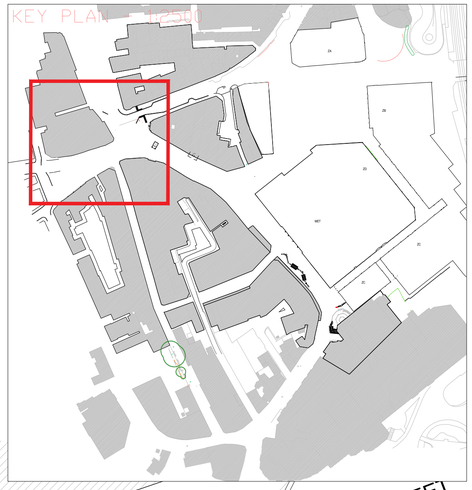
MFD Thornton Tomasetti Vehicle Dynamic Assessment [VDA] Commentary

6	20	1011	Mixed Static & Rising Bollards	N2A	65	Western closure of Peel Square (north part)	Church Street via Graham's Orchard	Southbound	36.9	59.5	984	Both	2	Standing start on Church Street between junctions with St. Mary's Gate and Sadler Gate. Turn over and then from offside footway at ATS junction with Market Hill and so via passage to Graham's Orchard. Note widely spaced stainless steel sleeved bollards on Shambles Street and two small concrete bollards at the top of Graham's Orchard. Note favourable gradient on much of this route.
	21			N2A	64		St. Mary's Place via Graham's Orchard	Southbound	43.2	69.5	1342	Both	1	Low speed incursion onto Church Lane from Church Street / Eastgate / Church Lane roundabout. Difficult run for around against the one-way traffic on Church Lane and St. Mary's Place, although the latter does have wide footways. Over Shambles Street at ATS junction then via passage to Graham's Orchard. Note widely spaced stainless steel sleeved bollards on Shambles Street and two small concrete bollards at the top of Graham's Orchard. Note favourable gradient on much of this route.
	22			N2A	62		Shambles Street via Graham's Orchard	Southbound	36.3	58.5	951	Both	2	Standing start on Shambles Street eastbound, turn over nearside footway at ATS junction with St. Mary's Place and then via passage to Graham's Orchard. Note widely spaced stainless steel sleeved bollards on Shambles Street and two small concrete bollards at the top of Graham's Orchard. Note favourable gradient on much of this route.

Target	Route ID.	VDA Drg.	Measure	Vehicle	ATR	Location	Roads	Direction	Speed (mph)	Speed (km/h)	Energy (kJ)	Limit	Outcome	Notes
	23			N2A	31		Graham's Orchard	Southbound	33.3	52.0	751	Acceleration	4	Standing start in yard to rear of Yorkshire House and turn onto Graham's Orchard. Impact to bollards forming return in Line Of Protection. Note favourable gradient on this route. Turning onto rising bollards providing access control would result in impact speed of 37.1km/h [ATR30].
	24			N2A	29		Peel Parade via Graham's Orchard	Southbound	27.3	44.0	538	Both	3	Standing start on Peel Parade and turn onto Graham's Orchard. Impact to bollards forming return in Line Of Protection. Note favourable gradient on this route. Turning onto rising bollards providing access control would result in impact speed of 37.1km/h [ATR30].
	25			N2A	33		Peel Street	Eastbound	46.0	74.0	1521	Acceleration	5	Standing start at entry to roundabout at junction of Shambles Street / Peel Street / West Way / Racecommon Road / Dodworth Road / Summer Lane. Straight acceleration to target with minimal obstruction.
	26			N2A	63		Lane to rear of 'Chambers' Public House	Eastbound	17.1	27.5	210	Acceleration	5	Standing start backed-up to north-west corner of yard/lane (an N2A would not be able to negotiate the corner because of the external fire escape here). Could equally apply to bollards in south part of Target 6.
	27			N2A	36	Western closure of Peel Square (south part)	Wellington Street	Northbound	32.6	52.5	766	Turning	3	Low speed turn onto Wellington Street from West Way or Pall Mall, impact to rising bollards. As drawn, the impact to the end bollard in the part parallel to back-edge-of-kerb would be at the same speed [ATR34], but more generally in this part impact speed would be 45.0km/h [ATR37]. Even at 30.0km/h, impact to a single bollard in the return to the line of access control is impossible for an N2A vehicle [ATR32].
	28			N2A	CHRT		Pitt Street West via Pitt Street	Eastbound	49.7	80.0	1778	Data limit	4	Standing start on Pitt Street West, between junctions with Blenheim Road and St. George's Road. Note that for the final 100m of this route (east of the junction with Blucher Street) the attacking vehicle will be running contrary to one-way traffic.
														The illustrative Line Of Protection here incorporates the existing structure of steps to the Ladies toilets, with adjacent north and south a set of access control bollards. These access points are 'set-back' to allow vehicles to pull clear of the highway while waiting to be admitted. The Line Of Protection has not been made straight between these two access points as it is presumed the that main underground structure of the toilets lurks here between the two sets of steps (one for Ladies and one for the Gents).
7	29	1011	Mixed Static & Rising Bollards	N2A	38	Peel Square at Queen Street	Church Street via Market Hill	Southbound	38.5	62.0	1068	Acceleration	3	Standing start on Church Street at ATS junction with Sadler Gate. Overrun nearside footway to cut ATS junction at Shamble Street (through gap at crossing-or existing bollards) then along Market Hill against one-way traffic. Note favourable gradient on this route, wide footways and non-crash rated bollards, some of them removable.
	30			N2A	39		Shambles Street via Market Hill	Southbound	33.2	53.5	795	Acceleration	3	Standing start on Shambles Street at ATS junction with St. Mary's Street. Immediately run against one-way traffic and through ATS junction at Shamble Street, turning onto along Market Hill within width of carriageway. Note favourable gradient on this route, wide footways and non-crash rated bollards.
	31			N2A	40		Eldon Street	Westbound	24.8	40.0	445	Turning	3	Standing start on Eldon Street, turn from offside footway onto part of Line Of Protection where bollards are more-or-less parallel to carriageway. Note wide footways and parallel parking bays on this route.
	32			N2A	41		Eldon Street North via Eldon Street	Westbound	44.4	71.5	1420	Acceleration	2	Standing start on Eldon Street North at ATS junction with Barnsley Transport Interchange, running ATS at junction with Regent Street. Note slight adverse gradient, wide footways and parallel parking bays on this route. If the standing start is instead at the ATS junction with Regent Street, impact speed would be reduced to 65.0km/h [CHRT]. This impact is to just one bollard in the Line of protection as shown on the drawings, so perhaps should be regarded as a quirk of the particular illustrative design. If the line can be moved south by 3 to 4m, it would be possible to draw a straight line between buildings and so remove any particularly vulnerable facets. BMBC may consider this undesirable for a number of reasons.

Summary of HVM measures needed include;

- 25Nr Static Bollards
- 1 Nr Rising Bollard. 9 Static Bollards





- SB1 — **Marshalls Static Bollard Stainless Steel - BSI PAS 68:2013 or IWA 14-1:2013** in response to HVM measures. *NBS TBC*
- SFB1 — **Marshalls Rising Bollard Stainless Steel - BSI PAS 68:2013 or IWA 14-1:2013** in response to HVM measures. *NBS TBC*
- W1 — **W1 Wall Type 1: Solid Granite** Seating Walls *- Q50 / 220A*
- **W1 Walls, Clad Granite walls and K2 Kerb type forming planting areas**
- S1 — **S1 Step Type 1:** Solid Granite Steps *Q25 / 310D*
- PL1 — **PL1 Planting Type 1 - See Planting Plan**: *Q31 + Q28*
- **Proposed Granite Stone Units [W1] 500mm high as alternative HVM measure**
- **Existing litter bin**
- **Existing Traffic Light Location**
- PB — **Existing post box**
- BOL — **Existing bollard to be retained / removed** *TBA*
- SGN — **Existing sign to be retained / removed / repositioned** *TBA*
- **Existing communication services**
- **Existing fence line**
- **Cable TV**
- **Unidentified**
- **CATV**
- **Traffic Light Cables**
- **Radio**
- **K Com Cables**
- **Street Light Cable**
- **Drains combined**
- **Electricity**
- **Gas**
- **British Telecom cables**
- **Communication cables**
- **Possible linear feature**
- **Water**
- **Drainage foul**
- **Street light cables**
- **Surface drainage**
- **Empty duct**

Notes:
- This drawing is copyright.
- Do not scale dimensions from this drawing.
- This drawing is to be read in conjunction with all other relevant drawings
- All discrepancies on this drawing are to be reported to the architect.
- Do not modify any element of this drawing.
- Use drawing only for purpose(s) issued.

North Sign / Key Plan

The following external model files are included within this drawing:

Rev	Date	Revision Notes	Dn	Rv
A	13/10/20	Minor amendments following comment from Client and Contractor team	JH	DW

Client / Contractor

IBI — Intelligence Buildings Infrastructure — www.ibigroup.com

Project: BETTER BARNSLEY TOWN CENTRE

Drawing Title: HOSTILE VEHICLE MITIGATION MEASURES - PEEL SQUARE [CCP081]

Job Number	Drawing Originated Date	PAS 1192 Status Code
51184	20/12/19	
Scale@A1	Purpose	
1:200	COMMENT AND APPROVAL	

Drawing Number: BBTC_IBI_N3_L_G700_PL_00_31 — Revision: A