0.0	0.0	0.0	0.0	0.0	33.3	0.0	1.3	11.1	0.0	0.5
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	4.6	0.0	0.0	0.4	0.0	0.0	3.6	0.0	6.0	11.9	0.0	3.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.2	0.0	0.0	14.3	0.0	0.0	52.0	0.0	13.4	31.2	0.0	16.5
LnGrp LOS	D	A	A	B	A	A	D	A	B	C	A	B
Approach Vol, veh/h		611			44			806			969	
Approach Delay, s/veh		50.2			14.3			22.9			27.0	
Approach LOS		D			B			C			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		40.0		30.0	8.0	32.0		30.0				
Change Period (Y+Rc), s		5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s		35.0		25.0	4.0	27.0		25.0				
Max Q Clear Time (g_c+I1), s		18.1		3.1	6.0	27.3		28.0				
Green Ext Time (p_c), s		2.5		0.1	0.0	0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay				31.2								
HCM 6th LOS				C								
Notes												
User approved pedestrian interval to be less than phase max green.												

SE Auburn-Black Diamond Road / 218th Avenue SE

Intersection						
Int Delay, s/veh	7.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	493	265	73	354	95	93
Future Vol, veh/h	493	265	73	354	95	93
Conflicting Peds, #/hr	0	1	1	0	1	1
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	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	514	276	76	369	99	97
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	791	0	1175	654
Stage 1	-	-	-	-	653	-
Stage 2	-	-	-	-	522	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.209	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	834	-	213	468
Stage 1	-	-	-	-	520	-
Stage 2	-	-	-	-	597	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	833	-	188	467
Mov Cap-2 Maneuver	-	-	-	-	188	-
Stage 1	-	-	-	-	519	-
Stage 2	-	-	-	-	528	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	1.7		48.2		
HCM LOS	E					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	267	-	-	833	-	
HCM Lane V/C Ratio	0.733	-	-	0.091	-	
HCM Control Delay (s)	48.2	-	-	9.8	0	
HCM Lane LOS	E	-	-	A	A	
HCM 95th %tile Q(veh)	5.2	-	-	0.3	-	

Intersection						
Int Delay, s/veh	7.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	498	270	73	368	95	93
Future Vol, veh/h	498	270	73	368	95	93
Conflicting Peds, #/hr	0	1	1	0	1	1
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	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	519	281	76	383	99	97
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	801	0	1197	662
Stage 1	-	-	-	-	661	-
Stage 2	-	-	-	-	536	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.209	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	827	-	206	464
Stage 1	-	-	-	-	515	-
Stage 2	-	-	-	-	589	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	826	-	181	463
Mov Cap-2 Maneuver	-	-	-	-	181	-
Stage 1	-	-	-	-	514	-
Stage 2	-	-	-	-	519	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.6		52	
HCM LOS					F	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	259	-	-	826	-	
HCM Lane V/C Ratio	0.756	-	-	0.092	-	
HCM Control Delay (s)	52	-	-	9.8	0	
HCM Lane LOS	F	-	-	A	A	
HCM 95th %tile Q(veh)	5.5	-	-	0.3	-	

Intersection						
Int Delay, s/veh	3.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	498	270	73	368	95	93
Future Vol, veh/h	498	270	73	368	95	93
Conflicting Peds, #/hr	0	1	1	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	519	281	76	383	99	97
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	801	0	1197	662
Stage 1	-	-	-	-	661	-
Stage 2	-	-	-	-	536	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.209	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	827	-	206	464
Stage 1	-	-	-	-	515	-
Stage 2	-	-	-	-	589	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	826	-	187	463
Mov Cap-2 Maneuver	-	-	-	-	324	-
Stage 1	-	-	-	-	514	-
Stage 2	-	-	-	-	534	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.6		24	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	381	-	-	826	-	
HCM Lane V/C Ratio	0.514	-	-	0.092	-	
HCM Control Delay (s)	24	-	-	9.8	-	
HCM Lane LOS	C	-	-	A	-	
HCM 95th %tile Q(veh)	2.8	-	-	0.3	-	







Intersection						
Int Delay, s/veh	3.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	506	280	73	390	95	97
Future Vol, veh/h	506	280	73	390	95	97
Conflicting Peds, #/hr	0	1	1	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	-
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	527	292	76	406	99	101
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	820	0	1233	675
Stage 1	-	-	-	-	674	-
Stage 2	-	-	-	-	559	-
Critical Hdwy	-	-	4.11	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.209	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	813	-	196	456
Stage 1	-	-	-	-	508	-
Stage 2	-	-	-	-	574	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	812	-	177	455
Mov Cap-2 Maneuver	-	-	-	-	315	-
Stage 1	-	-	-	-	507	-
Stage 2	-	-	-	-	519	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		1.6		25.3	
HCM LOS					D	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	373	-	-	812	-	
HCM Lane V/C Ratio	0.536	-	-	0.094	-	
HCM Control Delay (s)	25.3	-	-	9.9	-	
HCM Lane LOS	D	-	-	A	-	
HCM 95th %tile Q(veh)	3	-	-	0.3	-	

Roberts Drive / Ten Trails Place SE

HCM 6th TWSC
6: Roberts Drive & Ten Trail Place

Ten Trails and Lawson Hills MPDs - Phase 1B







Future (2023) With-Project PM Peak Hour

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	433	55	145	403	24	20	0	65	7	0	15
Future Vol, veh/h	8	433	55	145	403	24	20	0	65	7	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	150	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	9	476	60	159	443	26	22	0	71	8	0	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	469	0	0	536	0	0	1306	1311	506	1334	1328	456
Stage 1	-	-	-	-	-	-	524	524	-	774	774	-
Stage 2	-	-	-	-	-	-	782	787	-	560	554	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1098	-	-	1032	-	-	138	160	570	132	157	609
Stage 1	-	-	-	-	-	-	540	533	-	394	411	-
Stage 2	-	-	-	-	-	-	390	406	-	516	517	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1098	-	-	1032	-	-	118	134	570	101	132	609
Mov Cap-2 Maneuver	-	-	-	-	-	-	118	134	-	101	132	-
Stage 1	-	-	-	-	-	-	536	529	-	391	348	-
Stage 2	-	-	-	-	-	-	321	343	-	448	513	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			2.3			22.3			22.2		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	300	1098	-	-	1032	-	-	234				
HCM Lane V/C Ratio	0.311	0.008	-	-	0.154	-	-	0.103				
HCM Control Delay (s)	22.3	8.3	-	-	9.1	-	-	22.2				
HCM Lane LOS	C	A	-	-	A	-	-	C				
HCM 95th %tile Q(veh)	1.3	0	-	-	0.5	-	-	0.3				

HCM 6th TWSC
6: Roberts Drive & Ten Trail Place

Ten Trails and Lawson Hills MPDs - Phase 1B



















Future (2024) With-Project PM Peak Hour

Intersection												
Int Delay, s/veh	5.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	12	454	55	160	426	29	25	0	75	25	0	16
Future Vol, veh/h	12	454	55	160	426	29	25	0	75	25	0	16
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	150	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	1	1	1	2	2	2	0	0	0	0	0	0
Mvmt Flow	13	499	60	176	468	32	27	0	82	27	0	18
Major/Minor	Major1		Major2			Minor1			Minor2			
Conflicting Flow All	500	0	0	559	0	0	1400	1407	529	1432	1421	484
Stage 1	-	-	-	-	-	-	555	555	-	836	836	-
Stage 2	-	-	-	-	-	-	845	852	-	596	585	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1069	-	-	1012	-	-	119	140	554	113	138	587
Stage 1	-	-	-	-	-	-	520	516	-	364	385	-
Stage 2	-	-	-	-	-	-	360	379	-	494	501	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1069	-	-	1012	-	-	99	114	554	83	113	587
Mov Cap-2 Maneuver	-	-	-	-	-	-	99	114	-	83	113	-
Stage 1	-	-	-	-	-	-	514	510	-	360	318	-
Stage 2	-	-	-	-	-	-	288	313	-	415	495	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	0.2		2.4			28.9			49.2			
HCM LOS						D			E			
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	258	1069	-	-	1012	-	-	125				
HCM Lane V/C Ratio	0.426	0.012	-	-	0.174	-	-	0.36				
HCM Control Delay (s)	28.9	8.4	-	-	9.3	-	-	49.2				
HCM Lane LOS	D	A	-	-	A	-	-	E				
HCM 95th %tile Q(veh)	2	0	-	-	0.6	-	-	1.5				

HCM 6th Signalized Intersection Summary 6: Ten Trails Place & Roberts Drive

Ten Trails and Lawson Hills MPDs - Phase 1B



















Future (2024) With-Project PM Peak Hour - With Mitigation

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	454	55	160	426	29	25	0	75	25	0	16
Future Volume (veh/h)	12	454	55	160	426	29	25	0	75	25	0	16
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	1885	1885	1885	1870	1870	1870	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	13	499	60	176	468	32	27	0	82	27	0	18
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, %	1	1	1	2	2	2	0	0	0	0	0	0
Cap, veh/h	425	808	97	381	847	58	182	48	409	395	30	202
Arrive On Green	0.49	0.49	0.49	0.49	0.49	0.49	0.34	0.00	0.34	0.34	0.00	0.34
Sat Flow, veh/h	905	1651	199	850	1731	118	254	141	1201	802	89	594
Grp Volume(v), veh/h	13	0	559	176	0	500	109	0	0	45	0	0
Grp Sat Flow(s),veh/h/ln	905	0	1849	850	0	1849	1597	0	0	1484	0	0
Q Serve(g_s), s	0.5	0.0	10.4	9.0	0.0	8.9	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	9.4	0.0	10.4	19.4	0.0	8.9	2.2	0.0	0.0	0.8	0.0	0.0
Prop In Lane	1.00		0.11	1.00		0.06	0.25		0.75	0.60		0.40
Lane Grp Cap(c), veh/h	425	0	905	381	0	905	639	0	0	628	0	0
V/C Ratio(X)	0.03	0.00	0.62	0.46	0.00	0.55	0.17	0.00	0.00	0.07	0.00	0.00
Avail Cap(c_a), veh/h	483	0	1023	435	0	1023	639	0	0	628	0	0
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.7	0.0	8.8	15.9	0.0	8.4	10.9	0.0	0.0	10.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.9	0.9	0.0	0.5	0.6	0.0	0.0	0.2	0.0	0.0
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	0.1	0.0	3.4	1.4	0.0	2.1	0.8	0.0	0.0	0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.7	0.0	9.7	16.7	0.0	8.9	11.5	0.0	0.0	10.7	0.0	0.0
LnGrp LOS	B	A	A	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h	572			676			109			45		
Approach Delay, s/veh	9.7			11.0			11.5			10.7		
Approach LOS	A			B			B			B		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	20.0			27.0			20.0			27.0		
Change Period (Y+Rc), s	4.0			4.0			4.0			4.0		
Max Green Setting (Gmax), s	16.0			26.0			16.0			26.0		
Max Q Clear Time (g_c+I1), s	4.2			12.4			2.8			21.4		
Green Ext Time (p_c), s	0.4			3.4			0.1			1.6		
Intersection Summary												
HCM 6th Ctrl Delay	10.5											
HCM 6th LOS	B											

HCM 6th Signalized Intersection Summary

6: Ten Trails Place & Roberts Drive

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour - With Mitigation - No Pipeline




												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	569	60	165	579	34	25	0	90	33	0	23
Future Volume (veh/h)	14	569	60	165	579	34	25	0	90	33	0	23
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	1885	1885	1885	1870	1870	1870	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	15	618	65	179	629	37	27	0	98	36	0	25
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, %	1	1	1	2	2	2	0	0	0	0	0	0
Cap, veh/h	338	872	92	326	909	53	154	45	402	367	29	195
Arrive On Green	0.52	0.52	0.52	0.52	0.52	0.52	0.32	0.00	0.32	0.32	0.00	0.32
Sat Flow, veh/h	776	1677	176	758	1749	103	206	140	1256	789	91	611
Grp Volume(v), veh/h	15	0	683	179	0	666	125	0	0	61	0	0
Grp Sat Flow(s),veh/h/ln	776	0	1853	758	0	1852	1602	0	0	1490	0	0
Q Serve(g_s), s	0.7	0.0	14.0	11.7	0.0	13.5	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	14.2	0.0	14.0	25.8	0.0	13.5	2.8	0.0	0.0	1.2	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.06	0.22		0.78	0.59		0.41
Lane Grp Cap(c), veh/h	338	0	964	326	0	963	600	0	0	591	0	0
V/C Ratio(X)	0.04	0.00	0.71	0.55	0.00	0.69	0.21	0.00	0.00	0.10	0.00	0.00
Avail Cap(c_a), veh/h	338	0	964	326	0	963	600	0	0	591	0	0
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.3	0.0	9.1	18.9	0.0	9.0	12.5	0.0	0.0	12.0	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	2.4	2.0	0.0	2.1	0.8	0.0	0.0	0.3	0.0	0.0
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	0.1	0.0	5.0	1.8	0.0	3.6	1.0	0.0	0.0	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.4	0.0	11.5	20.9	0.0	11.1	13.3	0.0	0.0	12.3	0.0	0.0
LnGrp LOS	B	A	B	C	A	B	B	A	A	B	A	A
Approach Vol, veh/h	698			845			125			61		
Approach Delay, s/veh	11.6			13.2			13.3			12.3		
Approach LOS	B			B			B			B		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	20.0			30.0			20.0			30.0		
Change Period (Y+Rc), s	4.0			4.0			4.0			4.0		
Max Green Setting (Gmax), s	16.0			26.0			16.0			26.0		
Max Q Clear Time (g_c+I1), s	4.8			16.2			3.2			27.8		
Green Ext Time (p_c), s	0.4			3.6			0.2			0.0		
Intersection Summary												
HCM 6th Ctrl Delay	12.5											
HCM 6th LOS	B											

Roberts Drive / Morgan Street

HCM 6th TWSC
8: Morgan St & Roberts Drive/Roberts Dr




Ten Trails and Lawson Hills MPDs - Phase 1B

Future (2024) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	368	169	5	468	112	1
Future Vol, veh/h	368	169	5	468	112	1
Conflicting Peds, #/hr	0	1	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	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, %	1	1	2	2	0	0
Mvmt Flow	400	184	5	509	122	1
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	-	400	0	920	400
Stage 1	-	-	-	-	400	-
Stage 2	-	-	-	-	520	-
Critical Hdwy	-	-	4.12	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.218	-	3.5	3.3
Pot Cap-1 Maneuver	-	0	1159	-	303	654
Stage 1	-	0	-	-	681	-
Stage 2	-	0	-	-	601	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1159	-	301	654
Mov Cap-2 Maneuver	-	-	-	-	301	-
Stage 1	-	-	-	-	681	-
Stage 2	-	-	-	-	597	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.1		24.9		
HCM LOS				C		
Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT		
Capacity (veh/h)	302	-	1159	-		
HCM Lane V/C Ratio	0.407	-	0.005	-		
HCM Control Delay (s)	24.9	-	8.1	0		
HCM Lane LOS	C	-	A	A		
HCM 95th %tile Q(veh)	1.9	-	0	-		

HCM 6th TWSC
8: Morgan St & Roberts Drive/Roberts Dr










Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2025) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	5.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	371	198	5	444	166	1
Future Vol, veh/h	371	198	5	444	166	1
Conflicting Peds, #/hr	0	1	0	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	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, %	1	1	2	2	0	0
Mvmt Flow	403	215	5	483	180	1
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	403	0	897	403
Stage 1	-	-	-	-	403	-
Stage 2	-	-	-	-	494	-
Critical Hdwy	-	-	4.12	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.218	-	3.5	3.3
Pot Cap-1 Maneuver	-	0	1156	-	313	652
Stage 1	-	0	-	-	679	-
Stage 2	-	0	-	-	617	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1156	-	311	652
Mov Cap-2 Maneuver	-	-	-	-	311	-
Stage 1	-	-	-	-	679	-
Stage 2	-	-	-	-	613	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.1		31.4	
HCM LOS					D	
Minor Lane/Major Mvmt	NBLn1		EBT	WBL	WBT	
Capacity (veh/h)	312		-	1156	-	
HCM Lane V/C Ratio	0.582		-	0.005	-	
HCM Control Delay (s)	31.4		-	8.1	0	
HCM Lane LOS	D		-	A	A	
HCM 95th %tile Q(veh)	3.4		-	0	-	

HCM 6th Signalized Intersection Summary

8: Morgan St & Roberts Drive/Roberts Dr

Ten Trails Phase 1B
Future (2025) With-Project PM Peak Hour - With Mitigation

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	371	198	5	444	166	1
Future Volume (veh/h)	371	198	5	444	166	1
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1870	1870	1900	1900
Adj Flow Rate, veh/h	403	0	5	483	180	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	2	2	0	0
Cap, veh/h	754		179	743	379	2
Arrive On Green	0.40	0.00	0.40	0.40	0.21	0.21
Sat Flow, veh/h	1885	0	6	1858	1789	10
Grp Volume(v), veh/h	403	0	488	0	182	0
Grp Sat Flow(s),veh/h/ln	1885	0	1865	0	1809	0
Q Serve(g_s), s	3.4	0.0	0.0	0.0	1.8	0.0
Cycle Q Clear(g_c), s	3.4	0.0	4.4	0.0	1.8	0.0
Prop In Lane		0.00	0.01		0.99	0.01
Lane Grp Cap(c), veh/h	754		922	0	383	0
V/C Ratio(X)	0.53		0.53	0.00	0.47	0.00
Avail Cap(c_a), veh/h	1921		2069	0	1404	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	4.7	0.0	5.0	0.0	7.1	0.0
Incr Delay (d2), s/veh	0.6	0.0	0.5	0.0	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.6	0.0	0.5	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.3	0.0	5.5	0.0	8.0	0.0
LnGrp LOS	A		A	A	A	A
Approach Vol, veh/h	403	A		488	182	
Approach Delay, s/veh	5.3			5.5	8.0	
Approach LOS	A			A	A	
Timer - Assigned Phs	2		4		8	
Phs Duration (G+Y+Rc), s	8.4		12.2		12.2	
Change Period (Y+Rc), s	4.0		4.0		4.0	
Max Green Setting (Gmax), s	16.0		21.0		21.0	
Max Q Clear Time (g_c+I1), s	3.8		5.4		6.4	
Green Ext Time (p_c), s	0.5		1.5		1.9	
Intersection Summary						
HCM 6th Ctrl Delay			5.9			
HCM 6th LOS			A			

HCM 6th Signalized Intersection Summary 8: Morgan St & Roberts Drive/Roberts Dr

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour - With Mitigation - No Pipeline



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	494	198	5	595	143	1
Future Volume (veh/h)	494	198	5	595	143	1
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1870	1870	1900	1900
Adj Flow Rate, veh/h	537	0	5	647	155	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	2	2	0	0
Cap, veh/h	921		152	910	321	2
Arrive On Green	0.49	0.00	0.49	0.49	0.18	0.18
Sat Flow, veh/h	1885	0	4	1862	1786	12
Grp Volume(v), veh/h	537	0	652	0	157	0
Grp Sat Flow(s), veh/h/ln	1885	0	1866	0	1809	0
Q Serve(g_s), s	4.9	0.0	0.0	0.0	1.9	0.0
Cycle Q Clear(g_c), s	4.9	0.0	6.6	0.0	1.9	0.0
Prop In Lane		0.00	0.01		0.99	0.01
Lane Grp Cap(c), veh/h	921		1062	0	326	0
V/C Ratio(X)	0.58		0.61	0.00	0.48	0.00
Avail Cap(c_a), veh/h	2422		2538	0	1199	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	4.4	0.0	4.8	0.0	8.9	0.0
Incr Delay (d2), s/veh	0.6	0.0	0.6	0.0	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.9	0.0	0.6	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.0	0.0	5.4	0.0	10.0	0.0
LnGrp LOS	A		A	A	A	A
Approach Vol, veh/h	537	A		652	157	
Approach Delay, s/veh	5.0			5.4	10.0	
Approach LOS	A			A	A	
Timer - Assigned Phs		2		4		8
Phs Duration (G+Y+Rc), s		8.3		15.8		15.8
Change Period (Y+Rc), s		4.0		4.0		4.0
Max Green Setting (Gmax), s		16.0		31.0		31.0
Max Q Clear Time (g_c+I1), s		3.9		6.9		8.6
Green Ext Time (p_c), s		0.4		2.5		3.2
Intersection Summary						
HCM 6th Ctrl Delay			5.8			
HCM 6th LOS			A			







Notes







Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.







SR 169 / SR 288th Street

HCM 6th TWSC
9: SR 169 & SE 288th St

Ten Trails and Lawson Hills MPDs
Future (2021) With-Project PM Peak Hour - With Mitigation













Intersection						
Int Delay, s/veh	3.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	110	60	45	350	655	230
Future Vol, veh/h	110	60	45	350	655	230
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	0	175	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	1	1	0	0	2	2
Mvmt Flow	121	66	49	385	720	253
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1203	720	720	0	-	0
Stage 1	720	-	-	-	-	-
Stage 2	483	-	-	-	-	-
Critical Hdwy	6.41	6.21	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.2	-	-	-
Pot Cap-1 Maneuver	205	430	891	-	-	0
Stage 1	484	-	-	-	-	0
Stage 2	622	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	194	430	891	-	-	-
Mov Cap-2 Maneuver	326	-	-	-	-	-
Stage 1	457	-	-	-	-	-
Stage 2	622	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	19.8	1.1		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	891	-	326	430	-	
HCM Lane V/C Ratio	0.056	-	0.371	0.153	-	
HCM Control Delay (s)	9.3	-	22.4	14.9	-	
HCM Lane LOS	A	-	C	B	-	
HCM 95th %tile Q(veh)	0.2	-	1.7	0.5	-	

Intersection						
Int Delay, s/veh	4.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	115	85	60	450	861	245
Future Vol, veh/h	115	85	60	450	861	245
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	0	175	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	0	0	2	2
Mvmt Flow	125	92	65	489	936	266
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1555	936	936	0	-	0
Stage 1	936	-	-	-	-	-
Stage 2	619	-	-	-	-	-
Critical Hdwy	6.41	6.21	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.2	-	-	-
Pot Cap-1 Maneuver	125	323	740	-	-	0
Stage 1	383	-	-	-	-	0
Stage 2	539	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 114	323	740	-	-	-
Mov Cap-2 Maneuver	242	-	-	-	-	-
Stage 1	349	-	-	-	-	-
Stage 2	539	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	28.8	1.2		0		
HCM LOS	D					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	
Capacity (veh/h)	740	-	242	323	-	
HCM Lane V/C Ratio	0.088	-	0.517	0.286	-	
HCM Control Delay (s)	10.3	-	34.8	20.6	-	
HCM Lane LOS	B	-	D	C	-	
HCM 95th %tile Q(veh)	0.3	-	2.7	1.2	-	
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

Intersection						
Int Delay, s/veh	4.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	115	90	60	464	865	250
Future Vol, veh/h	115	90	60	464	865	250
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	0	175	-	-	200
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	0	0	2	2
Mvmt Flow	125	98	65	504	940	272
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1574	940	940	0	-	0
Stage 1	940	-	-	-	-	-
Stage 2	634	-	-	-	-	-
Critical Hdwy	6.41	6.21	4.1	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.2	-	-	-
Pot Cap-1 Maneuver	~ 122	321	737	-	-	0
Stage 1	382	-	-	-	-	0
Stage 2	530	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 111	321	737	-	-	-
Mov Cap-2 Maneuver	239	-	-	-	-	-
Stage 1	348	-	-	-	-	-
Stage 2	530	-	-	-	-	-
Approach	EB		NB		SB	
HCM Control Delay, s	29.2		1.2		0	
HCM LOS	D					
Minor Lane/Major Mvmt	NBL		NBT	EBLn1	EBLn2	SBT
Capacity (veh/h)	737		-	239	321	-
HCM Lane V/C Ratio	0.088		-	0.523	0.305	-
HCM Control Delay (s)	10.4		-	35.5	21.1	-
HCM Lane LOS	B		-	E	C	-
HCM 95th %tile Q(veh)	0.3		-	2.8	1.3	-
Notes						
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon

HCM 6th Signalized Intersection Summary 9: SR 169 & SE 288th St

Ten Trails Phase 1B
Future (2026) With-Project PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	115	90	60	464	865	250
Future Volume (veh/h)	115	90	60	464	865	250
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1900	1900	1870	1870
Adj Flow Rate, veh/h	124	97	65	499	930	269
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	0	0	2	2
Cap, veh/h	204	181	357	1225	1206	1022
Arrive On Green	0.11	0.11	0.64	0.64	0.64	0.64
Sat Flow, veh/h	1795	1598	474	1900	1870	1585
Grp Volume(v), veh/h	124	97	65	499	930	269
Grp Sat Flow(s),veh/h/ln	1795	1598	474	1900	1870	1585
Q Serve(g_s), s	2.2	1.9	3.7	4.2	11.6	2.4
Cycle Q Clear(g_c), s	2.2	1.9	15.3	4.2	11.6	2.4
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	204	181	357	1225	1206	1022
V/C Ratio(X)	0.61	0.53	0.18	0.41	0.77	0.26
Avail Cap(c_a), veh/h	326	290	710	2642	2601	2204
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	14.0	13.8	9.6	2.8	4.2	2.5
Incr Delay (d2), s/veh	2.9	2.4	0.2	0.2	1.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.6	0.3	0.5	1.5	0.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	16.9	16.3	9.8	3.1	5.2	2.7
LnGrp LOS	B	B	A	A	A	A
Approach Vol, veh/h	221			564	1199	
Approach Delay, s/veh	16.6			3.8	4.7	
Approach LOS	B			A	A	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	25.3		7.8		25.3	
Change Period (Y+Rc), s	4.0		4.0		4.0	
Max Green Setting (Gmax), s	46.0		6.0		46.0	
Max Q Clear Time (g_c+I1), s	17.3		4.2		13.6	
Green Ext Time (p_c), s	3.4		0.1		7.7	
Intersection Summary						
HCM 6th Ctrl Delay			5.8			
HCM 6th LOS			A			

HCM 6th Signalized Intersection Summary 9: SR 169 & SE 288th St

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour - With Mitigation - No Pipeline



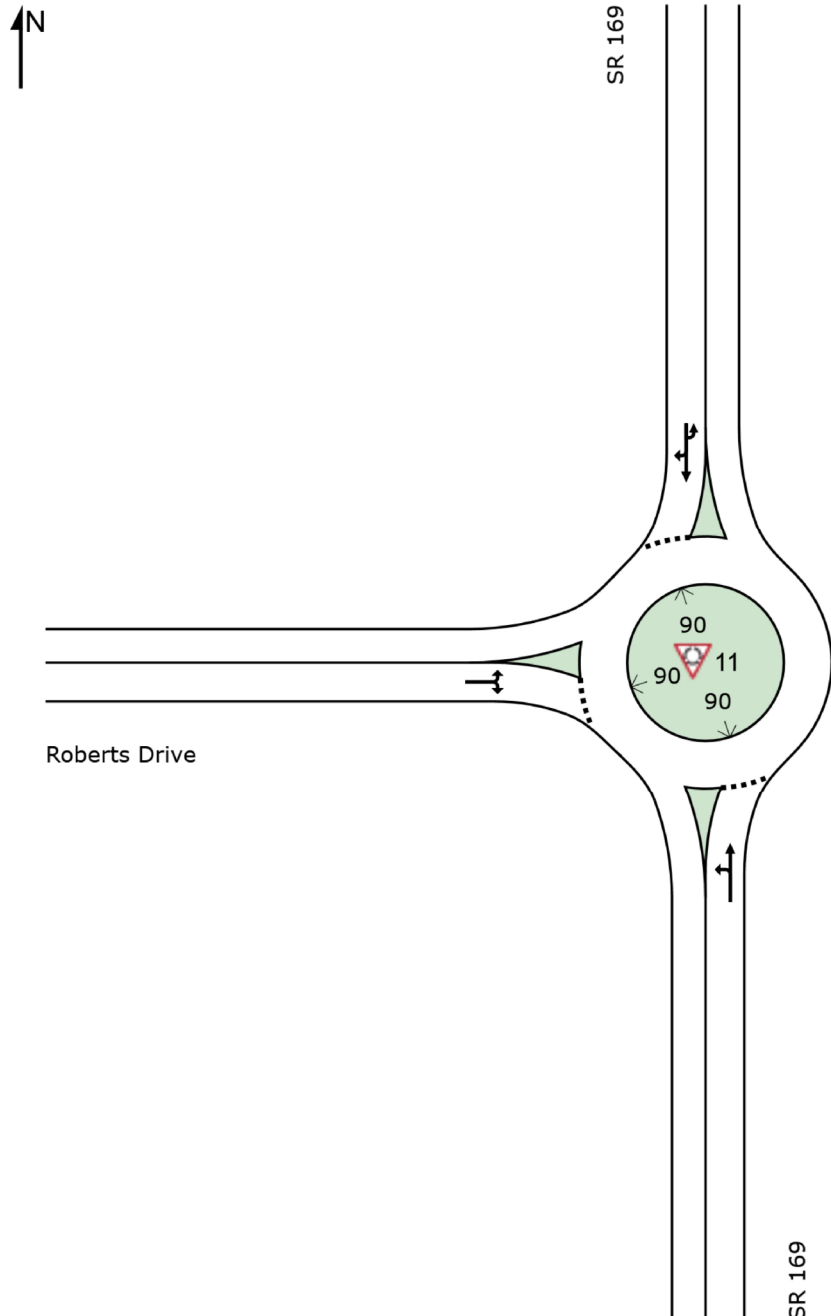
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	125	192	251	574	924	275
Future Volume (veh/h)	125	192	251	574	924	275
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1900	1900	1870	1870
Adj Flow Rate, veh/h	134	206	270	617	994	296
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	0	0	2	2
Cap, veh/h	166	147	346	1491	1468	1244
Arrive On Green	0.09	0.09	0.78	0.78	0.78	0.78
Sat Flow, veh/h	1795	1598	435	1900	1870	1585
Grp Volume(v), veh/h	134	206	270	617	994	296
Grp Sat Flow(s), veh/h/ln	1795	1598	435	1900	1870	1585
Q Serve(g_s), s	4.8	6.0	35.1	6.7	15.9	3.2
Cycle Q Clear(g_c), s	4.8	6.0	51.0	6.7	15.9	3.2
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	166	147	346	1491	1468	1244
V/C Ratio(X)	0.81	1.40	0.78	0.41	0.68	0.24
Avail Cap(c_a), veh/h	166	147	346	1491	1468	1244
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	28.9	29.5	17.2	2.2	3.2	1.9
Incr Delay (d2), s/veh	24.9	214.4	11.0	0.2	1.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	10.9	5.1	1.2	3.1	0.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	53.8	243.9	28.2	2.4	4.5	2.0
LnGrp LOS	D	F	C	A	A	A
Approach Vol, veh/h	340			887	1290	
Approach Delay, s/veh	169.0			10.3	3.9	
Approach LOS	F			B	A	
Timer - Assigned Phs	2			4		6
Phs Duration (G+Y+Rc), s	55.0			10.0		55.0
Change Period (Y+Rc), s	4.0			4.0		4.0
Max Green Setting (Gmax), s	51.0			6.0		51.0
Max Q Clear Time (g_c+I1), s	53.0			8.0		17.9
Green Ext Time (p_c), s	0.0			0.0		8.8
Intersection Summary						
HCM 6th Ctrl Delay			28.4			
HCM 6th LOS			C			

SR 169 / Roberts Drive

SITE LAYOUT

Site: 11 [WP SR 169/Roberts Drive]

SR 169/Roberts Drive
Future (2026) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

 **Site: 11 [WP SR 169/Roberts Drive]**

SR 169/Roberts Drive
Future (2026) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	146	2.0	0.480	11.5	LOS B	3.5	89.8	0.65	0.64	0.65	35.1
8	T1	382	2.0	0.480	5.9	LOS A	3.5	89.8	0.65	0.64	0.65	35.0
Approach		528	2.0	0.480	7.4	LOS A	3.5	89.8	0.65	0.64	0.65	35.1
North: SR 169												
7u	U	86	1.0	0.973	20.3	LOS E	35.3	888.8	1.00	0.76	1.21	33.3
4	T1	903	1.0	0.973	12.4	LOS E	35.3	888.8	1.00	0.76	1.21	32.6
14	R2	383	1.0	0.973	11.5	LOS E	35.3	888.8	1.00	0.76	1.21	30.4
Approach		1372	1.0	0.973	12.6	LOS B	35.3	888.8	1.00	0.76	1.21	32.0
West: Roberts Drive												
5	L2	255	1.0	0.881	42.5	LOS D	14.5	364.3	1.00	1.42	2.03	22.3
12	R2	157	1.0	0.881	38.0	LOS D	14.5	364.3	1.00	1.42	2.03	22.5
Approach		412	1.0	0.881	40.8	LOS D	14.5	364.3	1.00	1.42	2.03	22.4
All Vehicles		2312	1.2	0.973	16.5	LOS B	35.3	888.8	0.92	0.85	1.23	30.3

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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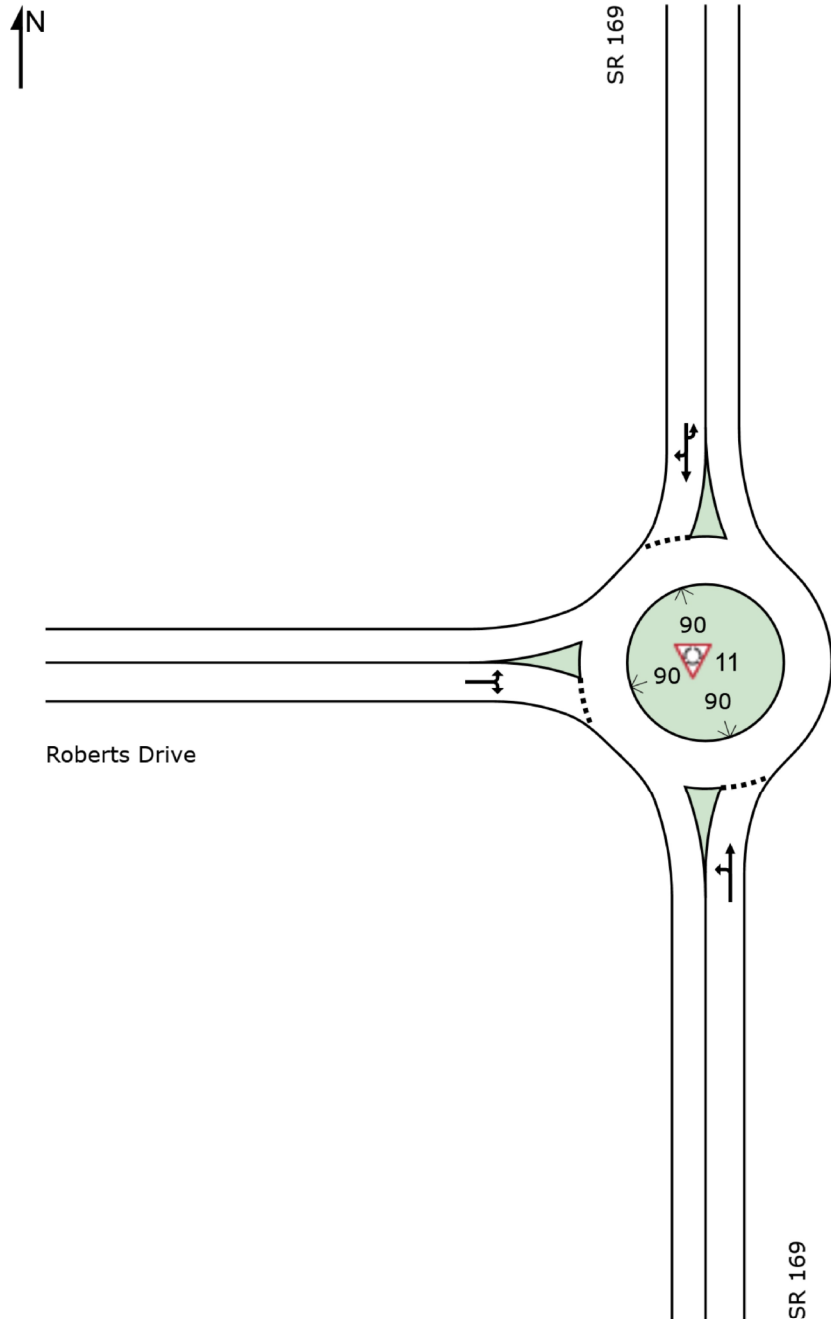
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Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Synchro\Phase 1B TMR (2020)\1.5 Percent Growth Rate\Year By Year Analysis (No Pipeline)\2026 - No Pipeline\No Mitigation\Future PM Peak Hour -.sip8

SITE LAYOUT

Site: 11 [WP SR 169/Roberts Drive]

SR 169/Roberts Drive
Future (2027) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

 **Site: 11 [WP SR 169/Roberts Drive]**

SR 169/Roberts Drive
Future (2027) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	173	2.0	0.538	11.9	LOS B	4.3	109.1	0.70	0.68	0.71	34.8
8	T1	409	2.0	0.538	6.2	LOS A	4.3	109.1	0.70	0.68	0.71	34.8
Approach		582	2.0	0.538	7.9	LOS A	4.3	109.1	0.70	0.68	0.71	34.8
North: SR 169												
7u	U	86	1.0	1.040	40.1	LOS F	56.7	1429.8	1.00	1.24	1.90	25.7
4	T1	934	1.0	1.040	32.2	LOS F	56.7	1429.8	1.00	1.24	1.90	25.3
14	R2	402	1.0	1.040	31.4	LOS F	56.7	1429.8	1.00	1.24	1.90	23.9
Approach		1423	1.0	1.040	32.4	LOS C	56.7	1429.8	1.00	1.24	1.90	24.9
West: Roberts Drive												
5	L2	276	1.0	0.965	56.9	LOS E	20.2	509.4	1.00	1.63	2.54	19.6
12	R2	178	1.0	0.965	52.4	LOS E	20.2	509.4	1.00	1.63	2.54	19.7
Approach		455	1.0	0.965	55.1	LOS E	20.2	509.4	1.00	1.63	2.54	19.6
All Vehicles		2459	1.2	1.040	30.8	LOS C	56.7	1429.8	0.93	1.18	1.74	25.4

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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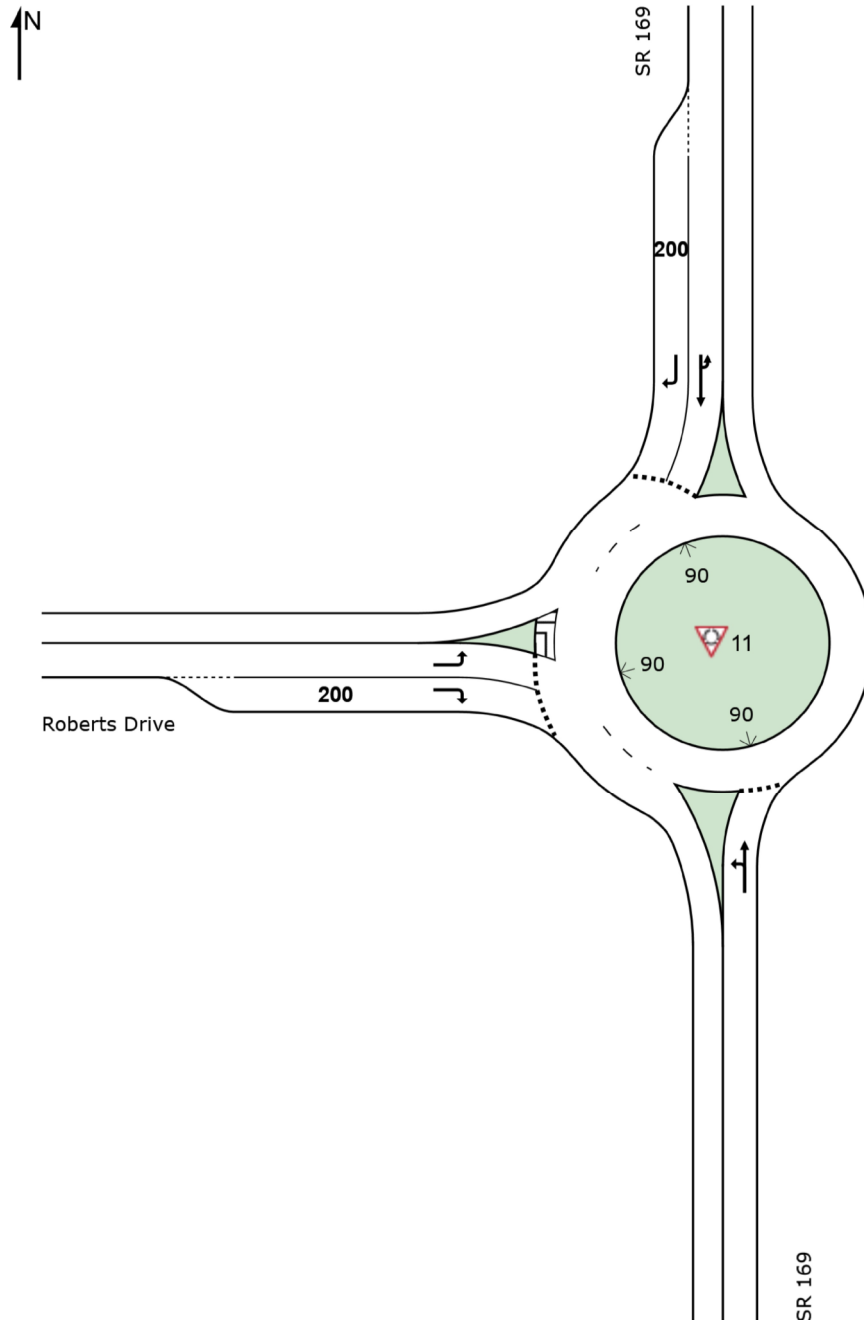
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Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Synchro\Phase 1B TMR (2020)\1.5 Percent Growth Rate\Year By Year Analysis (No Pipeline)\2027 - No Pipeline\No Mitigation\Future PM Peak Hour -.sip8

SITE LAYOUT

Site: 11 [WP SR 169/Roberts Drive]

SR 169/Roberts Drive
Future (2027) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

 **Site: 11 [WP SR 169/Roberts Drive]**

SR 169/Roberts Drive
Future (2027) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	173	2.0	0.538	11.9	LOS B	4.3	109.3	0.70	0.68	0.71	34.8
8	T1	409	2.0	0.538	6.3	LOS A	4.3	109.3	0.70	0.68	0.71	34.8
Approach		582	2.0	0.538	8.0	LOS A	4.3	109.3	0.70	0.68	0.71	34.8
North: SR 169												
7u	U	86	1.0	0.659	13.0	LOS B	6.7	167.7	0.57	0.51	0.57	36.6
4	T1	934	1.0	0.659	4.8	LOS A	6.7	167.7	0.57	0.51	0.57	35.7
14	R2	402	1.0	0.345	4.4	LOS A	2.2	55.6	0.43	0.53	0.43	32.1
Approach		1423	1.0	0.659	5.2	LOS A	6.7	167.7	0.53	0.51	0.53	34.7
West: Roberts Drive												
5	L2	276	1.0	0.366	14.9	LOS B	3.2	81.2	0.99	0.89	0.99	29.5
12	R2	178	1.0	0.328	11.8	LOS B	2.4	60.5	0.93	0.93	0.93	32.6
Approach		455	1.0	0.366	13.7	LOS B	3.2	81.2	0.96	0.90	0.96	30.6
All Vehicles		2459	1.2	0.659	7.4	LOS A	6.7	167.7	0.65	0.62	0.66	33.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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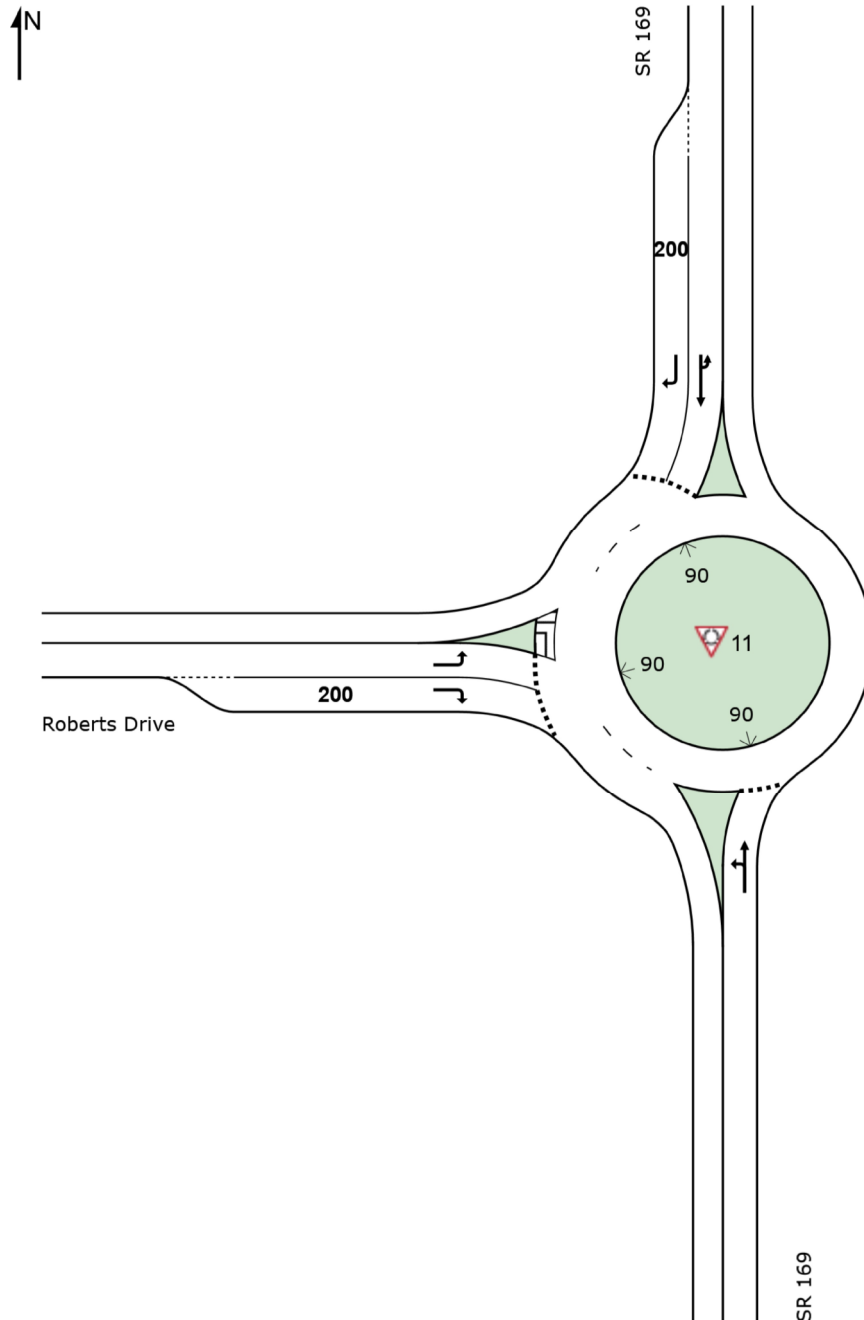
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Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Synchro\Phase 1B TMR (2020)\1.5 Percent Growth Rate\Year By Year Analysis (No Pipeline)\2027 - No Pipeline\Mitigation\Future PM Peak Hour -.sip8

SITE LAYOUT

Site: 11 [WP SR 169/Roberts Drive - SBR Added Lane]

SR 169/Roberts Drive
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

 **Site: 11 [WP SR 169/Roberts Drive - SBR Added Lane]**

SR 169/Roberts Drive
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	184	2.0	0.638	13.5	LOS B	6.4	162.9	0.80	0.83	0.91	34.4
8	T1	477	2.0	0.638	7.8	LOS A	6.4	162.9	0.80	0.83	0.91	34.4
Approach		661	2.0	0.638	9.4	LOS A	6.4	162.9	0.80	0.83	0.91	34.4
North: SR 169												
7u	U	90	1.0	0.759	13.3	LOS B	9.3	235.0	0.70	0.53	0.70	36.2
4	T1	1071	1.0	0.759	5.2	LOS A	9.3	235.0	0.70	0.53	0.70	35.3
14	R2	502	1.0	0.429	4.5	LOS A	3.1	77.5	0.49	0.55	0.49	32.0
Approach		1664	1.0	0.759	5.4	LOS A	9.3	235.0	0.64	0.53	0.64	34.3
West: Roberts Drive												
5	L2	319	1.0	0.555	23.3	LOS C	6.5	163.8	1.00	1.08	1.30	26.6
12	R2	190	1.0	0.465	18.6	LOS B	4.1	102.8	1.00	1.07	1.19	29.6
Approach		510	1.0	0.555	21.5	LOS C	6.5	163.8	1.00	1.07	1.26	27.6
All Vehicles		2834	1.2	0.759	9.2	LOS A	9.3	235.0	0.74	0.70	0.81	32.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Synchro\Phase 1B TMR (2020)\1.5 Percent Growth Rate\Year By Year Analysis (No Pipeline)\2032 - No Pipeline\Mitigation\Future PM Peak Hour -.sip8






SR 169 / Baker Street

HCM 6th TWSC
12: SR 169 & Baker St

Ten Trails and Lawson Hills MPDs - Phase 1B






Future (2022) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	90	30	451	885	40
Future Vol, veh/h	30	90	30	451	885	40
Conflicting Peds, #/hr	3	0	0	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	32	96	32	480	941	43
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1513	966	987	0	-	0
Stage 1	966	-	-	-	-	-
Stage 2	547	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	133	311	696	-	-	-
Stage 1	372	-	-	-	-	-
Stage 2	584	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	124	310	694	-	-	-
Mov Cap-2 Maneuver	124	-	-	-	-	-
Stage 1	348	-	-	-	-	-
Stage 2	583	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	40.1	0.7		0		
HCM LOS	E					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	694	-	225	-	-	
HCM Lane V/C Ratio	0.046	-	0.567	-	-	
HCM Control Delay (s)	10.4	0	40.1	-	-	
HCM Lane LOS	B	A	E	-	-	
HCM 95th %tile Q(veh)	0.1	-	3.1	-	-	

Intersection						
Int Delay, s/veh	2.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	90	30	451	885	40
Future Vol, veh/h	30	90	30	451	885	40
Conflicting Peds, #/hr	3	0	0	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	110	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	32	96	32	480	941	43
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1513	966	987	0	-	0
Stage 1	966	-	-	-	-	-
Stage 2	547	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	133	311	696	-	-	-
Stage 1	372	-	-	-	-	-
Stage 2	584	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	126	310	694	-	-	-
Mov Cap-2 Maneuver	254	-	-	-	-	-
Stage 1	354	-	-	-	-	-
Stage 2	583	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	26.3	0.7		0		
HCM LOS	D					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	694	-	294	-	-	
HCM Lane V/C Ratio	0.046	-	0.434	-	-	
HCM Control Delay (s)	10.4	-	26.3	-	-	
HCM Lane LOS	B	-	D	-	-	
HCM 95th %tile Q(veh)	0.1	-	2.1	-	-	











HCM 6th TWSC
12: SR 169 & Baker St

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2024) With-Project PM Peak Hour - With Mitigation

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	95	35	528	995	45
Future Vol, veh/h	30	95	35	528	995	45
Conflicting Peds, #/hr	3	0	0	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	25	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	3	3	2	2
Mvmt Flow	32	101	37	562	1059	48
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1725	1086	1110	0	-	0
Stage 1	1086	-	-	-	-	-
Stage 2	639	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.13	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.227	-	-	-
Pot Cap-1 Maneuver	99	265	625	-	-	-
Stage 1	327	-	-	-	-	-
Stage 2	530	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	93	264	623	-	-	-
Mov Cap-2 Maneuver	216	-	-	-	-	-
Stage 1	307	-	-	-	-	-
Stage 2	529	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	34.4	0.7		0		
HCM LOS	D					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	623	-	251	-	-	
HCM Lane V/C Ratio	0.06	-	0.53	-	-	
HCM Control Delay (s)	11.1	-	34.4	-	-	
HCM Lane LOS	B	-	D	-	-	
HCM 95th %tile Q(veh)	0.2	-	2.8	-	-	

HCM 6th Signalized Intersection Summary 12: SR 169 & Baker St

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2024) With-Project PM Peak Hour - With Mitigation

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	95	35	528	995	45
Future Volume (veh/h)	30	95	35	528	995	45
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	0.98	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1856	1856	1870	1870
Adj Flow Rate, veh/h	32	101	37	562	1059	48
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	0	3	3	2	2
Cap, veh/h	38	120	360	1552	1484	67
Arrive On Green	0.10	0.10	1.00	1.00	0.84	0.84
Sat Flow, veh/h	391	1233	505	1856	1775	80
Grp Volume(v), veh/h	134	0	37	562	0	1107
Grp Sat Flow(s),veh/h/ln	1636	0	505	1856	0	1856
Q Serve(g_s), s	9.7	0.0	2.8	0.0	0.0	29.1
Cycle Q Clear(g_c), s	9.7	0.0	31.9	0.0	0.0	29.1
Prop In Lane	0.24	0.75	1.00			0.04
Lane Grp Cap(c), veh/h	159	0	360	1552	0	1552
V/C Ratio(X)	0.84	0.00	0.10	0.36	0.00	0.71
Avail Cap(c_a), veh/h	177	0	360	1552	0	1552
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.97	0.97	0.00	1.00
Uniform Delay (d), s/veh	53.3	0.0	4.6	0.0	0.0	4.0
Incr Delay (d2), s/veh	27.1	0.0	0.6	0.6	0.0	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	0.0	0.3	0.3	0.0	8.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	80.4	0.0	5.2	0.6	0.0	6.8
LnGrp LOS	F	A	A	A	A	A
Approach Vol, veh/h	134			599	1107	
Approach Delay, s/veh	80.4			0.9	6.8	
Approach LOS	F			A	A	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	104.3		15.7		104.3	
Change Period (Y+Rc), s	4.0		4.0		4.0	
Max Green Setting (Gmax), s	99.0		13.0		99.0	
Max Q Clear Time (g_c+I1), s	33.9		11.7		31.1	
Green Ext Time (p_c), s	3.4		0.1		9.1	
Intersection Summary						
HCM 6th Ctrl Delay			10.3			
HCM 6th LOS			B			

HCM 6th Signalized Intersection Summary 12: SR 169 & Baker St

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour - With Mitigation - No Pipeline



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	LT	RT	LT	TH	TH	RT
Traffic Volume (veh/h)	50	110	40	606	1179	77
Future Volume (veh/h)	50	110	40	606	1179	77
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	0.99	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1900	1900	1856	1856	1870	1870
Adj Flow Rate, veh/h	53	117	43	645	1254	82
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	0	3	3	2	2
Cap, veh/h	55	122	210	1531	1432	94
Arrive On Green	0.11	0.11	1.00	1.00	0.82	0.82
Sat Flow, veh/h	512	1130	406	1856	1736	114
Grp Volume(v), veh/h	171	0	43	645	0	1336
Grp Sat Flow(s), veh/h/ln	1652	0	406	1856	0	1850
Q Serve(g_s), s	12.4	0.0	8.0	0.0	0.0	54.6
Cycle Q Clear(g_c), s	12.4	0.0	62.7	0.0	0.0	54.6
Prop In Lane	0.31	0.68	1.00			0.06
Lane Grp Cap(c), veh/h	179	0	210	1531	0	1526
V/C Ratio(X)	0.96	0.00	0.20	0.42	0.00	0.88
Avail Cap(c_a), veh/h	179	0	210	1531	0	1526
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.96	0.96	0.00	1.00
Uniform Delay (d), s/veh	53.2	0.0	17.3	0.0	0.0	6.6
Incr Delay (d2), s/veh	54.2	0.0	2.1	0.8	0.0	7.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.9	0.0	0.9	0.3	0.0	18.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	107.4	0.0	19.4	0.8	0.0	14.0
LnGrp LOS	F	A	B	A	A	B
Approach Vol, veh/h	171			688	1336	
Approach Delay, s/veh	107.4			2.0	14.0	
Approach LOS	F			A	B	
Timer - Assigned Phs	2			4		6
Phs Duration (G+Y+Rc), s	103.0			17.0		103.0
Change Period (Y+Rc), s	4.0			4.0		4.0
Max Green Setting (Gmax), s	99.0			13.0		99.0
Max Q Clear Time (g_c+I1), s	64.7			14.4		56.6
Green Ext Time (p_c), s	4.2			0.0		14.3
Intersection Summary						
HCM 6th Ctrl Delay			17.5			
HCM 6th LOS			B			

SR 169 / Lawson Street

HCM 6th TWSC
13: SR 169 & Lawson Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2022) With-Project PM Peak Hour

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	1	1	3	15	0	60	2	351	10	110	765	4
Future Vol, veh/h	1	1	3	15	0	60	2	351	10	110	765	4
Conflicting Peds, #/hr	3	0	3	5	0	5	3	0	5	5	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	3	3	3	2	2	2
Mvmt Flow	1	1	3	16	0	63	2	369	11	116	805	4
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1457	1431	815	1430	1428	385	812	0	0	385	0	0
Stage 1	1042	1042	-	384	384	-	-	-	-	-	-	-
Stage 2	415	389	-	1046	1044	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	109	136	381	113	136	667	810	-	-	1173	-	-
Stage 1	280	309	-	643	615	-	-	-	-	-	-	-
Stage 2	619	612	-	278	309	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	84	110	378	95	110	661	808	-	-	1168	-	-
Mov Cap-2 Maneuver	84	110	-	95	110	-	-	-	-	-	-	-
Stage 1	279	252	-	638	611	-	-	-	-	-	-	-
Stage 2	556	608	-	224	252	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	26.5		21.1		0.1		1.1					
HCM LOS	D		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	808	-	-	173	302	1168	-	-				
HCM Lane V/C Ratio	0.003	-	-	0.03	0.261	0.099	-	-				
HCM Control Delay (s)	9.5	0	-	26.5	21.1	8.4	0	-				
HCM Lane LOS	A	A	-	D	C	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.1	1	0.3	-	-				

HCM 6th TWSC
13: SR 169 & Lawson Rd

Ten Trails Phase 1B
Future (2022) With-Project PM Peak Hour - With Mitigation

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕		↕	↕	
Traffic Vol, veh/h	1	1	3	15	0	60	2	351	10	110	765	4
Future Vol, veh/h	1	1	3	15	0	60	2	351	10	110	765	4
Conflicting Peds, #/hr	3	0	3	5	0	5	3	0	5	5	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	110	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	3	3	3	2	2	2
Mvmt Flow	1	1	3	16	0	63	2	369	11	116	805	4

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1457	1431	815	1430	1428	385	812	0	0	385	0	0
Stage 1	1042	1042	-	384	384	-	-	-	-	-	-	-
Stage 2	415	389	-	1046	1044	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	109	136	381	113	136	667	810	-	-	1173	-	-
Stage 1	280	309	-	643	615	-	-	-	-	-	-	-
Stage 2	619	612	-	278	309	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	90	121	378	102	121	661	808	-	-	1168	-	-
Mov Cap-2 Maneuver	90	121	-	102	121	-	-	-	-	-	-	-
Stage 1	279	278	-	638	611	-	-	-	-	-	-	-
Stage 2	556	608	-	246	278	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	25.3		20.2		0.1		1.1	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	808	-	-	183	315	1168	-
HCM Lane V/C Ratio	0.003	-	-	0.029	0.251	0.099	-
HCM Control Delay (s)	9.5	0	-	25.3	20.2	8.4	-
HCM Lane LOS	A	A	-	D	C	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1	0.3	-







HCM 6th TWSC
13: SR 169 & Lawson Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2023) With-Project PM Peak Hour

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	1	3	15	0	60	2	367	10	110	780	4
Future Vol, veh/h	1	1	3	15	0	60	2	367	10	110	780	4
Conflicting Peds, #/hr	3	0	3	5	0	5	3	0	5	5	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	3	3	3	2	2	2
Mvmt Flow	1	1	3	16	0	63	2	386	11	116	821	4
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1490	1464	831	1463	1461	402	828	0	0	402	0	0
Stage 1	1058	1058	-	401	401	-	-	-	-	-	-	-
Stage 2	432	406	-	1062	1060	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	103	130	373	108	130	653	799	-	-	1157	-	-
Stage 1	274	304	-	630	604	-	-	-	-	-	-	-
Stage 2	606	601	-	273	303	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	79	105	371	90	105	648	797	-	-	1152	-	-
Mov Cap-2 Maneuver	79	105	-	90	105	-	-	-	-	-	-	-
Stage 1	273	247	-	626	600	-	-	-	-	-	-	-
Stage 2	543	597	-	218	246	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	27.5		22.1		0.1		1					
HCM LOS	D		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	797	-	-	165	289	1152	-	-				
HCM Lane V/C Ratio	0.003	-	-	0.032	0.273	0.101	-	-				
HCM Control Delay (s)	9.5	0	-	27.5	22.1	8.5	0	-				
HCM Lane LOS	A	A	-	D	C	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.1	1.1	0.3	-	-				



















HCM 6th TWSC
13: SR 169 & Lawson Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2024) With-Project PM Peak Hour - With Mitigation

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	3	25	0	105	2	388	25	185	800	4
Future Vol, veh/h	1	1	3	25	0	105	2	388	25	185	800	4
Conflicting Peds, #/hr	3	0	3	5	0	5	3	0	5	5	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	25	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	3	3	3	2	2	2
Mvmt Flow	1	1	3	26	0	111	2	408	26	195	842	4
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1723	1680	852	1671	1669	431	849	0	0	439	0	0
Stage 1	1237	1237	-	430	430	-	-	-	-	-	-	-
Stage 2	486	443	-	1241	1239	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	71	96	362	77	97	629	785	-	-	1121	-	-
Stage 1	217	250	-	607	587	-	-	-	-	-	-	-
Stage 2	566	579	-	216	250	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	50	79	360	65	79	624	783	-	-	1116	-	-
Mov Cap-2 Maneuver	50	79	-	65	79	-	-	-	-	-	-	-
Stage 1	216	206	-	603	583	-	-	-	-	-	-	-
Stage 2	463	575	-	175	206	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	35.8		39.7		0		1.7					
HCM LOS	E		E									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	783	-	-	122	235	1116	-	-				
HCM Lane V/C Ratio	0.003	-	-	0.043	0.582	0.174	-	-				
HCM Control Delay (s)	9.6	-	-	35.8	39.7	8.9	-	-				
HCM Lane LOS	A	-	-	E	E	A	-	-				
HCM 95th %tile Q(veh)	0	-	-	0.1	3.3	0.6	-	-				

HCM 6th Signalized Intersection Summary 13: SR 169 & Lawson Rd

Ten Trails and Lawson Hills MPDs - Phase 1B Future (2024) With-Project PM Peak Hour - With Mitigation

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	3	25	0	105	2	388	25	185	800	4
Future Volume (veh/h)	1	1	3	25	0	105	2	388	25	185	800	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.98	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	1900	1900	1900	1900	1900	1900	1856	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	1	1	3	26	0	111	2	408	26	195	842	4
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	3	3	3	2	2	2
Cap, veh/h	55	53	108	57	10	133	595	1430	91	800	1541	7
Arrive On Green	0.10	0.10	0.10	0.10	0.00	0.10	0.83	0.83	0.83	1.00	1.00	1.00
Sat Flow, veh/h	181	508	1033	206	91	1268	645	1725	110	954	1860	9
Grp Volume(v), veh/h	5	0	0	137	0	0	2	0	434	195	0	846
Grp Sat Flow(s),veh/h/ln	1721	0	0	1565	0	0	645	0	1835	954	0	1869
Q Serve(g_s), s	0.0	0.0	0.0	6.6	0.0	0.0	0.1	0.0	6.4	2.1	0.0	0.0
Cycle Q Clear(g_c), s	0.3	0.0	0.0	10.3	0.0	0.0	0.1	0.0	6.4	8.4	0.0	0.0
Prop In Lane	0.20		0.60	0.19		0.81	1.00		0.06	1.00		0.00
Lane Grp Cap(c), veh/h	216	0	0	199	0	0	595	0	1521	800	0	1549
V/C Ratio(X)	0.02	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.29	0.24	0.00	0.55
Avail Cap(c_a), veh/h	287	0	0	269	0	0	595	0	1521	800	0	1549
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.66	0.00	0.66
Uniform Delay (d), s/veh	48.3	0.0	0.0	52.6	0.0	0.0	1.8	0.0	2.3	0.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	4.4	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.9
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	0.1	0.0	0.0	4.3	0.0	0.0	0.0	0.0	1.9	0.1	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.3	0.0	0.0	57.1	0.0	0.0	1.8	0.0	2.8	0.7	0.0	0.9
LnGrp LOS	D	A	A	E	A	A	A	A	A	A	A	A
Approach Vol, veh/h	5			137				436			1041	
Approach Delay, s/veh	48.3			57.1				2.8			0.9	
Approach LOS	D			E				A			A	
Timer - Assigned Phs	2			4			6		8			
Phs Duration (G+Y+Rc), s	103.5			16.5			103.5		16.5			
Change Period (Y+Rc), s	4.0			4.0			4.0		4.0			
Max Green Setting (Gmax), s	94.0			18.0			94.0		18.0			
Max Q Clear Time (g_c+I1), s	8.4			2.3			10.4		12.3			
Green Ext Time (p_c), s	2.1			0.0			7.1		0.3			
Intersection Summary												
HCM 6th Ctrl Delay				6.3								
HCM 6th LOS				A								

HCM 6th Signalized Intersection Summary

13: SR 169 & Lawson Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour - With Mitigation - No Pipeline



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↙	↘		↙	↘	
Traffic Volume (veh/h)	1	1	4	30	0	130	2	436	30	215	959	5
Future Volume (veh/h)	1	1	4	30	0	130	2	436	30	215	959	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	0.99		0.98	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	1900	1900	1900	1900	1900	1900	1856	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	1	1	4	32	0	137	2	459	32	226	1009	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	3	3	3	2	2	2
Cap, veh/h	53	53	141	62	11	158	506	1387	97	729	1505	7
Arrive On Green	0.12	0.12	0.12	0.12	0.00	0.12	0.81	0.81	0.81	1.00	1.00	1.00
Sat Flow, veh/h	144	423	1134	212	85	1271	551	1714	120	905	1859	9
Grp Volume(v), veh/h	6	0	0	169	0	0	2	0	491	226	0	1014
Grp Sat Flow(s),veh/h/ln	1701	0	0	1568	0	0	551	0	1834	905	0	1869
Q Serve(g_s), s	0.0	0.0	0.0	8.6	0.0	0.0	0.1	0.0	8.4	3.7	0.0	0.0
Cycle Q Clear(g_c), s	0.4	0.0	0.0	12.7	0.0	0.0	0.1	0.0	8.4	12.1	0.0	0.0
Prop In Lane	0.17		0.67	0.19		0.81	1.00		0.07	1.00		0.00
Lane Grp Cap(c), veh/h	246	0	0	230	0	0	506	0	1484	729	0	1512
V/C Ratio(X)	0.02	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.33	0.31	0.00	0.67
Avail Cap(c_a), veh/h	287	0	0	270	0	0	506	0	1484	729	0	1512
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33	1.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.39	0.00	0.39
Uniform Delay (d), s/veh	46.2	0.0	0.0	51.5	0.0	0.0	2.2	0.0	3.0	0.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	8.3	0.0	0.0	0.0	0.0	0.6	0.4	0.0	0.9
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	0.2	0.0	0.0	5.6	0.0	0.0	0.0	0.0	2.7	0.1	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.2	0.0	0.0	59.8	0.0	0.0	2.2	0.0	3.6	1.0	0.0	0.9
LnGrp LOS	D	A	A	E	A	A	A	A	A	A	A	A
Approach Vol, veh/h	6		169			493			1240			
Approach Delay, s/veh	46.2		59.8			3.6			0.9			
Approach LOS	D		E			A			A			
Timer - Assigned Phs	2		4			6			8			
Phs Duration (G+Y+Rc), s	101.1		18.9			101.1			18.9			
Change Period (Y+Rc), s	4.0		4.0			4.0			4.0			
Max Green Setting (Gmax), s	94.0		18.0			94.0			18.0			
Max Q Clear Time (g_c+I1), s	10.4		2.4			14.1			14.7			
Green Ext Time (p_c), s	2.4		0.0			10.3			0.3			
Intersection Summary												
HCM 6th Ctrl Delay			7.0									
HCM 6th LOS			A									

SR 169 / SE Green Valley Road

HCM 6th TWSC
15: SR 169 & SE Green Valley Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2030) With-Project PM Peak Hour

Intersection

Int Delay, s/veh 1

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations 

Traffic Vol, veh/h 20 20 10 529 916 30

Future Vol, veh/h 20 20 10 529 916 30

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - Free

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, % 0 0 2 2 1 1

Mvmt Flow 22 22 11 575 996 33

Major/Minor Minor2 Major1 Major2

Conflicting Flow All 1593 996 996 0 - 0

Stage 1 996 - - - - -

Stage 2 597 - - - - -

Critical Hdwy 6.4 6.2 4.12 - - -

Critical Hdwy Stg 1 5.4 - - - - -

Critical Hdwy Stg 2 5.4 - - - - -

Follow-up Hdwy 3.5 3.3 2.218 - - -

Pot Cap-1 Maneuver 119 299 695 - - 0

Stage 1 360 - - - - 0

Stage 2 554 - - - - 0

Platoon blocked, % - -

Mov Cap-1 Maneuver 116 299 695 - - -

Mov Cap-2 Maneuver 116 - - - - -

Stage 1 352 - - - - -

Stage 2 554 - - - - -

Approach EB NB SB

HCM Control Delay, s 34 0.2 0

HCM LOS D

Minor Lane/Major Mvmt NBL NBT EBLn1 SBT

Capacity (veh/h) 695 - 167 -

HCM Lane V/C Ratio 0.016 - 0.26 -




HCM Control Delay (s) 10.3 0 34 -

HCM Lane LOS B A D -

HCM 95th %tile Q(veh) 0 - 1 -

HCM 6th TWSC
15: SR 169 & SE Green Valley Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2031) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	20	10	535	932	35
Future Vol, veh/h	25	20	10	535	932	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
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, %	0	0	2	2	1	1
Mvmt Flow	27	22	11	582	1013	38




Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1617	1013	1013	0	-	0
Stage 1	1013	-	-	-	-	-
Stage 2	604	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	115	293	684	-	-	0
Stage 1	354	-	-	-	-	0
Stage 2	550	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	112	293	684	-	-	-
Mov Cap-2 Maneuver	112	-	-	-	-	-
Stage 1	346	-	-	-	-	-
Stage 2	550	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	38.9	0.2	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT
Capacity (veh/h)	684	-	154	-
HCM Lane V/C Ratio	0.016	-	0.318	-
HCM Control Delay (s)	10.3	0	38.9	-
HCM Lane LOS	B	A	E	-
HCM 95th %tile Q(veh)	0	-	1.3	-




HCM 6th TWSC
15: SR 169 & SE Green Valley Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2031) With-Project PM Peak Hour - With Mitigation

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	20	10	535	932	35
Future Vol, veh/h	25	20	10	535	932	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
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, %	0	0	2	2	1	1
Mvmt Flow	27	22	11	582	1013	38
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1617	1013	1013	0	-	0
Stage 1	1013	-	-	-	-	-
Stage 2	604	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	115	293	684	-	-	0
Stage 1	354	-	-	-	-	0
Stage 2	550	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	112	293	684	-	-	-
Mov Cap-2 Maneuver	241	-	-	-	-	-
Stage 1	346	-	-	-	-	-
Stage 2	550	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	21.9	0.2		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT		
Capacity (veh/h)	684	-	262	-		
HCM Lane V/C Ratio	0.016	-	0.187	-		
HCM Control Delay (s)	10.3	0	21.9	-		
HCM Lane LOS	B	A	C	-		
HCM 95th %tile Q(veh)	0	-	0.7	-		

HCM 6th TWSC
15: SR 169 & SE Green Valley Rd





Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2032) With-Project PM Peak Hour - With Mitigation - No Pipeline

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	20	10	536	944	35
Future Vol, veh/h	25	20	10	536	944	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
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, %	0	0	2	2	1	1
Mvmt Flow	27	22	11	583	1026	38
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	1631	1026	1026	0	-	0
Stage 1	1026	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.12	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.218	-	-	-
Pot Cap-1 Maneuver	113	288	677	-	-	0
Stage 1	349	-	-	-	-	0
Stage 2	549	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	110	288	677	-	-	-
Mov Cap-2 Maneuver	239	-	-	-	-	-
Stage 1	341	-	-	-	-	-
Stage 2	549	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	22.1	0.2		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT		
Capacity (veh/h)	677	-	259	-		
HCM Lane V/C Ratio	0.016	-	0.189	-		
HCM Control Delay (s)	10.4	0	22.1	-		
HCM Lane LOS	B	A	C	-		
HCM 95th %tile Q(veh)	0	-	0.7	-		

SE Kent-Kangley Road / Landsburg Road SE

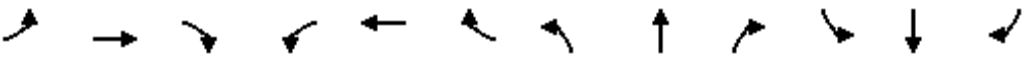
HCM 6th TWSC
16: Landsburg Rd SE & SE Kent-Kangley Rd

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2022) With-Project PM Peak Hour

















Intersection												
Int Delay, s/veh	29.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	245	4	10	165	35	1	76	20	110	234	64
Future Vol, veh/h	25	245	4	10	165	35	1	76	20	110	234	64
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	1	1	1	2	2	2	1	1	1	3	3	3
Mvmt Flow	26	258	4	11	174	37	1	80	21	116	246	67
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	211	0	0	262	0	0	683	545	260	578	529	193
Stage 1	-	-	-	-	-	-	312	312	-	215	215	-
Stage 2	-	-	-	-	-	-	371	233	-	363	314	-
Critical Hdwy	4.11	-	-	4.12	-	-	7.11	6.51	6.21	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.11	5.51	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.11	5.51	-	6.13	5.53	-
Follow-up Hdwy	2.209	-	-	2.218	-	-	3.509	4.009	3.309	3.527	4.027	3.327
Pot Cap-1 Maneuver	1366	-	-	1302	-	-	365	447	781	426	454	846
Stage 1	-	-	-	-	-	-	701	659	-	785	723	-
Stage 2	-	-	-	-	-	-	651	714	-	654	654	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1366	-	-	1302	-	-	183	433	781	347	439	846
Mov Cap-2 Maneuver	-	-	-	-	-	-	183	433	-	347	439	-
Stage 1	-	-	-	-	-	-	686	645	-	768	716	-
Stage 2	-	-	-	-	-	-	389	707	-	545	640	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.4			14.8			67.4		
HCM LOS							B			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	470	1366	-	-	1302	-	-	441				
HCM Lane V/C Ratio	0.217	0.019	-	-	0.008	-	-	0.974				
HCM Control Delay (s)	14.8	7.7	0	-	7.8	0	-	67.4				
HCM Lane LOS	B	A	A	-	A	A	-	F				
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	12				

HCM 6th Signalized Intersection Summary 16: Landsburg Rd SE & SE Kent-Kangley Rd

Ten Trails Phase 1B
Future (2022) With-Project PM Peak Hour - With Mitigation

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	25	245	4	10	165	35	1	76	20	110	234	64
Future Volume (veh/h)	25	245	4	10	165	35	1	76	20	110	234	64
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	1885	1885	1885	1870	1870	1870	1885	1885	1885	1856	1856	1856
Adj Flow Rate, veh/h	26	258	4	11	174	37	1	80	21	116	246	67
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	2	2	2	1	1	1	3	3	3
Cap, veh/h	194	449	7	174	381	78	159	563	146	322	426	102
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	92	1708	25	42	1449	298	5	1436	374	319	1087	260
Grp Volume(v), veh/h	288	0	0	222	0	0	102	0	0	429	0	0
Grp Sat Flow(s),veh/h/ln	1826	0	0	1789	0	0	1815	0	0	1666	0	0
Q Serve(g_s), s	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0
Cycle Q Clear(g_c), s	3.1	0.0	0.0	2.4	0.0	0.0	0.8	0.0	0.0	4.7	0.0	0.0
Prop In Lane	0.09		0.01	0.05		0.17	0.01		0.21	0.27		0.16
Lane Grp Cap(c), veh/h	650	0	0	634	0	0	868	0	0	850	0	0
V/C Ratio(X)	0.44	0.00	0.00	0.35	0.00	0.00	0.12	0.00	0.00	0.50	0.00	0.00
Avail Cap(c_a), veh/h	1411	0	0	1384	0	0	1795	0	0	1680	0	0
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	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	7.4	0.0	0.0	7.2	0.0	0.0	4.5	0.0	0.0	5.7	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.5	0.0	0.0
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	0.7	0.0	0.0	0.5	0.0	0.0	0.1	0.0	0.0	0.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.9	0.0	0.0	7.5	0.0	0.0	4.6	0.0	0.0	6.1	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	A	A	A	A	A	A
Approach Vol, veh/h		288			222			102			429	
Approach Delay, s/veh		7.9			7.5			4.6			6.1	
Approach LOS		A			A			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		13.1		10.1		13.1		10.1				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		21.0		16.0		21.0		16.0				
Max Q Clear Time (g_c+I1), s		2.8		5.1		6.7		4.4				
Green Ext Time (p_c), s		0.4		1.2		2.4		0.9				
Intersection Summary												
HCM 6th Ctrl Delay				6.8								
HCM 6th LOS				A								






HCM 6th Signalized Intersection Summary Ten Trails and Lawson Hills MPDs - Phase 1B
 16: Landsburg Rd SE & SE Kent-Kangley Rd Future (2032) With-Project PM Peak Hour - With Mitigation - No Pipeline

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	57	285	5	10	195	40	1	103	25	125	211	151
Future Volume (veh/h)	57	285	5	10	195	40	1	103	25	125	211	151
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	1885	1885	1885	1870	1870	1870	1885	1885	1885	1856	1856	1856
Adj Flow Rate, veh/h	60	300	5	11	205	42	1	108	26	132	222	159
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	2	2	2	1	1	1	3	3	3
Cap, veh/h	201	463	7	140	436	87	128	623	149	287	345	213
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.42	0.42	0.42	0.42	0.42	0.42
Sat Flow, veh/h	184	1562	24	30	1473	292	3	1467	350	304	811	501
Grp Volume(v), veh/h	365	0	0	258	0	0	135	0	0	513	0	0
Grp Sat Flow(s),veh/h/ln	1770	0	0	1795	0	0	1820	0	0	1616	0	0
Q Serve(g_s), s	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0
Cycle Q Clear(g_c), s	5.1	0.0	0.0	3.3	0.0	0.0	1.3	0.0	0.0	7.5	0.0	0.0
Prop In Lane	0.16		0.01	0.04		0.16	0.01		0.19	0.26		0.31
Lane Grp Cap(c), veh/h	670	0	0	663	0	0	900	0	0	845	0	0
V/C Ratio(X)	0.54	0.00	0.00	0.39	0.00	0.00	0.15	0.00	0.00	0.61	0.00	0.00
Avail Cap(c_a), veh/h	1115	0	0	1124	0	0	1456	0	0	1327	0	0
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	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.8	0.0	0.0	8.3	0.0	0.0	5.1	0.0	0.0	6.8	0.0	0.0
Incr Delay (d2), s/veh	0.7	0.0	0.0	0.4	0.0	0.0	0.1	0.0	0.0	0.7	0.0	0.0
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	1.4	0.0	0.0	0.9	0.0	0.0	0.3	0.0	0.0	1.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.5	0.0	0.0	8.7	0.0	0.0	5.2	0.0	0.0	7.5	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	A	A	A	A	A	A
Approach Vol, veh/h		365			258			135			513	
Approach Delay, s/veh		9.5			8.7			5.2			7.5	
Approach LOS		A			A			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		16.2		12.5		16.2		12.5				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		21.0		16.0		21.0		16.0				
Max Q Clear Time (g_c+I1), s		3.3		7.1		9.5		5.3				
Green Ext Time (p_c), s		0.6		1.5		2.7		1.1				
Intersection Summary												
HCM 6th Ctrl Delay				8.1								
HCM 6th LOS				A								

SE Auburn-Black Diamond Road / SE Green Valley Road

Intersection

Int Delay, s/veh 3.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	688	247	5	484	92	2
Future Vol, veh/h	688	247	5	484	92	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Stop
Storage Length	-	-	125	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	3	3	1	1
Mvmt Flow	748	268	5	526	100	2






Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	- 748	0 1284 748
Stage 1	-	-	- 748 -
Stage 2	-	-	- 536 -
Critical Hdwy	-	- 4.13	- 6.41 6.21
Critical Hdwy Stg 1	-	-	- 5.41 -
Critical Hdwy Stg 2	-	-	- 5.41 -
Follow-up Hdwy	-	- 2.227	- 3.509 3.309
Pot Cap-1 Maneuver	-	0 856	- 183 414
Stage 1	-	0	- 470 -
Stage 2	-	0	- 589 -
Platoon blocked, %	-		-
Mov Cap-1 Maneuver	-	- 856	- 182 414
Mov Cap-2 Maneuver	-	-	- 182 -
Stage 1	-	-	- 470 -
Stage 2	-	-	- 585 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	45.9
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBL	WBT
Capacity (veh/h)	182	414	-	856	-
HCM Lane V/C Ratio	0.549	0.005	-	0.006	-
HCM Control Delay (s)	46.6	13.7	-	9.2	-
HCM Lane LOS	E	B	-	A	-
HCM 95th %tile Q(veh)	2.9	0	-	0	-

Intersection






Int Delay, s/veh 3.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	701	249	5	507	95	2
Future Vol, veh/h	701	249	5	507	95	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	Stop
Storage Length	-	-	125	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	3	3	1	1
Mvmt Flow	762	271	5	551	103	2

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	-	762
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.13
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.227
Pot Cap-1 Maneuver	-	0	846
Stage 1	-	0	-
Stage 2	-	0	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	846
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	52.4
HCM LOS			F




Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	WBL	WBT
Capacity (veh/h)	172	406	-	846	-
HCM Lane V/C Ratio	0.6	0.005	-	0.006	-
HCM Control Delay (s)	53.2	13.9	-	9.3	-
HCM Lane LOS	F	B	-	A	-
HCM 95th %tile Q(veh)	3.3	0	-	0	-

Intersection							
Int Delay, s/veh	1.7						
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations							
Traffic Vol, veh/h	701	249	5	507	95	2	
Future Vol, veh/h	701	249	5	507	95	2	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	Free	-	None	-	Stop	
Storage Length	-	-	125	-	0	0	
Veh in Median Storage, #	0	-	-	0	0	-	
Grade, %	0	-	-	0	0	-	
Peak Hour Factor	92	92	92	92	92	92	
Heavy Vehicles, %	1	1	3	3	1	1	
Mvmt Flow	762	271	5	551	103	2	
Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	0	-	762	0	1323	762	
Stage 1	-	-	-	-	762	-	
Stage 2	-	-	-	-	561	-	
Critical Hdwy	-	-	4.13	-	6.41	6.21	
Critical Hdwy Stg 1	-	-	-	-	5.41	-	
Critical Hdwy Stg 2	-	-	-	-	5.41	-	
Follow-up Hdwy	-	-	2.227	-	3.509	3.309	
Pot Cap-1 Maneuver	-	0	846	-	173	406	
Stage 1	-	0	-	-	463	-	
Stage 2	-	0	-	-	573	-	
Platoon blocked, %	-			-			
Mov Cap-1 Maneuver	-	-	846	-	172	406	
Mov Cap-2 Maneuver	-	-	-	-	310	-	
Stage 1	-	-	-	-	463	-	
Stage 2	-	-	-	-	570	-	
Approach	EB		WB		NB		
HCM Control Delay, s	0		0.1		22.1		
HCM LOS	C						
Minor Lane/Major Mvmt	NBLn1		NBLn2		EBT	WBL	WBT
Capacity (veh/h)	310		406		-	846	-
HCM Lane V/C Ratio	0.333		0.005		-	0.006	-
HCM Control Delay (s)	22.3		13.9		-	9.3	-
HCM Lane LOS	C		B		-	A	-
HCM 95th %tile Q(veh)	1.4		0		-	0	-

Intersection							
Int Delay, s/veh	2						
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↱		↱	↱	↱	↱	
Traffic Vol, veh/h	739	266	5	554	106	2	
Future Vol, veh/h	739	266	5	554	106	2	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Free	Free	Free	Free	Stop	Stop	
RT Channelized	-	Free	-	None	-	Stop	
Storage Length	-	-	125	-	0	0	
Veh in Median Storage, #	0	-	-	0	0	-	
Grade, %	0	-	-	0	0	-	
Peak Hour Factor	92	92	92	92	92	92	
Heavy Vehicles, %	1	1	3	3	1	1	
Mvmt Flow	803	289	5	602	115	2	
Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	0	-	803	0	1415	803	
Stage 1	-	-	-	-	803	-	
Stage 2	-	-	-	-	612	-	
Critical Hdwy	-	-	4.13	-	6.41	6.21	
Critical Hdwy Stg 1	-	-	-	-	5.41	-	
Critical Hdwy Stg 2	-	-	-	-	5.41	-	
Follow-up Hdwy	-	-	2.227	-	3.509	3.309	
Pot Cap-1 Maneuver	-	0	816	-	152	385	
Stage 1	-	0	-	-	443	-	
Stage 2	-	0	-	-	543	-	
Platoon blocked, %	-			-			
Mov Cap-1 Maneuver	-	-	816	-	151	385	
Mov Cap-2 Maneuver	-	-	-	-	290	-	
Stage 1	-	-	-	-	443	-	
Stage 2	-	-	-	-	540	-	
Approach	EB		WB		NB		
HCM Control Delay, s	0		0.1		25.2		
HCM LOS	D						
Minor Lane/Major Mvmt	NBLn1		NBLn2		EBT	WBL	WBT
Capacity (veh/h)	290		385		-	816	-
HCM Lane V/C Ratio	0.397		0.006		-	0.007	-
HCM Control Delay (s)	25.4		14.4		-	9.4	-
HCM Lane LOS	D		B		-	A	-
HCM 95th %tile Q(veh)	1.8		0		-	0	-

HCM 6th TWSC
20: SR 169 & North Connector

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2027) With-Project PM Peak Hour

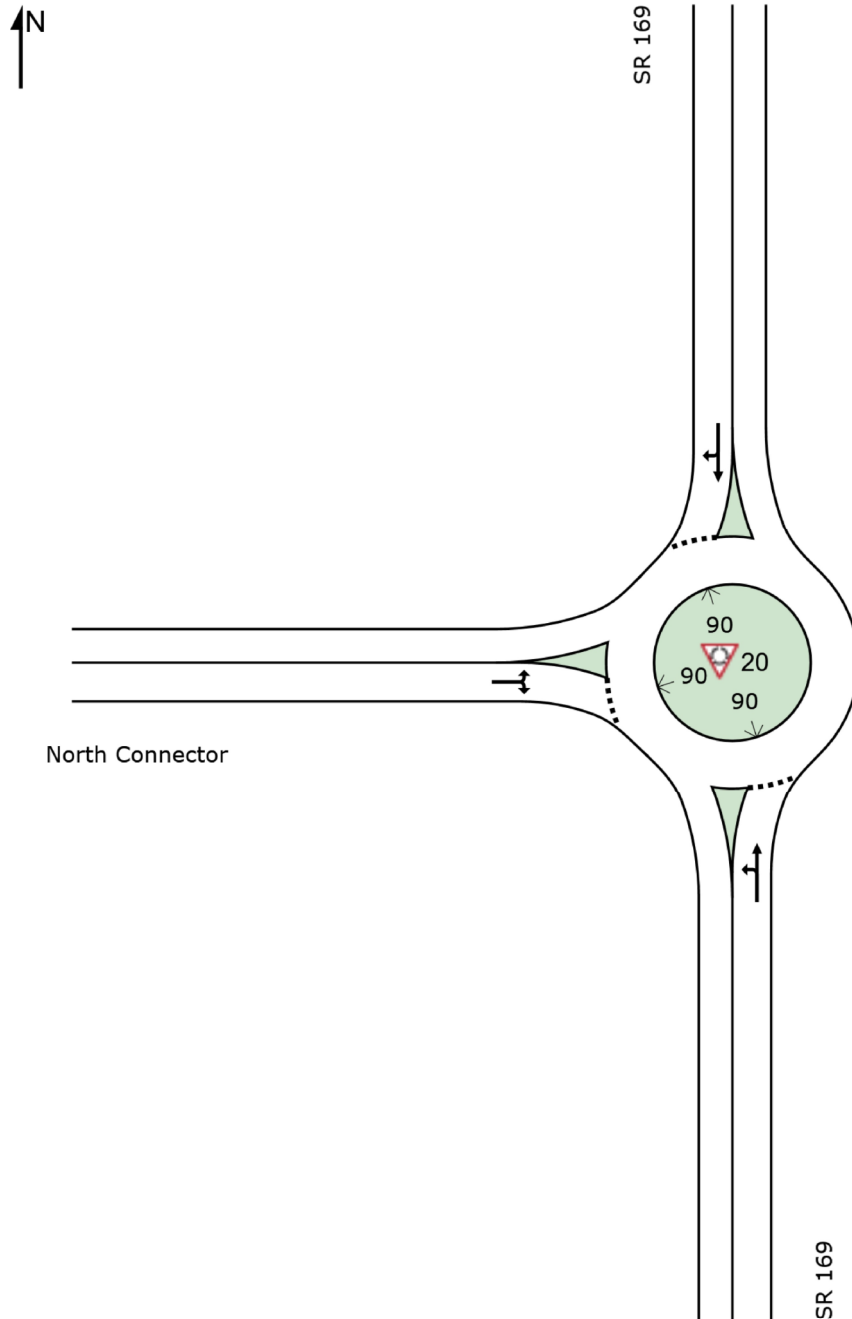
Intersection							
Int Delay, s/veh	34.8						
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Traffic Vol, veh/h	71	135	105	459	864	86	
Future Vol, veh/h	71	135	105	459	864	86	
Conflicting Peds, #/hr	0	0	0	0	0	0	
Sign Control	Stop	Stop	Free	Free	Free	Free	
RT Channelized	-	None	-	None	-	None	
Storage Length	0	-	-	-	-	-	
Veh in Median Storage, #	0	-	-	0	0	-	
Grade, %	0	-	-	0	0	-	
Peak Hour Factor	93	93	93	93	93	93	
Heavy Vehicles, %	2	2	2	2	2	2	
Mvmt Flow	76	145	113	494	929	92	
Major/Minor	Minor2		Major1		Major2		
Conflicting Flow All	1695	975	1021	0	-	0	
Stage 1	975	-	-	-	-	-	
Stage 2	720	-	-	-	-	-	
Critical Hdwy	6.42	6.22	4.12	-	-	-	
Critical Hdwy Stg 1	5.42	-	-	-	-	-	
Critical Hdwy Stg 2	5.42	-	-	-	-	-	
Follow-up Hdwy	3.518	3.318	2.218	-	-	-	
Pot Cap-1 Maneuver	102	305	680	-	-	-	
Stage 1	366	-	-	-	-	-	
Stage 2	482	-	-	-	-	-	
Platoon blocked, %				-	-	-	
Mov Cap-1 Maneuver	79	305	680	-	-	-	
Mov Cap-2 Maneuver	79	-	-	-	-	-	
Stage 1	282	-	-	-	-	-	
Stage 2	482	-	-	-	-	-	
Approach	EB		NB		SB		
HCM Control Delay, s	284.7		2.1		0		
HCM LOS	F						
Minor Lane/Major Mvmt			NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)			680	-	154	-	-
HCM Lane V/C Ratio			0.166	-	1.438	-	-
HCM Control Delay (s)			11.3	0	284.7	-	-
HCM Lane LOS			B	A	F	-	-
HCM 95th %tile Q(veh)			0.6	-	14.3	-	-

SR 169 / North Connector

SITE LAYOUT

Site: 20 [WP SR 169/North Connector]

SR 169/North Connector
Future (2027) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY



Site: 20 [WP SR 169/North Connector]

SR 169/North Connector
Future (2027) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	114	2.0	0.420	10.0	LOS A	3.4	85.1	0.32	0.47	0.32	36.2
8	T1	499	2.0	0.420	4.4	LOS A	3.4	85.1	0.32	0.47	0.32	36.2
Approach		613	2.0	0.420	5.4	LOS A	3.4	85.1	0.32	0.47	0.32	36.2
North: SR 169												
4	T1	939	2.0	0.714	5.0	LOS A	7.6	192.3	0.52	0.48	0.52	35.9
14	R2	93	2.0	0.714	4.2	LOS A	7.6	192.3	0.52	0.48	0.52	33.2
Approach		1033	2.0	0.714	4.9	LOS A	7.6	192.3	0.52	0.48	0.52	35.6
West: North Connector												
5	L2	77	2.0	0.357	15.1	LOS B	2.6	65.9	0.90	0.91	0.90	31.4
12	R2	147	2.0	0.357	10.6	LOS B	2.6	65.9	0.90	0.91	0.90	31.7
Approach		224	2.0	0.357	12.2	LOS B	2.6	65.9	0.90	0.91	0.90	31.6
All Vehicles		1870	2.0	0.714	5.9	LOS A	7.6	192.3	0.50	0.53	0.50	35.3

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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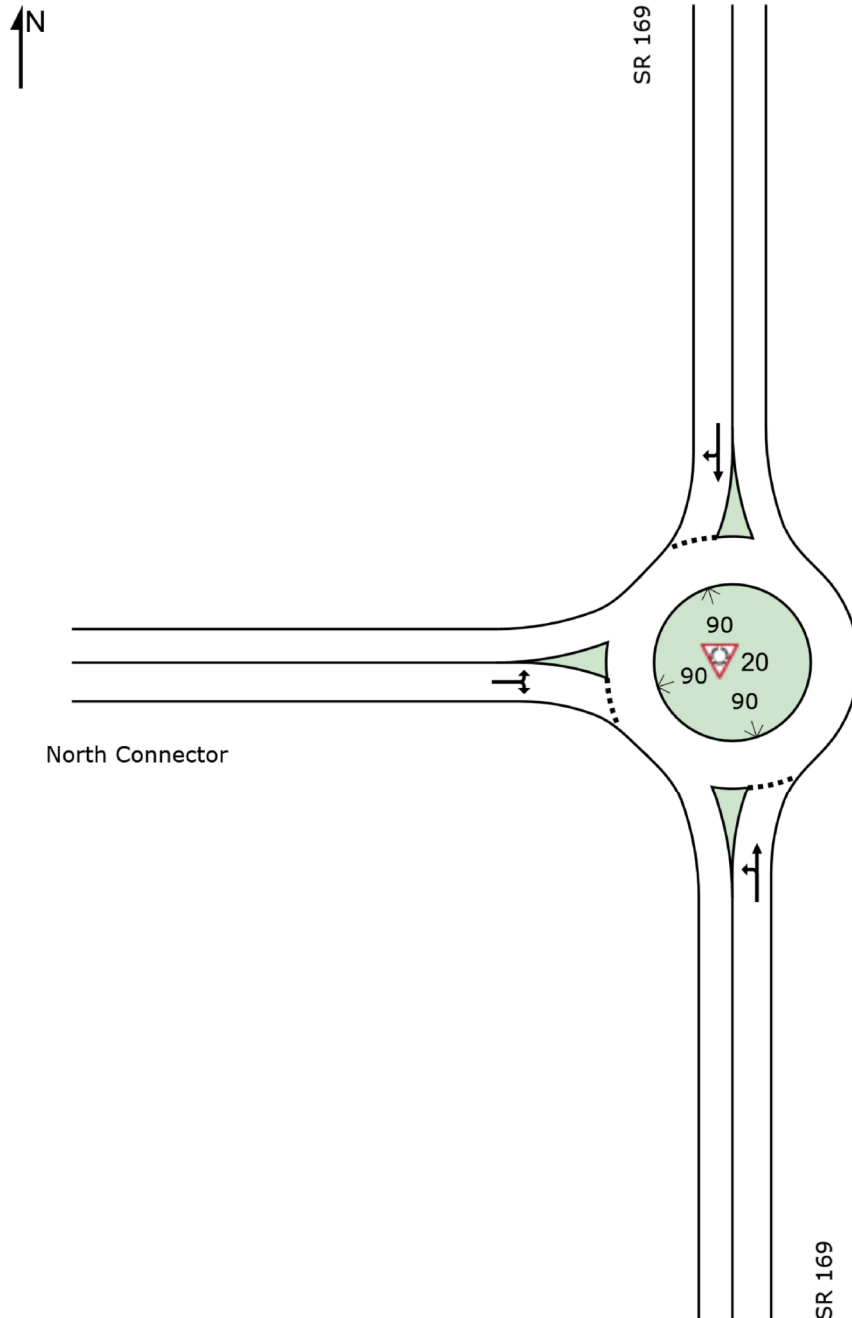
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SITE LAYOUT

Site: 20 [WP SR 169/North Connector]

SR 169/North Connector
Future (2028) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

 **Site: 20 [WP SR 169/North Connector]**

SR 169/North Connector
Future (2028) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	162	2.0	0.516	10.7	LOS B	4.4	111.0	0.56	0.55	0.56	35.4
8	T1	491	2.0	0.516	5.1	LOS A	4.4	111.0	0.56	0.55	0.56	35.4
Approach		654	2.0	0.516	6.5	LOS A	4.4	111.0	0.56	0.55	0.56	35.4
North: SR 169												
4	T1	922	2.0	0.804	6.0	LOS A	10.9	278.1	0.76	0.59	0.77	35.0
14	R2	174	2.0	0.804	5.2	LOS A	10.9	278.1	0.76	0.59	0.77	32.5
Approach		1096	2.0	0.804	5.9	LOS A	10.9	278.1	0.76	0.59	0.77	34.6
West: North Connector												
5	L2	189	2.0	0.736	25.5	LOS C	9.3	235.4	1.00	1.23	1.57	27.1
12	R2	234	2.0	0.736	21.0	LOS C	9.3	235.4	1.00	1.23	1.57	27.4
Approach		424	2.0	0.736	23.0	LOS C	9.3	235.4	1.00	1.23	1.57	27.3
All Vehicles		2173	2.0	0.804	9.4	LOS A	10.9	278.1	0.74	0.71	0.87	33.1

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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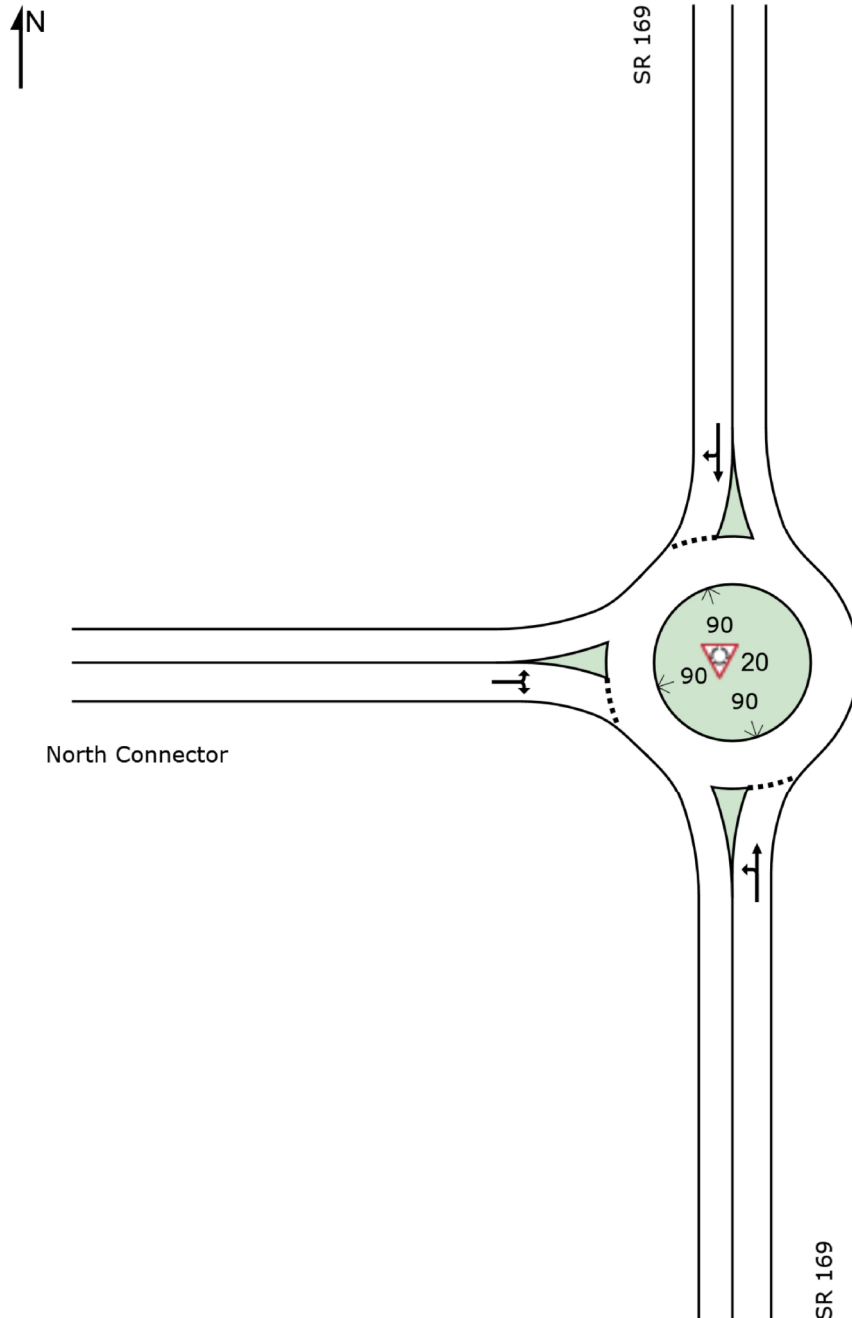
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SITE LAYOUT

Site: 20 [WP SR 169/North Connector]

SR 169/North Connector
Future (2029) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

 **Site: 20 [WP SR 169/North Connector]**

SR 169/North Connector
Future (2029) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	203	2.0	0.584	11.2	LOS B	5.1	129.9	0.67	0.61	0.67	35.0
8	T1	485	2.0	0.584	5.5	LOS A	5.1	129.9	0.67	0.61	0.67	35.0
Approach		688	2.0	0.584	7.2	LOS A	5.1	129.9	0.67	0.61	0.67	35.0
North: SR 169												
4	T1	912	2.0	0.887	9.3	LOS D	18.1	459.5	0.98	0.79	1.14	34.2
14	R2	241	2.0	0.887	8.5	LOS D	18.1	459.5	0.98	0.79	1.14	31.8
Approach		1153	2.0	0.887	9.1	LOS A	18.1	459.5	0.98	0.79	1.14	33.6
West: North Connector												
5	L2	283	2.0	1.133	100.6	LOS F	41.5	1054.1	1.00	2.29	4.20	14.2
12	R2	309	2.0	1.133	96.1	LOS F	41.5	1054.1	1.00	2.29	4.20	14.3
Approach		591	2.0	1.133	98.2	LOS F	41.5	1054.1	1.00	2.29	4.20	14.2
All Vehicles		2432	2.0	1.133	30.2	LOS C	41.5	1054.1	0.90	1.10	1.75	25.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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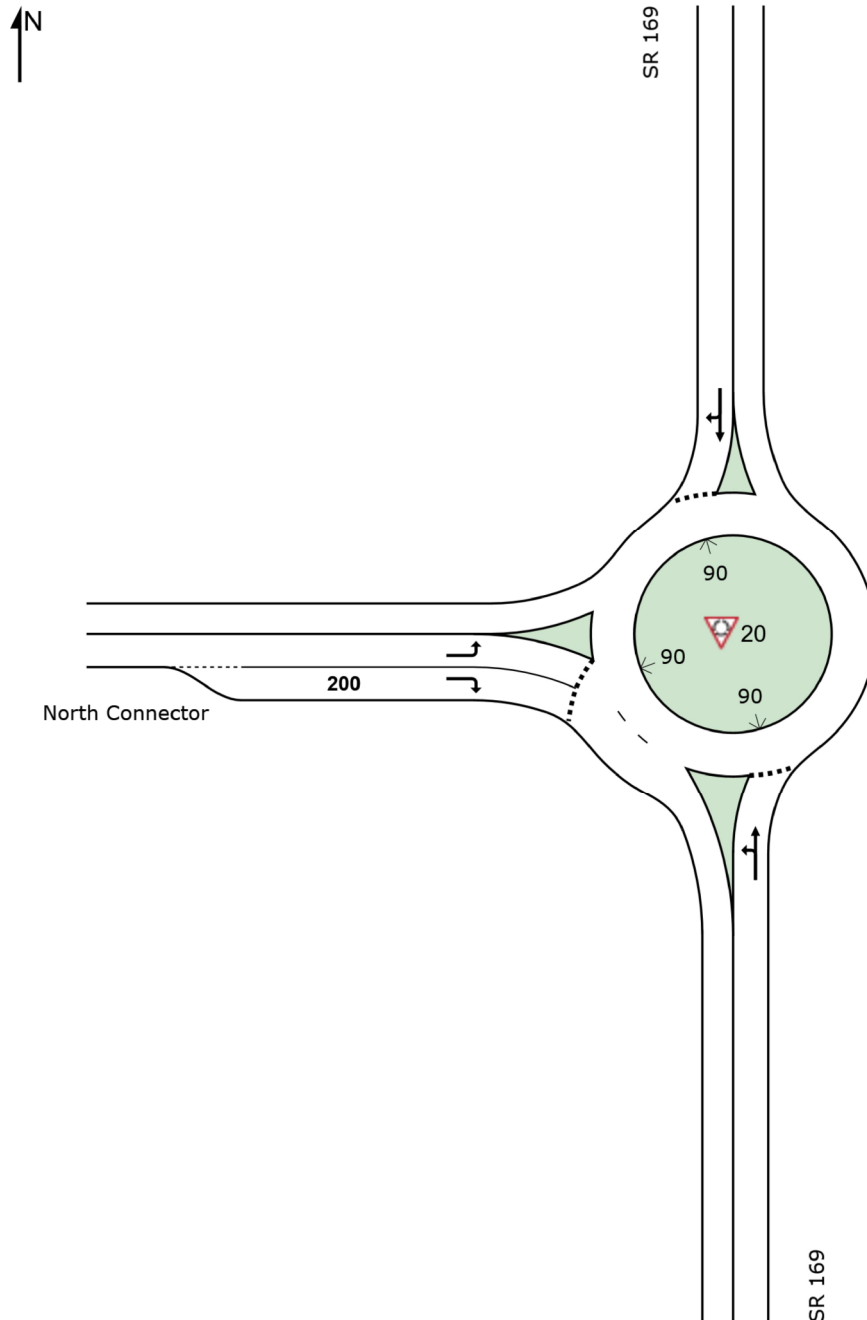
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SITE LAYOUT

 **Site: 20 [WP SR 169/North Connector - EBR]**

SR 169/North Connector
Future (2029) With-Project PM Peak - With Mitigation
Site Category: (None)
Roundabout



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MOVEMENT SUMMARY

 **Site: 20 [WP SR 169/North Connector - EBR]**

SR 169/North Connector
Future (2029) With-Project PM Peak - With Mitigation
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	203	2.0	0.599	11.6	LOS B	5.5	139.0	0.71	0.65	0.73	34.9
8	T1	485	2.0	0.599	5.9	LOS A	5.5	139.0	0.71	0.65	0.73	34.9
Approach		688	2.0	0.599	7.6	LOS A	5.5	139.0	0.71	0.65	0.73	34.9
North: SR 169												
4	T1	912	2.0	0.888	9.4	LOS D	18.3	465.2	0.99	0.79	1.15	34.1
14	R2	241	2.0	0.888	8.5	LOS D	18.3	465.2	0.99	0.79	1.15	31.7
Approach		1153	2.0	0.888	9.2	LOS A	18.3	465.2	0.99	0.79	1.15	33.6
West: North Connector												
5	L2	283	2.0	0.592	21.1	LOS C	5.9	148.9	1.00	1.12	1.28	27.2
12	R2	309	2.0	0.477	11.6	LOS B	4.8	121.6	1.00	0.95	1.08	32.5
Approach		591	2.0	0.592	16.1	LOS B	5.9	148.9	1.00	1.03	1.18	29.7
All Vehicles		2432	2.0	0.888	10.4	LOS B	18.3	465.2	0.91	0.81	1.04	32.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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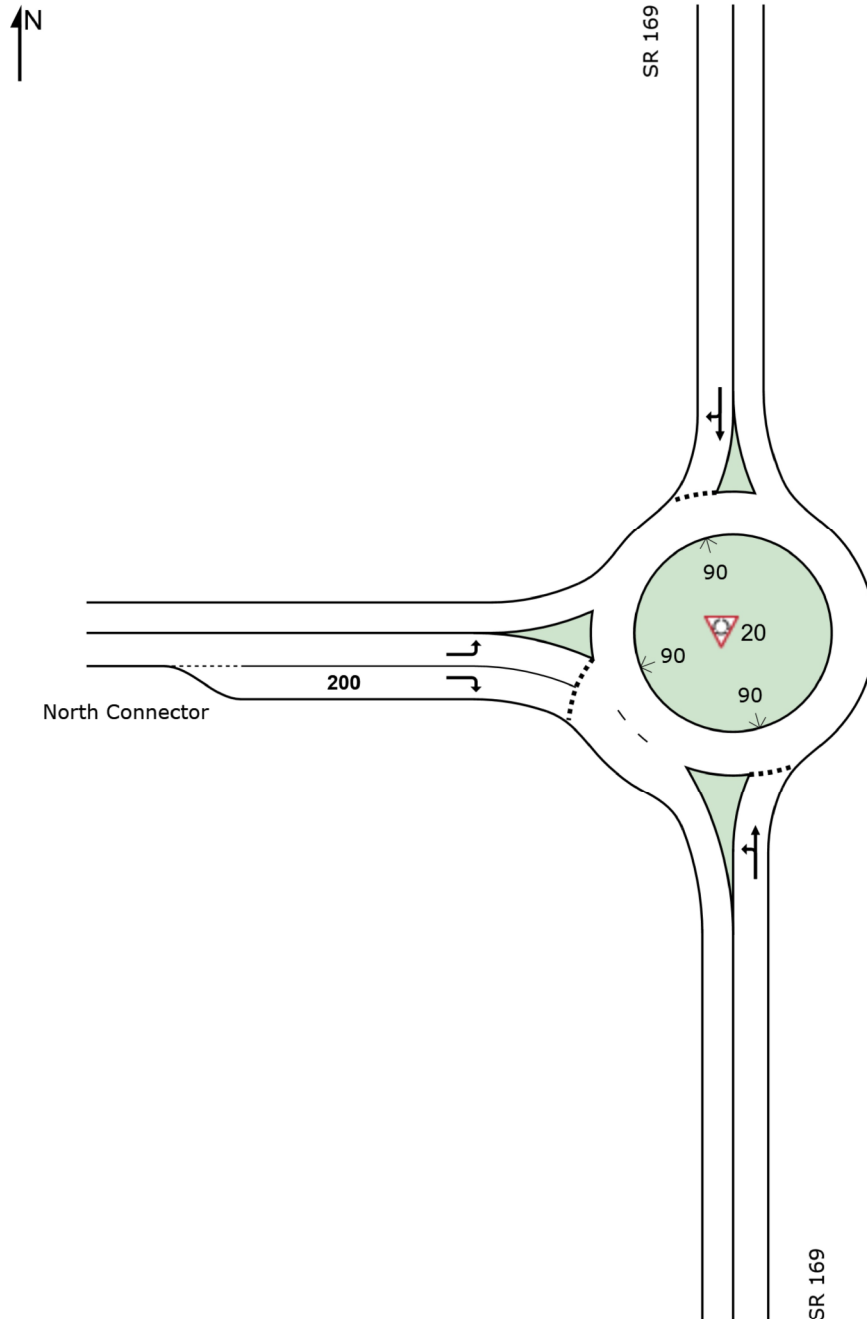
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SITE LAYOUT

 **Site: 20 [WP SR 169/North Connector - EBR]**

SR 169/North Connector
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

 **Site: 20 [WP SR 169/North Connector - EBR]**

SR 169/North Connector
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: SR 169												
3	L2	214	2.0	0.683	13.6	LOS B	7.7	196.1	0.85	0.84	0.97	34.2
8	T1	505	2.0	0.683	8.0	LOS A	7.7	196.1	0.85	0.84	0.97	34.2
Approach		719	2.0	0.683	9.6	LOS A	7.7	196.1	0.85	0.84	0.97	34.2
North: SR 169												
4	T1	940	2.0	0.932	12.3	LOS D	24.5	622.0	1.00	0.88	1.29	32.9
14	R2	249	2.0	0.932	11.5	LOS D	24.5	622.0	1.00	0.88	1.29	30.7
Approach		1189	2.0	0.932	12.1	LOS B	24.5	622.0	1.00	0.88	1.29	32.4
West: North Connector												
5	L2	370	2.0	0.600	19.9	LOS B	7.1	179.6	1.00	1.06	1.26	27.6
12	R2	365	2.0	0.804	29.7	LOS C	10.9	276.0	1.00	1.27	1.72	25.7
Approach		734	2.0	0.804	24.8	LOS C	10.9	276.0	1.00	1.16	1.49	26.6
All Vehicles		2643	2.0	0.932	15.0	LOS B	24.5	622.0	0.96	0.95	1.26	31.0

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Lake Sawyer Road SE / Ten Trails Parkway SE




HCM 6th TWSC
21: Lake Sawyer Road & Ten Trails Parkway

Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2024) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	2.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	84	10	8	357	404	109
Future Vol, veh/h	84	10	8	357	404	109
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	94	11	9	401	454	122
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	934	515	576	0	-	0
Stage 1	515	-	-	-	-	-
Stage 2	419	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	295	560	997	-	-	-
Stage 1	600	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	291	560	997	-	-	-
Mov Cap-2 Maneuver	291	-	-	-	-	-
Stage 1	593	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	22.8	0.2		0		
HCM LOS	C					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	997	-	307	-	-	
HCM Lane V/C Ratio	0.009	-	0.344	-	-	
HCM Control Delay (s)	8.6	0	22.8	-	-	
HCM Lane LOS	A	A	C	-	-	
HCM 95th %tile Q(veh)	0	-	1.5	-	-	

HCM 6th TWSC
21: Lake Sawyer Rd SE & Ten Trails Parkway SE

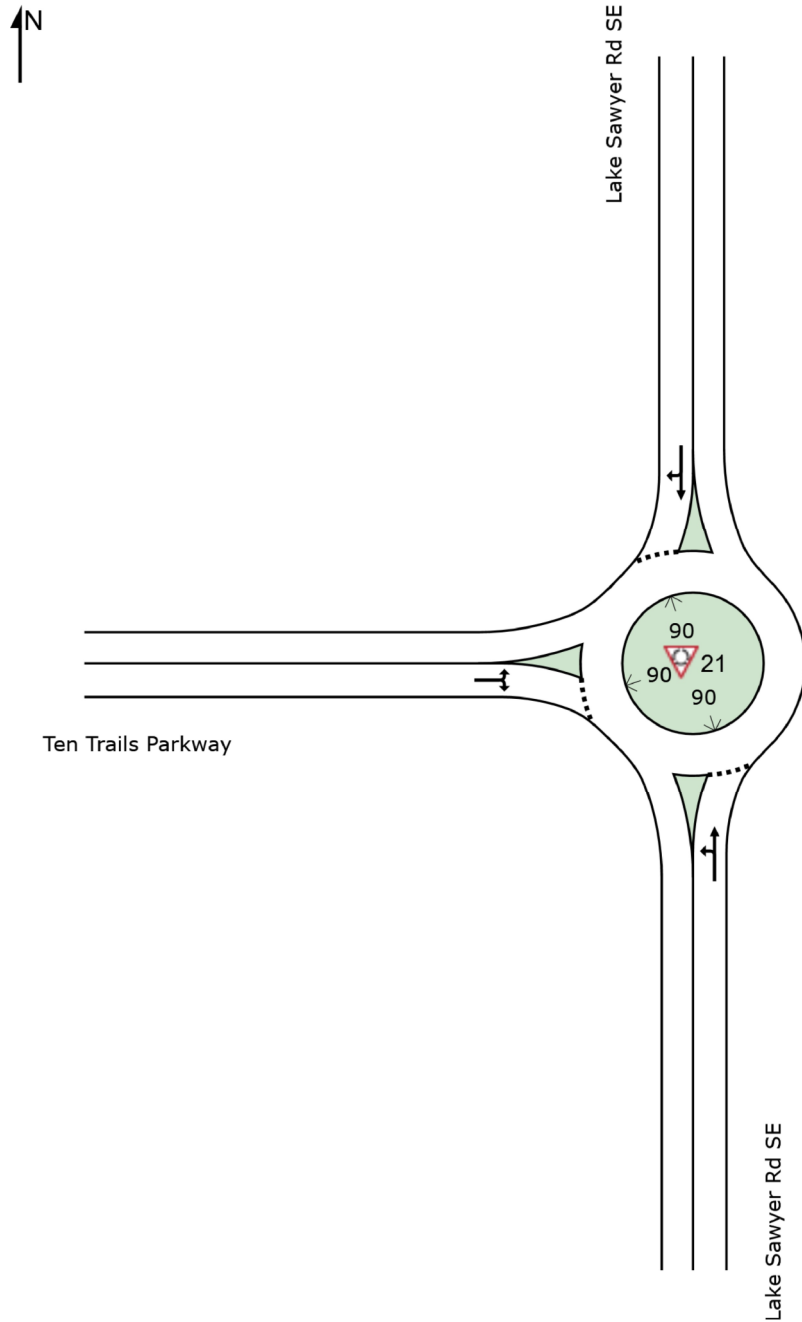
Ten Trails and Lawson Hills MPDs - Phase 1B
Future (2025) With-Project PM Peak Hour

Intersection						
Int Delay, s/veh	3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	105	12	10	370	422	118
Future Vol, veh/h	105	12	10	370	422	118
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	115	13	11	407	464	130
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	958	529	594	0	-	0
Stage 1	529	-	-	-	-	-
Stage 2	429	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	285	550	982	-	-	-
Stage 1	591	-	-	-	-	-
Stage 2	657	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	281	550	982	-	-	-
Mov Cap-2 Maneuver	281	-	-	-	-	-
Stage 1	583	-	-	-	-	-
Stage 2	657	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	26.2	0.2		0		
HCM LOS	D					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	982	-	296	-	-	
HCM Lane V/C Ratio	0.011	-	0.434	-	-	
HCM Control Delay (s)	8.7	0	26.2	-	-	
HCM Lane LOS	A	A	D	-	-	
HCM 95th %tile Q(veh)	0	-	2.1	-	-	

SITE LAYOUT

Site: 21 [WP Lake Sawyer Road/Ten Trails Parkway]

Lake Sawyer Road/Ten Trails Parkway SE
Future (2025) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 21 [WP Lake Sawyer Road/Ten Trails Parkway]

Lake Sawyer Road/Ten Trails Parkway SE
Future (2025) With-Project PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Lake Sawyer Rd SE												
3	L2	11	2.0	0.303	10.2	LOS B	2.0	50.0	0.33	0.44	0.33	36.6
8	T1	407	2.0	0.303	4.5	LOS A	2.0	50.0	0.33	0.44	0.33	36.6
Approach		418	2.0	0.303	4.7	LOS A	2.0	50.0	0.33	0.44	0.33	36.6
North: Lake Sawyer Rd SE												
4	T1	464	2.0	0.352	4.0	LOS A	2.4	59.7	0.08	0.38	0.08	37.2
14	R2	130	2.0	0.352	3.2	LOS A	2.4	59.7	0.08	0.38	0.08	34.3
Approach		593	2.0	0.352	3.8	LOS A	2.4	59.7	0.08	0.38	0.08	36.5
West: Ten Trails Parkway												
5	L2	115	2.0	0.123	10.6	LOS B	0.6	16.1	0.52	0.69	0.52	31.3
12	R2	13	2.0	0.123	6.1	LOS A	0.6	16.1	0.52	0.69	0.52	31.7
Approach		129	2.0	0.123	10.1	LOS B	0.6	16.1	0.52	0.69	0.52	31.3
All Vehicles		1140	2.0	0.352	4.9	LOS A	2.4	59.7	0.22	0.44	0.22	35.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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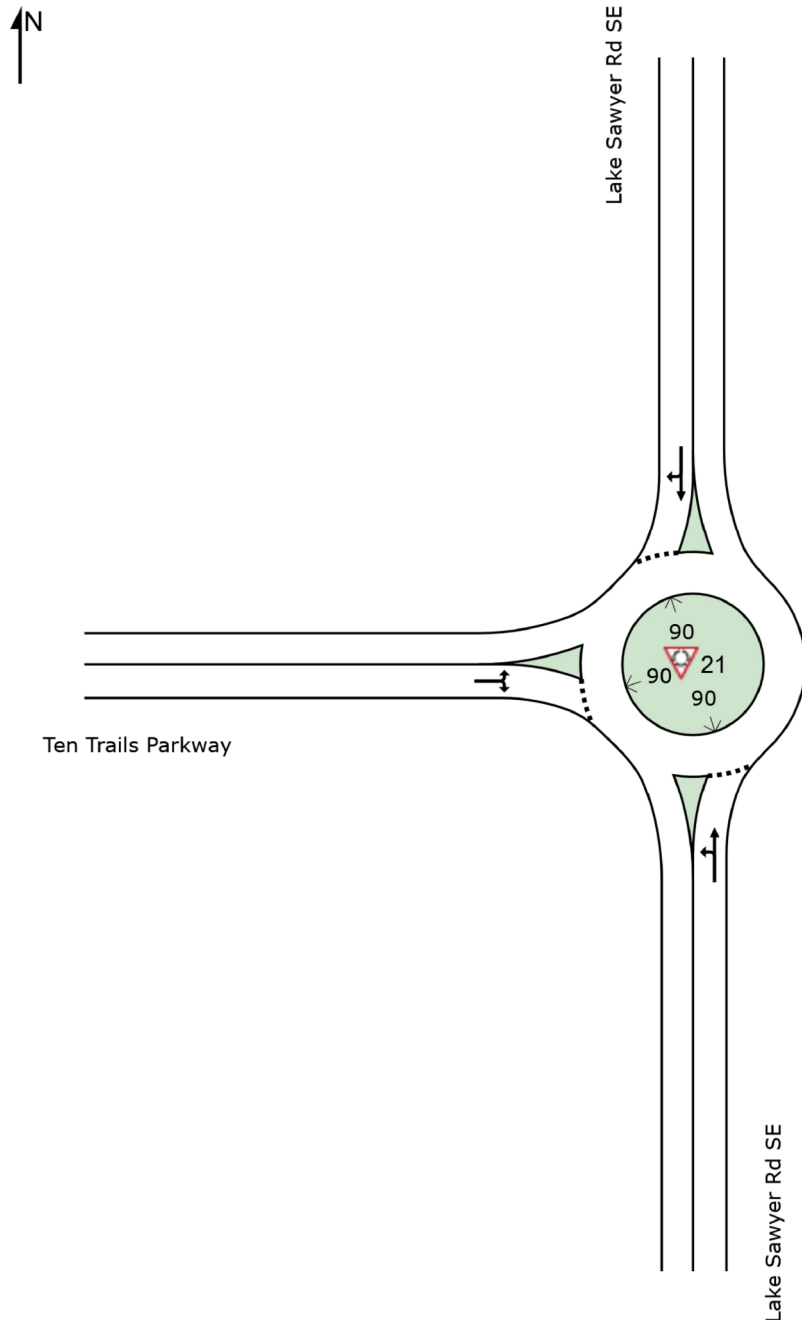
Organisation: THE TRANSPO GROUP | Processed: Tuesday, September 1, 2020 7:37:42 AM

Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Synchro\Phase 1B TMR (2020)\1.5 Percent Growth Rate\Year By Year Analysis (No Pipeline)\2025 - No Pipeline\Mitigation\Future PM Peak Hour - MEF Edits.sip8

SITE LAYOUT

Site: 21 [WP Lake Sawyer Road/Ten Trails Parkway]

Lake Sawyer Road/Ten Trails Parkway SE
Future (2032) With-Project PM Peak
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 21 [WP Lake Sawyer Road/Ten Trails Parkway]

Lake Sawyer Road/Ten Trails Parkway SE
 Future (2032) With-Project PM Peak
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Lake Sawyer Rd SE												
3	L2	10	2.0	0.337	10.2	LOS B	2.3	57.7	0.36	0.45	0.36	36.5
8	T1	452	2.0	0.337	4.6	LOS A	2.3	57.7	0.36	0.45	0.36	36.5
Approach		462	2.0	0.337	4.7	LOS A	2.3	57.7	0.36	0.45	0.36	36.5
North: Lake Sawyer Rd SE												
4	T1	474	2.0	0.355	4.0	LOS A	2.4	61.1	0.08	0.38	0.08	37.2
14	R2	127	2.0	0.355	3.2	LOS A	2.4	61.1	0.08	0.38	0.08	34.4
Approach		601	2.0	0.355	3.8	LOS A	2.4	61.1	0.08	0.38	0.08	36.6
West: Ten Trails Parkway												
5	L2	124	2.0	0.133	10.7	LOS B	0.7	17.6	0.53	0.70	0.53	31.3
12	R2	14	2.0	0.133	6.2	LOS A	0.7	17.6	0.53	0.70	0.53	31.6
Approach		138	2.0	0.133	10.2	LOS B	0.7	17.6	0.53	0.70	0.53	31.3
All Vehicles		1201	2.0	0.355	4.9	LOS A	2.4	61.1	0.24	0.45	0.24	35.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: M:\16\16450.00 - Ten Trails Community Final Design\Traffic Analysis\Traffic Operations\Synchro\Phase 1B TMR (2020)\1.5 Percent Growth Rate\Year By Year Analysis (No Pipeline)\2032 - No Pipeline\Mitigation\Future PM Peak Hour -.sip8

2022 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	53	19	72	0%	0	0	0	885	550	335
Multifamily	221	336 DUs	Eqn	0.42	142	61%	87	55	8	3	11	0%	0	0	0	131	79	52
Senior Adult Housing	251	150 DUs	Eqn	0.44	66	61%	40	26	4	1	5	0%	0	0	0	61	36	25
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	84,500 SF	Eqn	5.68	480	48%	230	250	23	65	88	20%	78	39	39	314	168	146
Total					1,645		960	685	88	88	176		78	39	39	1,391	833	558

2022 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	30	11	41	0%	0	0	0	782	488	294
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	4	1	5	0%	0	0	0	110	66	44
Senior Adult Housing	251	150 DUs	Eqn	0.44	66	61%	40	26	3	1	4	0%	0	0	0	62	37	25
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	39,500 SF	Eqn	6.92	273	48%	131	142	13	37	50	20%	44	22	22	179	96	83
Total					1,277		759	518	50	50	100		44	22	22	1,133	687	446

2022 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶			Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs			134	63%	84	50	23	8	31	0%	0	0	0	103	61	42
Multifamily	221	65 DUs			27	61%	16	11	5	2	7	0%	0	0	0	20	11	9
Senior Adult Housing	251	DUs			0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students			0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF			0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	45,000 SF			207	48%	99	108	10	28	38	20%	34	17	17	135	72	63
Total					368		199	169	38	38	76		34	17	17	258	144	114

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2022)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				480	230	250
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1165	730	435
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				1645	960	685

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	65	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	23	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,645	960	685
Internal Capture Percentage	11%	9%	13%
External Vehicle-Trips ³	1,469	872	597
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	9%	5%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2022)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	230	230	1.00	250	250
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	730	730	1.00	435	435
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	5		73	10	65	13
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	17	183	91	0		13
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		18	0	0	29	0
Retail	0		0	0	336	0
Restaurant	0	115		0	117	0
Cinema/Entertainment	0	9	0		29	0
Residential	0	23	0	0		0
Hotel	0	5	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	23	207	230	207	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	65	665	730	665	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	65	185	250	185	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	23	412	435	412	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2022)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				273	131	142
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1004	628	376
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				1277	759	518

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	37	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	13	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,277	759	518
Internal Capture Percentage	8%	7%	10%
External Vehicle-Trips ³	1,177	709	468
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	6%	3%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2022)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	131	131	1.00	142	142
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	628	628	1.00	376	376
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	3		41	6	37	7
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	15	158	79	0		11
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		10	0	0	25	0
Retail	0		0	0	289	0
Restaurant	0	66		0	100	0
Cinema/Entertainment	0	5	0		25	0
Residential	0	13	0	0		0
Hotel	0	3	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	13	118	131	118	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	37	591	628	591	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	37	105	142	105	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	13	363	376	363	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal T+B2:I58rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2022)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				207	99	108
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				161	100	61
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				368	199	169

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	28	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	10	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	368	199	169
Internal Capture Percentage	21%	19%	22%
External Vehicle-Trips ³	292	161	131
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	28%	16%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2022)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	99	99	1.00	108	108
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	100	100	1.00	61	61
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	2		31	4	28	5
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	26	13	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	0	0	4	0
Retail	0		0	0	46	0
Restaurant	0	50		0	16	0
Cinema/Entertainment	0	4	0		4	0
Residential	0	10	0	0		0
Hotel	0	2	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	10	89	99	89	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	28	72	100	72	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	28	80	108	80	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	10	51	61	51	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2023)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				801	384	417
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1216	761	455
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				2017	1145	872

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	108	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	38	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,017	1,145	872
Internal Capture Percentage	14%	13%	17%
External Vehicle-Trips ³	1,725	999	726
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	14%	8%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

2023 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	85	30	115	0%	0	0	0	842	518	324
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	15	5	20	0%	0	0	0	146	86	60
Senior Adult Housing	251	232 DUs	Eqn	0.40	93	61%	57	36	8	3	11	0%	0	0	0	82	49	33
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	169,000 SF	Eqn	4.74	801	48%	384	417	38	108	146	20%	132	66	66	523	280	243
Total					2,017		1,145	872	146	146	292		132	66	66	1,593	933	660

2023 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	49	18	67	0%	0	0	0	756	469	287
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	7	2	9	0%	0	0	0	106	63	43
Senior Adult Housing	251	232 DUs	Eqn	0.40	93	61%	57	36	6	2	8	0%	0	0	0	85	51	34
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	79,000 SF	Eqn	5.78	456	48%	219	237	22	62	84	20%	74	37	37	298	160	138
Total					1,487		864	623	84	84	168		74	37	37	1,245	743	502

2023 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B			Gross Trips ¹				Internal Trips ²			Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs	134	63%	84	50	34	12	46	0%	0	0	0	88	50	38
Multifamily	221	125 DUs	51	61%	31	20	13	5	18	0%	0	0	0	33	18	15
Senior Adult Housing	251	DUs	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	90,000 SF	345	48%	166	179	17	47	64	20%	58	29	29	223	120	103
Total			530		281	249	64	64	128		58	29	29	344	188	156

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

Project Name:	Ten Trails MPD (2023)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	384	384	1.00	417	417
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	761	761	1.00	455	455
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	8		121	17	108	21
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	18	191	96	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		31	0	0	30	0
Retail	0		0	0	350	0
Restaurant	0	192		0	122	0
Cinema/Entertainment	0	15	0		30	0
Residential	0	38	0	0		0
Hotel	0	8	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	38	346	384	346	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	108	653	761	653	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	108	309	417	309	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	38	417	455	417	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal T+B2:I52rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2023)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				456	219	237
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1031	645	386
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				1487	864	623

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	62	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	22	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,487	864	623
Internal Capture Percentage	11%	10%	13%
External Vehicle-Trips ³	1,319	780	539
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	10%	6%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2023)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	219	219	1.00	237	237
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	645	645	1.00	386	386
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	5		69	9	62	12
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	15	162	81	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		18	0	0	26	0
Retail	0		0	0	297	0
Restaurant	0	110		0	103	0
Cinema/Entertainment	0	9	0		26	0
Residential	0	22	0	0		0
Hotel	0	4	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	22	197	219	197	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	62	583	645	583	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	62	175	237	175	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	22	364	386	364	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal T+B2:I58rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2023)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				345	166	179
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				530	281	249

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	47	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	17	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	530	281	249
Internal Capture Percentage	24%	23%	26%
External Vehicle-Trips ³	402	217	185
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	41%	24%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2023)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	166	166	1.00	179	179
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	4		52	7	47	9
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		13	0	0	5	0
Retail	0		0	0	53	0
Restaurant	0	83		0	18	0
Cinema/Entertainment	0	7	0		5	0
Residential	0	17	0	0		0
Hotel	0	3	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	17	149	166	149	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	47	68	115	68	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	47	132	179	132	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	17	53	70	53	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

2024 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	111	39	150	0%	0	0	0	807	492	315
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	19	7	26	0%	0	0	0	140	82	58
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	14	5	19	0%	0	0	0	97	57	40
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	249,000 SF	Eqn	4.29	1067	48%	512	555	51	144	195	20%	174	87	87	698	374	324
Total					2,306		1,287	1019	195	195	390		174	87	87	1,742	1005	737

2024 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	63	23	86	0%	0	0	0	737	455	282
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	9	3	12	0%	0	0	0	103	61	42
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	9	3	12	0%	0	0	0	104	62	42
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	114,000 SF	Eqn	5.25	599	48%	288	311	29	81	110	20%	98	49	49	391	210	181
Total					1,653		947	706	110	110	220		98	49	49	1,335	788	547

2024 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B				Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷		Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs		134	63%	84	50	0%	38	17	55	0%	0	0	0	79	46	33
Multifamily	221	125 DUs		51	61%	31	20	41%	15	6	21	0%	0	0	0	30	16	14
Senior Adult Housing	251	DUs		0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students		0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	SF		0	16%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Retail	820	135,000 SF		468	48%	225	243	16%	23	53	76	20%	76	38	38	316	164	152
Total				653		340	313		76	76	152		76	38	38	425	226	199

2024 PM Peak Hour Trip Generation Calculations – Lawson Hills (Phase 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	1.01	107	63%	67	40	0	0	0	0%	0	0	0	107	67	40
Multifamily	221	72 DUs	Eqn	0.45	32	61%	20	12	0	0	0	0%	0	0	0	32	20	12
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					139		87	52	0	0	0		0	0	0	139	87	52

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2024)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				1067	512	555
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1239	775	464
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				2306	1287	1019

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	144	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	51	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,306	1,287	1,019
Internal Capture Percentage	17%	15%	19%
External Vehicle-Trips ³	1,916	1,092	824
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	19%	11%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2024)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	512	512	1.00	555	555
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	775	775	1.00	464	464
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	11		161	22	144	28
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		41	0	0	31	0
Retail	0		0	0	357	0
Restaurant	0	256		0	124	0
Cinema/Entertainment	0	20	0		31	0
Residential	0	51	0	0		0
Hotel	0	10	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	51	461	512	461	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	144	631	775	631	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	144	411	555	411	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	51	413	464	413	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2024)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				599	288	311
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1054	659	395
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				1653	947	706

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	81	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	29	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,653	947	706
Internal Capture Percentage	13%	12%	16%
External Vehicle-Trips ³	1,433	837	596
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	12%	7%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2024)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	288	288	1.00	311	311
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	659	659	1.00	395	395
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	6		90	12	81	16
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	16	166	83	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		23	0	0	26	0
Retail	0		0	0	303	0
Restaurant	0	144		0	105	0
Cinema/Entertainment	0	12	0		26	0
Residential	0	29	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	29	259	288	259	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	81	578	659	578	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	81	230	311	230	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	29	366	395	366	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2024)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				468	225	243
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				653	340	313

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	53	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	23	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	653	340	313
Internal Capture Percentage	23%	22%	24%
External Vehicle-Trips ³	501	264	237
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	22%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	46%	33%
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Informational Report</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
³ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
⁴ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
<i>Estimation Tool Developed by the Texas Transportation Institute</i>

Project Name:	Ten Trails MPD (2024)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	225	225	1.00	243	243
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	5		70	10	63	12
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		18	0	0	5	0
Retail	0		0	0	53	0
Restaurant	0	113		0	18	0
Cinema/Entertainment	0	9	0		5	0
Residential	0	23	0	0		0
Hotel	0	5	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	23	202	225	202	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	53	62	115	62	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	53	190	243	190	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	23	47	70	47	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

2025 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	136	48	184	0%	0	0	0	773	467	306
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	24	8	32	0%	0	0	0	134	77	57
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	16	6	22	0%	0	0	0	94	55	39
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	325,000 SF	Eqn	4.00	1300	48%	624	676	62	176	238	20%	212	106	106	850	456	394
Total					2,539		1,399	1140	238	238	476		212	106	106	1,851	1055	796

2025 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	76	27	103	0%	0	0	0	720	442	278
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	11	4	15	0%	0	0	0	100	59	41
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	10	3	13	0%	0	0	0	103	61	42
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	145,000 SF	Eqn	4.93	715	48%	343	372	34	97	131	20%	116	58	58	468	251	217
Total					1,769		1,002	767	131	131	262		116	58	58	1,391	813	578

2025 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B				Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷		Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs		134	63%	84	50	0%	38	20	58	0%	0	0	0	76	46	30
Multifamily	221	125 DUs		51	61%	31	20	45%	15	8	23	0%	0	0	0	28	16	12
Senior Adult Housing	251	DUs		0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students		0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	SF		0	16%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Retail	820	180,000 SF		585	48%	281	304	14%	28	53	81	20%	96	48	48	408	205	203
Total				770		396	374		81	81	162		96	48	48	512	267	245

2025 PM Peak Hour Trip Generation Calculations – Lawson Hills (Phase 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	1.01	107	63%	67	40	0	0	0	0%	0	0	0	107	67	40
Multifamily	221	72 DUs	Eqn	0.45	32	61%	20	12	0	0	0	0%	0	0	0	32	20	12
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					139		87	52	0	0	0		0	0	0	139	87	52

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal T+B2:N45rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2025)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				1300	624	676
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1239	775	464
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				2539	1399	1140

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	176	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	62	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,539	1,399	1,140
Internal Capture Percentage	19%	17%	21%
External Vehicle-Trips ³	2,063	1,161	902
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	23%	13%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2025)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	624	624	1.00	676	676
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	775	775	1.00	464	464
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	14		196	27	176	34
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		50	0	0	31	0
Retail	0		0	0	357	0
Restaurant	0	312		0	124	0
Cinema/Entertainment	0	25	0		31	0
Residential	0	62	0	0		0
Hotel	0	12	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	62	562	624	562	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	176	599	775	599	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	176	500	676	500	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	62	402	464	402	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2025)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				715	343	372
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1054	659	395
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				1769	1002	767

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	97	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	34	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,769	1,002	767
Internal Capture Percentage	15%	13%	17%
External Vehicle-Trips ³	1,507	871	636
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	26%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	15%	9%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2025)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	343	343	1.00	372	372
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	659	659	1.00	395	395
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	7		108	15	97	19
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	16	166	83	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		27	0	0	26	0
Retail	0		0	0	303	0
Restaurant	0	172		0	105	0
Cinema/Entertainment	0	14	0		26	0
Residential	0	34	0	0		0
Hotel	0	7	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	34	309	343	309	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	97	562	659	562	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	97	275	372	275	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	34	361	395	361	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal T+B2:I36rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2025)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				585	281	304
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				770	396	374

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	53	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	28	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	770	396	374
Internal Capture Percentage	21%	20%	22%
External Vehicle-Trips ³	608	315	293
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	17%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	46%	40%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2025)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	281	281	1.00	304	304
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	6		88	12	79	15
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		22	0	0	5	0
Retail	0		0	0	53	0
Restaurant	0	141		0	18	0
Cinema/Entertainment	0	11	0		5	0
Residential	0	28	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	28	253	281	253	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	53	62	115	62	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	53	251	304	251	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	28	42	70	42	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

2026 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	153	70	223	0%	0	0	0	734	450	284
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	24	10	34	0%	0	0	0	132	77	55
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	17	6	23	0%	0	0	0	93	54	39
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	85,000 SF	Eqn	1.15	98	16%	16	82	14	18	32	0%	0	0	0	66	2	64
Retail	820	325,000 SF	Eqn	4.00	1300	48%	624	676	78	181	259	20%	208	104	104	833	442	391
Total					2,739		1,464	1275	301	301	602		208	104	104	1,929	1059	870

2026 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	93	45	138	0%	0	0	0	685	425	260
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	11	4	15	0%	0	0	0	100	59	41
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	10	5	15	0%	0	0	0	101	61	40
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	45,000 SF	Eqn	1.18	53	16%	8	45	7	10	17	0%	0	0	0	36	1	35
Retail	820	145,000 SF	Eqn	4.93	715	48%	343	372	43	99	142	20%	114	57	57	459	243	216
Total					1,924		1,059	865	179	179	358		114	57	57	1,452	823	629

2026 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B				Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷		Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs		134	63%	84	50	0%	39	22	61	0%	0	0	0	73	45	28
Multifamily	221	125 DUs		51	61%	31	20	47%	15	9	24	0%	0	0	0	27	16	11
Senior Adult Housing	251	DUs		0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students		0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	40,000 SF		45	16%	7	38	31%	5	9	14	0%	0	0	0	31	2	29
Retail	820	180,000 SF		585	48%	281	304	16%	36	55	91	20%	94	47	47	400	198	202
Total				815		403	412		95	95	190		94	47	47	531	261	270

2026 PM Peak Hour Trip Generation Calculations – Lawson Hills (Phase 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	1.01	107	63%	67	40	0	0	0	0%	0	0	0	107	67	40
Multifamily	221	72 DUs	Eqn	0.45	32	61%	20	12	0	0	0	0%	0	0	0	32	20	12
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					139		87	52	0	0	0		0	0	0	139	87	52

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2026)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				98	16	82
Retail				1300	624	676
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1239	775	464
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				2739	1464	1275

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	0	0	2	0
Retail	5		0	0	176	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	62	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,739	1,464	1,275
Internal Capture Percentage	20%	18%	21%
External Vehicle-Trips ³	2,199	1,194	1,005
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	23%	15%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Devel+B2:166oped by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2026)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	16	16	1.00	82	82
Retail	1.00	624	624	1.00	676	676
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	775	775	1.00	464	464
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	3	0	2	0
Retail	14		196	27	176	34
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		50	0	0	31	0
Retail	5		0	0	357	0
Restaurant	5	312		0	124	0
Cinema/Entertainment	1	25	0		31	0
Residential	9	62	0	0		0
Hotel	0	12	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	14	2	16	2	0	0
Retail	78	546	624	546	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	178	597	775	597	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	18	64	82	64	0	0
Retail	181	495	676	495	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	71	393	464	393	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal T+B2:I58rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2026)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				53	8	45
Retail				715	343	372
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1054	659	395
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				1924	1059	865

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	0	0	1	0
Retail	2		0	0	97	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	5	34	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,924	1,059	865
Internal Capture Percentage	15%	14%	17%
External Vehicle-Trips ³	1,628	911	717
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	15%	10%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2026)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	8	8	1.00	45	45
Retail	1.00	343	343	1.00	372	372
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	659	659	1.00	395	395
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	2	0	1	0
Retail	7		108	15	97	19
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	16	166	83	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		27	0	0	26	0
Retail	2		0	0	303	0
Restaurant	2	172		0	105	0
Cinema/Entertainment	0	14	0		26	0
Residential	5	34	0	0		0
Hotel	0	7	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	7	1	8	1	0	0
Retail	43	300	343	300	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	98	561	659	561	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	10	35	45	35	0	0
Retail	99	273	372	273	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	39	356	395	356	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2026)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				45	7	38
Retail				585	281	304
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				815	403	412

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	0	0	1	0
Retail	2		0	0	53	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	28	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	815	403	412
Internal Capture Percentage	23%	24%	23%
External Vehicle-Trips ³	625	308	317
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	71%	24%
Retail	13%	18%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	44%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2026)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	7	7	1.00	38	38
Retail	1.00	281	281	1.00	304	304
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	2	0	1	0
Retail	6		88	12	79	15
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		22	0	0	5	0
Retail	2		0	0	53	0
Restaurant	2	141		0	18	0
Cinema/Entertainment	0	11	0		5	0
Residential	4	28	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	5	2	7	2	0	0
Retail	36	245	281	245	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	54	61	115	61	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	29	38	29	0	0
Retail	55	249	304	249	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	31	39	70	39	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

2027 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	153	70	223	0%	0	0	0	734	450	284
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	24	10	34	0%	0	0	0	132	77	55
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	17	6	23	0%	0	0	0	93	54	39
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	85,000 SF	Eqn	1.15	98	16%	16	82	14	18	32	0%	0	0	0	66	2	64
Retail	820	325,000 SF	Eqn	4.00	1300	48%	624	676	78	181	259	20%	208	104	104	833	442	391
Total					2,739		1,464	1275	301	301	602		208	104	104	1,929	1059	870

2027 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	93	45	138	0%	0	0	0	685	425	260
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	11	4	15	0%	0	0	0	100	59	41
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	10	5	15	0%	0	0	0	101	61	40
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	45,000 SF	Eqn	1.18	53	16%	8	45	7	10	17	0%	0	0	0	36	1	35
Retail	820	145,000 SF	Eqn	4.93	715	48%	343	372	43	99	142	20%	114	57	57	459	243	216
Total					1,924		1,059	865	179	179	358		114	57	57	1,452	823	629

2027 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B				Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷		Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs		134	63%	84	50	0%	39	22	61	0%	0	0	0	73	45	28
Multifamily	221	125 DUs		51	61%	31	20	47%	15	9	24	0%	0	0	0	27	16	11
Senior Adult Housing	251	DUs		0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students		0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	40,000 SF		45	16%	7	38	31%	5	9	14	0%	0	0	0	31	2	29
Retail	820	180,000 SF		585	48%	281	304	16%	36	55	91	20%	94	47	47	400	198	202
Total				815		403	412		95	95	190		94	47	47	531	261	270

2027 PM Peak Hour Trip Generation Calculations – Lawson Hills (Phase 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	1.01	107	63%	67	40	0	0	0	0%	0	0	0	107	67	40
Multifamily	221	72 DUs	Eqn	0.45	32	61%	20	12	0	0	0	0%	0	0	0	32	20	12
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					139		87	52	0	0	0		0	0	0	139	87	52

2027 PM Peak Hour Trip Generation Calculations – North Triangle (Phase 1B)

Weekday PM Peak Hour - Cumulative Phase 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	DUs	Eqn	0.00	0	63%	0	0				0%	0	0	0	0	0	0
Multifamily	221	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	65,000 SF	Eqn	6.08	395	48%	190	205	0	0	0	20%	80	40	40	315	150	165
Total					395		190	205	0	0	0		80	40	40	315	150	165

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal T+B2:I34rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2027)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				98	16	82
Retail				1300	624	676
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1239	775	464
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				2739	1464	1275

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	0	0	2	0
Retail	5		0	0	176	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	62	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,739	1,464	1,275
Internal Capture Percentage	20%	18%	21%
External Vehicle-Trips ³	2,199	1,194	1,005
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	23%	15%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2027)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	16	16	1.00	82	82
Retail	1.00	624	624	1.00	676	676
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	775	775	1.00	464	464
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	3	0	2	0
Retail	14		196	27	176	34
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		50	0	0	31	0
Retail	5		0	0	357	0
Restaurant	5	312		0	124	0
Cinema/Entertainment	1	25	0		31	0
Residential	9	62	0	0		0
Hotel	0	12	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	14	2	16	2	0	0
Retail	78	546	624	546	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	178	597	775	597	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	18	64	82	64	0	0
Retail	181	495	676	495	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	71	393	464	393	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2027)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				53	8	45
Retail				715	343	372
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1054	659	395
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				1924	1059	865

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	0	0	1	0
Retail	2		0	0	97	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	5	34	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,924	1,059	865
Internal Capture Percentage	15%	14%	17%
External Vehicle-Trips ³	1,628	911	717
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	15%	10%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2027)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	8	8	1.00	45	45
Retail	1.00	343	343	1.00	372	372
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	659	659	1.00	395	395
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	2	0	1	0
Retail	7		108	15	97	19
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	16	166	83	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		27	0	0	26	0
Retail	2		0	0	303	0
Restaurant	2	172		0	105	0
Cinema/Entertainment	0	14	0		26	0
Residential	5	34	0	0		0
Hotel	0	7	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	7	1	8	1	0	0
Retail	43	300	343	300	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	98	561	659	561	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	10	35	45	35	0	0
Retail	99	273	372	273	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	39	356	395	356	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2027)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				45	7	38
Retail				585	281	304
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				815	403	412

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	0	0	1	0
Retail	2		0	0	53	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	28	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	815	403	412
Internal Capture Percentage	23%	24%	23%
External Vehicle-Trips ³	625	308	317
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	71%	24%
Retail	13%	18%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	44%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2027)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	7	7	1.00	38	38
Retail	1.00	281	281	1.00	304	304
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	2	0	1	0
Retail	6		88	12	79	15
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		22	0	0	5	0
Retail	2		0	0	53	0
Restaurant	2	141		0	18	0
Cinema/Entertainment	0	11	0		5	0
Residential	4	28	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	5	2	7	2	0	0
Retail	36	245	281	245	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	54	61	115	61	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	29	38	29	0	0
Retail	55	249	304	249	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	31	39	70	39	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal T+C3+B2:I58+B2:I60+C3+B2:I58+B2:I6+B2:I60					
Project Name:	North Triangle (2027)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				395	190	205
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				0	0	0
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				395	190	205

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	395	190	205
Internal Capture Percentage	0%	0%	0%
External Vehicle-Trips ³	395	190	205
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	0%	0%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Project Name:	North Triangle (2027)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	190	190	1.00	205	205
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	4		59	8	53	10
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		15	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	95		0	0	0
Cinema/Entertainment	0	8	0		0	0
Residential	0	19	0	0		0
Hotel	0	4	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	190	190	190	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	205	205	205	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

2028 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	153	70	223	0%	0	0	0	734	450	284
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	24	10	34	0%	0	0	0	132	77	55
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	17	6	23	0%	0	0	0	93	54	39
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	85,000 SF	Eqn	1.15	98	16%	16	82	14	18	32	0%	0	0	0	66	2	64
Retail	820	325,000 SF	Eqn	4.00	1300	48%	624	676	78	181	259	20%	208	104	104	833	442	391
Total					2,739		1,464	1275	301	301	602		208	104	104	1,929	1059	870

2028 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	93	45	138	0%	0	0	0	685	425	260
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	11	4	15	0%	0	0	0	100	59	41
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	10	5	15	0%	0	0	0	101	61	40
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	45,000 SF	Eqn	1.18	53	16%	8	45	7	10	17	0%	0	0	0	36	1	35
Retail	820	145,000 SF	Eqn	4.93	715	48%	343	372	43	99	142	20%	114	57	57	459	243	216
Total					1,924		1,059	865	179	179	358		114	57	57	1,452	823	629

2028 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B				Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷		Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs		134	63%	84	50	0%	39	22	61	0%	0	0	0	73	45	28
Multifamily	221	125 DUs		51	61%	31	20	47%	15	9	24	0%	0	0	0	27	16	11
Senior Adult Housing	251	DUs		0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students		0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	40,000 SF		45	16%	7	38	31%	5	9	14	0%	0	0	0	31	2	29
Retail	820	180,000 SF		585	48%	281	304	16%	36	55	91	20%	94	47	47	400	198	202
Total				815		403	412		95	95	190		94	47	47	531	261	270

2028 PM Peak Hour Trip Generation Calculations – Lawson Hills (Phase 2)

Weekday PM Peak Hour - Cumulative Phase 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	1.01	107	63%	67	40	0	0	0	0%	0	0	0	107	67	40
Multifamily	221	72 DUs	Eqn	0.45	32	61%	20	12	0	0	0	0%	0	0	0	32	20	12
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					139		87	52	0	0	0		0	0	0	139	87	52

2028 PM Peak Hour Trip Generation Calculations – North Triangle (Phase 1B)

Weekday PM Peak Hour - Cumulative Phase 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	DUs	Eqn	0.00	0	63%	0	0				0%	0	0	0	0	0	0
Multifamily	221	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	70,000 SF	Eqn	1.16	81	16%	13	68	4	14	18	0%	0	0	0	63	9	54
Retail	820	130,000 SF	Eqn	5.08	660	48%	317	343	14	4	18	20%	128	64	64	514	239	275
Total					741		330	411	18	18	36		128	64	64	577	248	329

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal T+B2:I34rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2028)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				98	16	82
Retail				1300	624	676
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1239	775	464
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				2739	1464	1275

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	0	0	2	0
Retail	5		0	0	176	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	62	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,739	1,464	1,275
Internal Capture Percentage	20%	18%	21%
External Vehicle-Trips ³	2,199	1,194	1,005
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	23%	15%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2028)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	16	16	1.00	82	82
Retail	1.00	624	624	1.00	676	676
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	775	775	1.00	464	464
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	3	0	2	0
Retail	14		196	27	176	34
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		50	0	0	31	0
Retail	5		0	0	357	0
Restaurant	5	312		0	124	0
Cinema/Entertainment	1	25	0		31	0
Residential	9	62	0	0		0
Hotel	0	12	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	14	2	16	2	0	0
Retail	78	546	624	546	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	178	597	775	597	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	18	64	82	64	0	0
Retail	181	495	676	495	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	71	393	464	393	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2028)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				53	8	45
Retail				715	343	372
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1054	659	395
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				1924	1059	865

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	0	0	1	0
Retail	2		0	0	97	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	5	34	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,924	1,059	865
Internal Capture Percentage	15%	14%	17%
External Vehicle-Trips ³	1,628	911	717
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	15%	10%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2028)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	8	8	1.00	45	45
Retail	1.00	343	343	1.00	372	372
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	659	659	1.00	395	395
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	2	0	1	0
Retail	7		108	15	97	19
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	16	166	83	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		27	0	0	26	0
Retail	2		0	0	303	0
Restaurant	2	172		0	105	0
Cinema/Entertainment	0	14	0		26	0
Residential	5	34	0	0		0
Hotel	0	7	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	7	1	8	1	0	0
Retail	43	300	343	300	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	98	561	659	561	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	10	35	45	35	0	0
Retail	99	273	372	273	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	39	356	395	356	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal T+B2:I58rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2028)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				45	7	38
Retail				585	281	304
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				815	403	412

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	0	0	1	0
Retail	2		0	0	53	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	28	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	815	403	412
Internal Capture Percentage	23%	24%	23%
External Vehicle-Trips ³	625	308	317
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	71%	24%
Retail	13%	18%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	44%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2028)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	7	7	1.00	38	38
Retail	1.00	281	281	1.00	304	304
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	2	0	1	0
Retail	6		88	12	79	15
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		22	0	0	5	0
Retail	2		0	0	53	0
Restaurant	2	141		0	18	0
Cinema/Entertainment	0	11	0		5	0
Residential	4	28	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	5	2	7	2	0	0
Retail	36	245	281	245	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	54	61	115	61	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	29	38	29	0	0
Retail	55	249	304	249	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	31	39	70	39	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	North Triangle (2028)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				81	13	68
Retail				660	317	343
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				0	0	0
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				741	330	411

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		14	0	0	0	0
Retail	4		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	741	330	411
Internal Capture Percentage	5%	5%	4%
External Vehicle-Trips ³	705	312	393
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	31%	21%
Retail	4%	1%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	North Triangle (2028)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	13	13	1.00	68	68
Retail	1.00	317	317	1.00	343	343
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		14	3	0	1	0
Retail	7		99	14	89	17
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		25	0	0	0	0
Retail	4		0	0	0	0
Restaurant	4	159		0	0	0
Cinema/Entertainment	1	13	0		0	0
Residential	7	32	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	4	9	13	9	0	0
Retail	14	303	317	303	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	14	54	68	54	0	0
Retail	4	339	343	339	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

2029 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	153	70	223	0%	0	0	0	734	450	284
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	24	10	34	0%	0	0	0	132	77	55
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	17	6	23	0%	0	0	0	93	54	39
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	85,000 SF	Eqn	1.15	98	16%	16	82	14	18	32	0%	0	0	0	66	2	64
Retail	820	325,000 SF	Eqn	4.00	1300	48%	624	676	78	181	259	20%	208	104	104	833	442	391
Total					2,739		1,464	1275	301	301	602		208	104	104	1,929	1059	870

2029 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	93	45	138	0%	0	0	0	685	425	260
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	11	4	15	0%	0	0	0	100	59	41
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	10	5	15	0%	0	0	0	101	61	40
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	45,000 SF	Eqn	1.18	53	16%	8	45	7	10	17	0%	0	0	0	36	1	35
Retail	820	145,000 SF	Eqn	4.93	715	48%	343	372	43	99	142	20%	114	57	57	459	243	216
Total					1,924		1,059	865	179	179	358		114	57	57	1,452	823	629

2029 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B				Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷		Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs		134	63%	84	50	0%	39	22	61	0%	0	0	0	73	45	28
Multifamily	221	125 DUs		51	61%	31	20	47%	15	9	24	0%	0	0	0	27	16	11
Senior Adult Housing	251	DUs		0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students		0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	40,000 SF		45	16%	7	38	31%	5	9	14	0%	0	0	0	31	2	29
Retail	820	180,000 SF		585	48%	281	304	16%	36	55	91	20%	94	47	47	400	198	202
Total				815		403	412		95	95	190		94	47	47	531	261	270

2029 PM Peak Hour Trip Generation Calculations – Lawson Hills (Phase 2)

Weekday PM Peak Hour - Cumulative Phase 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	1.01	107	63%	67	40	0	0	0	0%	0	0	0	107	67	40
Multifamily	221	72 DUs	Eqn	0.45	32	61%	20	12	0	0	0	0%	0	0	0	32	20	12
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					139		87	52	0	0	0		0	0	0	139	87	52

2029 PM Peak Hour Trip Generation Calculations – North Triangle (Phase 1B)

Weekday PM Peak Hour - Cumulative Phase 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	DUs	Eqn	0.00	0	63%	0	0				0%	0	0	0	0	0	0
Multifamily	221	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	135,000 SF	Eqn	1.12	151	16%	24	127	7	25	32	0%	0	0	0	119	17	102
Retail	820	190,000 SF	Eqn	4.60	874	48%	420	454	25	7	32	20%	168	84	84	674	311	363
Total					1,025		444	581	32	32	64		168	84	84	793	328	465

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2029)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				98	16	82
Retail				1300	624	676
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1239	775	464
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				2739	1464	1275

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	0	0	2	0
Retail	5		0	0	176	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	62	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,739	1,464	1,275
Internal Capture Percentage	20%	18%	21%
External Vehicle-Trips ³	2,199	1,194	1,005
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	23%	15%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2029)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	16	16	1.00	82	82
Retail	1.00	624	624	1.00	676	676
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	775	775	1.00	464	464
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	3	0	2	0
Retail	14		196	27	176	34
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		50	0	0	31	0
Retail	5		0	0	357	0
Restaurant	5	312		0	124	0
Cinema/Entertainment	1	25	0		31	0
Residential	9	62	0	0		0
Hotel	0	12	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	14	2	16	2	0	0
Retail	78	546	624	546	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	178	597	775	597	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	18	64	82	64	0	0
Retail	181	495	676	495	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	71	393	464	393	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2029)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				53	8	45
Retail				715	343	372
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1054	659	395
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				1924	1059	865

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	0	0	1	0
Retail	2		0	0	97	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	5	34	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,924	1,059	865
Internal Capture Percentage	15%	14%	17%
External Vehicle-Trips ³	1,628	911	717
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	15%	10%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2029)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	8	8	1.00	45	45
Retail	1.00	343	343	1.00	372	372
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	659	659	1.00	395	395
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	2	0	1	0
Retail	7		108	15	97	19
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	16	166	83	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		27	0	0	26	0
Retail	2		0	0	303	0
Restaurant	2	172		0	105	0
Cinema/Entertainment	0	14	0		26	0
Residential	5	34	0	0		0
Hotel	0	7	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	7	1	8	1	0	0
Retail	43	300	343	300	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	98	561	659	561	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	10	35	45	35	0	0
Retail	99	273	372	273	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	39	356	395	356	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal T+B2:I58rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2029)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				45	7	38
Retail				585	281	304
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				815	403	412

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	0	0	1	0
Retail	2		0	0	53	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	28	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	815	403	412
Internal Capture Percentage	23%	24%	23%
External Vehicle-Trips ³	625	308	317
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	71%	24%
Retail	13%	18%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	44%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2029)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	7	7	1.00	38	38
Retail	1.00	281	281	1.00	304	304
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	2	0	1	0
Retail	6		88	12	79	15
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		22	0	0	5	0
Retail	2		0	0	53	0
Restaurant	2	141		0	18	0
Cinema/Entertainment	0	11	0		5	0
Residential	4	28	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	5	2	7	2	0	0
Retail	36	245	281	245	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	54	61	115	61	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	29	38	29	0	0
Retail	55	249	304	249	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	31	39	70	39	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	North Triangle (2029)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				151	24	127
Retail				874	420	454
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				0	0	0
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				1025	444	581

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		25	0	0	0	0
Retail	7		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,025	444	581
Internal Capture Percentage	6%	7%	6%
External Vehicle-Trips ³	961	412	549
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	29%	20%
Retail	6%	2%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	North Triangle (2029)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	24	24	1.00	127	127
Retail	1.00	420	420	1.00	454	454
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		25	5	0	3	0
Retail	9		132	18	118	23
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		34	0	0	0	0
Retail	7		0	0	0	0
Restaurant	7	210		0	0	0
Cinema/Entertainment	1	17	0		0	0
Residential	14	42	0	0		0
Hotel	0	8	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	7	17	24	17	0	0
Retail	25	395	420	395	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	25	102	127	102	0	0
Retail	7	447	454	447	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

2030 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	153	70	223	0%	0	0	0	734	450	284
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	24	10	34	0%	0	0	0	132	77	55
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	17	6	23	0%	0	0	0	93	54	39
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	85,000 SF	Eqn	1.15	98	16%	16	82	14	18	32	0%	0	0	0	66	2	64
Retail	820	325,000 SF	Eqn	4.00	1300	48%	624	676	78	181	259	20%	208	104	104	833	442	391
Total					2,739		1,464	1275	301	301	602		208	104	104	1,929	1059	870

2030 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	93	45	138	0%	0	0	0	685	425	260
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	11	4	15	0%	0	0	0	100	59	41
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	10	5	15	0%	0	0	0	101	61	40
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	45,000 SF	Eqn	1.18	53	16%	8	45	7	10	17	0%	0	0	0	36	1	35
Retail	820	145,000 SF	Eqn	4.93	715	48%	343	372	43	99	142	20%	114	57	57	459	243	216
Total					1,924		1,059	865	179	179	358		114	57	57	1,452	823	629

2030 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B				Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷		Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs		134	63%	84	50	0%	39	22	61	0%	0	0	0	73	45	28
Multifamily	221	125 DUs		51	61%	31	20	47%	15	9	24	0%	0	0	0	27	16	11
Senior Adult Housing	251	DUs		0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students		0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	40,000 SF		45	16%	7	38	31%	5	9	14	0%	0	0	0	31	2	29
Retail	820	180,000 SF		585	48%	281	304	16%	36	55	91	20%	94	47	47	400	198	202
Total				815		403	412		95	95	190		94	47	47	531	261	270

2030 PM Peak Hour Trip Generation Calculations – Lawson Hills (Phase 2)

Weekday PM Peak Hour - Cumulative Phase 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	1.01	107	63%	67	40	0	0	0	0%	0	0	0	107	67	40
Multifamily	221	72 DUs	Eqn	0.45	32	61%	20	12	0	0	0	0%	0	0	0	32	20	12
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					139		87	52	0	0	0		0	0	0	139	87	52

2030 PM Peak Hour Trip Generation Calculations – North Triangle (Phase 1B)

Weekday PM Peak Hour - Cumulative Phase 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	DUs	Eqn	0.00	0	63%	0	0				0%	0	0	0	0	0	0
Multifamily	221	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	200,000 SF	Eqn	1.10	220	16%	35	185	9	34	43	0%	0	0	0	177	26	151
Retail	820	190,000 SF	Eqn	4.60	874	48%	420	454	34	9	43	20%	166	83	83	665	303	362
Total					1,094		455	639	43	43	86		166	83	83	842	329	513

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2030)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				98	16	82
Retail				1300	624	676
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1239	775	464
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				2739	1464	1275

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	0	0	2	0
Retail	5		0	0	176	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	62	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,739	1,464	1,275
Internal Capture Percentage	20%	18%	21%
External Vehicle-Trips ³	2,199	1,194	1,005
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	23%	15%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2030)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	16	16	1.00	82	82
Retail	1.00	624	624	1.00	676	676
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	775	775	1.00	464	464
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	3	0	2	0
Retail	14		196	27	176	34
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		50	0	0	31	0
Retail	5		0	0	357	0
Restaurant	5	312		0	124	0
Cinema/Entertainment	1	25	0		31	0
Residential	9	62	0	0		0
Hotel	0	12	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	14	2	16	2	0	0
Retail	78	546	624	546	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	178	597	775	597	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	18	64	82	64	0	0
Retail	181	495	676	495	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	71	393	464	393	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2030)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				53	8	45
Retail				715	343	372
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1054	659	395
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				1924	1059	865

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	0	0	1	0
Retail	2		0	0	97	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	5	34	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,924	1,059	865
Internal Capture Percentage	15%	14%	17%
External Vehicle-Trips ³	1,628	911	717
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	15%	10%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2030)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	8	8	1.00	45	45
Retail	1.00	343	343	1.00	372	372
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	659	659	1.00	395	395
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	2	0	1	0
Retail	7		108	15	97	19
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	16	166	83	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		27	0	0	26	0
Retail	2		0	0	303	0
Restaurant	2	172		0	105	0
Cinema/Entertainment	0	14	0		26	0
Residential	5	34	0	0		0
Hotel	0	7	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	7	1	8	1	0	0
Retail	43	300	343	300	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	98	561	659	561	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	10	35	45	35	0	0
Retail	99	273	372	273	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	39	356	395	356	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2030)	Organization:	Oakpointe		
Project Location:	Black Diamond, WA	Performed By:	Transpo Group		
Scenario Description:	Phase 1B	Date:	9/3/2020		
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				45	7	38
Retail				585	281	304
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				815	403	412

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	0	0	1	0
Retail	2		0	0	53	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	28	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	815	403	412
Internal Capture Percentage	23%	24%	23%
External Vehicle-Trips ³	625	308	317
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	71%	24%
Retail	13%	18%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	44%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2030)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	7	7	1.00	38	38
Retail	1.00	281	281	1.00	304	304
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	2	0	1	0
Retail	6		88	12	79	15
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		22	0	0	5	0
Retail	2		0	0	53	0
Restaurant	2	141		0	18	0
Cinema/Entertainment	0	11	0		5	0
Residential	4	28	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	5	2	7	2	0	0
Retail	36	245	281	245	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	54	61	115	61	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	29	38	29	0	0
Retail	55	249	304	249	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	31	39	70	39	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	North Triangle (2030)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				220	35	185
Retail				874	420	454
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				0	0	0
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				1094	455	639

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		34	0	0	0	0
Retail	9		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,094	455	639
Internal Capture Percentage	8%	9%	7%
External Vehicle-Trips ³	1,008	412	596
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	26%	18%
Retail	8%	2%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	North Triangle (2030)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	35	35	1.00	185	185
Retail	1.00	420	420	1.00	454	454
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		37	7	0	4	0
Retail	9		132	18	118	23
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		34	0	0	0	0
Retail	11		0	0	0	0
Restaurant	11	210		0	0	0
Cinema/Entertainment	2	17	0		0	0
Residential	20	42	0	0		0
Hotel	0	8	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	26	35	26	0	0
Retail	34	386	420	386	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	34	151	185	151	0	0
Retail	9	445	454	445	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

2031 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	153	70	223	0%	0	0	0	734	450	284
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	24	10	34	0%	0	0	0	132	77	55
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	17	6	23	0%	0	0	0	93	54	39
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	85,000 SF	Eqn	1.15	98	16%	16	82	14	18	32	0%	0	0	0	66	2	64
Retail	820	325,000 SF	Eqn	4.00	1300	48%	624	676	78	181	259	20%	208	104	104	833	442	391
Total					2,739		1,464	1275	301	301	602		208	104	104	1,929	1059	870

2031 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	93	45	138	0%	0	0	0	685	425	260
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	11	4	15	0%	0	0	0	100	59	41
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	10	5	15	0%	0	0	0	101	61	40
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	45,000 SF	Eqn	1.18	53	16%	8	45	7	10	17	0%	0	0	0	36	1	35
Retail	820	145,000 SF	Eqn	4.93	715	48%	343	372	43	99	142	20%	114	57	57	459	243	216
Total					1,924		1,059	865	179	179	358		114	57	57	1,452	823	629

2031 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B				Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷		Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs		134	63%	84	50	0%	39	22	61	0%	0	0	0	73	45	28
Multifamily	221	125 DUs		51	61%	31	20	47%	15	9	24	0%	0	0	0	27	16	11
Senior Adult Housing	251	DUs		0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students		0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	40,000 SF		45	16%	7	38	31%	5	9	14	0%	0	0	0	31	2	29
Retail	820	180,000 SF		585	48%	281	304	16%	36	55	91	20%	94	47	47	400	198	202
Total				815		403	412		95	95	190		94	47	47	531	261	270

2031 PM Peak Hour Trip Generation Calculations – Lawson Hills (Phase 2)

Weekday PM Peak Hour - Cumulative Phase 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	1.01	107	63%	67	40	16	15	31	0%	0	0	0	76	51	25
Multifamily	221	72 DUs	Eqn	0.45	32	61%	20	12	0	0	0	0%	0	0	0	32	20	12
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					241		136	105	31	31	62		0	0	0	179	105	74

2031 PM Peak Hour Trip Generation Calculations – North Triangle (Phase 1B)

Weekday PM Peak Hour - Cumulative Phase 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	DUs	Eqn	0.00	0	63%	0	0				0%	0	0	0	0	0	0
Multifamily	221	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	253,000 SF	Eqn	1.09	275	16%	44	231	9	34	43	0%	0	0	0	232	35	197
Retail	820	190,000 SF	Eqn	4.60	874	48%	420	454	34	9	43	20%	166	83	83	665	303	362
Total					1,149		464	685	43	43	86		166	83	83	897	338	559

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).

2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.

3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten

4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.

5. Land use code used in the ITE *Trip Generation Manual*.

6. Proposed land use size.

7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.

8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2031)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				98	16	82
Retail				1300	624	676
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1239	775	464
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				2739	1464	1275

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	0	0	2	0
Retail	5		0	0	176	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	62	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,739	1,464	1,275
Internal Capture Percentage	20%	18%	21%
External Vehicle-Trips ³	2,199	1,194	1,005
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	23%	15%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Devel+B2:166oped by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2031)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	16	16	1.00	82	82
Retail	1.00	624	624	1.00	676	676
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	775	775	1.00	464	464
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	3	0	2	0
Retail	14		196	27	176	34
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		50	0	0	31	0
Retail	5		0	0	357	0
Restaurant	5	312		0	124	0
Cinema/Entertainment	1	25	0		31	0
Residential	9	62	0	0		0
Hotel	0	12	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	14	2	16	2	0	0
Retail	78	546	624	546	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	178	597	775	597	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	18	64	82	64	0	0
Retail	181	495	676	495	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	71	393	464	393	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2031)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				53	8	45
Retail				715	343	372
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1054	659	395
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				1924	1059	865

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	0	0	1	0
Retail	2		0	0	97	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	5	34	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,924	1,059	865
Internal Capture Percentage	15%	14%	17%
External Vehicle-Trips ³	1,628	911	717
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	15%	10%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2031)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	8	8	1.00	45	45
Retail	1.00	343	343	1.00	372	372
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	659	659	1.00	395	395
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	2	0	1	0
Retail	7		108	15	97	19
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	16	166	83	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		27	0	0	26	0
Retail	2		0	0	303	0
Restaurant	2	172		0	105	0
Cinema/Entertainment	0	14	0		26	0
Residential	5	34	0	0		0
Hotel	0	7	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	7	1	8	1	0	0
Retail	43	300	343	300	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	98	561	659	561	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	10	35	45	35	0	0
Retail	99	273	372	273	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	39	356	395	356	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2031)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				45	7	38
Retail				585	281	304
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				815	403	412

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	0	0	1	0
Retail	2		0	0	53	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	28	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	815	403	412
Internal Capture Percentage	23%	24%	23%
External Vehicle-Trips ³	625	308	317
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	71%	24%
Retail	13%	18%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	44%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2031)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	7	7	1.00	38	38
Retail	1.00	281	281	1.00	304	304
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	2	0	1	0
Retail	6		88	12	79	15
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		22	0	0	5	0
Retail	2		0	0	53	0
Restaurant	2	141		0	18	0
Cinema/Entertainment	0	11	0		5	0
Residential	4	28	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	5	2	7	2	0	0
Retail	36	245	281	245	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	54	61	115	61	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	29	38	29	0	0
Retail	55	249	304	249	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	31	39	70	39	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Lawson Hills (2031)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				0	0	0
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				139	87	52
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				241	136	105

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	241	136	105
Internal Capture Percentage	0%	0%	0%
External Vehicle-Trips ³	241	136	105
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	N/A	N/A
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	0%	0%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Project Name:	Lawson Hills (2031)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	0	0	1.00	0	0
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	87	87	1.00	52	52
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	22	11	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	3	0
Retail	0		0	0	40	0
Restaurant	0	0		0	14	0
Cinema/Entertainment	0	0	0		3	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	87	87	87	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	52	52	52	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	North Triangle (2031)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				275	44	231
Retail				874	420	454
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				0	0	0
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				1149	464	685

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		34	0	0	0	0
Retail	9		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,149	464	685
Internal Capture Percentage	7%	9%	6%
External Vehicle-Trips ³	1,063	421	642
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	20%	15%
Retail	8%	2%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	North Triangle (2031)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	44	44	1.00	231	231
Retail	1.00	420	420	1.00	454	454
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		46	9	0	5	0
Retail	9		132	18	118	23
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		34	0	0	0	0
Retail	14		0	0	0	0
Restaurant	13	210		0	0	0
Cinema/Entertainment	3	17	0		0	0
Residential	25	42	0	0		0
Hotel	0	8	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	35	44	35	0	0
Retail	34	386	420	386	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	34	197	231	197	0	0
Retail	9	445	454	445	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

2032 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1A, 1B and 2)

Weekday PM Peak Hour - Cumulative Phase 1A, 2 and 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	1,034 DUs	Eqn	0.93	957	63%	603	354	153	70	223	0%	0	0	0	734	450	284
Multifamily	221	396 DUs	Eqn	0.42	166	61%	101	65	24	10	34	0%	0	0	0	132	77	55
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	17	6	23	0%	0	0	0	93	54	39
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	85,000 SF	Eqn	1.15	98	16%	16	82	14	18	32	0%	0	0	0	66	2	64
Retail	820	325,000 SF	Eqn	4.00	1300	48%	624	676	78	181	259	20%	208	104	104	833	442	391
Total					2,739		1,464	1275	301	301	602		208	104	104	1,929	1059	870

2032 PM Peak Hour Trip Generation Calculations – Ten Trails (Phase 1A and 2)

Weekday PM Peak Hour - Cumulative Phase 1A and 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	884 DUs	Eqn	0.93	823	63%	518	305	93	45	138	0%	0	0	0	685	425	260
Multifamily	221	271 DUs	Eqn	0.43	115	61%	70	45	11	4	15	0%	0	0	0	100	59	41
Senior Adult Housing	251	311 DUs	Eqn	0.37	116	61%	71	45	10	5	15	0%	0	0	0	101	61	40
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	45,000 SF	Eqn	1.18	53	16%	8	45	7	10	17	0%	0	0	0	36	1	35
Retail	820	145,000 SF	Eqn	4.93	715	48%	343	372	43	99	142	20%	114	57	57	459	243	216
Total					1,924		1,059	865	179	179	358		114	57	57	1,452	823	629

2032 PM Peak Hour Trip Generation Calculations – Ten Trails/Plat A (Phase 1B)

Weekday PM Peak Hour - Phase 1B			Gross Trips ¹				Internal Trips ²				Pass-By Trips ⁴				Net Trips ⁵		
Land Use	ITE LU ⁶	Size ⁷	Total Trips	% Inbound ⁹	In	Out	Rate	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	150 DUs	134	63%	84	50	0%	39	22	61	0%	0	0	0	73	45	28
Multifamily	221	125 DUs	51	61%	31	20	47%	15	9	24	0%	0	0	0	27	16	11
Senior Adult Housing	251	DUs	0	61%	0	0	0%	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	Students	0	48%	0	0	30%	0	0	0	0%	0	0	0	0	0	0
Office	710	40,000 SF	45	16%	7	38	31%	5	9	14	0%	0	0	0	31	2	29
Retail	820	180,000 SF	585	48%	281	304	16%	36	55	91	20%	94	47	47	400	198	202
Total			815		403	412		95	95	190		94	47	47	531	261	270

2032 PM Peak Hour Trip Generation Calculations – Lawson Hills (Phase 2)

Weekday PM Peak Hour - Cumulative Phase 2					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	% Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	106 DUs	Eqn	1.01	107	63%	67	40	16	15	31	0%	0	0	0	76	51	25
Multifamily	221	72 DUs	Eqn	0.45	32	61%	20	12	0	0	0	0%	0	0	0	32	20	12
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0	0	0	0	0%	0	0	0	0	0	0
Elementary School	520	600 Students	Ave	0.17	102	48%	49	53	15	16	31	0%	0	0	0	71	34	37
Office	710	SF	Eqn	0.00	0	16%	0	0	0	0	0	0%	0	0	0	0	0	0
Retail	820	SF	Eqn	0.00	0	48%	0	0	0	0	0	20%	0	0	0	0	0	0
Total					241		136	105	31	31	62		0	0	0	179	105	74

2032 PM Peak Hour Trip Generation Calculations – North Triangle (Phase 1B)

Weekday PM Peak Hour - Cumulative Phase 1B					Gross Trips ¹				Internal Trips ²			Pass-By Trips ³				Net Trips ⁴		
Land Use	ITE LU ⁵	Size ⁶	Ave or Eqn	Trip Rate ⁷	Total Trips	Inbound ⁸	In	Out	In	Out	Total	Rate	Total	In	Out	Total	In	Out
Single Family	210	DUs	Eqn	0.00	0	63%	0	0				0%	0	0	0	0	0	0
Multifamily	221	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Senior Adult Housing	251	DUs	Eqn	0.00	0	61%	0	0				0%	0	0	0	0	0	0
Elementary School	520	Students	Ave	0.17	0	48%	0	0	0	0	0	0%	0	0	0	0	0	0
Office	710	303,000 SF	Eqn	1.08	326	16%	52	274	9	34	43	0%	0	0	0	283	43	240
Retail	820	190,000 SF	Eqn	4.60	874	48%	420	454	34	9	43	20%	166	83	83	665	303	362
Total					1,200		472	728	43	43	86		166	83	83	948	346	602

Note: DU = dwelling unit, SF= square feet

1. Total vehicle trips generated by the proposed land uses during the weekday PM peak hour based on rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition, 2017).
2. Trips that are anticipated to remain internal to the proposed land uses and would not use roads external to the MPD calculated using the methodology and rates from ITE Trip Generation Handbook (3rd Edition, 2017). Ten Trails/Plat A (Phase 1A, 1B and 2) internal trips include trips that travel across Roberts Drive between Phase 1A/2 and Phase 1B. These trips are added back into the trip generation calculations when broken out by phase. As such the cumulative trip generation is slightly lower than the sum of the phases as part of this summary.
3. Vehicle trips that would already be on the adjacent street system and would make an intermediate stop at the proposed land uses before continuing to their final destination based on rates from *Trip Generation Handbook*. Ten
4. The overall new vehicle trip to the street system anticipated to be generated by the proposed land uses which would travel externally to the proposed land uses.
5. Land use code used in the ITE *Trip Generation Manual*.
6. Proposed land use size.
7. Trip generation rate based on either the average trip rate or regression equation from the *Trip Generation Manual*.
8. Percentage of trips travelling into the development during the weekday PM peak hour based on rates from the *Trip Generation Manual*.

NCHRP 8-51 Internal T+B2:I37rip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2032)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A, 2 and 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				98	16	82
Retail				1300	624	676
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1239	775	464
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				2739	1464	1275

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	0	0	2	0
Retail	5		0	0	176	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	9	62	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	2,739	1,464	1,275
Internal Capture Percentage	20%	18%	21%
External Vehicle-Trips ³	2,199	1,194	1,005
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	23%	15%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2032)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	16	16	1.00	82	82
Retail	1.00	624	624	1.00	676	676
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	775	775	1.00	464	464
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		16	3	0	2	0
Retail	14		196	27	176	34
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	19	195	97	0		14
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		50	0	0	31	0
Retail	5		0	0	357	0
Restaurant	5	312		0	124	0
Cinema/Entertainment	1	25	0		31	0
Residential	9	62	0	0		0
Hotel	0	12	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	14	2	16	2	0	0
Retail	78	546	624	546	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	178	597	775	597	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	18	64	82	64	0	0
Retail	181	495	676	495	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	71	393	464	393	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2032)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Cumulative Phase 1A and 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				53	8	45
Retail				715	343	372
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				1054	659	395
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				1924	1059	865

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	0	0	1	0
Retail	2		0	0	97	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	5	34	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,924	1,059	865
Internal Capture Percentage	15%	14%	17%
External Vehicle-Trips ³	1,628	911	717
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	88%	22%
Retail	13%	27%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	15%	10%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2032)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	8	8	1.00	45	45
Retail	1.00	343	343	1.00	372	372
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	659	659	1.00	395	395
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		9	2	0	1	0
Retail	7		108	15	97	19
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	16	166	83	0		12
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		27	0	0	26	0
Retail	2		0	0	303	0
Restaurant	2	172		0	105	0
Cinema/Entertainment	0	14	0		26	0
Residential	5	34	0	0		0
Hotel	0	7	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	7	1	8	1	0	0
Retail	43	300	343	300	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	98	561	659	561	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	10	35	45	35	0	0
Retail	99	273	372	273	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	39	356	395	356	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Ten Trails MPD (2032)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				45	7	38
Retail				585	281	304
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				185	115	70
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				815	403	412

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	0	0	1	0
Retail	2		0	0	53	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	28	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	815	403	412
Internal Capture Percentage	23%	24%	23%
External Vehicle-Trips ³	625	308	317
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	71%	24%
Retail	13%	18%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	47%	44%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Ten Trails MPD (2032)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	7	7	1.00	38	38
Retail	1.00	281	281	1.00	304	304
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	115	115	1.00	70	70
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		8	2	0	1	0
Retail	6		88	12	79	15
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	3	29	15	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		22	0	0	5	0
Retail	2		0	0	53	0
Restaurant	2	141		0	18	0
Cinema/Entertainment	0	11	0		5	0
Residential	4	28	0	0		0
Hotel	0	6	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	5	2	7	2	0	0
Retail	36	245	281	245	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	54	61	115	61	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	29	38	29	0	0
Retail	55	249	304	249	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	31	39	70	39	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	Lawson Hills (2032)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 2			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0	0	0
Retail				0	0	0
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				139	87	52
Hotel				0	0	0
All Other Land Uses ²				102	49	53
Total				241	136	105

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	241	136	105
Internal Capture Percentage	0%	0%	0%
External Vehicle-Trips ³	241	136	105
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	N/A	N/A
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	0%	0%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Project Name:	Lawson Hills (2032)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	0	0	1.00	0	0
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	87	87	1.00	52	52
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	2	22	11	0		2
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	3	0
Retail	0		0	0	40	0
Restaurant	0	0		0	14	0
Cinema/Entertainment	0	0	0		3	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	87	87	87	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	49	49	49	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	52	52	52	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	53	53	53	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool					
Project Name:	North Triangle (2032)			Organization:	Oakpointe
Project Location:	Black Diamond, WA			Performed By:	Transpo Group
Scenario Description:	Phase 1B			Date:	9/3/2020
Analysis Year:					
Analysis Period:	PM Street Peak Hour				

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				326	52	274
Retail				874	420	454
Restaurant				0	0	0
Cinema/Entertainment				0	0	0
Residential				0	0	0
Hotel				0	0	0
All Other Land Uses ²				0	0	0
Total				1200	472	728

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office	1.00	0%	0%	1.00	0%	0%
Retail	1.00	0%	0%	1.00	0%	0%
Restaurant	1.00	0%	0%	1.00	0%	0%
Cinema/Entertainment	1.00	0%	0%	1.00	0%	0%
Residential	1.00	0%	0%	1.00	0%	0%
Hotel	1.00	0%	0%	1.00	0%	0%
All Other Land Uses ²	1.00	0%	0%	1.00	0%	0%

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		34	0	0	0	0
Retail	9		0	0	0	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,200	472	728
Internal Capture Percentage	7%	9%	6%
External Vehicle-Trips ³	1,114	429	685
External Transit-Trips ⁴	0	0	0
External Non-Motorized Trips ⁴	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	17%	12%
Retail	8%	2%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

³Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

⁴Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas Transportation Institute

Project Name:	North Triangle (2032)
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	52	52	1.00	274	274
Retail	1.00	420	420	1.00	454	454
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		55	11	0	5	0
Retail	9		132	18	118	23
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		34	0	0	0	0
Retail	16		0	0	0	0
Restaurant	16	210		0	0	0
Cinema/Entertainment	3	17	0		0	0
Residential	30	42	0	0		0
Hotel	0	8	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	9	43	52	43	0	0
Retail	34	386	420	386	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	34	240	274	240	0	0
Retail	9	445	454	445	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

Future 2032 With Phase 1B Weekday PM Peak Hour Intersection Queue Summary

#	Intersection	Available Storage (ft)	95th Percentile Queue (ft)
1	<u>SE 288th Street / 216th Avenue SE</u> Westbound Left-Turn Westbound Right-Turn Northbound Through Northbound Right-Turn Southbound Left-Turn Southbound Through	>500 110 225 120 150 >500	120 60 135 25 140 170
2	<u>SE 288th Street/232nd Avenue SE</u> Westbound Left-Turn / Through Northbound Left-/Right-Turn	>500 425	25 25
3	<u>SE Covington-Sawyer Road/216th Avenue SE</u> Eastbound Through / Left-Turn Westbound Northbound Left-Turn Northbound Through / Right-Turn Southbound Through / Left-Turn Southbound Right-Turn	>500 >500 250 650 725 75	455 30 135 275 500 100
4	<u>SE Auburn-Black Diamond Road/218th Avenue SE</u> Westbound Left-Turn / Through Northbound Left- / Right-Turn	>500 >500	25 75
5	<u>Roberts Drive/Ten Trails Parkway SE</u> Eastbound Westbound Northbound Southbound	>500 >500 125 125	105 110 65 35
6	<u>Roberts Drive/Ten Trails Place SE</u> Eastbound Left-Turn Eastbound Through / Right-Turn Westbound Left-Turn Westbound Through / Right-Turn Northbound Southbound	150 >500 150 475 200 200	25 235 150 230 35 30
7	<u>Roberts Drive/Lake Sawyer Road SE</u> Eastbound Westbound Northbound Southbound	475 >500 200 >500	295 265 150 185
8	<u>Roberts Drive/Morgan Street</u> Eastbound Through / Right-Turn Westbound Left-Turn / Through Northbound Left-/Right-Turn	>500 >500 >500	230 190 80

Future 2032 With Phase 1B Weekday PM Peak Hour Intersection Queue Summary

#	Intersection	Available Storage (ft)	95th Percentile Queue (ft)
9	<u>SR 169/SE 288th Street</u> Eastbound Left-Turn Eastbound Right-Turn Northbound Left-Turn Northbound Through Southbound Through Southbound Right-Turn	>500 75 175 >500 >500 200	140 60 105 85 210 25
10	<u>SR 169/SE Black Diamond-Ravensdale Road</u> Westbound Right-Turn Northbound Through / Right-Turn	>500 375	130 25
11	<u>SR 169/Roberts Drive</u> Eastbound Left-Turn Eastbound Right Turn Northbound Left-Turn / Through Southbound Through Southbound Right-Turn	>500 200 >500 1,050 200	165 105 165 235 80
12	<u>SR 169 / Baker Road</u> Eastbound Left- / Right-Turn Northbound Left-Turn Northbound Through Southbound Through / Right-Turn	300 50 225 850	160 25 115 830
13	<u>SR 169 / Lawson Road</u> Eastbound Westbound Northbound Left-Turn Northbound Through / Right-Turn Southbound Left-Turn Southbound Through / Right-Turn	175 425 100 >500 175 225	25 95 25 115 25 120
14	<u>SR 169/Jones Lake Road</u> Eastbound Through / Right-Turn Northbound Left-Turn / Through	>500 100	25 25
15	<u>SR 169 / SE Green Valley Road</u> Eastbound Left- / Right-Turn Northbound Left-Turn / Through	>500 >500	25 25
16	<u>SE Kent-Kangley Road/Landsburg Road SE</u> Eastbound Westbound Northbound Southbound	>500 >500 >500 250	145 90 40 165

Future 2032 With Phase 1B Weekday PM Peak Hour Intersection Queue Summary

#	Intersection	Available Storage (ft)	95th Percentile Queue (ft)
17	<u>SE Auburn-Black Diamond Road/SE Green Valley Road</u> <i>Westbound Left-Turn</i> <i>Northbound Left-Turn</i> <i>Northbound Right-Turn</i>	150 >500 125	25 45 25
18	Lawson Street/Lawson Parkway <i>Eastbound</i> <i>Westbound</i> <i>Northbound</i> <i>Southbound</i>	>500 >500 250 400	25 25 25 25
19	SR 169/Pipeline Road <i>Eastbound</i> <i>Northbound</i> <i>Southbound Through</i> <i>Southbound Right-Turn</i>	>500 >500 >500 200	25 215 240 50
20	SR 169/North Connector <i>Eastbound Left-Turn</i> <i>Eastbound Right-Turn</i> <i>Northbound</i> <i>Southbound</i>	>500 300 >500 >500	180 280 200 625
21	Lake Sawyer Road SE/Ten Trails Parkway SE <i>Eastbound</i> <i>Northbound</i> <i>Southbound</i>	>500 >500 >500	25 60 65
22	Lake Sawyer Road SE/Plat A Driveway <i>Eastbound</i>	>500	25

THE VILLAGES / TEN TRAILS MPD
PHASE 1B PLAT A – PRELIMINARY PLAT
PLN20-0107

EXHIBIT 7

TITLE: Ten Trails MPD Phase 1B Detailed Implementation
Schedule for Regional Infrastructure Improvements

PREPARED BY: Oakpointe LLC

DATE: June 30, 2022

Ten Trails

Detailed Implementation Schedule Phase 1B Regional Infrastructure Improvements

(June 30, 2022)

Pursuant to Conditions of Approval of Ten Trails (formerly The Villages) MPD (Nos. 29 and 164) and Lawson Hills MPD (Nos. 27 and 169) and consistent with Sections 11.2 – 11.5 of Ten Trails and Lawson Hills MPD Development Agreements, the following provides a list of both on-site and off-site regional infrastructure and its timing necessary to serve Phase 1B of Ten Trails and Lawson Hills MPDs, as well as all future transportation improvements. Acceptable engineering alternatives or equivalents may be proposed by the Master Developer during final engineering for the following list of on-site and off-site regional infrastructure improvements as provided in Section 11 of Ten Trails and Lawson Hills MPD Development Agreements. Model home permits shall be excluded from associated triggers noted below as set forth in Section 11.4 of Ten Trails and Lawson Hills MPD Development Agreements.

In background, extensive infrastructure improvements have been designed, permitted and constructed since the approval of the Ten Trails and Lawson Hills Development Agreements. Of pertinence to Phase 1B please note the following:

- A dual water main providing redundant, looped water service (750 pz zone) to Phase 1B was constructed within Roberts Drive and has now been accepted by the City of Black Diamond for service. This project is an engineering equivalent to 1B-10, which is therefore not required to serve (westerly) Phase 1B with water.
- A new pressure reducing valve station has been constructed on the east side of Ten Trails Parkway just north of SE Dogwood Street. This completes the redundancy system for the 750 pz zone by delivering 750 pz flows from the 850 pz pipeline.
- A new roundabout at the intersection of Ten Trails Parkway and Roberts Drive SE has been constructed and accepted by the City of Black Diamond for use. The northerly stem of the roundabout stubs into Phase 1B Plat A “Parcel C” (now known as Mountain View) for extension of the Ten Trails MPD Community Connector (see below).

The scope and timing of transportation-related improvements are based on the Phase 1B Traffic Monitoring Report (Phase 1B TMR, Transpo 2020) and as applicable, updated analyses performed as part of the Phase 1A Mid-Point Traffic Monitoring Report (Phase 1A MP TMR, Transpo 2021). According to the Phase 1A Mid-point TMR, the dedication and construction of Pipeline Road will be triggered prior to build-out of Phase 1B development. In addition, the roadway capacity within each MPD (Lawson Hills and Ten Trails) will accommodate the anticipated traffic demand, and there is sufficient capacity to accommodate the maximum vehicle queues at each study intersection with the proposed improvements. Note: Other intersection improvements to control traffic may be proposed by the Master Developer as acceptable to the City’s Master Development Review Team or King County/WSDOT for those intersections located outside the City.

The following section describes the implementation schedule for the phased improvements associated with Phase 1B and is summarized in the table below.

1. Parcel A Small Interim Lift Station

Construction Threshold

Development within Parcel A and the northerly portion of Parcel B will require the use of a temporary lift station until improvement of the Lawson Hills North Connector in future phases extends gravity sewer service southerly

to the sewer main within Pipeline Road (see attached exhibit showing Parcels A and B). This infrastructure improvement shall be required to be operational prior to the City's issuance of the first occupancy permit within Parcel A or B.

Improvement Details

The Interim Lift Station will be designed and constructed in accordance with the City of Black Diamond Engineering Design and Construction Standards as though the facility was intended to be a permanent facility. Prior to design of this facility, Master Developer shall submit a plan showing the interim service area boundary and maximum number of units (in ERU) that can be served by this interim facility.

2. Parcel A Wastewater Storage

Construction Threshold

The capacity of the downstream sewer system may require storage to enable off-peak pumping of sewer effluent. This will be further analyzed in final design. This infrastructure improvement may be required to be operational prior to the City's issuance of the first occupancy permit within Parcel A or B.

Improvement Details

The wastewater storage facility (if needed) will be designed and constructed in accordance with the City of Black Diamond Engineering Design and Construction Standards as though the facility was intended to be a permanent facility. It may consist of an underground vault or oversized pipe.

3. Parcel A Sewer Discharge Improvement

Construction Threshold

With the development of the Interim Lift Station (see #1 above), a discharge line will be concurrently constructed to connect to the existing sewer main within SR 169 to the east. The precise alignment of this improvement is subject to future analysis. This infrastructure improvement may be required to be operational prior to the City's issuance of the first occupancy permit within Parcel A or B.

Improvement Details

A corridor for this improvement will be cleared and graded to allow for construction of the pipeline. A sewer force main of appropriate diameter will be constructed within this corridor and along SR 169 to reach the discharge point.

4. Parcel A Water Main Extension

Construction Threshold

The development of Parcel A and northerly Parcel B will require extension of water service from the existing City of Black Diamond water system. It will be sized to accommodate the level of development proposed and shall be functional prior to the City's issuance of the first building permit requiring flammable construction materials.

Improvement Details

The improvement will consist of one or two water mains extended from existing water facilities within SR 169. With improvement of other properties along SR 169, the extent of required extensions will change over time depending on the timing of development of Parcel A and northerly Parcel B. The design requirement will be the provision of a redundant water main loop with sufficient fire flow capacity to serve the proposed development.

5. Parcel A Stormwater Facilities

Construction Threshold

The Parcel A Stormwater Pond and Infiltration Facilities will either be constructed in phases or as a single facility depending on the level of intensity of development of Parcel A.

Improvement Details

The Parcel A stormwater facilities will consist of water quality treatment facilities followed by an infiltration facility. The water quality treatment facilities will be designed to meet the phosphorous control standards of Appendix O of the Ten Trails and Lawson Hills Development Agreements. The infiltration facilities will be designed based on infiltration rate testing meeting the requirements of the 2012 DOE manual with 2014 updates.

6. Lawson Hills MPD North Connector From SR 169 Through Parcel A and 700 Feet Into Parcel B

Construction Threshold

Lawson Hills MPD North Connector through the North Triangle property is proposed to be constructed in multiple phases according to the development of sub-parcels needing access. Its final phase will provide access to and into Parcel B. Each phase of this infrastructure improvement shall be required to be operational prior to the City's issuance of the first occupancy permit for each successive phase within Parcel A or B.

Improvement Details

The first phase of Lawson Hills MPD North Connector will be constructed from a new intersection with SR 169 near the northerly tip of the "triangle". This intersection will provide access to the North Triangle and Parcel B but also to the future Pipeline Road and the Ten Trails main property to the west. Recent analysis has shown that a roundabout will likely provide the best operation of this intersection. From this intersection the North Connector will continue south with intervening intersections as needed to serve sub-parcels. The North Connector will typically consist of a single 10-foot travel lane in each direction with 5-foot bike lanes except at intersections where left turn lanes may be required. Meandering paths/walkways will be installed on either side of the roadway instead of sidewalks in open space tracts adjacent to the right-of-way. The North Connector will be designed for a 25-mph design speed.

Utilities will be installed with construction of the North Connector to serve sub-parcels as they develop. Storm drainage will consist of water quality treatment facilities being directed to infiltration galleries within the portions of the site containing outwash soils suitable for infiltration. These may be phased temporary facilities that are replaced by larger master facilities at the build-out of the North Triangle. One water main (850 pressure zone) will be installed within the roadway to connect to a planned stub at SR 169 for looping of the water system. A gravity sewer main will also be provided to connect to an interim lift station (see below).

7. SR 169 Frontage Improvements Adjoining Lawson Hills Parcel A

Construction Threshold

In conjunction with the proposed roundabout at the intersection with the Lawson Hills MPD North Connector, adjustment and reorientation of the approaching lanes within SR 169 will be required for the northbound and southbound approaches to the intersection. In addition, pedestrian improvements will be added along the west side of SR169 where it adjoins Parcel A. This infrastructure improvement shall be required to be operational prior to the City's issuance of the first occupancy permit within Parcel A.

Improvement Details

The northerly leg of this improvement will primarily consist of lane improvements to coordinate with the proper approach to the roundabout. It is within rural King County and extension of sewer and water facilities are not anticipated. Storm drainage will consist of water quality treatment facilities being directed to infiltration galleries within the portions of the site containing outwash soils suitable for infiltration.

The southerly leg of this improvement will consist of lane improvements, pedestrian facilities and utility extensions. It is within the City of Black Diamond and will include urban improvements. Storm drainage will consist of water quality treatment facilities being directed to infiltration galleries within the portions of the site containing outwash soils suitable for infiltration. The pedestrian improvement will consist of either a 4.5-foot planter strip with adjoining 5-foot sidewalk or meandering 5-foot sidewalk with minimum separation of 4.5 feet

from the back of curb. Water mains within this portion of SR 169 will be constructed as discussed in Item 4 above. Sewer facilities may or may not be constructed depending on the needs of adjoining properties and potential alternate routes.

8. Phase 1B Looped Water Main

Construction Threshold

As discussed in the preamble, an engineering alternative has already been constructed which serves the westerly portion of Phase 1B in the vicinity of Lake Sawyer Rd SE and Roberts Dr. No additional improvements are required for Phase 1B apart from those discussed in Item 4 above.

9. Lake Sawyer Road SE Pressure Reducing Valve

Construction Threshold

As discussed in the preamble, an engineering alternate to the Lake Sawyer Road SE Pressure Reducing Valve has already been constructed to provide equivalent service to this portion of Phase 1B. No additional improvements are required.

10. Extend Ten Trails MPD Community Connector (Ten Trails Parkway SE)

Construction Threshold

The extension of Ten Trails MPD Community Connector through Phase 1B in Ten Trails MPD will be constructed in one phase through Mountain View at the construction of the plat.

Improvement Details

The Ten Trails MPD Community Connector (Ten Trails Parkway SE) will be extended through Mountain View from the existing roundabout at Roberts Drive northerly to its intersection with Lake Sawyer Rd SE. An interim tee intersection will be provided. The ultimate planned roundabout at this intersection will be constructed with the improvement of future Pipeline Road (Phase 3). This section of the Community Connector will consist of 31 feet of right-of-way from back of curb to back of curb with a single 10-foot travel lane in each direction and-foot bike lanes and vertical curbs with gutters. Meandering paths/walkways will be installed on either side of the roadway instead of sidewalks in open space tracts adjacent to the right-of-way.

Mountain View is planned for infiltration of all stormwater. Therefore, bio-retention cells (or equivalent) and infiltration galleries will be provided for the Community Connector to water quality treat and infiltrate all runoff. An adaptive management connection to Roberts Drive will be provided for the southerly portion of Mountain View. One water main (750 pressure zone) will be installed within the roadway to connect to the existing stub at Roberts Drive for looping of the water system. A gravity sewer main will also be provided (serves only Mountain View).

11. Mountain View Frontage Improvements Along Existing Lake Sawyer Rd SE

Construction Threshold

With the development of Mountain View, frontage improvements will be constructed along the west side of Lake Sawyer Rd SE from the north property line of Mountain View southerly to the north leg of the newly constructed roundabout at Roberts Drive SE. These improvements will be constructed in one phase and will be completed prior to the City's issuance of the first occupancy permit within Mountain View.

Improvement Details

This frontage improvement will consist of adding sufficient pavement on the west side of Lake Sawyer Rd SE for a southbound travel lane and one 5-foot bike lane. The pedestrian improvement will consist of either a 4.5-foot planter strip with adjoining 5-foot sidewalk or meandering 5-foot sidewalk with minimum separation of 4.5 feet

from the back of curb. These improvements will be accomplished within the existing 30-foot half street right-of-way.

Utilities will be installed with construction of the frontage improvements. Storm drainage will consist of water quality treatment facilities being directed to infiltration galleries. Sewer and water facilities already exist within the right-of-way and will not be augmented.

12. Pipeline Road

Construction Threshold

Per Section 6.4.3 of The Ten Trails Development Agreement, Pipeline Road shall be dedicated to the City prior to the City's approval of a building permit for the 1,200th Dwelling Unit of the Ten Trails MPD, and that Pipeline Road shall be constructed by the Master Developer and open for traffic prior to the City's approval of a building permit for the 1746th Dwelling Unit of the Ten Trails MPD (inclusive of all Phases). It is expected that both of these triggers will be met prior to build-out of the Mountain View parcel in conjunction with the combined Ten Trails dwelling units of Phases 1A, 1B and 2.

Improvement Details

The design of Pipeline Road is to extend from Mountain View at the intersection of Ten Trails Parkway SE and Lake Sawyer Road SE, easterly towards SR 169, intersection SR 169 in the vicinity of Black Diamond-Ravensdale Road.

13. SR 169/SE 288th St Intersection Improvements (Phases 1 and 2)

Construction Threshold

A phased intersection improvement is anticipated. Construction of the phase 1 intersection improvement at SR 169 and SE 288th Street will commence as soon as design and permitting are completed and prior to the City's issuance of a certificate of occupancy for the 646th ERU (Phases 1A, 1B and 2 combined). The second phase will occur prior to the City's issuance of a certificate of occupancy for the 1,954th ERU¹ (Phases 1A, 1B and 2 combined). The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.

Improvement Details

The first phase to be implemented immediately is the rechannelization of the north leg of the intersection to provide a refuge and merge lane to receive eastbound left turning vehicles from SE 288th St. The second phase involves installation of traffic signal.

14. SE 288 St/216th Ave SE Intersection Improvement

Construction Threshold

Construction of an intersection improvement at 216th Ave SE and SE 288th Street will commence as soon as design and permitting are completed and prior to the City's issuance of a certificate of occupancy for the 827th ERU (provided that at least one ERU is located within Phase 1B).

Improvement Details

The intersection improvement at this location is anticipated to consist of the installation of a traffic signal and northbound right-turn lane.

¹ ERU trigger based on updated analyses from the Phase 1A Mid-Point TMR

15. SE Covington-Sawyer Rd/216th Ave SE Intersection Improvement

Construction Threshold

An intersection improvement will be necessary by approximately the end of the first year of Phase 1B development and should commence prior to the City's issuance of a certificate of occupancy for the 1,089th ERU² (Phases 1A, 1B, and 2 combined).

Improvement Details

The intersection improvement is anticipated to be a north bound, left-turn lane.

16. SR 169/Baker St and SR 169/Lawson Street Intersection Improvements (Phases 1 and 2)

Construction Threshold

A phased intersection improvement is anticipated. Due to the proximity of the two intersections, improvements at one intersection influence the operations of the other intersection. Near term intersection improvements at SR 169 and Baker Street and SR 169 and Lawson Street will be constructed prior to the City's issuance of a certificate of occupancy for the 1,089th ERU² provided at least one ERU is located in Phase 1B (Phases 1A, 1B and 2 combined). Phase 2 intersection improvements will be installed prior to the City's issuance of a certificate of occupancy for the 1,422nd ERU³ (Phases 1A, 1B and 2 combined). The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.

Implementation Details

The Phase 1 improvement will include rechannelization to provide a two-way, left-turn lane at SR 169/Baker Street. While an improvement at SR169/Lawson Street is not needed at this time, the proximity of SR 169/Lawson Street and SR 169/Baker Street is such that the two-way left-turn lane will naturally extend to Lawson Street. To accommodate the necessary tapers north and south of the two-way left-turn lane between Baker Street and Lawson Street, the two-way left-turn lane will extend north of Baker Street allowing for an eastbound-to-northbound left-turn refuge lane, and a northbound left-turn lane will be provided at Lawson Street.

Phase 2 improvements include installing a traffic signal at the SR 169/Baker Street and SR 169/Lawson Street intersections. Similar to Phase 1, it is not necessary at this time to install a traffic signal at the SR 169/Baker Street intersection; however, it is recommended to install both signals at the same time so they can be immediately coordinated.

17. Roberts Dr/Ten Trails Pl SE Intersection Improvement

Construction Threshold

The intersection improvement will occur in approximately the third year of Phase 1B development prior to the City's issuance of a certificate of occupancy for the 1,422nd ERU³ (Phases 1A, 1B and 2 combined).

Improvement Details

The intersection improvement at this location is anticipated to be the installation of a traffic signal.

18. Roberts Drive/Morgan Street Intersection Improvement

Construction Threshold

The intersection improvement will be necessary by approximately the fourth year of Phase 1B development and prior to the City's issuance of a certificate of occupancy for the 1,900th ERU (Phases 1A, 1B and 2 combined).

² ERU trigger based on updated analyses from the Phase 1A Mid-Point TMR

However, this future improvement will not be necessary in the event that Pipeline Road is under construction prior to the City's issuance of a certificate of occupancy for the 1,900th ERU.

Implementation Details

It is anticipated that a traffic signal will be installed at this location.

19. Lake Sawyer Rd/Ten Trails Pkwy SE Intersection Improvement

Construction Threshold

An intersection improvement will be required prior to the City's issuance of a certificate of occupancy for the 1,800th ERU³ (Phases 1A, 1B and 2 combined).

Implementation Details

A single-lane roundabout will be constructed at this location.

20. SR 169/North Connector Intersection Improvements (Phases 1 and 2)

Construction Threshold

A phased intersection improvement is anticipated. The Phase 1 intersection improvement will be implemented prior to the 2,123rd ERU (Phases 1A, 1B, and 2 combined). Phase 2 will occur prior to the City's issuance of a certificate of occupancy for the 2,700th ERU (Phases 1A, 1B, and 2 combined). Construction of this intersection and all associated improvements shall only be required provided the North Triangle of Lawson Hills has development activity. The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.

Implementation Details

The phase 1 improvement includes construction of a single-lane roundabout. Approximately three years later after the 2,700th ERU, the phase 2 improvements will include constructing an eastbound right-turn lane.

21. SE Auburn-Black Diamond Rd/SE Green Valley Rd Intersection Improvement

Construction Threshold

An intersection improvement will be required prior to the City's issuance of a certificate of occupancy for the 2,438th ERU (Phases 1A, 1B and 2 combined). The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.

Implementation Details

The west leg of the intersection will be rechannelized to provide a refuge/merge lane for northbound to westbound left turning vehicles.

22. SE Auburn-Black Diamond Rd/218th Ave SE Intersection Improvement

Construction Threshold

Construction of an intersection improvement at Auburn-Black Diamond Rd and 218th Ave SE will commence prior to the City's issuance of a certificate of occupancy for the 2,916th ERU (Phases 1A, 1B and 2 combined).

³ ERU trigger based on updated analyses from the Phase 1A Mid-Point TMR

The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.

Improvement Details

The intersection improvement at this location is anticipated to consist of constructing a north bound to west bound refuge and merge lane to receive northbound left turning vehicles.

23. SR 169/SE Green Valley Rd Intersection Improvement

Construction Threshold

An intersection improvement will be necessary prior to the City's issuance of a certificate of occupancy for the 2,965th ERU (Phases 1A, 1B and 2 combined). The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.

Implementation Details

The improvement at this location includes restriping SR 169 through and leading up to the intersection to include a two-way, left-turn lane.

24. SE Kent-Kangley Rd/Landsburg Rd SE Intersection Improvement

Construction Threshold

An intersection improvement was cited as being necessary by approximately the end of the first year of Phase 1B development based on the findings of the Phase 1B TMR. Following completion of Phase 1B TMR, King County completed an improvement at this intersection consisting of the conversion from two-way stop-controlled to all-way stop-controlled. This intersection was reevaluated as part of the Phase 1A Mid-Point TMR with incorporation of the all-way stop-control improvement. It was determined that no additional improvement would be needed at this intersection through build-out of Phase 1A (or through the build-out of 2,123 ERUs). This intersection will continue to be evaluated as part of subsequent TMRs and Mid-Point TMRs for the Ten Trails and Lawson Hills TMRs to determine the scope and timing of any subsequent improvements.

25. SR 169/Roberts Dr Intersection Improvement

Construction Threshold

An intersection improvement (rechannalization and roundabout) will be completed at SR 169 and Roberts Drive as soon as design and permitting are completed (not part of Phase 1B) and in accordance with the City's approval schedule. While an additional improvement at this intersection was identified as part of the Phase 1B TMR, the design of the initial improvement has since been adjusted to include a northbound left-turn lane within the roundabout. This intersection was reevaluated as part of the Phase 1A Mid-Point TMR with incorporation of the revised roundabout design. It was determined that no additional improvement would be needed at this intersection through build-out of Phase 1A (or through the build-out of 2,123 ERUs). This intersection will continue to be evaluated as part of subsequent TMRs and Mid-Point TMRs for the Ten Trails and Lawson Hills TMRs to determine the scope and timing of any subsequent improvements.

Regional Infrastructure Improvement	Construction Threshold	Funding Responsibility
Parcel A Small Interim Lift Station	Development within Parcel A and the northerly portion of Parcel B will require the use of a temporary lift station until improvement of the Lawson Hills North Connector in future phases extends gravity sewer service southerly to the sewer main within Pipeline Road. This infrastructure improvement will be required to be operational prior to the first occupancy permit within Parcel A or B.	Master Developer
Parcel A Wastewater Storage	The capacity of the downstream sewer system may require storage to enable off-peak pumping of sewer effluent. This will be further analyzed in final design. This infrastructure improvement may be required to be operational prior to the City's issuance of the first occupancy permit within Parcel A or B.	Master Developer
Parcel A Sewer Discharge Improvement	With the development of the Interim Lift Station, a discharge line will be concurrently constructed to connect to the existing sewer main within SR 169 to the east. The precise alignment of this improvement is subject to future analysis. This infrastructure improvement may be required to be operational prior to the City's issuance of the first occupancy permit within Parcel A or B.	Master Developer
Parcel A Water Main Extension	The development of Parcel A and northerly Parcel B will require extension of water service from the existing City of Black Diamond water system. It will be sized to accommodate the level of development proposed and will be required to be functional prior to the first building permit requiring flammable construction materials.	Master Developer
Parcel A Stormwater Facilities	The Parcel A Stormwater Pond and Infiltration Facilities will either be constructed in phase or as a single facility depending on the level of intensity for development of Parcel A.	Master Developer
Lawson Hills MPD North Connector from SR 169 Through Parcel A and 700 Feet Into Parcel B	Lawson Hills MPD North Connector through the North Triangle property is proposed to be constructed in multiple phases according to the development of sub-parcels needing access. Its final phase will provide access to and into Parcel B. Each phase of this infrastructure improvement shall be required to be operational prior to the City's issuance of the first occupancy permit for each successive phase within Parcel A or B.	Master Developer
SR 169 Frontage Improvements Adjoining Lawson Hills Parcel A	In conjunction with the proposed roundabout at the intersection with the Lawson Hills MPD North Connector, adjustment and reorientation of the approaching lanes within SR 169 will be required for the northbound and southbound approaches to the intersection. In addition, pedestrian improvements will be added	Master Developer

	along the west side of SR169 where it adjoins Parcel A. This infrastructure improvement shall be required to be operational prior to the City's issuance of the first occupancy permit within Parcel A.	
Phase 1B Looped Water Main	An engineering equivalent has already been constructed.	Master Developer
Lake Sawyer Road SE Pressure Reducing Valve	An engineering equivalent has already been constructed.	Master Developer
Extend Ten Trails MPD Community Connector (Ten Trails Parkway SE)	The extension of Ten Trails MPD Community Connector through Phase 1B in Ten Trails MPD will be constructed in one phase through Mountain View at the commencement of development of Mountain View.	Master Developer
Mountain View Frontage Improvements along existing Lake Sawyer Rd SE	With the Development of Mountain View, frontage improvements will be constructed along the west side of Lake Sawyer Rd SE from the north property line of Mountain View southerly to the north leg of the newly constructed roundabout at Roberts Drive SE. These improvements will be constructed in one phase and will be completed prior to the first occupancy permit within Mountain View.	Master Developer
Pipeline Road	Pipeline Road shall be dedicated to the City prior to the City's approval of a building permit for the 1,200 th Dwelling Unit of the Ten Trails MPD, and Pipeline Road shall be constructed by the Master Developer and open for traffic prior to the City's approval of a building permit for the 1746 th Dwelling Unit of the Ten Trails MPD (inclusive of all Phases). It is expected that both of these triggers will be met prior to build-out of the Mountain View parcel in conjunction with the combined Ten Trails dwelling units of Phases 1A, 1B and 2. The design of Pipeline Road is to extend from Mountain View at the intersection of Ten Trails Parkway SE and Lake Sawyer Road SE, easterly towards SR 169, intersection SR 169 in the vicinity of Black Diamond-Ravensdale Road.	Master Developer
SR 169/SE 288th St Intersection Improvement	A phased intersection improvement is anticipated. Construction of the phase 1 intersection improvement at SR 169 and SE 288 th Street will commence as soon as design and permitting are completed and prior to the City's issuance of a certificate of occupancy for the 646 th ERU (Phases 1A, 1B and 2 combined). The second phase will occur prior to the City's issuance of a certificate of occupancy for the 1,954 th ERU (Phases 1A, 1B and 2 combined). <i>See</i> Phase 1B Traffic Monitoring Report by Transpo Group (September 2020) and Phase 1A Mid-Point Traffic Monitoring Report by Transpo Group (November 2021). The timing shown for this transportation improvement is dependent on any additional time demonstrated to	Master Developer

	the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.	
SE 288 St/216th Ave SE Intersection Improvement	Construction of an intersection improvement at 216th Ave SE and SE 288th Street will commence as soon as design and permitting are completed and prior to the City's issuance of a certificate of occupancy for the 827 th ERU (provided that at least one ERU is located within Phase 1B). <i>See</i> Traffic Monitoring Report by Transpo Group (September 2020).	Master Developer
SE Covington-Sawyer Rd/216th Ave SE	An intersection improvement will be necessary by approximately the end of the first year of Phase 1B development and should commence prior to the City's issuance of a certificate of occupancy for the 1,089 th ERU (Phases 1A, 1B, and 2 combined). <i>See</i> Phase 1A Mid-Point Traffic Monitoring Report by Transpo Group (November 2021).	Master Developer
SR 169/Baker St and SR 169/Lawson St	A phased intersection improvement is anticipated. Due to the proximity of the two intersections, improvements at one intersection influence the operations of the other intersection. Near term intersection improvements at SR 169 and Baker Street and SR 169 and Lawson Street will be constructed prior to the City's issuance of a certificate of occupancy for the 1,089 th ERU provided at least one ERU is located in Phase 1B (Phases 1A, 1B and 2 combined). Phase 2 intersection improvements will be installed prior to the City's issuance of a certificate of occupancy for the 1,422 nd ERU (Phases 1A, 1B and 2 combined). <i>See</i> Phase 1A Mid-Point Traffic Monitoring Report by Transpo Group (November 2021). The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.	Master Developer
Roberts Dr/Ten Trails Pl SE	The intersection improvement will occur in approximately the third year of Phase 1B development prior to the City's issuance of a certificate of occupancy for the 1,422 nd ERU (Phases 1A, 1B and 2 combined). <i>See</i> Phase 1A Mid-Point Traffic Monitoring Report by Transpo Group (November 2021).	Master Developer
Roberts Dr/Morgan St	The intersection improvement will be necessary by approximately the fourth year of Phase 1B development and prior to the City's issuance of a certificate of occupancy for the 1,900 th ERU (Phases 1A, 1B and 2 combined). However, this future improvement will not be necessary in the event that Pipeline Road is under construction prior to the City's issuance of a certificate of occupancy for the 1,900 th ERU. <i>See</i> Traffic Monitoring Report by Transpo Group (September 2020).	Master Developer

Lake Sawyer Rd/Ten Trails Pkwy SE	An intersection improvement will be required prior to the City's issuance of a certificate of occupancy for the 1,800 th ERU (Phases 1A, 1B and 2 combined). <i>See</i> Phase 1A Mid-Point Traffic Monitoring Report by Transpo Group (November 2021).	Master Developer
SR 169/North Connector	A phased intersection improvement is anticipated. The Phase 1 intersection improvement will be implemented prior to the 2,123 rd ERU (Phases 1A, 1B, and 2 combined). Phase 2 will occur prior to the City's issuance of a certificate of occupancy for the 2,700 th ERU (Phases 1A, 1B, and 2 combined). Construction of this intersection and all associated improvements shall only be required if development provided the North Triangle of Lawson Hills has development activity. <i>See</i> Traffic Monitoring Report by Transpo Group (September 2020). The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.	Master Developer
SE Auburn-Black Diamond Rd/SE Green Valley Rd	An intersection improvement will be required prior to the City's issuance of a certificate of occupancy for the 2,438 th ERU (Phases 1A, 1B and 2 combined). <i>See</i> Traffic Monitoring Report by Transpo Group (September 2020). The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.	Master Developer
SE Auburn-Black Diamond Rd/218th Ave SE	Construction of an intersection improvement at Auburn-Black Diamond Rd and 218 th Ave SE will commence prior to the City's issuance of a certificate of occupancy for the 2,916 th ERU (Phases 1A, 1B and 2 combined). <i>See</i> Traffic Monitoring Report by Transpo Group (September 2020). The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.	Master Developer
SR 169/SE Green Valley Rd	An intersection improvement will be necessary prior to the 2,965 th ERU (Phases 1A, 1B and 2 combined). <i>See</i> Traffic Monitoring Report by Transpo Group (September 2020). The timing shown for this transportation improvement is dependent on any additional time demonstrated to the reasonable satisfaction of the City's Designated Official to be necessary due to action, inaction, or events outside the Master Developer's control.	Master Developer

THE VILLAGES / TEN TRAILS MPD
PHASE 1B PLAT A – PRELIMINARY PLAT
PLN20-0107

EXHIBIT 8

TITLE: Ten Trails MPD Phase 1B Fiscal Impact Analysis Approval

PREPARED BY: The City of Black Diamond

DATE: September 21, 2021



CITY OF BLACK DIAMOND

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MEMORANDUM

Date: September 21, 2021

From: Andrew Williamson

Re: Approval Fiscal Impact Analysis for Phase 1A, 2 and 1B

Pursuant to Section 13.6 (Fiscal Impacts Analysis) of The Villages Master Planned Development Development Agreement (adopted by Ordinance 11-970) the Master Developer submitted documents pertaining to the Fiscal Impacts Analysis. These documents have been reviewed by the Designated Official and the contracted Master Development Review Team (MDRT) fiscal impact consultant, FCS Group.

Mr. Martin Chaw of FCS Group, prepared a memorandum dated September 17, 2021, documenting the independent review of the subject fiscal analysis prepared by DPGF, titled, "Phase 1A & 2 & 1B Fiscal Impact Analysis for the Ten Trails (fka The Villages) and Lawson Hills Master Planned Development dated August 20, 2021. The recommendation is: "Based on our review, we recommend that the City approve DPGF's August 20, 2021 FIA as submitted". This fulfills the requirements of Section 13.6 of the Development Agreement"

The additional fiscal condition #83 set by the Hearing Examiner's condition of approval on the Villages MPD Phase 1A and Phase 2 has been fulfilled.

The undersigned Designated Official hereby approves the Fiscal Analysis prepared for Ten Trails fkaThe Villages MPD Phase 1A and Phase 2 and Phase 1B based on the recommendation of the MDRT fiscal consultant.

Andrew Williamson
Designated Official Fiscal Analysis