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MEMORANDUM

Date:	September 24, 2021	**TG:**	16450.00
To:	Andrew Williamson – City of Black Diamond		
From:	Mike Swenson, P.E., PTOE and Maris Fry, P.E. – Transpo Group		
cc:	Brian Ross and Justin Wortman – Oakpointe		
Subject:	Requested Comprehensive Plan Amendment – SE Connector Alternative		

This memorandum provides analysis evaluating the proposed inclusion of a route for the SE Connector that differs from the conceptual route depicted in the City of Black Diamond's 2019 Comprehensive Plan. This updated route has been referred to as the SE Connector Alternative. Oakpointe is requesting the SE Connector Alternative be added to the Comprehensive Plan as preliminary engineering studies of the current SE Connector alignment have identified significant challenges. It would be beneficial to include both alignments in the Comprehensive Plan to allow continued refinement of site development and roadway engineering plans. In support of this proposed amendment, this memorandum includes the following information:

- Overview of the proposed SE Connector Alternative
- SE Connector Challenges and Considerations
- Operational impacts of the SE Connector Alternative
    - Summary of pertinent EIS analyses and findings
    - SE Connecter Alternative impacts

As detailed below, this analysis determined that the impacts of the proposed SE Connector Alternative could be sufficiently mitigated through the addition of turn lanes at the intersection of SR 169/Baker Street and installation of a traffic signal at Lawson Street/Lawson Connector. Improvements are still required at the intersection of SR 169/Jones Lake Road, but to a lesser extent than proposed in the EIS. All other mitigation measures outlined in the EIS are sufficient to accommodate shifts in traffic patterns with the proposed SE Connector Alternative.

SE Connector Alternative Overview

As shown in Figure 1, the Comprehensive Plan currently identifies the SE Connector as a connection between the Lawson Connector and State Route (SR) 169. In addition to the Lawson Street and the Lawson Connector, the SE Connector was proposed to provide additional connectivity between the Lawson Hills MPD and SR 169. The SE Connector Alternative proposed to be incorporated into the Comprehensive Plan has been identified as shown in Figure 1. The SE Connector Alternative would connect the Lawson Hills MPD to Lawson Street, which then connects to SR 169. The Lawson Connector would remain.

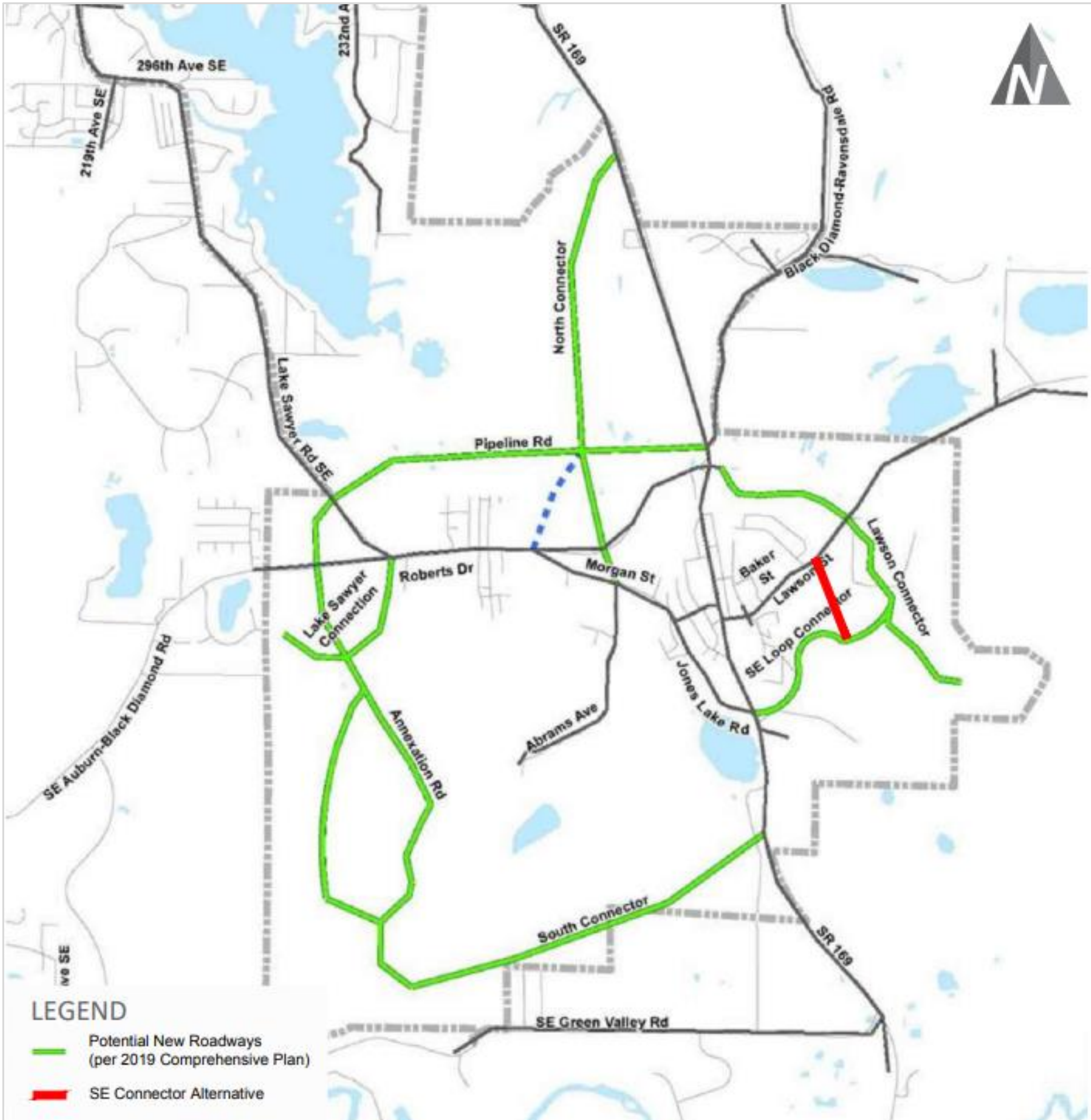

Figure 1: Proposed SE Connector Alternative **(Base Map Source: City of Black Diamond 2019 Comprehensive Plan)**

To understand the anticipated impacts of the proposed SE Connector Alternative, the volume projections outlined in the Environmental Impact Study (EIS), which were documented in detail in the *Lawson Hills Transportation Technical Report* (TTR) performed by Parametrix in 2009, were updated assuming traffic shifts from the SE Connector to the Lawson Connector and Lawson Street via the SE Connector Alternative. In contrast, the previously submitted analysis determined the *worst-case impacts* of the proposed SE Connector Alternative assuming that *all traffic* shifts from the SE Connector to Lawson Street.

The routing patterns outlined in the EIS assume most project traffic travels to and from the north and west. Specifically, 60 percent of traffic is projected to travel to and from the north via SR 169 and 25 percent of traffic is projected to travel to and from the west via Roberts Drive or downtown Black Diamond. These assumptions are generally based on the City's and the Puget Sound

Regional Council (PSRC) travel demand model with minor adjustments incorporated based on local knowledge of the regional transportation system.

Based on routing patterns outlined in the EIS, this analysis assumes that approximately 60 percent of traffic previously routed to the SE Connector is routed to the Lawson Connector, and the remaining 40 percent is routed to Lawson Street. This assumes that all traffic traveling to and from the south utilizes Lawson Street only. Traffic traveling to and from the north and west primarily utilizes the Lawson Connector and secondarily utilizes Lawson Street. The proposed alignment of the Lawson Connector results in a vehicular route that is more convenient than Lawson Street for the majority of vehicles traveling north and west, but this analysis assumes that approximately 15 percent of vehicles traveling north and west are rerouted to Lawson Street and the remainder are rerouted to the Lawson Connector. Based on the anticipated trip assignment and re-routing associated with the revised Alternative analysis, volume and operations impacts were evaluated at the following intersections:

1. SR 169/Lawson Connector
2. SR 169/Baker Street
3. SR 169/Lawson Street
4. SR 169/Jones Lake Road
5. Railroad Avenue/Baker Street
6. Lawson Street/SE Connector Alternative
7. Lawson Street/Lawson Connector

SE Connector Challenges and Considerations

Since completion of the EIS, preliminary designs of the currently identified SE Connector have identified several challenges associated with the roadway, including but not limited to roadway grade, right of way impacts, and storm drainage. The SE Connector Alternative was explored to help mitigate these challenges while maintaining a supplemental access to the Lawson Hills MPD. A summary of the evaluation between the SE Connector and the Alternative is summarized in Table 1. A comprehensive alternatives evaluation is included as Attachment A.

Table 1. SE Connector Alternative Evaluation

Evaluation Parameter	SE Connector	SE Connector Alternative
Max. Roadway Grade (%)	12	2
Road Length	2,600 ft	900 ft
Earthwork Volume	15,920 CY Cut; 25,575 CY Fill	650 CY Cut; 1,200 CY Fill
Max. Wall Height	25 ft	No walls
Wall Square Footage	24,900	No walls
Storm Drainage	Large vault	Utilizes MPD facilities
Right of Way Acquisition	16 properties	1 parcel
SR 169 Intersection Improvements	New intersection	No new intersection

Source: Lawson Hills MPD Condition #25 memorandum prepared by David Evans and Associates in August 2020.

Considering the above challenges, it should also be noted that most traffic traveling to and from the Lawson Hills MPD will be oriented to the north and west, rather than the south. While the SE Connector would provide a supplemental access to the Lawson Hills MPD, vehicular traffic is more likely to use the Lawson Connector as an alternative to the SE Connector rather than Lawson Street given the proposed orientation of the Lawson Connector. The following section describes the impacts to the transportation network considering the proposed SE Connector Alternative.

Traffic Operations Analysis

This section summarizes the findings of the EIS at the study intersections and the impacts of the proposed SE Connector Alternative.

Summary of Pertinent EIS Findings

The analysis contained within the EIS developed traffic volume projections and defined impacts for the Lawson Hills MPD, as well as the collective impacts of the Lawson Hills and Ten Trails MPDs. Based on this analysis, the following mitigations were identified at the above study intersections for full build-out conditions of both MPDs.

- **SR 169/Lawson Connector**: As part of the EIS, it was assumed that the Lawson Connector would intersect with SR 169 as the fourth (westbound) leg of the SR 169/Roberts Drive intersection. The proposed mitigation included second southbound and northbound through lanes and southbound and northbound left turn pockets.

  It should be noted that since the EIS was completed, the construction of a fourth leg at SR 169/Roberts Drive has been determined infeasible. As such, the SR 169/Roberts Drive intersection is currently proposed as a three-leg roundabout and the Lawson Connector will intersect with SR 169 approximately 400 feet south of Roberts Drive. While the ultimate traffic control of SR 169/Lawson Connector has not been finalized, it is preliminarily planned as a traffic signal with a single northbound through lane, a single southbound through lane and southbound left-turn lane, and a single westbound lane that would be restricted to right turns only. The analyses contained within this report assume the revised alignment and traffic control.

- **SR 169/Baker Street**: The proposed mitigation measure included implementation of a traffic signal.
- **SR 169/Lawson Street**: The proposed mitigation measure included implementation of a traffic signal and southbound left-turn lane.
- **SR 169/Jones Lake Road**: The proposed mitigation measure included implementation of a traffic signal and northbound, westbound, and southbound left-turn lanes.
- **Railroad Avenue/Baker Street:** No mitigation measures were identified in the EIS.
- **Lawson Street/SE Connector Alternative:** This intersection was not contemplated as part of the EIS.
- **Lawson Street/Lawson Connector:** This intersection was assumed to operate as side-street (Lawson Connector) stop-controlled as part of the EIS.

The mitigated channelization and traffic control as well as the future EIS traffic volumes at each intersection[1] are summarized in Figure 2. Based on a review of the EIS analysis, approximately 776 project trips were routed via the Lawson Connector, 239 project trips were routed via Lawson Street, and 778 project trips were routed via the SE Connector.

Operations Analysis

To understand the anticipated impacts of the proposed SE Connector Alternative, the volume projections outlined in the EIS were updated assuming traffic shifts from the SE Connector to the Alternative and the Lawson Connector. Based on the anticipated orientation of MPD traffic, and as

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1 The traffic volumes at SR 169/Lawson Connector are based on the future EIS traffic volumes at the intersection of SR 169/Roberts Drive/Lawson Connector with turning volumes adjusted as necessary based on the change in alignment.

outlined previously, this analysis assumes that approximately 60 percent of traffic previously routed to the SE Connector is routed to the Lawson Connector, and the remaining 40 percent is routed to Lawson Street. Figure 2 depicts the re-routed volumes and the adjusted future traffic volumes.

Using these adjusted volumes, intersection level of service (LOS) was evaluated at the study intersections. The channelization and traffic control associated with the EIS-identified mitigations were used as a baseline to determine if additional mitigations would be necessary, with the following exceptions:

- **SR 169/Lawson Connector**: As noted previously, this intersection is preliminarily planned as a traffic signal with a single northbound through lane, a single southbound through lane and southbound left-turn lane, and a single westbound lane that would be restricted to right turns only.
- **Lawson Street/SE Connector Alternative**: This intersection is assumed to operate as side-street (SE Connector Alternative) stop-controlled.

Weekday PM peak hour levels of service and delays were calculated at study intersections based on methodologies contained in the *Highway Capacity Manual, 6th Edition* (Transportation Research Board). As shown in Table 2, the re-rerouted traffic volumes result in the need for additional improvements beyond those identified in the EIS at two intersections: SR 169/Baker Street and Lawson Street/Lawson Connector. Additionally, mitigations are still required at the intersection of SR 169/Jones Lake Road, but to a lesser extent than proposed in the EIS.

To meet WSDOT's LOS D or better standard at SR 169/Baker Street, a northbound left-turn lane and southbound right-turn lane would be necessary. To meet the City of Black Diamond's LOS C or better standard at Lawson Street/Lawson Connector, the intersection would need to be signalized. Additionally, the traffic signal and northbound left-turn lane would need to remain at the intersection of SR 169/Jones Lake Road. Consistent with the EIS, no mitigations would be necessary at the intersection of Railroad Avenue/Baker Street. The mitigated channelization and traffic control assumptions are summarized in Figure 2. With these additional mitigations in place, the intersections are projected to operate at acceptable level of service, as shown on Table 2.

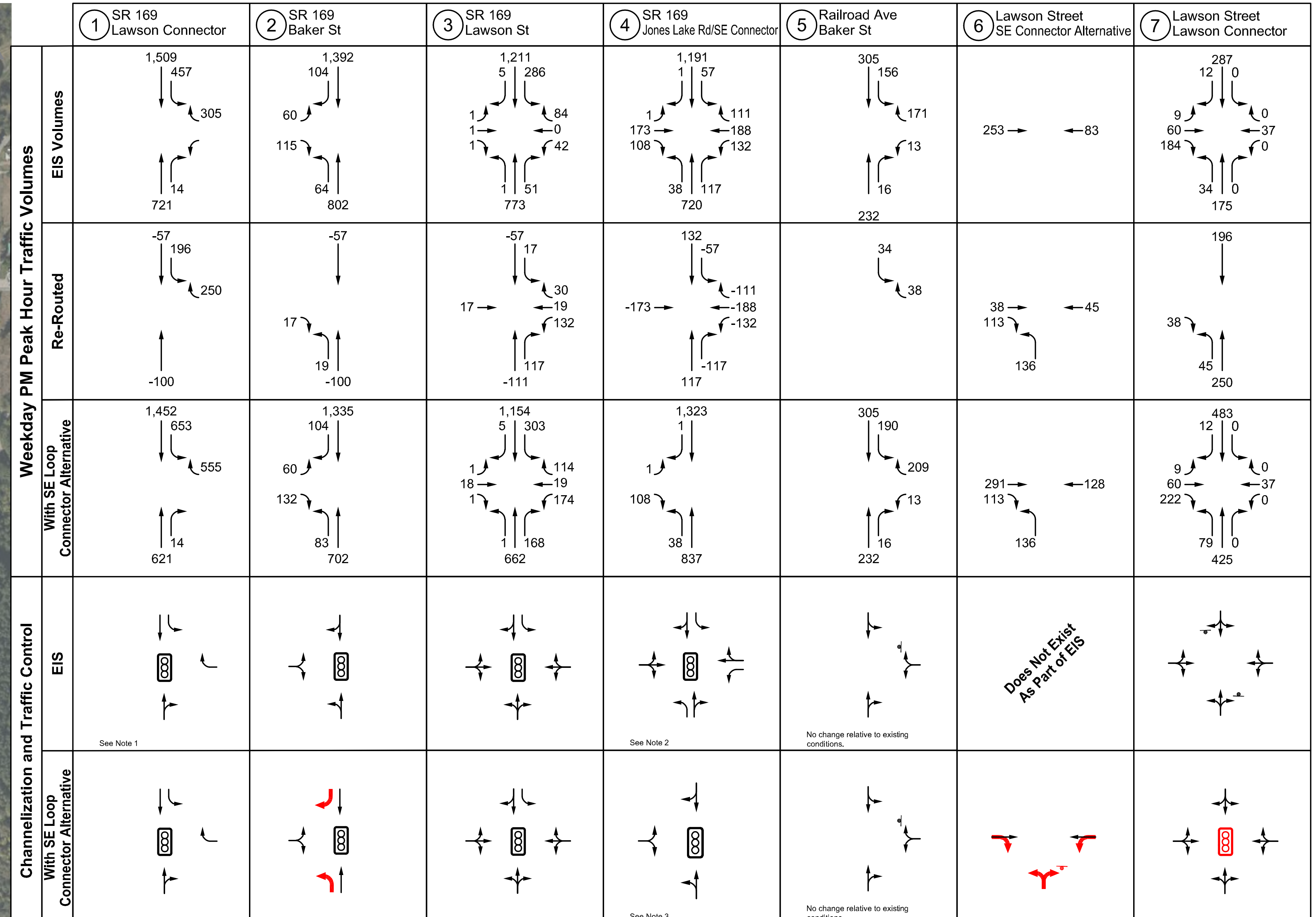
Table 2. Traffic Analysis Summary – SE Connector Alternative

Intersection	LOS Standard	With Mitigated Traffic Control from EIS			With Changes to Proposed Mitigation Measures		
		LOS[1]	Delay[2]	WM[3]	LOS	Delay	WM
1. SR 169/Lawson Connector	D	B	15	-		*No Change*	
2. SR 169/Baker St	D	F	>120	-	C	32	-
3. SR 169/Lawson St	D	B	15	-		*No Change*	
4. SR 169/Jones Lake Rd	D	B	13	-	B	16	-
5. Railroad Ave/Baker St	C	B	14	WB		*No Change*	
6. Lawson St/SE Connector Alt.	C	C	15	NB		*No Change*	
7. Lawson St/Lawson Connector	C	F	>120	NB	A	9	-

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

Conclusions

- As part of the EIS, it was assumed that vehicles accessing the Lawson Hills MPD would utilize the SE Connector, Lawson Street, and the Lawson Connector. With the proposed comprehensive plan amendment, vehicles previously assumed to utilize the SE Connector would shift to Lawson Street and the Lawson Connector. In line with the anticipated routing patterns, approximately 60 percent of trips are expected to shift to the Lawson Connector, and the remaining 40 percent are expected to shift to Lawson Street.
- The operations analysis determined that the impacts of the SE Connector Alternative can be adequately mitigated assuming the following:
    - Implementation of additional improvements beyond those identified in the EIS at two intersections:
        - **SR 169/Baker Street**: New northbound left-turn lane and southbound right-turn lane
        - **Lawson Street/Lawson Connector**: Traffic signal
    - Implementation of limited improvements (traffic signal) at the intersection of **SR 169/Jones Lake Road**
    - Improvements would remain unnecessary at the intersection of Railroad Avenue/Baker Street.



Notes:
1) Intersection was analyzed as a four leg intersection as part of the EIS (with Roberts Drive as fourth leg). Channelization adjusted as part of this analysis to be consistent with current feasible mitigation measures.
2) Signal was proposed with new east leg of intersection
3) East leg of intersection no longer proposed and northbound left-turn lane not necessary as a mitigation measure.

Summary of Traffic Analysis in Support of SE Connector Alternative

Comprehensive Plan Amendment

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FIGURE 2

Attachment A:

Comprehensive Alternatives Evaluation

DAVID EVANS AND ASSOCIATES INC.

MEMORANDUM

DATE: September 21, 2021

TO: Mona Davis
Community Development Director
24301 Roberts Drive
Black Diamond, WA 98010

FROM: Adam Stricker, PE, David Evans and Associates, Inc.
Beau Willert, PE, David Evans and Associates, Inc.

SUBJECT: Lawson Hills MPD SE Connector Analysis

PROJECT: Lawson Hills MPD

CC: Brian Ross, Oakpointe
Justin Wortman, Oakpointe
Tom Matt, PE, David Evans and Associates, Inc.

This memorandum is intended to compare the impacts of constructing secondary access roads for the Lawson MPD. The SE Connector would connect the southeastern portion of the site to SR169 via a new intersection with SR169 at Railroad Ave. An alternative route, called the "SE Connector Alternative" in this memo, has been identified that provides a secondary connection to Lawson Street.

Preliminary design studies of both the SE Connector and SE Connector Alternative have been prepared; copies are attached to this memorandum. Significant right of way, engineering and neighborhood impacts are present in the design. This memorandum compares the two alternatives relative to grading, walls, storm drainage, right of way acquisition and neighborhood impacts.

Alternative Analysis Summary:

Evaluation Parameter	SE Connector	SE Connector Alternative
Max. Roadway Grade (%)	12	2
Road Length	2,600 ft	900 ft
Earthwork Volume	15,920 CY Cut 25,575 CY Fill	650 CY Cut 1,200 CY Fill
Max. Wall Height	25'	No Walls
Wall Square Footage	24,900	No Walls
Storm Drainage	Large vault	Utilizes MPD Facilities
Right of Way Acquisition	16 Properties	1 Parcel
Proximity to Existing Homes	40 feet	250 feet
SR 169 Intersection Improvements	New intersection	No new intersection

These categories will be discussed in greater length below, but as can be seen from the brief summary above, the SE Connector Alternative is a significantly shorter road that requires substantially less impacts to surrounding properties, and will not require an independent off-site stormwater system.

A preliminary design of the SE Connector has been prepared by David Evans Associates and is presented in an engineering exhibit set titled “Lawson South Access Conceptual Plans” and has been attached to this memorandum. A preliminary plan and profile of the SE Connector Alternative has also been prepared and is presented in the attached “SE Connector Alternative” exhibits. The same road section was used in both of these design studies. These plans were created using LIDAR contours, parcel boundaries and aerial photography.

Existing Conditions and Critical Areas

The SE Connector is to be constructed over a steeply sloping forested hillside with existing grades in the range of 20% to 40% in some sections. The soils and slopes found on the SE Connector site suggest the presence of landslide hazards and potential erosion hazard areas. These critical areas are found on the Lawson Hills MPD site near the connection point to the SE Connector. Geotechnical analysis would be required to determine if construction on these slopes could be done safely. The lower portions of the SE Connector are within the 225’ core buffer and shoreline zone of Jones Lake and cross Lawson Creek and its associated buffer.

The SE Connector Alternative route is through a relatively flat parcel of land that is outside of mapped landslide hazard areas. There are wetlands in the vicinity of the SE Connector Alternative, however no wetland buffers would need to be encroached upon for the SE Connector Alternative. The SE Connector Alternative will have to cross Lawson Creek, passing through the Lawson Creek Buffer.

Roadway Grade

The SE Connector is approximately 2,600 feet in length and accomplishes an elevation change of approximately 220’ over its length. The SE Connector will have a maximum road grade of 12% for a distance of approximately 580’.

The SE Connector Alternative requires a shorter length (approximate 900’) of road before connecting to other proposed roads internal to the Lawson Hills MPD. The majority of slopes in the SE Connector Alternative are 2% or less. Total elevation change for the SE Connector Alternative is approximately 10’.

Earthwork Volumes

The SE Connector requires 15,920 cubic yards of cut and 25,575 cubic yards of fill resulting in a net of 9,655 cubic yards fill. It is not known if the soils produced from the cut are suitable for use as fill.

The SE Connector Alternative requires a 650 cubic yards of cut and 2,600 cubic yards of fill for the grading of the SE Connector Alternative.

Wall Height

The SE Connector will require approximately ten retaining walls with several of these walls being over 20’ tall. Nearly all of these walls are proposed in areas of extreme slopes, which will complicate design and construction. The walls at stations 7+50, 11+00 and 18+00 are within 50’ of existing residences and will require special design consideration to not undermine the adjacent structures.

The SE Connector Alternative would require no retaining walls except for walls related to the crossing of Lawson Creek.

Wall Square Footage

The SE Connector requires a total of 24,900 Square feet of wall face. Additional sections of wall may be required if geotechnical studies show that the areas of proposed cut and fill slopes are not suitable.

The SE Connector alternative would require no walls or rockeries except as needed for crossing of Lawson Creek .

Bridge

The SE Connector will have to cross Lawson Creek using a 120’ long bridge. Likely construction types for this bridge could include wide flange deck girder or steel deck girder with an anticipated structure depth in the range of 50”. The allowable structure depth of the future bridge may be limited by the low clearance to the high water elevations of Lawson Creek. The bed of Lawson Creek lies about 12’ below the bridge deck and the available freeboard to pass high stream flows precludes the use of a culvert and fill style of crossing.

The SE Connector alternative would also require a similar bridge crossing of Lawson Creek.

Storm Drainage Vault

The SE Connector proposes over 2.5 acres of impervious surfaces; approximately 1.8 acres of this will be pollution generating impervious surfaces. The SE Connector will require a stormwater vault and a water quality treatment train to accomplish flow control and water quality treatment minimum requirements. Preliminary sizing of this system shows that a vault with a live storage volume of 60,800 cubic feet and a water quality volume of 30,400 cubic feet will be required. This results in a vault with a minimum footprint of 44’ wide by 196’ long by 13’ deep. The depth and width of this vault footprint was selected to minimize grading back into the hillside to the north of the vault. The north side of Railroad Ave, although in a steep hillside, is the only possible location for the vault as the south side of Railroad Ave is within the Jones Lake buffer and shoreline setback and would involve the placement of fill within this critical area. A 23’ max height wall will be required to grade in the vault location. This stormwater facility would only treat stormwater from the SE Connector.

The SE Connector Alternative will require a similar level of flow control and water quality treatment but will be able to utilize stormwater infrastructure built for other phases of the Lawson Hills MPD. The SE Connector Alternative proposes much less impervious surface than the SE Connector.

The SE Connector Alternative’s ability to utilize MPD stormwater facilities reduces the City’s maintenance burden compared to the SE Connector which would require a standalone stormwater facility. The SE Connector Alternative provides a way to prevent many of the impacts that the SE Connector presents and provides a much more economic and feasible connection.

Right of Way Acquisition

The SE Connector proposes roadway or grading over 16 privately owned parcels. Of these parcels the SE Connector bisects three and completely envelopes one. Rerouting of utility lines may require disturbances to additional properties. Some of these property owners may not be interested in selling property for ROW and grading. If this is the case the city would have to use eminent domain to make the SE Connector feasible. In total there are seven parcels containing residences that would need to be partially or completely acquired for the construction of the SE Connector.

The SE Connector Alternative can be constructed with the acquisition of a single additional parcel (parcel number 1321069018). This parcel was identified in Figure 3-3 of the Lawson Hills MPD as a potential expansion parcel.

Proximity to Existing Homes

The SE Connector passes within 100’ of eight existing structures and three existing structures are within 40’ of proposed retaining walls. Significant grading revisions are required for the driveways to six residences that are currently accessed from Pacific Street.

Pacific Street in its existing condition is a minimally traveled, gravel paved, dead end road that serves as the access to eight residences. The SE Connector would replace Pacific Street as the access to six of these existing residences and would route a significant volume of traffic through this neighborhood. Pacific Street would need to be terminated to the north of the SE Connector as the SE Connector must be constructed approximately 6’ above the existing grade of Pacific Street at that point for slope criteria to be met.

There is one residence currently on the offsite parcel to be acquired for the SE Connector Alternative. This house could potentially remain after construction of the SE Connector Alternative. The nearest offsite house is 250’ from the SE Connector Alternative entry at Lawson street. There would be no encroachments on this off site property.

The SE Connector Alternative provides access to Lawson Street, which is currently a well-utilized route to downtown Black Diamond and SR 169. The SE Connector Alternative is much less impactful to existing residences.

SR 169 Intersection Improvements

The intersection of the SE Connector and State Route 169 presents several design challenges including intersection type selection, grading and pedestrian access. Roundabouts are the intersection type preferred by WSDOT, however the centerline slope of SR 169 in the area of the intersection ranges from 6% to 8% based on LIDAR contours. This is above the ideal range of centerline slopes for roundabout intersections (slopes of up to 4% are typical for roundabouts, 2% being ideal) however, WSDOT has designed and requested non-standard roundabouts in this range of existing slopes. Shown on the conceptual plan is a signal-controlled intersection with two travel lanes along the access and two travel lanes and a center turn lane along SR-169 requiring widening of SR169 at this location. Regrading of SR169 to a lower slope through the intersection can be anticipated. If a roundabout is ultimately required at this location additional impacts and ROW acquisition should be anticipated. The addition of an intersection, whether a roundabout or a signal, will tend to decrease the level of service of SR 169.

The SE Connector Alternative will take access off Lawson Street which intersects SR 169 near downtown Black Diamond. Intersection improvements at Lawson Street and SR 169 are already a requirement of the MPD and would provide far less impacts to traffic than an additional intersection on SR 169 as is necessary with the SE Connector. A new intersection at Lawson Street would be required. It is acknowledged that further traffic impact analysis would need to be conducted to fully understand offsite road improvements that the SE Connector Alternative may trigger.

Conclusion

The SE Connector design has a number of design constraints that make it much more impactful than the SE Connector Alternative. The SE Connector proposes to add a major roadway, several large walls and a bridge in the middle of a quiet neighborhood. The SE Connector requires a new intersection on SR169 and a standalone stormwater facility. This infrastructure and the property acquisition, including possible eminent domain, necessary to construct this alternative would have a major impact on the character of the community.

The SE Connector Alternative is able to accomplish a secondary connection with a significantly shorter length of road through fewer critical areas. The reduction in impervious surfaces that the SE Connector Alternative can provide is in keeping with the overall MPD goals of reducing impervious coverage and impacts to critical areas.

Attachments/Enclosures:

- SE Connector Overall Improvement Plan – Aerial
- SE Connector Overall Improvement Plan & Property Owner Impacts
- SE Connector (Lawson South Access) Profiles
- SE Connector Alternative Improvement Plan & Profile

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

LAWSON SOUTH ACCESS

CONCEPTUAL PLAN

CITY OF BLACK DIAMOND

WASHINGTON

OVERALL IMPROVEMENT PLAN
AERIAL

CONCEPTUAL NOT FOR CONSTRUCTION

STAMP NOT VALID UNLESS SIGNED AND DATED

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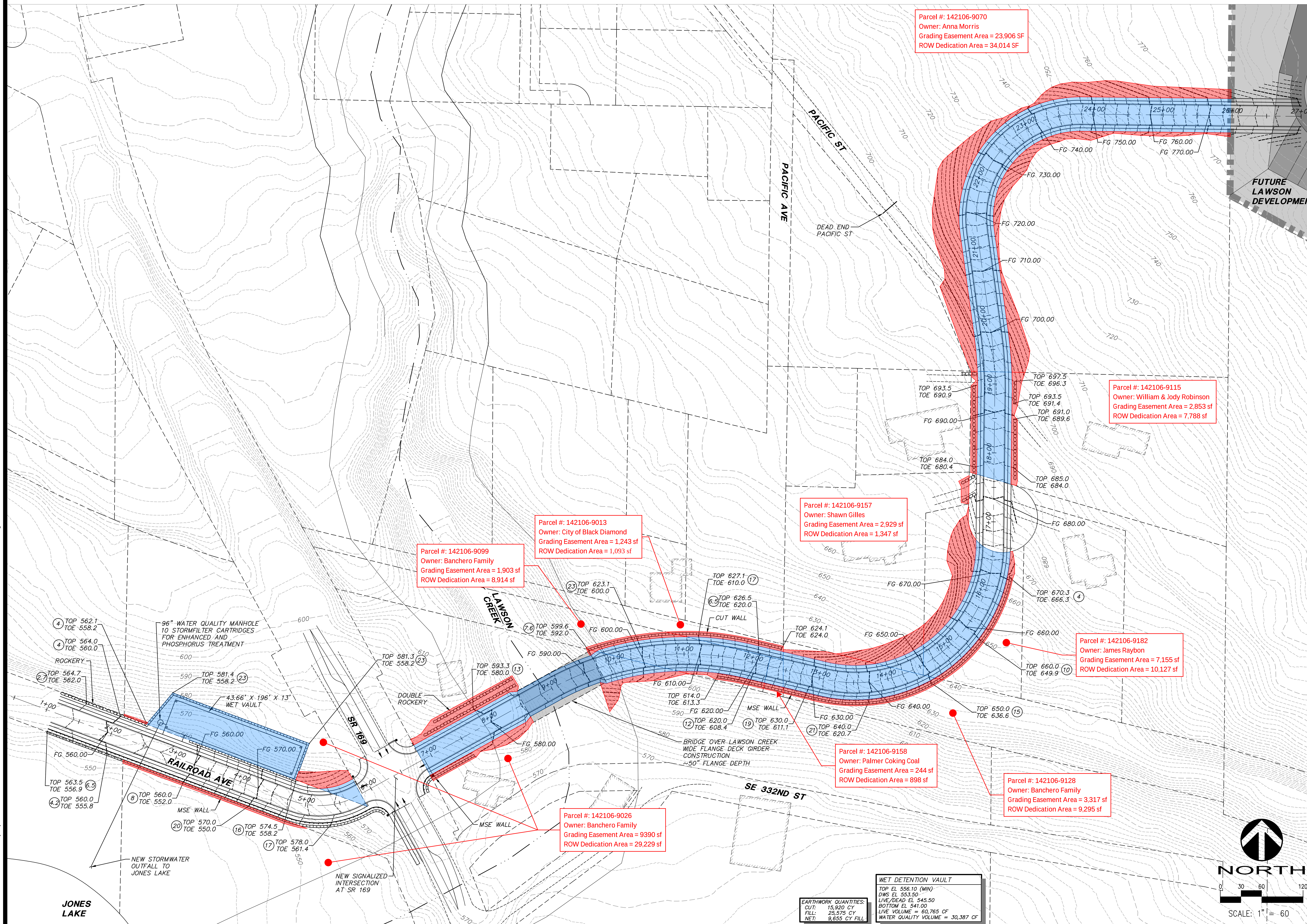

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CONCEPTUAL PLAN

OVERALL IMPROVEMENT PLAN

CITY OF BLACK DIAMOND

WASHINGTON

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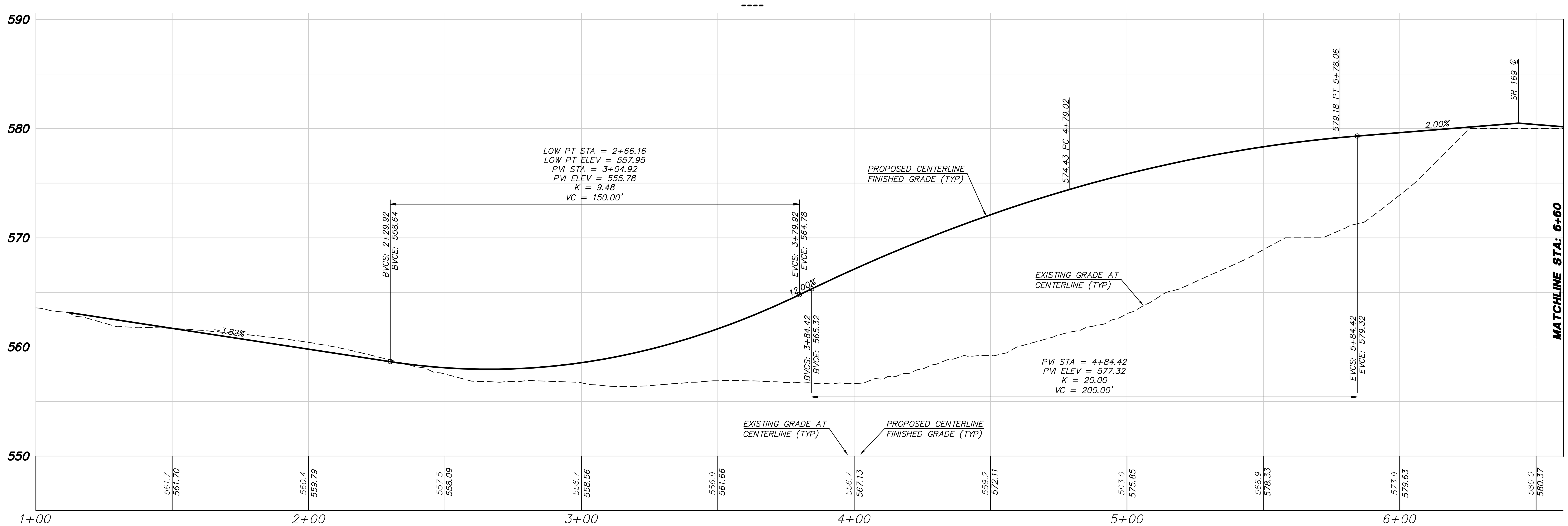

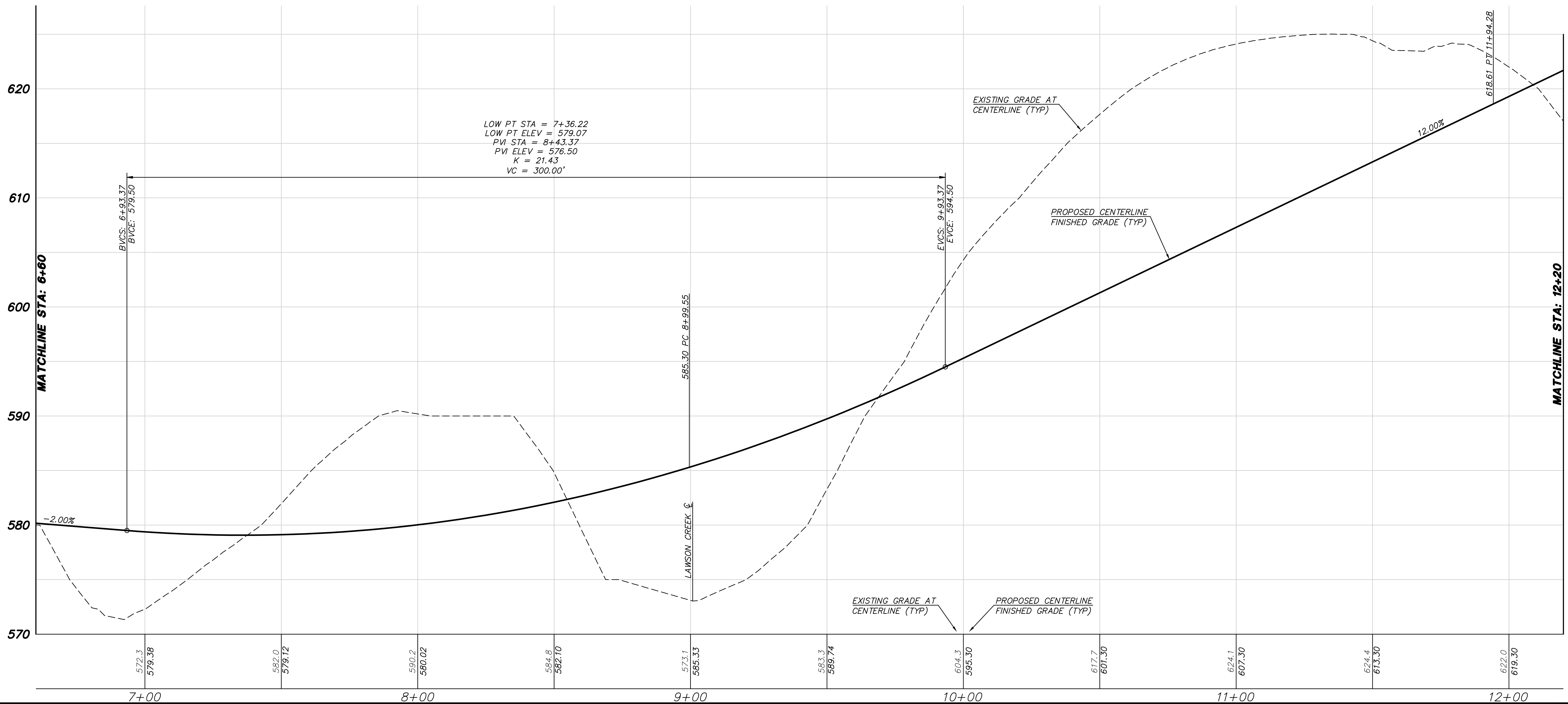

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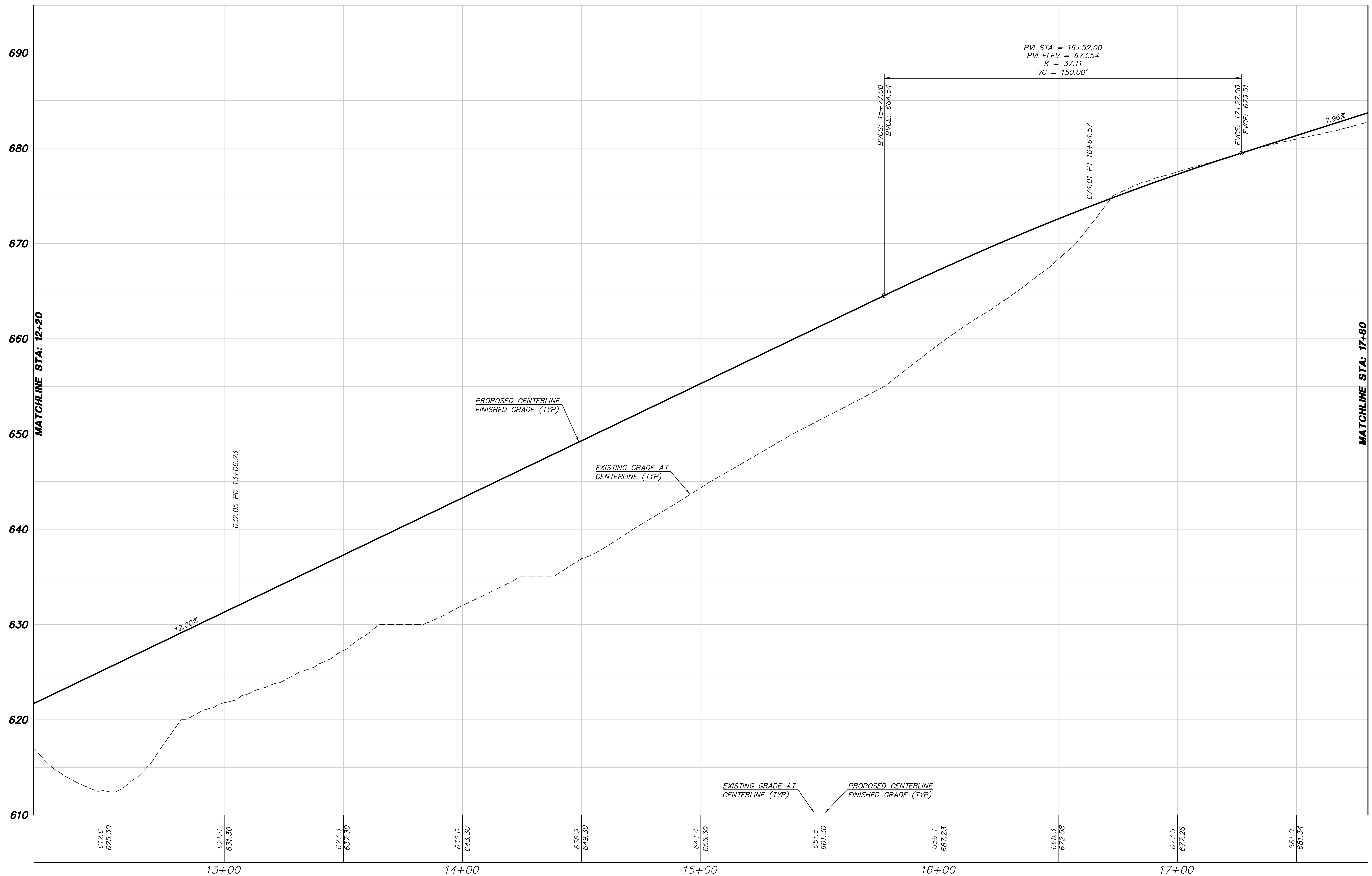

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CONCEPTUAL PLAN

CITY OF BLACK DIAMOND WASHINGTON

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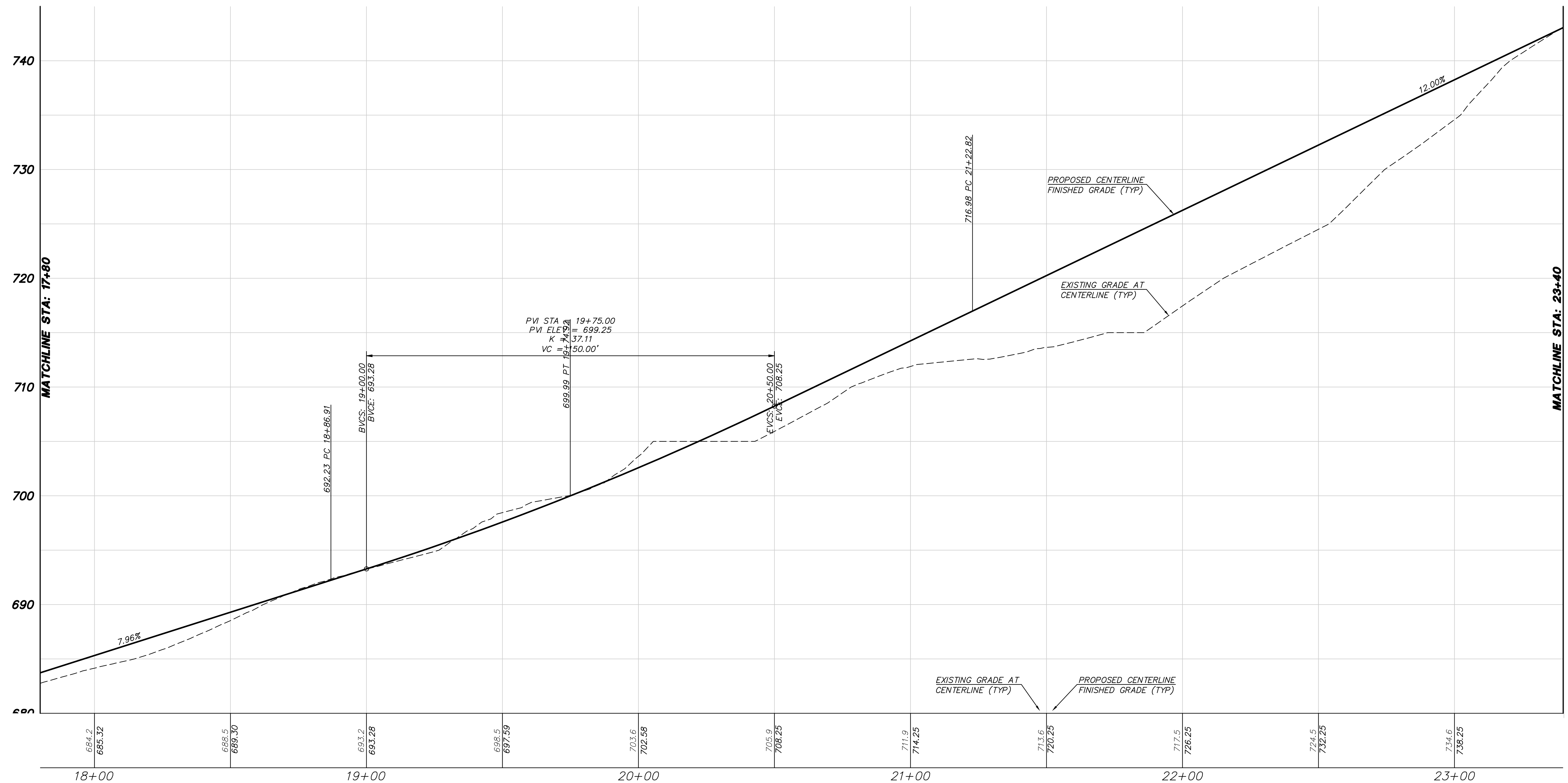

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CONCEPTUAL PLAN

CITY OF BLACK DIAMOND — WASHINGTON

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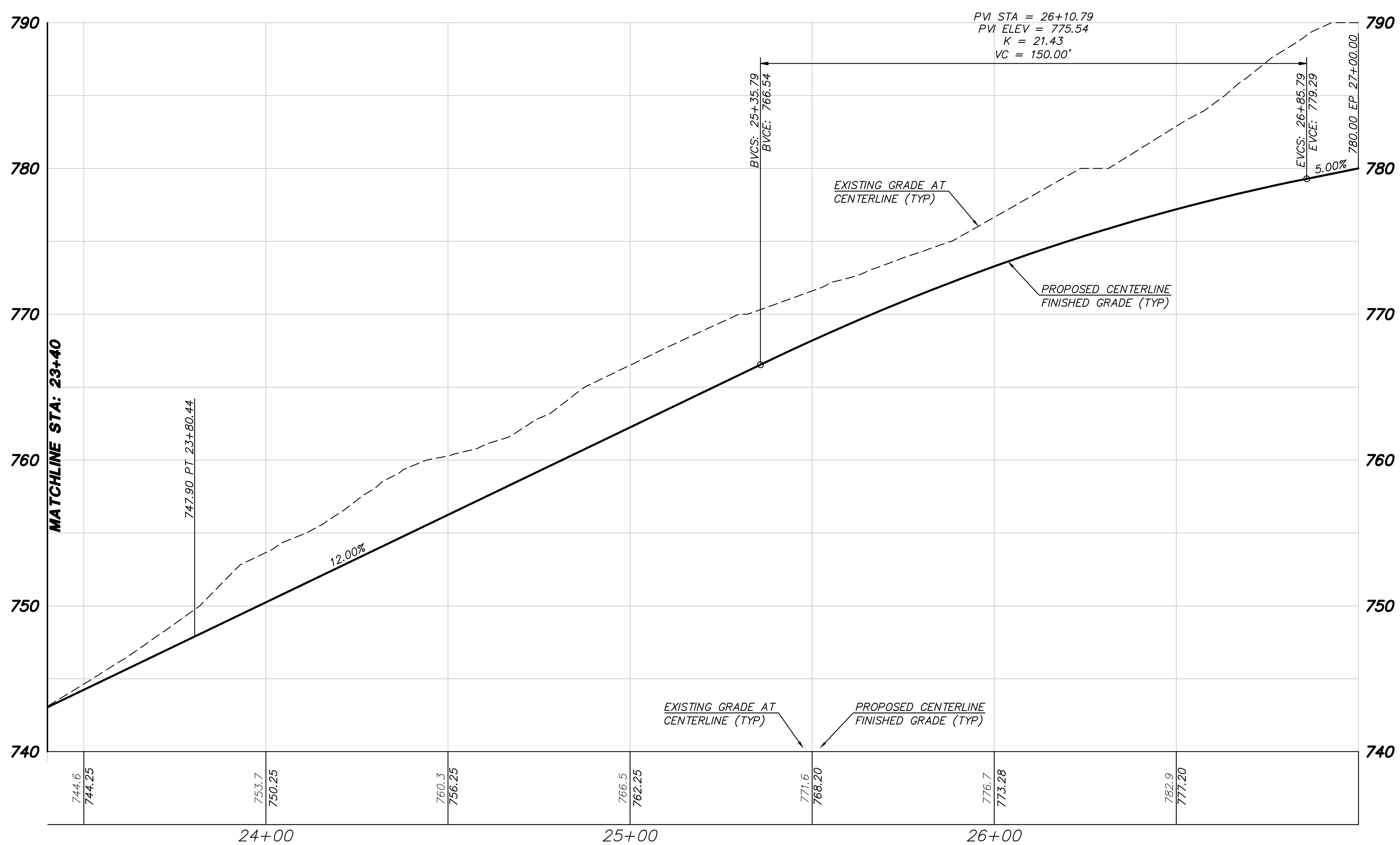

DAVID EVANS AND ASSOCIATES INC.
20300 Woodinville Snohomish Rd NE
Woodinville Washington 98072
Phone: 425.415.2000

LAWSON SOUTH ACCESS PROFILE

LAWSON SOUTH ACCESS
CONCEPTUAL PLAN
CITY OF BLACK DIAMOND WASHINGTON

CONCEPTUAL NOT FOR CONSTRUCTION

STAMP NOT VALID UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE: ----
SCALE: HORIZ.: ---- VERT.: ----
PROJECT NO. OAKPCBDP6001
SHEET NO. 6 OF 6

Plot Date: 9/19/2018 9:43 AM By: Dave Dapelo
Save Date: 9/11/2018 12:02 PM By: Djd File: P:\O\OAKPCBDP6001\0400CADD\CONCEPTUAL\Lawson South Access\SHEETS\PF-1-OAKPCBDP6001-LSA.dwg

SE CONNECTOR ALTERNATIVE

N

SCALE

100 0 50 100 200

(FEET)

1 INCH = 100 FT.

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Phone: 425.415.2000

SE CONNECTOR ALTERNATIVE

OAKPOINTE
LAWSON HILLS
BLACK DIAMOND WA

NO.	DATE	REVISION	BY	CK

DATE:
REVIEWED BY:
CADD: ----
DESIGNED: ----

EXHIBIT

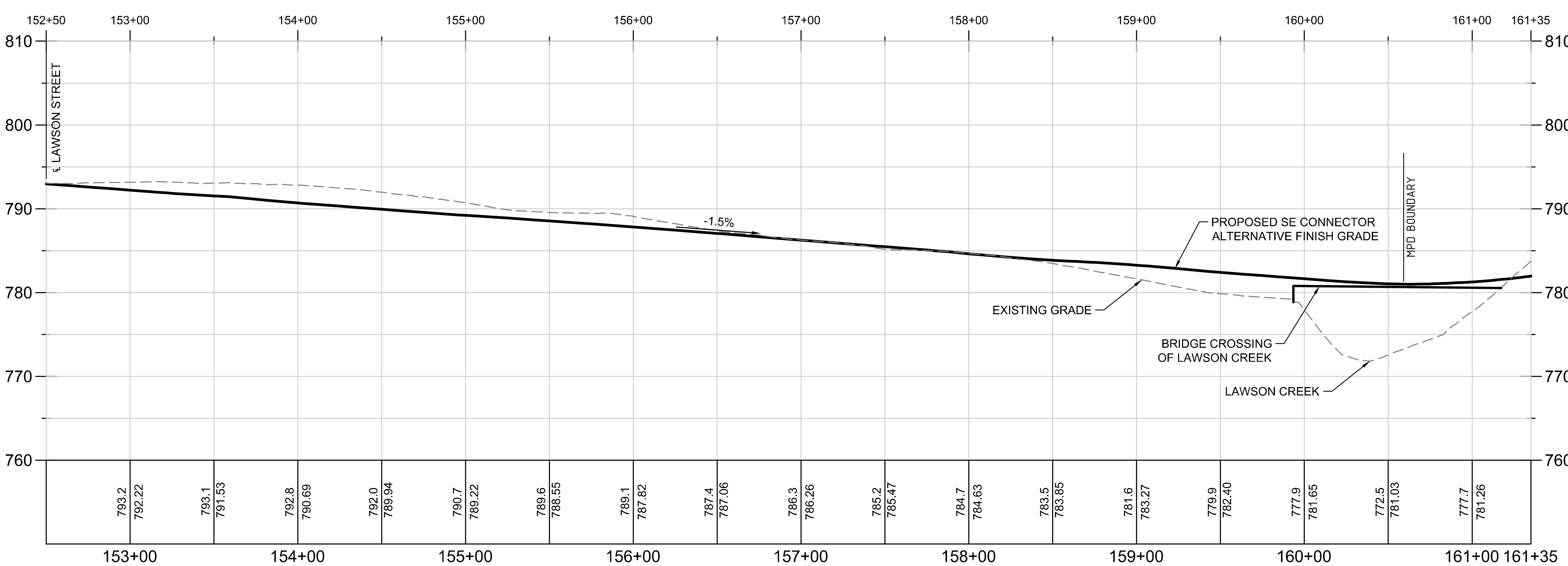
STAMP NOT VALID UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE: ----
SCALE: HORIZ.: ---- VERT.: ----

PROJECT NO.
OAKPCBDP6007

SHEET NO.
1
OF 3

Plot Date: 8/26/2020 4:31 PM By: Travis Wageman
Save Date: 8/13/2020 8:29 AM By: Ays File: P:\O\OAKPCBDP6007\0400CAD\EC\EXHIBITS\Master Plan\Roadway\SE Connector Alternative Plan.dwg



SE CONNECTOR ALTERNATIVE

SCALE: 1"=50' HORIZ, 1"=10' VERT

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Phone: 425.415.2000

SE CONNECTOR ALTERNATIVE PROFILE

OAKPOINTE
LAWSON HILLS

BLACK DIAMOND WA

NO.	DATE	REVISION	BY	CK

REVIEWED BY:
DATE:
CADD: ----
DESIGNED: ----

EXHIBIT

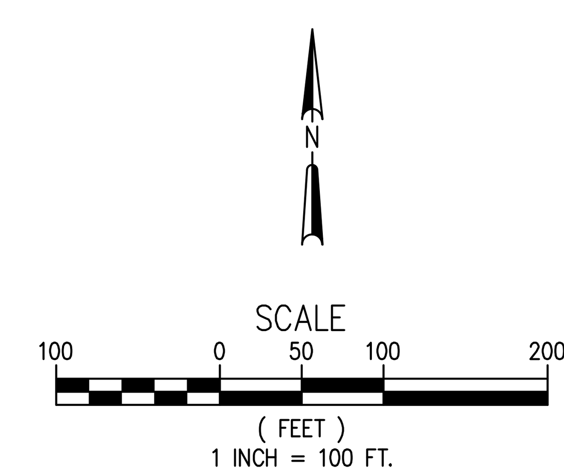
STAMP NOT VALID UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE: ----
SCALE: HORIZ.: ---- VERT.: ----

PROJECT NO.
OAKPCBDP6007

SHEET NO.
2
OF 3

SE CONNECTOR ALTERNATIVE



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SE CONNECTOR ALTERNATIVE

OAKPOINTE

LAWSON HILLS

BLACK DIAMOND WA

EXHIBIT

STAMP NOT VALID UNLESS SIGNED AND DATED

FIRST SUBMITTAL DATE: ----

SCALE: HORIZ.: ---- VERT.: ----

PROJECT NO. OAKPCBDP6007

SHEET NO. 3 OF 3

Plot Date: 8/26/2020 4:34 PM By: Travis Wageman
Save Date: 8/13/2020 8:29 AM By: Ays File: P:\O\OAKPCBDP6007\0400CAD\EC\EXHIBITS\Master Plan\Roadway\SE Connector Alternative Plan.dwg

Attachment B:

LOS Worksheets

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	555	621	14	653	1452
Future Volume (vph)	0	555	621	14	653	1452
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0
Lane Util. Factor		1.00	1.00		1.00	1.00
Frt		0.86	1.00		1.00	1.00
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1611	1857		1770	1863
Flt Permitted		1.00	1.00		0.20	1.00
Satd. Flow (perm)		1611	1857		371	1863
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	590	661	15	695	1545
RTOR Reduction (vph)	0	121	1	0	0	0
Lane Group Flow (vph)	0	469	675	0	695	1545
Turn Type		Over	NA		pm+pt	NA
Protected Phases		1	2		1	6
Permitted Phases					6	
Actuated Green, G (s)		19.9	30.1		55.0	60.0
Effective Green, g (s)		19.9	30.1		55.0	60.0
Actuated g/C Ratio		0.33	0.50		0.92	1.00
Clearance Time (s)		5.0	5.0		5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		534	931		804	1863
v/s Ratio Prot		0.29	0.36		0.29	c0.83
v/s Ratio Perm					0.51	
v/c Ratio		0.88	0.72		0.86	0.83
Uniform Delay, d1		18.9	11.7		11.6	0.0
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		15.1	4.9		9.6	4.4
Delay (s)		34.0	16.6		21.2	4.4
Level of Service		C	B		C	A
Approach Delay (s)	34.0		16.6			9.6
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	60	132	83	702	1335	104
Future Volume (veh/h)	60	132	83	702	1335	104
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	65	142	89	755	1435	112
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	3	3	2	2
Cap, veh/h	76	167	50	314	1245	97
Arrive On Green	0.15	0.15	1.00	1.00	0.73	0.73
Sat Flow, veh/h	518	1131	0	432	1712	134
Grp Volume(v), veh/h	208	0	844	0	0	1547
Grp Sat Flow(s),veh/h/ln	1657	0	432	0	0	1846
Q Serve(g_s), s	9.8	0.0	0.0	0.0	0.0	58.2
Cycle Q Clear(g_c), s	9.8	0.0	58.2	0.0	0.0	58.2
Prop In Lane	0.31	0.68	0.11			0.07
Lane Grp Cap(c), veh/h	245	0	364	0	0	1343
V/C Ratio(X)	0.85	0.00	2.32	0.00	0.00	1.15
Avail Cap(c_a), veh/h	269	0	364	0	0	1343
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.45	0.00	0.00	0.45
Uniform Delay (d), s/veh	33.2	0.0	35.2	0.0	0.0	10.9
Incr Delay (d2), s/veh	20.6	0.0	598.4	0.0	0.0	72.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	0.0	65.6	0.0	0.0	44.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	53.8	0.0	633.5	0.0	0.0	83.7
LnGrp LOS	D	A	F	A	A	F
Approach Vol, veh/h	208			844	1547	
Approach Delay, s/veh	53.8			633.5	83.7	
Approach LOS	D			F	F	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		63.2		16.8		63.2
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		57.0		13.0		57.0
Max Q Clear Time (g_c+I1), s		60.2		11.8		60.2
Green Ext Time (p_c), s		0.0		0.1		0.0

Intersection Summary		
HCM 6th Ctrl Delay		259.9
HCM 6th LOS		F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	18	1	174	19	114	1	662	168	303	1154	5
Future Volume (veh/h)	1	18	1	174	19	114	1	662	168	303	1154	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		0.99	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	1900	1900	1900	1900	1900	1900	1856	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	1	19	1	185	20	121	1	704	179	322	1228	5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0	3	3	3	2	2	2
Cap, veh/h	51	356	18	242	19	112	45	962	244	399	1256	5
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.68	0.68	0.68	0.90	0.90	0.90
Sat Flow, veh/h	18	1778	90	856	93	560	0	1426	362	629	1861	8
Grp Volume(v), veh/h	21	0	0	326	0	0	884	0	0	322	0	1233
Grp Sat Flow(s),veh/h/ln	1886	0	0	1509	0	0	1788	0	0	629	0	1869
Q Serve(g_s), s	0.0	0.0	0.0	15.3	0.0	0.0	0.0	0.0	0.0	28.6	0.0	44.0
Cycle Q Clear(g_c), s	0.7	0.0	0.0	16.0	0.0	0.0	25.4	0.0	0.0	54.0	0.0	44.0
Prop In Lane	0.05		0.05	0.57		0.37	0.00		0.20	1.00		0.00
Lane Grp Cap(c), veh/h	424	0	0	372	0	0	1252	0	0	399	0	1262
V/C Ratio(X)	0.05	0.00	0.00	0.88	0.00	0.00	0.71	0.00	0.00	0.81	0.00	0.98
Avail Cap(c_a), veh/h	424	0	0	372	0	0	1252	0	0	399	0	1262
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	0.80	0.00	0.00	0.09	0.00	0.09
Uniform Delay (d), s/veh	25.9	0.0	0.0	32.5	0.0	0.0	8.4	0.0	0.0	10.3	0.0	3.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	20.2	0.0	0.0	2.7	0.0	0.0	1.7	0.0	4.0
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	0.3	0.0	0.0	8.4	0.0	0.0	8.9	0.0	0.0	4.4	0.0	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.9	0.0	0.0	52.7	0.0	0.0	11.1	0.0	0.0	11.9	0.0	7.6
LnGrp LOS	C	A	A	D	A	A	B	A	A	B	A	A
Approach Vol, veh/h		21			326			884			1555	
Approach Delay, s/veh		25.9			52.7			11.1			8.5	
Approach LOS		C			D			B			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		59.0		21.0		59.0		21.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		54.0		16.0		54.0		16.0				
Max Q Clear Time (g_c+I1), s		27.4		2.7		56.0		18.0				
Green Ext Time (p_c), s		5.4		0.0		0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			14.6									
HCM 6th LOS			B									

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	108	38	837	1323	1
Future Volume (veh/h)	1	108	38	837	1323	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	1900	1900	1870	1870	1856	1856
Adj Flow Rate, veh/h	1	116	41	900	1423	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	2	2	3	3
Cap, veh/h	1	117	186	1547	1534	1
Arrive On Green	0.07	0.07	0.83	0.83	0.83	0.83
Sat Flow, veh/h	14	1586	376	1870	1854	1
Grp Volume(v), veh/h	118	0	41	900	0	1424
Grp Sat Flow(s),veh/h/ln	1614	0	376	1870	0	1855
Q Serve(g_s), s	5.9	0.0	7.4	13.0	0.0	46.2
Cycle Q Clear(g_c), s	5.9	0.0	53.6	13.0	0.0	46.2
Prop In Lane	0.01	0.98	1.00			0.00
Lane Grp Cap(c), veh/h	119	0	186	1547	0	1535
V/C Ratio(X)	0.99	0.00	0.22	0.58	0.00	0.93
Avail Cap(c_a), veh/h	119	0	367	2447	0	2427
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	37.5	0.0	25.1	2.3	0.0	5.2
Incr Delay (d2), s/veh	78.3	0.0	0.6	0.3	0.0	4.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	0.7	2.2	0.0	9.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	115.7	0.0	25.7	2.7	0.0	9.8
LnGrp LOS	F	A	C	A	A	A
Approach Vol, veh/h	118			941	1424	
Approach Delay, s/veh	115.7			3.7	9.8	
Approach LOS	F			A	A	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		71.0		10.0		71.0
Change Period (Y+Rc), s		4.0		4.0		4.0
Max Green Setting (Gmax), s		106.0		6.0		106.0
Max Q Clear Time (g_c+I1), s		55.6		7.9		48.2
Green Ext Time (p_c), s		6.9		0.0		18.8

Intersection Summary			
HCM 6th Ctrl Delay			12.5
HCM 6th LOS			B

Intersection						
Int Delay, s/veh	4.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	209	232	16	190	305
Future Vol, veh/h	13	209	232	16	190	305
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	15	235	261	18	213	343

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1039	270	0	0	279	0
Stage 1	270	-	-	-	-	-
Stage 2	769	-	-	-	-	-
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	255	769	-	-	1284	-
Stage 1	775	-	-	-	-	-
Stage 2	457	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	203	769	-	-	1284	-
Mov Cap-2 Maneuver	203	-	-	-	-	-
Stage 1	775	-	-	-	-	-
Stage 2	363	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	0	3.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	661	1284	-
HCM Lane V/C Ratio	-	-	0.377	0.166	-
HCM Control Delay (s)	-	-	13.7	8.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.8	0.6	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	291	113	0	128	136	0
Future Vol, veh/h	291	113	0	128	136	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	327	127	0	144	153	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	454	0	535	391
Stage 1	-	-	-	-	391	-
Stage 2	-	-	-	-	144	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1107	-	506	658
Stage 1	-	-	-	-	683	-
Stage 2	-	-	-	-	883	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1107	-	506	658
Mov Cap-2 Maneuver	-	-	-	-	506	-
Stage 1	-	-	-	-	683	-
Stage 2	-	-	-	-	883	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		0		15.2	
HCM LOS					C	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	506	-	-	1107	-
HCM Lane V/C Ratio	0.302	-	-	-	-
HCM Control Delay (s)	15.2	-	-	0	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1.3	-	-	0	-

Intersection	
Int Delay, s/veh	98.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	60	209	0	37	0	63	414	0	0	465	12
Future Vol, veh/h	9	60	209	0	37	0	63	414	0	0	465	12
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	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	66	230	0	41	0	69	455	0	0	511	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	41	0	0	296	0	0	504	242	181	470	357	41
Stage 1	-	-	-	-	-	-	201	201	-	41	41	-
Stage 2	-	-	-	-	-	-	303	41	-	429	316	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1568	-	-	1265	-	-	478	660	862	504	569	1030
Stage 1	-	-	-	-	-	-	801	735	-	974	861	-
Stage 2	-	-	-	-	-	-	706	861	-	604	655	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1568	-	-	1265	-	-	101	655	862	219	564	1030
Mov Cap-2 Maneuver	-	-	-	-	-	-	101	655	-	219	564	-
Stage 1	-	-	-	-	-	-	795	729	-	966	861	-
Stage 2	-	-	-	-	-	-	283	861	-	225	650	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	214.6	47.5
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	380	1568	-	-	1265	-	-	570
HCM Lane V/C Ratio	1.379	0.006	-	-	-	-	-	0.92
HCM Control Delay (s)	214.6	7.3	0	-	0	-	-	47.5
HCM Lane LOS	F	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	25.7	0	-	-	0	-	-	11.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	555	621	14	653	1452
Future Volume (vph)	0	555	621	14	653	1452
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0
Lane Util. Factor		1.00	1.00		1.00	1.00
Frt		0.86	1.00		1.00	1.00
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1611	1857		1770	1863
Flt Permitted		1.00	1.00		0.20	1.00
Satd. Flow (perm)		1611	1857		371	1863
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	590	661	15	695	1545
RTOR Reduction (vph)	0	121	1	0	0	0
Lane Group Flow (vph)	0	469	675	0	695	1545
Turn Type		Over	NA		pm+pt	NA
Protected Phases		1	2		1	6
Permitted Phases					6	
Actuated Green, G (s)		19.9	30.1		55.0	60.0
Effective Green, g (s)		19.9	30.1		55.0	60.0
Actuated g/C Ratio		0.33	0.50		0.92	1.00
Clearance Time (s)		5.0	5.0		5.0	5.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		534	931		804	1863
v/s Ratio Prot		0.29	0.36		0.29	c0.83
v/s Ratio Perm					0.51	
v/c Ratio		0.88	0.72		0.86	0.83
Uniform Delay, d1		18.9	11.7		11.6	0.0
Progression Factor		1.00	1.00		1.00	1.00
Incremental Delay, d2		15.1	4.9		9.6	4.4
Delay (s)		34.0	16.6		21.2	4.4
Level of Service		C	B		C	A
Approach Delay (s)	34.0		16.6			9.6
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	60	132	83	702	1335	104
Future Volume (vph)	60	132	83	702	1335	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	0.97
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.91		1.00	1.00	1.00	0.85
Flt Protected	0.98		0.95	1.00	1.00	1.00
Satd. Flow (prot)	1697		1752	1845	1863	1540
Flt Permitted	0.98		0.07	1.00	1.00	1.00
Satd. Flow (perm)	1697		124	1845	1863	1540
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	65	142	89	755	1435	112
RTOR Reduction (vph)	64	0	0	0	0	22
Lane Group Flow (vph)	143	0	89	755	1435	90
Confl. Peds. (#/hr)	3					3
Heavy Vehicles (%)	0%	0%	3%	3%	2%	2%
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Actuated Green, G (s)	10.6		59.4	59.4	59.4	59.4
Effective Green, g (s)	10.6		59.4	59.4	59.4	59.4
Actuated g/C Ratio	0.13		0.74	0.74	0.74	0.74
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	224		92	1369	1383	1143
v/s Ratio Prot	c0.08			0.41	c0.77	
v/s Ratio Perm			0.72			0.06
v/c Ratio	0.64		0.97	0.55	1.04	0.08
Uniform Delay, d1	32.9		9.4	4.5	10.3	2.8
Progression Factor	1.00		0.60	0.75	1.00	1.00
Incremental Delay, d2	5.8		59.2	0.8	34.5	0.1
Delay (s)	38.7		64.8	4.2	44.8	3.0
Level of Service	D		E	A	D	A
Approach Delay (s)	38.7			10.6	41.8	
Approach LOS	D			B	D	

Intersection Summary			
HCM 2000 Control Delay	31.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	60	132	83	702	1335	104
Future Volume (veh/h)	60	132	83	702	1335	104
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	65	142	89	755	1435	112
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	3	3	2	2
Cap, veh/h	76	167	90	1350	1360	1150
Arrive On Green	0.15	0.15	1.00	1.00	0.73	0.73
Sat Flow, veh/h	518	1131	332	1856	1870	1582
Grp Volume(v), veh/h	208	0	89	755	1435	112
Grp Sat Flow(s),veh/h/ln	1657	0	332	1856	1870	1582
Q Serve(g_s), s	9.8	0.0	0.0	0.0	58.2	1.7
Cycle Q Clear(g_c), s	9.8	0.0	58.2	0.0	58.2	1.7
Prop In Lane	0.31	0.68	1.00			1.00
Lane Grp Cap(c), veh/h	245	0	90	1350	1360	1150
V/C Ratio(X)	0.85	0.00	0.99	0.56	1.05	0.10
Avail Cap(c_a), veh/h	269	0	90	1350	1360	1150
HCM Platoon Ratio	1.00	1.00	2.00	2.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.45	0.45	0.45	0.45
Uniform Delay (d), s/veh	33.2	0.0	29.1	0.0	10.9	3.2
Incr Delay (d2), s/veh	20.6	0.0	60.8	0.8	33.2	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	5.3	0.0	3.2	0.3	29.6	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	53.8	0.0	89.9	0.8	44.1	3.3
LnGrp LOS	D	A	F	A	F	A
Approach Vol, veh/h	208			844	1547	
Approach Delay, s/veh	53.8			10.2	41.2	
Approach LOS	D			B	D	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		63.2		16.8		63.2
Change Period (Y+Rc), s		5.0		5.0		5.0
Max Green Setting (Gmax), s		57.0		13.0		57.0
Max Q Clear Time (g_c+I1), s		60.2		11.8		60.2
Green Ext Time (p_c), s		0.0		0.1		0.0

Intersection Summary		
HCM 6th Ctrl Delay		32.1
HCM 6th LOS		C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	18	1	174	19	114	1	662	168	303	1154	5
Future Volume (vph)	1	18	1	174	19	114	1	662	168	303	1154	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frpb, ped/bikes		1.00			0.99			0.99		1.00	1.00	
Flpb, ped/bikes		1.00			0.99			1.00		1.00	1.00	
Frt		0.99			0.95			0.97		1.00	1.00	
Flt Protected		1.00			0.97			1.00		0.95	1.00	
Satd. Flow (prot)		1880			1717			1782		1765	1861	
Flt Permitted		0.99			0.81			0.88		0.31	1.00	
Satd. Flow (perm)		1864			1435			1564		583	1861	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1	19	1	185	20	121	1	704	179	322	1228	5
RTOR Reduction (vph)	0	1	0	0	26	0	0	11	0	0	0	0
Lane Group Flow (vph)	0	20	0	0	300	0	0	873	0	322	1233	0
Confl. Peds. (#/hr)	3		3	5		5	3		5	5		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	3%	3%	3%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		16.0			16.0			54.0		54.0	54.0	
Effective Green, g (s)		16.0			16.0			54.0		54.0	54.0	
Actuated g/C Ratio		0.20			0.20			0.68		0.68	0.68	
Clearance Time (s)		5.0			5.0			5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		372			287			1055		393	1256	
v/s Ratio Prot											c0.66	
v/s Ratio Perm		0.01			c0.21			0.56		0.55		
v/c Ratio		0.05			1.04			0.83		0.82	0.98	
Uniform Delay, d1		25.9			32.0			9.6		9.5	12.5	
Progression Factor		1.00			1.00			1.00		0.36	0.41	
Incremental Delay, d2		0.1			65.0			7.5		4.4	8.5	
Delay (s)		25.9			97.0			17.0		7.8	13.7	
Level of Service		C			F			B		A	B	
Approach Delay (s)		25.9			97.0			17.0			12.4	
Approach LOS		C			F			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	143.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	18	1	174	19	114	1	662	168	303	1154	5
Future Volume (veh/h)	1	18	1	174	19	114	1	662	168	303	1154	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		0.99	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	1900	1900	1900	1900	1900	1900	1856	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	1	19	1	185	20	121	1	704	179	322	1228	5
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	0	0	0	0	0	0	3	3	3	2	2	2
Cap, veh/h	51	356	18	242	19	112	45	962	244	399	1256	5
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.68	0.68	0.68	0.90	0.90	0.90
Sat Flow, veh/h	18	1778	90	856	93	560	0	1426	362	629	1861	8
Grp Volume(v), veh/h	21	0	0	326	0	0	884	0	0	322	0	1233
Grp Sat Flow(s),veh/h/ln	1886	0	0	1509	0	0	1788	0	0	629	0	1869
Q Serve(g_s), s	0.0	0.0	0.0	15.3	0.0	0.0	0.0	0.0	0.0	28.6	0.0	44.0
Cycle Q Clear(g_c), s	0.7	0.0	0.0	16.0	0.0	0.0	25.4	0.0	0.0	54.0	0.0	44.0
Prop In Lane	0.05		0.05	0.57		0.37	0.00		0.20	1.00		0.00
Lane Grp Cap(c), veh/h	424	0	0	372	0	0	1252	0	0	399	0	1262
V/C Ratio(X)	0.05	0.00	0.00	0.88	0.00	0.00	0.71	0.00	0.00	0.81	0.00	0.98
Avail Cap(c_a), veh/h	424	0	0	372	0	0	1252	0	0	399	0	1262
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	0.47	0.00	0.00	0.09	0.00	0.09
Uniform Delay (d), s/veh	25.9	0.0	0.0	32.5	0.0	0.0	8.4	0.0	0.0	10.3	0.0	3.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	20.2	0.0	0.0	1.6	0.0	0.0	1.7	0.0	4.0
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	0.3	0.0	0.0	8.4	0.0	0.0	8.5	0.0	0.0	4.4	0.0	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.9	0.0	0.0	52.7	0.0	0.0	10.0	0.0	0.0	11.9	0.0	7.6
LnGrp LOS	C	A	A	D	A	A	A	A	A	B	A	A
Approach Vol, veh/h		21			326			884			1555	
Approach Delay, s/veh		25.9			52.7			10.0			8.5	
Approach LOS		C			D			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		59.0		21.0		59.0		21.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		54.0		16.0		54.0		16.0				
Max Q Clear Time (g_c+I1), s		27.4		2.7		56.0		18.0				
Green Ext Time (p_c), s		5.4		0.0		0.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			14.2									
HCM 6th LOS			B									

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1	108	38	837	1323	1
Future Volume (vph)	1	108	38	837	1323	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.87			1.00	1.00	
Flt Protected	1.00			1.00	1.00	
Satd. Flow (prot)	1645			1859	1844	
Flt Permitted	1.00			0.70	1.00	
Satd. Flow (perm)	1645			1296	1844	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	1	116	41	900	1423	1
RTOR Reduction (vph)	109	0	0	0	0	0
Lane Group Flow (vph)	8	0	0	941	1424	0
Heavy Vehicles (%)	0%	0%	2%	2%	3%	3%
Turn Type	Prot		Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases			2			
Actuated Green, G (s)	5.9			82.6	82.6	
Effective Green, g (s)	5.9			82.6	82.6	
Actuated g/C Ratio	0.06			0.86	0.86	
Clearance Time (s)	4.0			4.0	4.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	100			1109	1578	
v/s Ratio Prot	c0.00				c0.77	
v/s Ratio Perm				0.73		
v/c Ratio	0.08			0.85	0.90	
Uniform Delay, d1	42.7			3.7	4.4	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.3			6.2	7.6	
Delay (s)	43.1			9.9	12.0	
Level of Service	D			A	B	
Approach Delay (s)	43.1			9.9	12.0	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	96.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	108	38	837	1323	1
Future Volume (veh/h)	1	108	38	837	1323	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	1900	1900	1870	1870	1856	1856
Adj Flow Rate, veh/h	1	116	41	900	1423	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	2	2	3	3
Cap, veh/h	1	103	65	1145	1573	1
Arrive On Green	0.06	0.06	0.85	0.85	0.85	0.85
Sat Flow, veh/h	14	1586	29	1349	1854	1
Grp Volume(v), veh/h	118	0	941	0	0	1424
Grp Sat Flow(s),veh/h/ln	1614	0	1378	0	0	1855
Q Serve(g_s), s	6.0	0.0	22.9	0.0	0.0	46.2
Cycle Q Clear(g_c), s	6.0	0.0	69.0	0.0	0.0	46.2
Prop In Lane	0.01	0.98	0.04			0.00
Lane Grp Cap(c), veh/h	105	0	1209	0	0	1574
V/C Ratio(X)	1.13	0.00	0.78	0.00	0.00	0.90
Avail Cap(c_a), veh/h	105	0	1687	0	0	2130
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	0.00	1.00
Uniform Delay (d), s/veh	43.2	0.0	5.5	0.0	0.0	4.6
Incr Delay (d2), s/veh	125.6	0.0	1.6	0.0	0.0	4.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	0.0	4.5	0.0	0.0	9.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	168.7	0.0	7.0	0.0	0.0	9.3
LnGrp LOS	F	A	A	A	A	A
Approach Vol, veh/h	118			941	1424	
Approach Delay, s/veh	168.7			7.0	9.3	
Approach LOS	F			A	A	

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		82.2		10.0		82.2
Change Period (Y+Rc), s		4.0		4.0		4.0
Max Green Setting (Gmax), s		106.0		6.0		106.0
Max Q Clear Time (g_c+I1), s		71.0		8.0		48.2
Green Ext Time (p_c), s		7.2		0.0		18.8

Intersection Summary			
HCM 6th Ctrl Delay			16.0
HCM 6th LOS			B

Intersection	
Int Delay, s/veh	4.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	209	232	16	190	305
Future Vol, veh/h	13	209	232	16	190	305
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	15	235	261	18	213	343

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1039	270	0	0	279	0
Stage 1	270	-	-	-	-	-
Stage 2	769	-	-	-	-	-
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	255	769	-	-	1284	-
Stage 1	775	-	-	-	-	-
Stage 2	457	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	203	769	-	-	1284	-
Mov Cap-2 Maneuver	203	-	-	-	-	-
Stage 1	775	-	-	-	-	-
Stage 2	363	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	13.7		0		3.2	
HCM LOS	B					

Minor Lane/Major Mvmt		NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)		-	-	661	1284	-
HCM Lane V/C Ratio		-	-	0.377	0.166	-
HCM Control Delay (s)		-	-	13.7	8.4	0
HCM Lane LOS		-	-	B	A	A
HCM 95th %tile Q(veh)		-	-	1.8	0.6	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	291	113	0	128	136	0
Future Vol, veh/h	291	113	0	128	136	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	327	127	0	144	153	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	454	0	535	391
Stage 1	-	-	-	-	391	-
Stage 2	-	-	-	-	144	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1107	-	506	658
Stage 1	-	-	-	-	683	-
Stage 2	-	-	-	-	883	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1107	-	506	658
Mov Cap-2 Maneuver	-	-	-	-	506	-
Stage 1	-	-	-	-	683	-
Stage 2	-	-	-	-	883	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	15.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	506	-	-	1107	-
HCM Lane V/C Ratio	0.302	-	-	-	-
HCM Control Delay (s)	15.2	-	-	0	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	1.3	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	60	209	0	37	0	79	425	0	0	483	12
Future Volume (vph)	9	60	209	0	37	0	79	425	0	0	483	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			5.0			5.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.90			1.00			1.00			1.00	
Flt Protected		1.00			1.00			0.99			1.00	
Satd. Flow (prot)		1671			1863			1848			1857	
Flt Permitted		0.99			1.00			0.85			1.00	
Satd. Flow (perm)		1655			1863			1591			1857	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	10	66	230	0	41	0	87	467	0	0	531	13
RTOR Reduction (vph)	0	180	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	126	0	0	41	0	0	554	0	0	543	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA			NA		Perm	NA			NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		8.5			8.5			20.3			20.3	
Effective Green, g (s)		8.5			8.5			20.3			20.3	
Actuated g/C Ratio		0.22			0.22			0.52			0.52	
Clearance Time (s)		5.0			5.0			5.0			5.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		362			408			832			971	
v/s Ratio Prot					0.02						0.29	
v/s Ratio Perm		c0.08						c0.35				
v/c Ratio		0.35			0.10			0.67			0.56	
Uniform Delay, d1		12.8			12.1			6.8			6.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.6			0.1			2.0			0.7	
Delay (s)		13.4			12.2			8.8			6.9	
Level of Service		B			B			A			A	
Approach Delay (s)		13.4			12.2			8.8			6.9	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	38.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	60	209	0	37	0	79	425	0	0	483	12
Future Volume (veh/h)	9	60	209	0	37	0	79	425	0	0	483	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	10	66	230	0	41	0	87	467	0	0	531	13
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	107	96	308	0	467	0	179	645	0	0	865	21
Arrive On Green	0.25	0.25	0.25	0.00	0.25	0.00	0.48	0.48	0.00	0.00	0.48	0.48
Sat Flow, veh/h	22	386	1233	0	1870	0	135	1356	0	0	1818	45
Grp Volume(v), veh/h	306	0	0	0	41	0	554	0	0	0	0	544
Grp Sat Flow(s),veh/h/ln	1640	0	0	0	1870	0	1492	0	0	0	0	1862
Q Serve(g_s), s	0.8	0.0	0.0	0.0	0.6	0.0	3.9	0.0	0.0	0.0	0.0	7.9
Cycle Q Clear(g_c), s	6.2	0.0	0.0	0.0	0.6	0.0	11.8	0.0	0.0	0.0	0.0	7.9
Prop In Lane	0.03		0.75	0.00		0.00	0.16		0.00	0.00		0.02
Lane Grp Cap(c), veh/h	512	0	0	0	467	0	824	0	0	0	0	886
V/C Ratio(X)	0.60	0.00	0.00	0.00	0.09	0.00	0.67	0.00	0.00	0.00	0.00	0.61
Avail Cap(c_a), veh/h	821	0	0	0	821	0	1330	0	0	0	0	1482
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	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	12.6	0.0	0.0	0.0	10.5	0.0	7.7	0.0	0.0	0.0	0.0	7.1
Incr Delay (d2), s/veh	1.1	0.0	0.0	0.0	0.1	0.0	1.0	0.0	0.0	0.0	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	0.0	0.0	0.2	0.0	2.1	0.0	0.0	0.0	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.7	0.0	0.0	0.0	10.6	0.0	8.7	0.0	0.0	0.0	0.0	7.8
LnGrp LOS	B	A	A	A	B	A	A	A	A	A	A	A
Approach Vol, veh/h		306			41			554			544	
Approach Delay, s/veh		13.7			10.6			8.7			7.8	
Approach LOS		B			B			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.3		14.1		22.3		14.1				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		29.0		16.0		29.0		16.0				
Max Q Clear Time (g_c+I1), s		13.8		8.2		9.9		2.6				
Green Ext Time (p_c), s		3.5		1.1		3.5		0.1				
Intersection Summary												
HCM 6th Ctrl Delay			9.4									
HCM 6th LOS			A									