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Transportation: Engineering • Planning • Design

M E M O R A N D U M

Ref: 1821A

To: Doug Pinciaro, Clipper Traders, LLC
Ed Hayes, Ricci Lumber

From: Stephen G. Pernaw, P.E., PTOE

Subject: Proposed Residential Subdivision
Portsmouth, New Hampshire

Date: October 1, 2018

On June 18, 2018 our office published the report entitled *"Traffic Impact and Site Access Study – Proposed Residential Subdivision"* for Clipper Traders, LLC to assess the traffic impacts associated with the proposed residential subdivision/development located on the south side of North Mill Pond in Portsmouth, New Hampshire. That document was followed up by *"Addendum One"* dated August 20, 2018. We are now in receipt of peer review comments from The Engineering Corporation (TEC) dated September 17, 2018. The purpose of this memorandum is to provide responses to each of their comments.

TEC Comment 1: Study Area – *"The Traffic Impact and Site Access Study (TISAS) and the Addendum evaluate a reasonable study area for the purposes of evaluating the potential traffic impacts to the surrounding street system with the construction of the proposed development. TEC concurs that the scope of the study is in general accordance with NHDOT guidelines."*

SGP & Company, Inc. Response: Comment acknowledged; no response necessary.

TEC Comment 2: Traffic Counts – *"Traffic counts used within the TISAS were conducted in April 2018 during a period in which area schools were in session. The counts used within the Addendum were conducted in August 2018. The April counts were seasonally adjusted upward by 3% during the weekday morning peak hour and 4% during the weekday evening peak hour, and the August counts were seasonally adjusted upward by 7% during the weekday morning peak hour and 2% during the weekday evening peak hour to reflect peak month conditions, consistent with NHDOT standards. This is generally reflective of summertime volumes in the seacoast area. TEC concurs with the use of these traffic volumes and adjustment factors based on NHDOT guidelines.*

The weekday morning and evening peak commuter hours were studied within the TISAS and Addendum to determine the Project's overall effect on the roadway system. TEC concurs that these selected time periods are generally appropriate for a residential development, as the morning and evening peak hours of the residential dwelling units will typically overlap with the morning and evening peak commuter hours of the adjacent street system."

SGP & Company, Inc. Response: Comment acknowledged; no response necessary.

TEC Comment 3 - Background Growth – *"The TISAS and the Addendum use an annual traffic volume growth adjustment factor of 1.0 percent per year based on standard rates approved by NHDOT. TEC concurs with the adjustment factors based on NHDOT guidelines. Steven G. Pernaw and Company, Inc. (SGP) concurrently overlaid projected traffic volumes associated with four pending development projects within the study area. The future conditions in 2020 (opening year) and 2030 (10-year horizon) were studied in conformance with NHDOT requirements."*

"TEC notes that the mixed-use development along Cate Street, including the extension of Cate Street between US 1 Bypass and Bartlett Street, which is currently within the public hearing process, is not included within this study. TEC understands that the timing of the completion of the subject residential development will likely occur prior to or concurrent with the opening of the Cate Street Extension. Further, it is noted that the traffic from the mixed-use development will have an impact on the Bartlett Street study area intersections in the future. The mixed-use development traffic will not materially affect the Maplewood Avenue intersection studied within the Addendum. TEC recommends that SGP discuss the potential impact of the extension of Cate Street on the residential development access drive intersection with Bartlett Street."

SGP & Company, Inc. Response: The mixed-use development that involves the extension of Cate Street will have several different impacts at the Bartlett Street/Existing Shared Driveway intersection: 1) the site generated traffic from the mixed-used development will add vehicle-trips to Bartlett Street, 2) the extension of Cate Street will reduce vehicle-trips on certain sections of Bartlett Street due to local trip diversions, and 3) the extension of Cate Street will alter the travel patterns of those currently using the Existing Shared Driveway. For example, some drivers will exit left rather than exit right from the Existing Shared Driveway to reach the new alignment (Cate Street Extension). The net change on Bartlett Street during the weekday PM peak hour is approximately -200 vph north of the shared driveway and -50 vph south of the shared driveway.

TEC Comment 4 - Crash Data - "*No motor vehicle crash data was provided within the TISAS or Addendum. SGP should obtain and review crash data at the study area intersections to determine whether any specific crash trends exist. This is primarily of concern at the two site access points onto Bartlett Street and Maplewood Avenue. The crash data typically indicates the number, type, and severity of crashes at the study area intersections for the most recent three years on record. SGP should further provide documentation of other traffic safety related issues/deficiencies at the intersections and subject roadways, such as sight distances, if applicable."*

SGP & Company, Inc. Response: Crash data from the State of New Hampshire Department of Transportation for the most recent three-year period (2013 to 2015) was researched to identify accident rates and patterns in the study area. Over the three-year period, the Location Data Reports indicate that 2,407 crashes were recorded on a city-wide basis. It should be noted that this database is considered to be a subset of the total collisions as not all incidents are required to be reported to the State. Of these, thirteen crashes contained sufficient detail to locate them in the study area. These reports, along with a summary table, are attached (see Attachments 1-3).

Five crashes occurred in the vicinity of the Bartlett Street/Cate Street intersection. There was one collision that resulted in personal injury and the majority (80%) of the crashes involved two or more vehicles. Inclement weather or unfavorable surface conditions may have been a contributing factor in four of the five collisions.

Eight collisions occurred in the vicinity of the Bartlett Street/Islington Street intersection. There was one crash that resulted in injury to one person. All of the crashes involved two vehicles. Inclement weather or unfavorable surface conditions were not a contributing factor in any of these eight collisions.

No fatalities were reported in this study group. There were no discernible trends in terms of crash frequency as four crashes occurred in 2013, three occurred in 2014, and six occurred in 2015. In terms of

monthly variations, August was the highest months (3 crashes) and the lowest months included January, April, and June (0 crashes each). In terms of daily variations, four crashes over the three-year period occurred on Fridays, and the lowest days were Mondays, Tuesdays, Thursdays and Saturdays with one crash each.

TEC Comment 5 - Site Trip Generation - *"The TISAS and Addendum uses data published in the industry standard Institute of Transportation Engineers (ITE) publication, Trip Generation, 10th Edition to estimate the traffic generated by the proposed development. The TISAS uses data found under Land Use Code (LUC) 221 - Multi-Family Housing (High Rise) for the apartment units. TEC concurs with these land uses and general traffic generation methodology."*

SGP & Company, Inc. Response: Comment acknowledged; no response necessary.

TEC Comment 6 - Trip Distribution – *"The traffic generated by the proposed Project was distributed onto the adjacent roadway system based upon existing travel patterns at the Bartlett Street driveway. The Addendum relocates approximately a third of the site traffic to the Maplewood Avenue driveway. SGP should confirm this distribution based on available Journey to Work data published by the US Census and considering other in-City trips related to school or shopping activities. As previously noted, the impact of the extension of Cate Street from Bartlett Street to US 1 Bypass was not considered within this report. Therefore, no site traffic was distributed toward US 1 Bypass via Cate Street. TEC recommends SGP provide a discussion on whether the residential development site generated traffic will divert to this connection."*

SGP & Company, Inc. Response: An alternative trip distribution analysis based on Journey to Work data suggests that the primary trips will be distributed 57% West and 43% East on Bartlett Street, rather than a 50-50 split. When these percentages are applied to the trip generation estimates for the subject site, the net change in turning movement volumes is negligible (+/- 2 PM peak hour trips). The extension of Cate Street from Bartlett Street to US1 Bypass was not considered in this traffic study as it preceded the traffic study for the Cate Street project, and is not an approved project at this juncture. Nevertheless, it is expected that a portion of the site generated traffic from this residential development will utilize the new Cate Street extension; if/when that project comes to fruition. It should be noted that the non-residential trips currently using the shared driveway are also expected to utilize Cate Street extension, and this has been accounted for in the traffic study for the Cate Street project.

TEC Comment 7 - Capacity and Queue Analysis – *"TEC generally concurs with the results of the capacity and queue analysis provided as part of the TISAS; utilizing Highway Capacity Manual 2010 (HCM 2010) methodology as modeled by Synchro 10."*

SGP & Company, Inc. Response: Comment acknowledged; no response necessary.

TEC Comment 8 - *"Overall, TEC concurs that the general impact of the Project on the control delay, queue, and level of service along the approaches to the study area intersections is anticipated to be nominal in terms of 'vehicular' traffic."*

SGP & Company, Inc. Response: Comment acknowledged; no response necessary.

TEC Comment 9 - *"At the intersection of Islington Street / Bartlett Street / Pharmacy Driveway, the capacity and queue analyses depict significant vehicle delay and queues along the eastbound Bartlett Street approach and the northbound Islington Street left turn during the weekday evening peak hour in the 2020 and 2030 No Build conditions. The addition of site generated traffic increases the delay and projected queue lengths on these movements. Improvements at this intersection are under final design by the City for construction next year. No additional lanes will be provided with*

the planned improvements. Additional mitigation by the applicant is not likely to be warranted as the site generated traffic increases the overall volumes through the intersection by approximately 1%."

SGP & Company, Inc. Response: Comment acknowledged; no response necessary.

TEC Comment 10 – *"SGP analyzed the intersection of Bartlett Street / Cate Street without the addition of the multi-use development and extension of Cate Street. With the addition of the residential development site traffic and without the additional multi-use development site traffic, the intersection operates with acceptable levels of service in the 2020 and 2030 Build conditions. TEC notes that the condominium development under construction at 30 Cate Street will be widening the Cate Street approach to the intersection to provide an exclusive right turn lane as a condition of their approval. The analyses within the TISAS should be revised to reflect the eastbound right turn lane as constructed within the No Build and Build analyses."*

SGP & Company, Inc. Response: The No-Build and Build analyses have been updated as requested, and Table 4A has been updated accordingly (see Attachments 4-12).

TEC Comment 11 – *"The intersections of the site access with Bartlett Street and the site access with Maplewood Avenue are projected to operate with acceptable levels of service in the 2030 Build condition with the addition of site generated traffic."*

SGP & Company, Inc. Response: Comment acknowledged; no response necessary.

TEC Comment 12 – *"TEC agrees that the site access onto Maplewood Avenue should be gate controlled to allow access to residents and emergency vehicles only. This will prevent cut-through traffic within the development by the general public. The location of the gate will be confirmed during the site plan review process. TEC recommends that delivery and refuse vehicles should be restricted from using this access and should be directed to the Bartlett Street access."*

SGP & Company, Inc. Response: Comment acknowledged; no response necessary.

TEC Comment 13 – *"TEC concurs with the determination that the site access onto Bartlett Street warrants the addition of a left turn lane on the southbound approach of Bartlett Street during the existing condition. SGP has provided a Concept Plan within the TISAS illustrating the potential for a two-way left turn lane along the site frontage of Bartlett Street. Due to the constrained width and horizontal geometry of Bartlett Street in the vicinity of Cate Street, TEC does not recommend the construction of a two-way left turn lane along this section of Bartlett Street. Further, large trucks use, and are proposed to continue to use, the existing driveway to access Ricci Lumber and other commercial uses on the site. These vehicles are consistently observed to cross the double-yellow centerline of Bartlett Street when turning right exiting from the driveway onto northbound Bartlett Street. The provision of a southbound left turn lane into the site access would be desirable from a safety standpoint for vehicles turning into the site as well as through vehicles along Bartlett Street. However, the intersection of the site access with Bartlett Street would need to be redesigned to ensure safe and efficient turning movements for all size vehicles prior to construction of this improvement. TEC recommends this intersection be considered for redesign during the site plan review process to accommodate all vehicles and provide the southbound left turn lane, if possible."*

SGP & Company, Inc. Response: It is not possible to provide both a southbound left-turn lane on Bartlett Street and a sufficient pavement area for large trucks to exit right from the driveway due to space limitations. Based on the TEC recommendation not to construct a two-way left turn lane along the section of Bartlett Street, we recommend that consideration be given to prohibiting right-turn departures by large trucks once the Cate Street Extension project is completed (by others). In response to the TEC recommendation to consider a redesign of this intersection in conjunction with

the site plan review process, we offer Exhibit 1, a preliminary conceptual plan for discussion purposes only. This design includes a 5-foot bike lane, a 2-foot bike lane buffer and two 11-foot travel lanes on the site access road. The following exhibits (that follow Attachment 12) show the implications associated with several Design Vehicle movements.

- Exhibit 1-A: A single-unit box truck (SU) works well with this design and there is no lane encroachment on Bartlett Street.
- Exhibit 1-B: A WB-50 tractor-trailer truck is able to exit right without lane encroachment on Bartlett Street; however the full width of the site access road is required.
- Exhibit 1-C: A WB-50 tractor-trailer truck is able to enter from the south without lane encroachment on Bartlett Street; however it requires the full width of the site access road.
- Exhibit 1-D: A WB-50 tractor-trailer truck is able to enter the site access road from the north without lane encroachment on Bartlett Street; however it requires most of the width of the site access road.
- Exhibit 1-E: A WB-50 tractor-trailer truck is able to exit left from the site access road with no issues.
- Exhibit 1-F: A WB-67 tractor-trailer truck is able to exit right from the site access road with this design; however it requires the full width of both the site access road and Bartlett Street.

TEC Comment 14 – *"Routing the residential development traffic through the existing commercial development changes the nature of the access from Bartlett Street and through the commercial portions of the site to a circulation road rather than a driveway. During the site plan review process, the on-site circulation should be analyzed to remove or reconfigure the existing head-in parking for the commercial uses along the new access roadway. In addition, TEC recommends reviewing the on-site truck circulation to potentially relocate these vehicles from the primary access to the existing secondary driveway onto Bartlett Street along the south side of the commercial buildings."*

SGP & Company, Inc. Response: Comment acknowledged; alternative circulation plans will be investigated during the site plan review process.

TEC Comment 15 - Sight Distances – *"The sight distances reported in the Addendum are visually represented rather than measured in accordance with the American Association of State Highway and Transportation Officials (AASHTO) requirements. There are two types of sight distances required at an intersection: Intersection Sight Distance (ISD), which is the sight distance necessary for vehicles exiting a stop condition to enter the through traffic flow without the through vehicles slowing down significantly; and Stopping Sight Distance (SSD), which is the sight distance necessary for through vehicles to see a vehicle entering the roadway and be able to avoid collision. It appears that sufficient sight distances are provided at both site access points to meet the minimum SSD for a vehicle travel speed of 30 mph."*

"During the site plan review process, the Applicant shall provide a plan within the set that depicts the AASHTO minimum sight distance to/from each of the site access intersections onto Bartlett Street and Maplewood Avenue. The sight line clear areas should be compared against future proposed Landscaping Plans to confirm that the sight lines will remain clear as reported in the traffic study. The Applicant should commit to remove and maintain vegetation along the site frontage consistently to ensure that sight lines remain unobstructed at the site access intersections."

SGP & Company, Inc. Response: Ambit Engineering, Inc. will prepare said plans in conjunction with the site plan review process.

cc: John Chagnon, P.E. – Ambit Engineering, Inc.

ATTACHMENTS

Stephen G. Pernaw & Company, Inc.

Crash Summary (2013-2015)[1]

	Bartlett Street/ Existing Shared Driveway	Bartlett Strreet/ Cate Street	Bartlett Strreet/ Islington Street
CRASH FREQUENCY			
Total Crashes	0	5	8
Crashes per Year (Ave)	0.00	1.67	2.67
CRASH SEVERITY			
Property Damage Only	0	4	7
Personal Injury	0	1	1
Fatalities	0	0	0
CRASH TYPE			
Other Motor Vehicle	0	4	8
Rear End	0	0	0
Head-On	0	0	0
Fixed Object	0	0	0
Pedestrian	0	0	0
Other Object	0	1	0
ADVERSE CONDITIONS (%)	(0) 0%	(4) 80%	(0) 0%

[1] Source: NHDOT - Accident Location Data Report (2013-2015)

SUMMARY OF NHDOT CRASH DATA - 2013

Stephen G. Pernaw & Company, Inc.

ACDYEAR	ACDNUMBER	ACDDATE	ACDTIME	ACDDAY	TOTALFATAL	TOTALINJUR	PEDFATALS	PEDINJURY	PROPDAMAGE	INFONOTREP	NUMVEHICLE	ACDTYPE	OBJECTSTRU	FEETFROMNO	NODE2NODE	FEETTOMARK	NSEWFROMMA	MILEMARKER	ACDROUTE	ACDSTREET	MILESFTFRO	MILEFTIND	NSEWTOINTE	INTERROUTE	INTERSTREE	LOCFIRSTEV	TRAFFICCON	ROADDESIGN	ADLROADFEA	ROADALIGNM	ROADCONDIT	SURFACECON	LIGHTING	WEATHER	POSTEDSPEE	DIAGRAMCOD	TOWN_NAME	SEVERITY
I. Vicinity of Bartlett Street/Existing Shared Driveway Intersection																																						
NONE																																						
II. Vicinity of Bartlett Street/Cate Street Intersection																																						
13	006856	20130208	0720	FRI	000	000	000	000		X	002	01	00	00000	0000	00000		0000	00000	124 BARTLETT STREET	00100	F	N	00000	CATE STREET	03	06	03	04	04	01	03	01	04	25	98	PORTSMOUTH	6
III. Vicinity of Bartlett Street/Islington Street Intersection																																						
13	003781	20130310	1749	SUN	000	001	000	000			002	01	00	00000	0000	00000		0000	00000	1 BARTLETT STREET	00100	F	W	00000	ISLINGTON STREET	03	05	03	04	01	01	01	01	01	20	98	PORTSMOUTH	3
13	022095	20131228	1847	SAT	000	000	000	000		X	002	01	00	00000	0000	00000		0000	00000	1 BARTLETT STREET	00000		AT	00000	653 ISLINGTON STREET	02	02	03	99	01	01	01	04	01	30	98	PORTSMOUTH	6
13	021362	20130801	1125	THU	000	000	000	000		X	002	01	00	00000	0000	00000		0000	00000	653 ISLINGTON ST	00000		AT	00000	1 BARTLETT ST	01	02	98	04	01	01	01	01	01	25	98	PORTSMOUTH	6

Attachment 2

SUMMARY OF NHDOT CRASH DATA - 2014, 2015

Stephen G. Pernaw & Company, Inc.

CRASH_DATE	ACDYEAR	ACDDAY	ACDTIME	TOWN_NAME	ACDSTREET	ACDROUTE	INTERSTREE	INTERROUTE	MILESFTFRO	NSEW_TO_IN	MILEMARKER	FEET_TO_MA	NSEW_FROM_	TYPE_OF_AC	FIXED_OBJE	LOCATION_F	NUMVEHICLE	TOTALFATAL	TOTALINJUR	PEDFATALS	PROPDAMAGE	INFONOTREP	SEVERITY	DIAGRAM_CO	POSTEDSPEE	ROAD_ALIGN	ROAD_CONDI	SURFACE_CO	LIGHTING_D	WEATHER_DE	ROAD_DESIG	TRAFFIC_CO
VII. Vicinity of Bartlett Street/Existing Shared Driveway Intersection																																
NONE																																
III. Vicinity of Bartlett Street/Cate Street Intersection																																
10/24/2014	14	FRI	1634	PORTSMOUTH	54 BARTLETT ST	00000	CATE ST	00000	00000	AT	0000	00000		Other Motor Vehicle		At Intersection	002	000	000	000	X	No Apparent Injury	25	Curve and Level	Normal	Wet	Daylight	Rain	Not Physically Divided (2 Way Traffic)	Visible Road Markings
11/28/2014	14	FRI	0750	PORTSMOUTH	54 BARTLETT ST	00000	1 CATE ST	00000	00000	AT	0000	00000		Other Motor Vehicle		Along the Road	002	000	001	000		Possible	25	Curve and Level	Normal	Ice	Daylight	Snow	Not Physically Divided (2 Way Traffic)	Visible Road Markings
8/4/2015	15	TUE	1755	PORTSMOUTH	1 CATE ST	00000	54 BARTLETT ST	00000	00000	AT	0000	00000		Other Motor Vehicle		At Intersection	002	000	000	000	X	No Apparent Injury	20	Straight and Level	Normal	Dry	Daylight	Clear	Not Physically Divided (2 Way Traffic)	Stop Sign
2/1/2015	15	SUN	0958	PORTSMOUTH	105 BARTLETT ST	00000	CATE ST	00000	00050	S	0000	00000		Other Object		Unknown	001	000	000	000	X	No Apparent Injury	00	Unknown	Normal	Snow/Slush	Daylight	Snow		None
IV. Vicinity of Bartlett Street/Islington Street Intersection																																
10/10/2014	14	FRI	1924	PORTSMOUTH	674 ISLINGTON ST	00000	BARTLETT ST	00000	00000	AT	0000	00000		Other Motor Vehicle		Intersection Related	002	000	000	000	X	No Apparent Injury	25	Straight and Level	Normal	Dry	c-Street Ligl	Clear	Not Physically Divided (2 Way Traffic)	Traffic Signals
9/16/2015	15	WED	1850	PORTSMOUTH	1 BARTLETT ST	00000	653 ISLINGTON ST	00000	00000	AT	0000	00000		Other Motor Vehicle		At Intersection	002	000	000	000	X	No Apparent Injury	20	Straight and Level	Normal	Dry	Daylight	Clear	Not Physically Divided (2 Way Traffic)	Traffic Signals
5/6/2015	15	WED	0840	PORTSMOUTH	1 BARTLETT ST	00000	653 ISLINGTON ST	00000	00000	AT	0000	00000		Other Motor Vehicle		At Intersection	002	000	000	000	X	No Apparent Injury	00	Unknown	Normal	Dry	Daylight	Clear		Traffic Signals
7/19/2015	15	SUN	1327	PORTSMOUTH	653 ISLINGTON ST	00000	BARTLETT ST	00000	00050	S	0000	00000		Other Motor Vehicle		Unknown	002	000	000	000	X	No Apparent Injury	00	Unknown	Normal	Dry	Daylight	Clear		None
8/31/2015	15	MON	1241	PORTSMOUTH	653 ISLINGTON ST	00000	1 BARTLETT ST	00000	00000	AT	0000	00000		Other Motor Vehicle		At Intersection	002	000	000	000	X	Unknown	30	Straight and Level	Normal	Dry	Daylight	Clear	Not Physically Divided (2 Way Traffic)	Traffic Signals

Attachment 3

Stephen G. Pernaw & Company, Inc.

Table 4A

STOP-Controlled Intersection Capacity Analysis - Revised 9/27/18
Bartlett Street / Cate Street

	Weekday AM Peak Hour				Weekday PM Peak Hour			
	Delay [1]	V/C [2]	LOS [3]	Queue [4]	Delay [1]	V/C [2]	LOS [3]	Queue [4]
Bartlett Street - WB Left-Turns								
2018 Existing	9	0.12	A	<1	9	0.09	A	<1
2020 No Build	9	0.16	A	1	10	0.15	A	1
2020 Build	9	0.16	A	1	10	0.15	A	1
2030 No Build	10	0.18	A	1	10	0.17	B	1
2030 Build	10	0.18	A	1	10	0.17	B	1
Cate Street - NB Left & Right Turns								
2018 Existing	13	0.07	B	<1	15	0.21	C	1
2020 No Build	-	-	-	-	-	-	-	-
2020 Build	-	-	-	-	-	-	-	-
2030 No Build	-	-	-	-	-	-	-	-
2030 Build	-	-	-	-	-	-	-	-
Cate Street - NB Left Turns								
2018 Existing	-	-	-	-	-	-	-	-
2020 No Build	32	0.02	D	<1	45	0.05	E	<1
2020 Build	33	0.02	D	<1	47	0.05	E	<1
2030 No Build	39	0.02	E	<1	58	0.07	F	<1
2030 Build	40	0.02	E	<1	61	0.07	F	<1
Cate Street - NB Right Turns								
2018 Existing	-	-	-	-	-	-	-	-
2020 No Build	13	0.13	B	<1	16	0.28	C	1
2020 Build	13	0.13	B	<1	17	0.29	C	1
2030 No Build	14	0.14	B	1	18	0.33	C	1
2030 Build	14	0.15	B	1	19	0.34	C	2

[1] HCM Control Delay (seconds per vehicle), [2] HCM Volume to Capacity Ratio, [3] HCM Level of Service, [4] HCM 95th Percentile Queue (vehicles)

HCM 2010 TWSC
2: Bartlett Street & Cate Street

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	59	138	400	507	22
Future Vol, veh/h	2	59	138	400	507	22
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	250	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	66	153	444	563	24

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1325	575	587	0	-	0
Stage 1	575	-	-	-	-	-
Stage 2	750	-	-	-	-	-
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	172	518	988	-	-	-
Stage 1	563	-	-	-	-	-
Stage 2	467	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	137	518	988	-	-	-
Mov Cap-2 Maneuver	137	-	-	-	-	-
Stage 1	447	-	-	-	-	-
Stage 2	467	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.6	2.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	988	-	137	518	-	-
HCM Lane V/C Ratio	0.155	-	0.016	0.127	-	-
HCM Control Delay (s)	9.3	0	31.7	13	-	-
HCM Lane LOS	A	A	D	B	-	-
HCM 95th %tile Q(veh)	0.5	-	0	0.4	-	-

HCM 2010 TWSC
2: Bartlett Street & Cate Street

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	59	138	406	521	23
Future Vol, veh/h	2	59	138	406	521	23
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	250	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	66	153	451	579	26

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1349	592	605	0	-	0
Stage 1	592	-	-	-	-	-
Stage 2	757	-	-	-	-	-
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	166	506	973	-	-	-
Stage 1	553	-	-	-	-	-
Stage 2	463	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	131	506	973	-	-	-
Mov Cap-2 Maneuver	131	-	-	-	-	-
Stage 1	437	-	-	-	-	-
Stage 2	463	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.8	2.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	973	-	131	506	-	-
HCM Lane V/C Ratio	0.158	-	0.017	0.13	-	-
HCM Control Delay (s)	9.4	0	33	13.2	-	-
HCM Lane LOS	A	A	D	B	-	-
HCM 95th %tile Q(veh)	0.6	-	0.1	0.4	-	-

HCM 2010 TWSC
2: Bartlett Street & Cate Street

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	62	150	439	556	24
Future Vol, veh/h	2	62	150	439	556	24
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	250	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	69	167	488	618	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1454	632	645	0	-	0
Stage 1	632	-	-	-	-	-
Stage 2	822	-	-	-	-	-
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	143	480	940	-	-	-
Stage 1	530	-	-	-	-	-
Stage 2	432	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	108	480	940	-	-	-
Mov Cap-2 Maneuver	108	-	-	-	-	-
Stage 1	401	-	-	-	-	-
Stage 2	432	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.6	2.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	940	-	108	480	-	-
HCM Lane V/C Ratio	0.177	-	0.021	0.144	-	-
HCM Control Delay (s)	9.7	0	39	13.8	-	-
HCM Lane LOS	A	A	E	B	-	-
HCM 95th %tile Q(veh)	0.6	-	0.1	0.5	-	-

HCM 2010 TWSC
2: Bartlett Street & Cate Street

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	62	150	445	570	25
Future Vol, veh/h	2	62	150	445	570	25
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	250	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	69	167	494	633	28

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1475	647	661	0	-	0
Stage 1	647	-	-	-	-	-
Stage 2	828	-	-	-	-	-
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	139	471	927	-	-	-
Stage 1	521	-	-	-	-	-
Stage 2	429	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	105	471	927	-	-	-
Mov Cap-2 Maneuver	105	-	-	-	-	-
Stage 1	392	-	-	-	-	-
Stage 2	429	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.7	2.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	927	-	105	471	-	-
HCM Lane V/C Ratio	0.18	-	0.021	0.146	-	-
HCM Control Delay (s)	9.7	0	40	13.9	-	-
HCM Lane LOS	A	A	E	B	-	-
HCM 95th %tile Q(veh)	0.7	-	0.1	0.5	-	-

HCM 2010 TWSC
2: Cate Street & Bartlett Street

Intersection	
Int Delay, s/veh	2.2

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations		↰	↱		↰	↱
Traffic Vol, veh/h	116	532	665	14	4	102
Future Vol, veh/h	116	532	665	14	4	102
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	250
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	95	95	83	83
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	132	605	700	15	5	123

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	715	0	-	0	1577	708
Stage 1	-	-	-	-	708	-
Stage 2	-	-	-	-	869	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	895	-	-	-	122	438
Stage 1	-	-	-	-	492	-
Stage 2	-	-	-	-	414	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	895	-	-	-	95	438
Mov Cap-2 Maneuver	-	-	-	-	95	-
Stage 1	-	-	-	-	383	-
Stage 2	-	-	-	-	414	-

Approach	NB	SB	NE
HCM Control Delay, s	1.7	0	17.5
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NBL	NBT	SBT	SBR
Capacity (veh/h)	95	438	895	-	-	-
HCM Lane V/C Ratio	0.051	0.281	0.147	-	-	-
HCM Control Delay (s)	44.9	16.4	9.7	0	-	-
HCM Lane LOS	E	C	A	A	-	-
HCM 95th %tile Q(veh)	0.2	1.1	0.5	-	-	-

HCM 2010 TWSC
2: Cate Street & Bartlett Street

Intersection	
Int Delay, s/veh	2.2

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	116	548	676	14	4	102
Future Vol, veh/h	116	548	676	14	4	102
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	250
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	95	95	83	83
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	132	623	712	15	5	123

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	727	0	-	0	1607	720
Stage 1	-	-	-	-	720	-
Stage 2	-	-	-	-	887	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	886	-	-	-	117	431
Stage 1	-	-	-	-	486	-
Stage 2	-	-	-	-	406	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	886	-	-	-	90	431
Mov Cap-2 Maneuver	-	-	-	-	90	-
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	406	-

Approach	NB	SB	NE
HCM Control Delay, s	1.7	0	17.9
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NBL	NBT	SBT	SBR
Capacity (veh/h)	90	431	886	-	-	-
HCM Lane V/C Ratio	0.054	0.285	0.149	-	-	-
HCM Control Delay (s)	47.3	16.7	9.8	0	-	-
HCM Lane LOS	E	C	A	A	-	-
HCM 95th %tile Q(veh)	0.2	1.2	0.5	-	-	-

HCM 2010 TWSC
2: Cate Street & Bartlett Street

Intersection	
Int Delay, s/veh	2.4

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	125	583	731	15	4	110
Future Vol, veh/h	125	583	731	15	4	110
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	250
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	95	95	83	83
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	142	663	769	16	5	133

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	785	0	-	0	1724	777
Stage 1	-	-	-	-	777	-
Stage 2	-	-	-	-	947	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	843	-	-	-	99	400
Stage 1	-	-	-	-	457	-
Stage 2	-	-	-	-	380	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	843	-	-	-	73	400
Mov Cap-2 Maneuver	-	-	-	-	73	-
Stage 1	-	-	-	-	335	-
Stage 2	-	-	-	-	380	-

Approach	NB	SB	NE
HCM Control Delay, s	1.8	0	19.8
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NBL	NBT	SBT	SBR
Capacity (veh/h)	73	400	843	-	-	-
HCM Lane V/C Ratio	0.066	0.331	0.168	-	-	-
HCM Control Delay (s)	57.8	18.4	10.1	0	-	-
HCM Lane LOS	F	C	B	A	-	-
HCM 95th %tile Q(veh)	0.2	1.4	0.6	-	-	-

HCM 2010 TWSC
2: Cate Street & Bartlett Street

Intersection	
Int Delay, s/veh	2.4

Movement	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	125	599	742	15	4	110
Future Vol, veh/h	125	599	742	15	4	110
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	250
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	95	95	83	83
Heavy Vehicles, %	0	1	1	0	0	0
Mvmt Flow	142	681	781	16	5	133

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	797	0	-	0	1754	789
Stage 1	-	-	-	-	789	-
Stage 2	-	-	-	-	965	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	834	-	-	-	95	394
Stage 1	-	-	-	-	451	-
Stage 2	-	-	-	-	373	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	834	-	-	-	69	394
Mov Cap-2 Maneuver	-	-	-	-	69	-
Stage 1	-	-	-	-	327	-
Stage 2	-	-	-	-	373	-

Approach	NB	SB	NE
HCM Control Delay, s	1.8	0	20.2
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NBL	NBT	SBT	SBR
Capacity (veh/h)	69	394	834	-	-	-
HCM Lane V/C Ratio	0.07	0.336	0.17	-	-	-
HCM Control Delay (s)	61.1	18.7	10.2	0	-	-
HCM Lane LOS	F	C	B	A	-	-
HCM 95th %tile Q(veh)	0.2	1.5	0.6	-	-	-

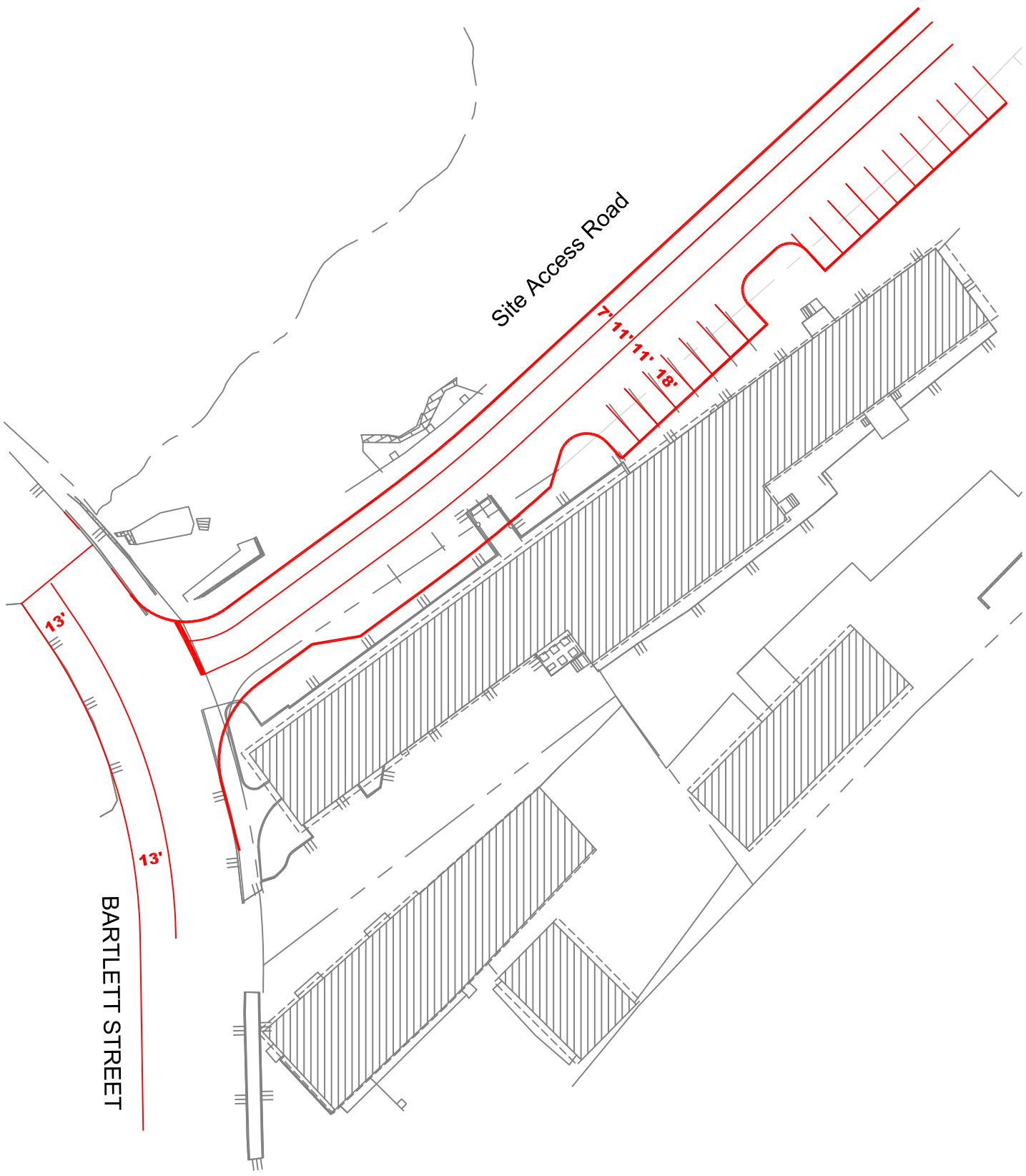


EXHIBIT 1

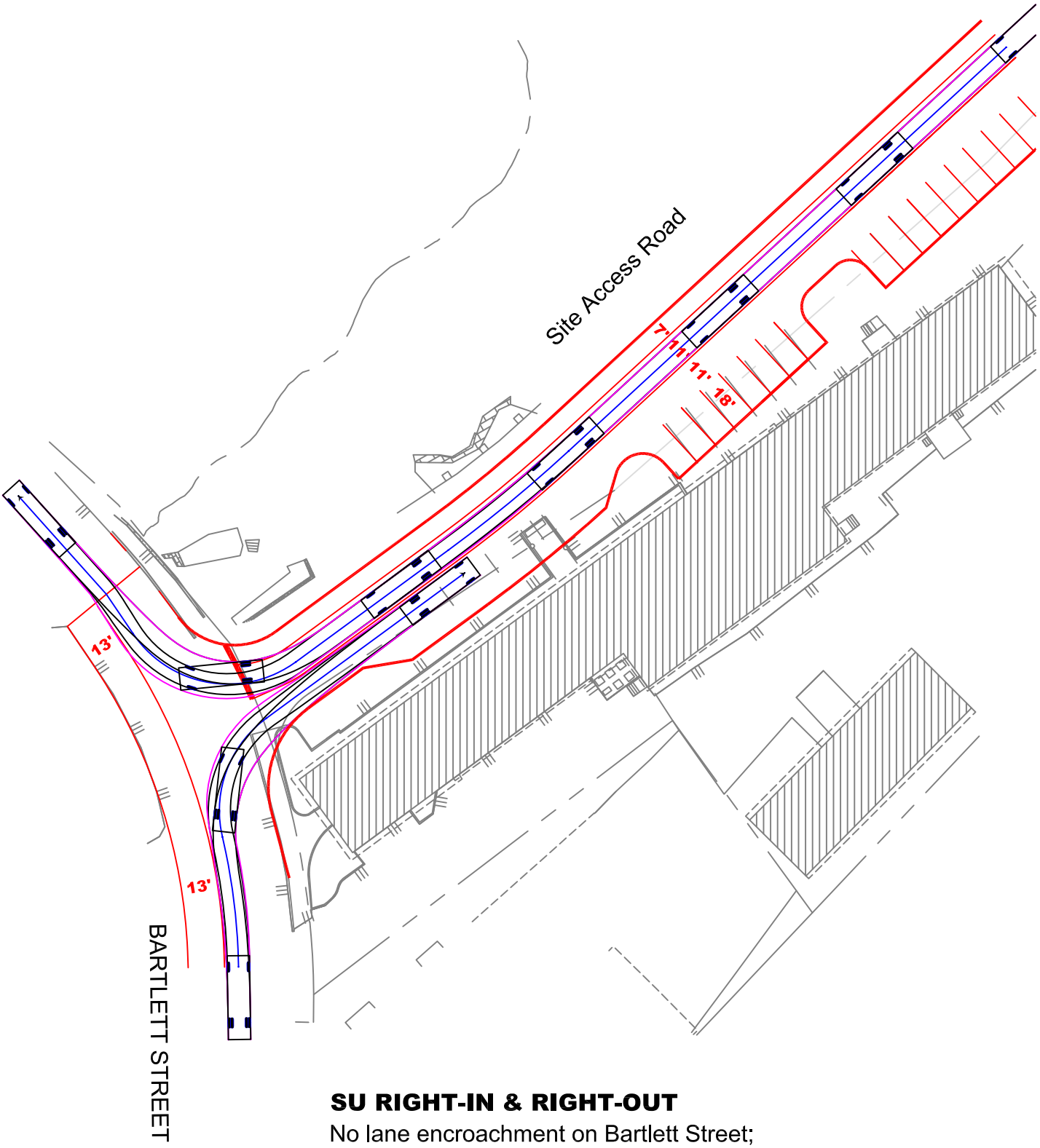
DRAFT FOR DISCUSSION PURPOSES ONLY

CLIPPER TRADERS RESIDENTIAL DEVELOPMENT PORTSMOUTH, NEW HAMPSHIRE	DRAWN: CAP	SCALE: 1" = 50'
	DESIGNED: SGP	JOB NO. 1821A
BARTLETT STREET / SITE ACCESS ROAD INTERSECTION	CHECKED: SGP	DATE: 9/28/18

TRANSPORTATION
• ENGINEERING
• PLANNING
• DESIGN

SGP

Stephen G. Pernaw & Co. Inc.
P.O. Box 1721, Concord, NH 03302
Phone: (603) 731-8500, Fax: (866) 929-6094,
sgp@pernaw.com



SU RIGHT-IN & RIGHT-OUT

No lane encroachment on Bartlett Street; movements can occur simultaneously.

EXHIBIT 1-A

DRAFT FOR DISCUSSION PURPOSES ONLY

CLIPPER TRADERS DEVELOPMENT PORTSMOUTH, NEW HAMPSHIRE	DRAWN: CAP	SCALE: 1" = 50'
	DESIGNED: SGP	JOB NO. 1821A
BARTLETT STREET / SITE ACCESS ROAD INTERSECTION	CHECKED: SGP	DATE: 9/28/18

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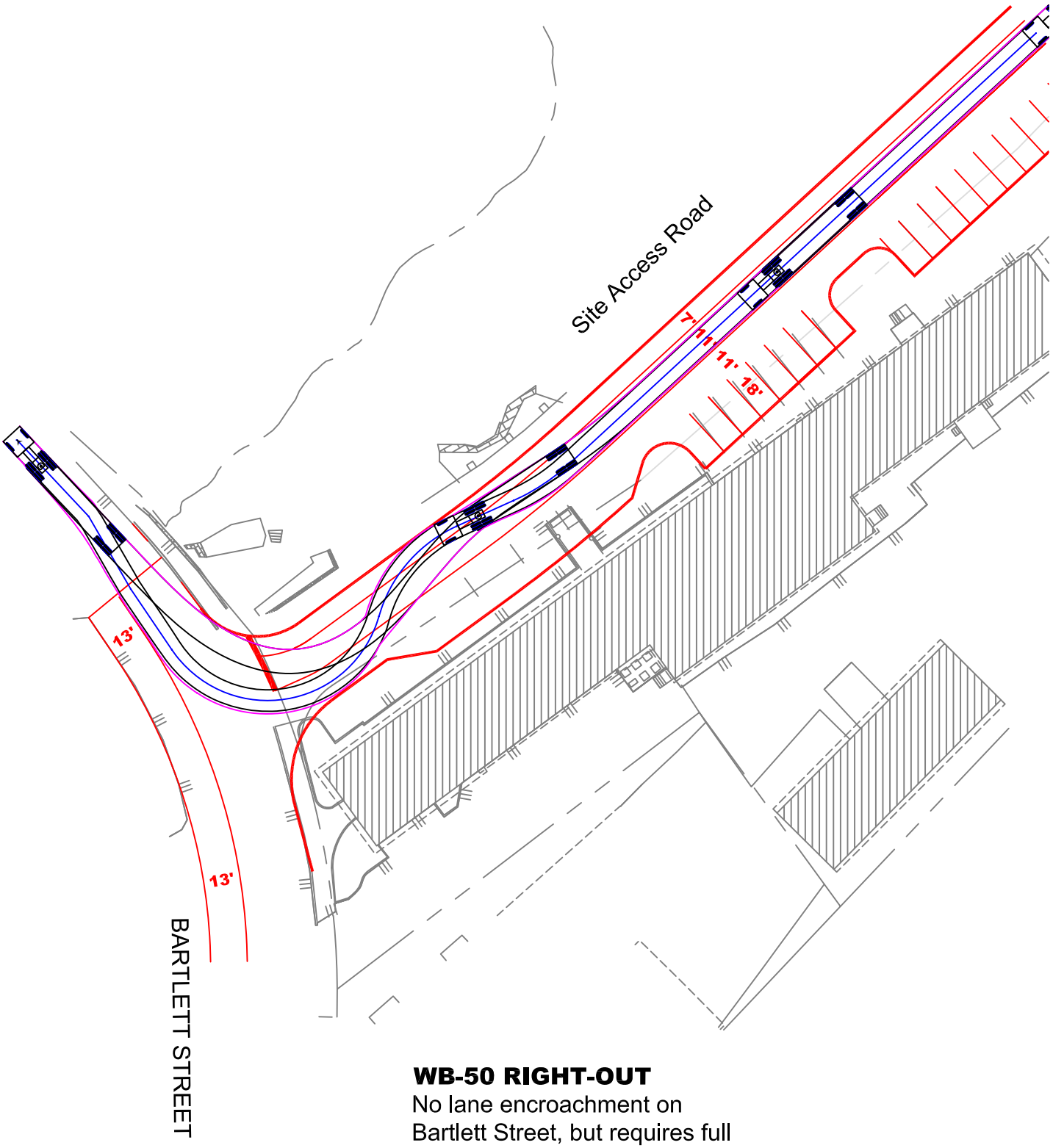

WB-50 RIGHT-OUT

No lane encroachment on Bartlett Street, but requires full width of the site access road to exit right.

EXHIBIT 1-B

DRAFT FOR DISCUSSION PURPOSES ONLY

CLIPPER TRADERS DEVELOPMENT PORTSMOUTH, NEW HAMPSHIRE	DRAWN: CAP	SCALE: 1" = 50'
	DESIGNED: SGP	JOB NO. 1821A
BARTLETT STREET / SITE ACCESS ROAD INTERSECTION	CHECKED: SGP	DATE: 9/28/18

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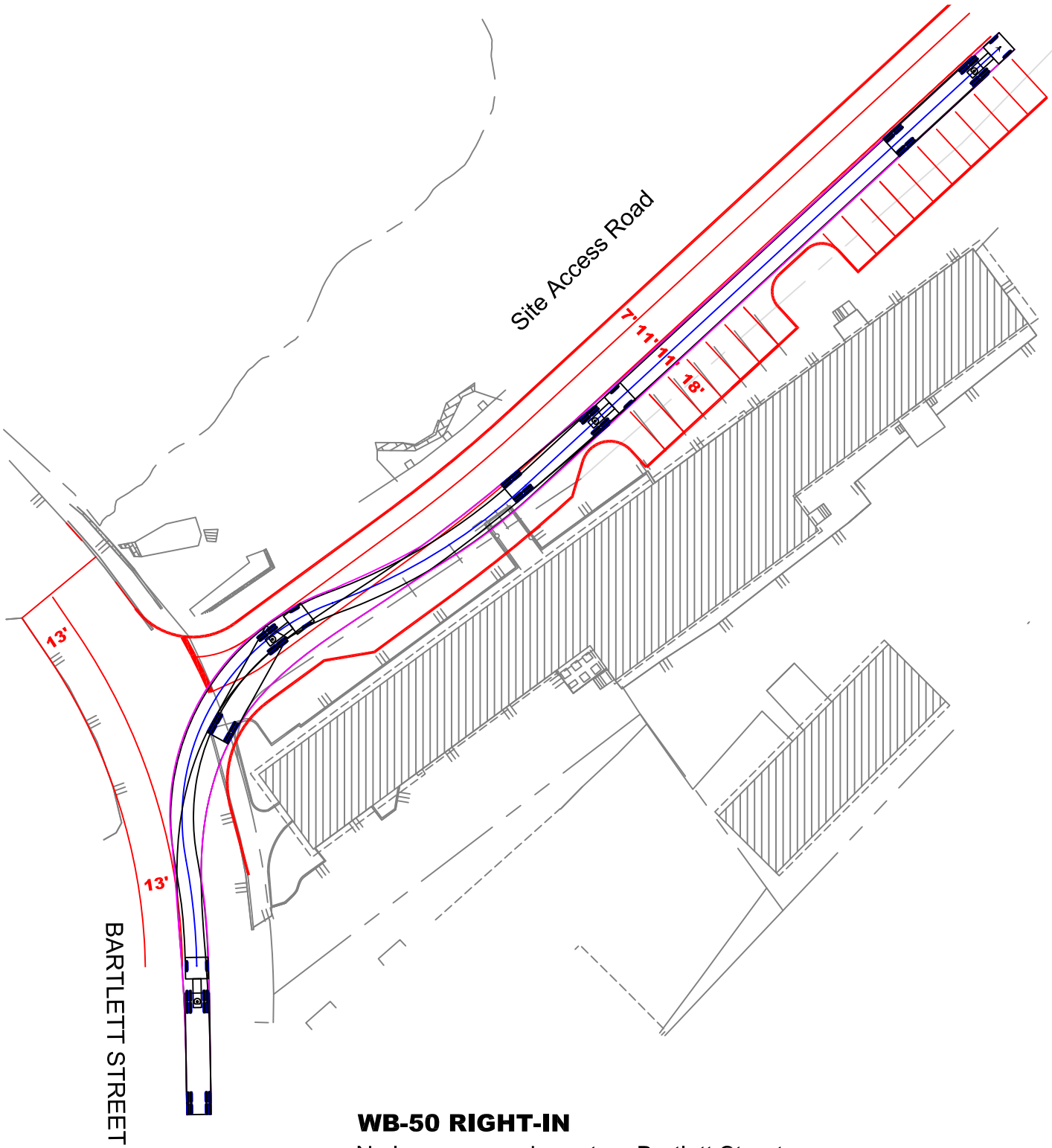

WB-50 RIGHT-IN

No lane encroachment on Bartlett Street, but requires the driver to wait until the full width of the site access road is available to enter.

EXHIBIT 1-C

DRAFT FOR DISCUSSION PURPOSES ONLY

CLIPPER TRADERS DEVELOPMENT PORTSMOUTH, NEW HAMPSHIRE	DRAWN: CAP	SCALE: 1" = 50'
	DESIGNED: SGP	JOB NO. 1821A
BARTLETT STREET / SITE ACCESS ROAD INTERSECTION	CHECKED: SGP	DATE: 9/28/18

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WB-50 LEFT-IN

Requires driver to wait until full width of the site access road is available to enter.

EXHIBIT 1-D

DRAFT FOR DISCUSSION PURPOSES ONLY

CLIPPER TRADERS DEVELOPMENT PORTSMOUTH, NEW HAMPSHIRE	DRAWN: CAP	SCALE: 1" = 50'
	DESIGNED: SGP	JOB NO. 1821A
BARTLETT STREET / SITE ACCESS ROAD INTERSECTION	CHECKED: SGP	DATE: 9/28/18

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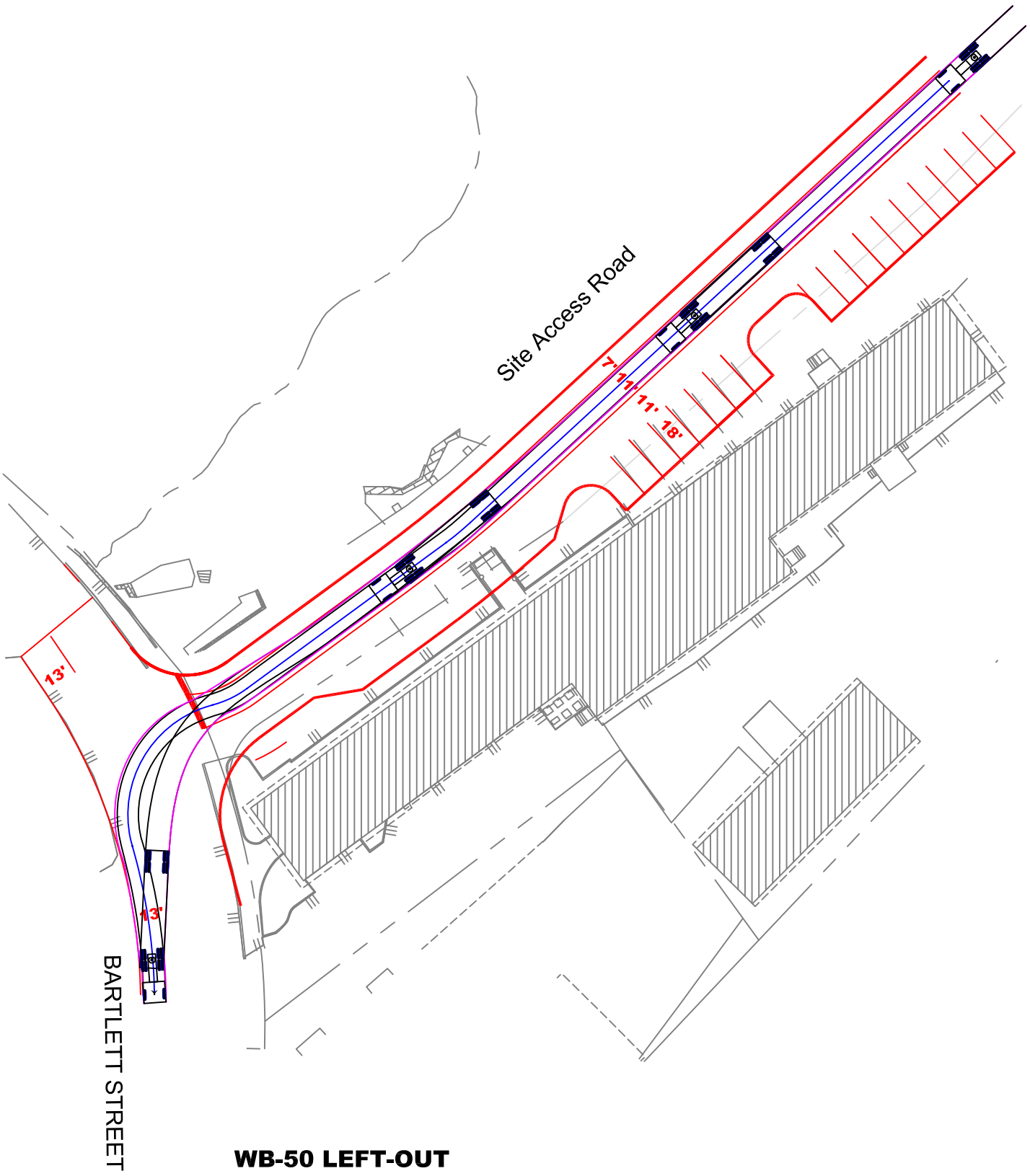

WB-50 LEFT-OUT

No issues.

EXHIBIT 1-E

DRAFT FOR DISCUSSION PURPOSES ONLY

CLIPPER TRADERS DEVELOPMENT PORTSMOUTH, NEW HAMPSHIRE	DRAWN: CAP	SCALE: 1" = 50'
	DESIGNED: SGP	JOB NO. 1821A
BARTLETT STREET / SITE ACCESS ROAD INTERSECTION	CHECKED: SGP	DATE: 9/28/18

TRANSPORTATION
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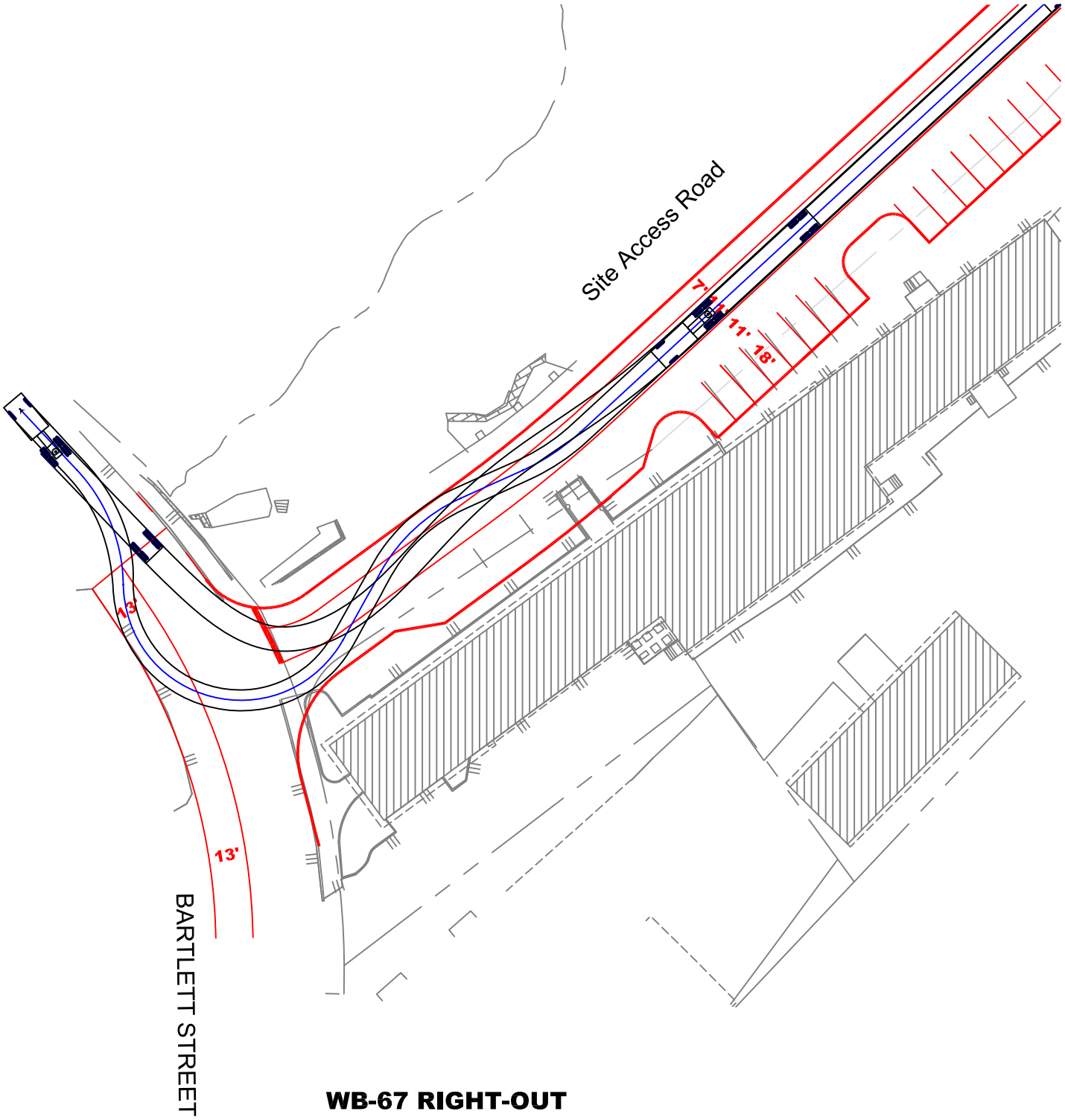

WB-67 RIGHT-OUT

Lane encroachment occurs on Bartlett Street and full width of the site access road is needed to exit right. Note: existing intersection is likely not capable of accomodating a WB-67 properly.

EXHIBIT 1-F

DRAFT FOR DISCUSSION PURPOSES ONLY

CLIPPER TRADERS DEVELOPMENT PORTSMOUTH, NEW HAMPSHIRE	DRAWN: CAP	SCALE: 1" = 50'
	DESIGNED: SGP	JOB NO. 1821A
BARTLETT STREET / SITE ACCESS ROAD INTERSECTION	CHECKED: SGP	DATE: 9/28/18

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