



Road Safety Matters

Quality Audit
Inclusive of Stage 1 Road Safety Audit
for
PROPOSED RESIDENTIAL DEVELOPMENT
AT
THE GRANGE
BREWERY RD, STILLORGAN, DUBLIN 18

Date: August 2019

Report produced for: Waterman Moylan Consulting Engineers

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BACKGROUND INFORMATION

The report which follows is the preliminary Quality Audit and Road Safety Audit - Stage 1 for access to a proposed residential development in The Grange, off Brewery Rd, Stillorgan, Co Dublin, based on the information supplied to the Audit Team, as detailed below. The scheme involves reconfiguration of an existing priority controlled access into an existing development site to the southeast of the subject site off Brewery Road. The existing access junction will be re-configured and the existing site access road realigned. Footways will also be provided throughout the site, along with landscaping and all associated ancillary works.

Table 1: Information Supplied

Item		Supplied	Comment
A	Plans / Drawings	Y	1818-OMP-00-01-DR-A-XX-10001 Rev 25: Level 01 Plan
			LGRA032 2019 07 10 Landscape Masterplan-A0
			18-093-P010-Site Location Plan
			18-093-P100-Road Levels and Watermain Layout-Sheet 1 of 2
			18-093-P101-Road Levels and Watermain Layout-Sheet 2 of 2
			18-093-P140-Entrance Sightlines
			18-093-P150-Swept Path Analysis - Fire Tender
			18-093-P201-Drainage Layout-Level 01
			18-093-P202-Drainage Layout-Level 00
B	Traffic Volume Information	Y	Included in TTA
C	Speed Count Data	N	
D	Collision Data	Y	
E	Departures from Standards	N	
F	Audit Brief	Y	Preliminary Design Quality Audit to include Stage 1 Road Safety Audit, Access Audit, Walking Audit and a Cycle Audit in accordance with DMURS and TII GE-STY-01024 Dec 2017. Audit excludes full internal site Audit
			18-093r.007 - TTA - 26-07-19. pdf 18-093r.009 DMURS Statement of Consistency DRAFT 18-093r.011 Car Parking Strategy & Mobility Management Plan DRAFT 1-08-19

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Appendix A - Quality Audit Brief Checklist

Appendix B - Photographs from Site Visit

Appendix C - Scheme Drawing(s)

Appendix D - Feedback Form

1. INTRODUCTION

- 1.1 This report results from a Stage 1 Road Safety Audit (RSA) and Quality Audit (QA) carried out at the proposed access to a residential development site off the N31 Brewery Road in Stillorgan, Dublin 18, carried out at the request of Waterman Moylan Consulting Engineers. The proposals involve construction of 287 No. residential units and a new Crèche with the associated tenant amenities over basement bike and carparking, and all associated ancillary services. The proposals include use of an existing priority controlled access into an existing development site to the southeast of the subject site off Brewery Road. The existing access junction will be re-configured and the existing site access road realigned. The majority of the carparking onsite will be accessed from a ramp off the main site access road. There are a total of 100 car parking spaces, 5 motorcycle spaces and 596 bicycle parking spaces provided. Pedestrian access will be provided along the building elevation facing onto Brewery Road and from the footway provided on both sides of the vehicular entrance road. The site location has been presented in Figures 1 and 2, with the proposed internal site layout shown in figure 3.

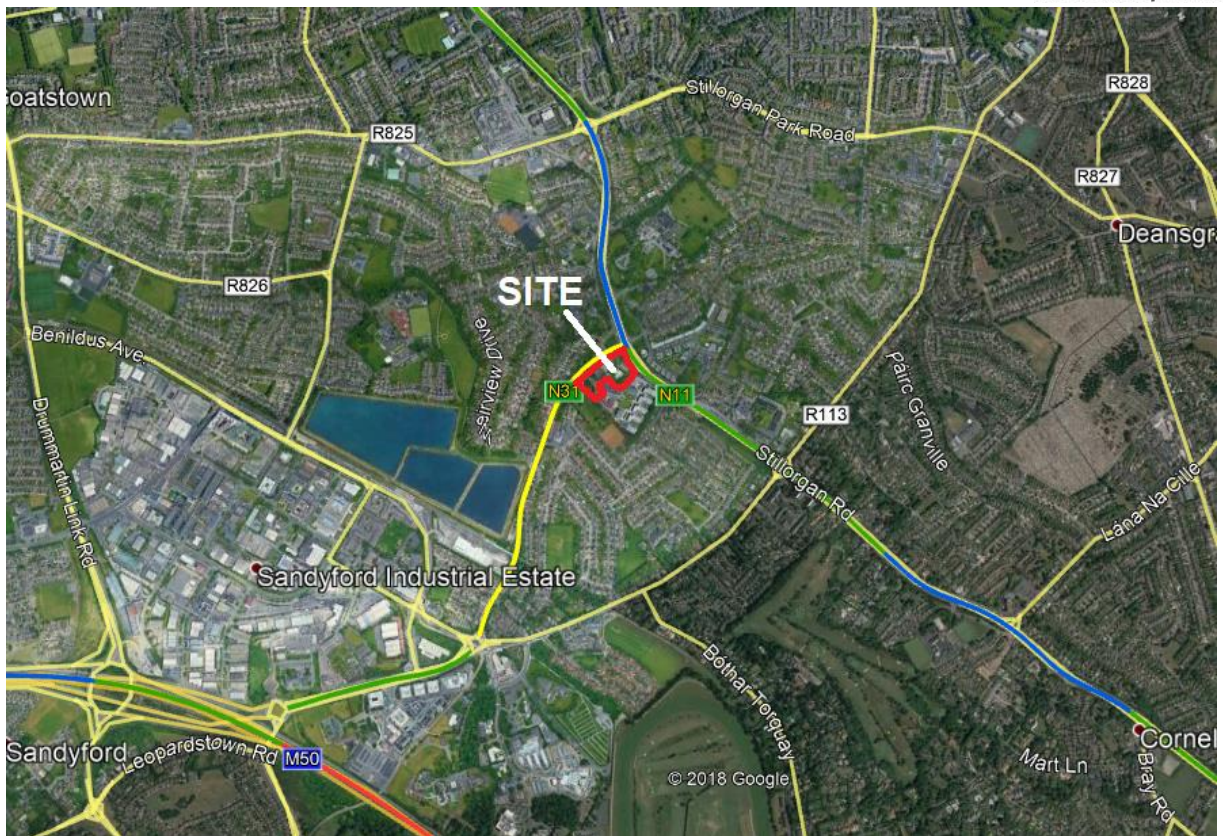


Figure 1: Site Location Plan



Figure 2: Site Location Plan



Figure 3: Proposed Site Layout

- 1.2 The scope of this Quality Audit includes an assessment of the proposed layout, a summary of safety issues observed surrounding and on approaches to the site and on the adjoining road network, including accessibility for Vulnerable Road Users (VRUs – including cyclists and pedestrians), in accordance with the Design Manual for Urban Roads and Streets (DMURS).
- 1.3 The scope of the RSA is generally confined to the extents of the proposals within the red line site boundary, and immediate tie-ins, whilst the scope of the QA extends to the surrounding environment and general accessibility issues which need to be considered for all transport modes, as the site design progresses.

- 1.4 The RSA and QA was carried out during July 2019, and included a site visit by the Audit Team on Monday 8th July 2019 during daylight hours. The weather at the time of the site visit was fine and dry, and the surface of the road was predominantly dry. Traffic conditions were moderate, and the posted speed limit at the site was 50 km/hr on Brewery Rd (N31) and 60 km/hr on the N11 Stillorgan dual carriageway which runs along the northeastern boundary of the site.
- 1.5 The Audit Team Membership was as follows;
- | | |
|--------------|---|
| Team Leader: | Miriam O'Brien – BE (Civil) FIHE MIEI MCIHT SoRSA CoC |
| Team Member: | Anthony Sumner – HNC Civil Eng, AEng MIEI |
- 1.6 The Audit took place at the offices of Road Safety Matters following the site visit by the Audit Team. The Audit was undertaken in accordance with the Design Team's Audit Brief, and comprised an examination of the plan provided by the Design Team, as listed in Background Information, Table 1.
- 1.7 The terms of reference of the Road Safety Audit are as described in TII GE-STY-01024 Dec 2017. The team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria. The Quality Audit (QA) has been carried out in accordance with recommendations within the Design Manual for Urban Roads and Streets (DMURS), and in consultation with other Industry recommendations on QA procedures.
- 1.8 Section 2 of this report contains a summary of the issues identified by the QA. Section 3 contains issues raised by the Stage 1 RSA together with recommendations to be considered. Section 4 contains the Auditor Team Statement. Most issues raised in Section 3 can be cross-referenced with photographs taken on the site visit which are included in **Appendix B** or in the body of the report where necessary, as well as the scheme drawing (**Appendix C**).

2. ISSUES RAISED BY THE STAGE 1 QUALITY AUDIT

2.1 INTRODUCTION

2.1.1 This Quality Audit (QA) has been produced in accordance with recommendations within the DMURS with a view to meeting the broad objectives of place, functionality, maintenance and road safety for the examined site, taking into account the needs of all user groups strategically on the local road network / streetscape on the approaches to the site. A full Audit of the internal site layout and building accessibility was outside the scope of this preliminary design Stage 1 QA.

2.1.2 The QA includes a Walkability Audit, a Cycling Audit and an Accessibility Audit, which provides an overview of access to the site by all possible transport modes, and identifies any issues which may arise for mobility and sensory impaired pedestrians. The QA has been divided into the following sections:

- Non-Motorised User Audit (including cyclists and walkers) – Section 2.2
- Accessibility Audit – Section 2.3
- Road Safety Audit (Section 3 of this report).

2.1.3 The QA has focused predominantly on the impact of the proposed site redevelopment on the public road network. As the design presented is at preliminary design / planning stage, it is advised that the findings of this preliminary QA should be revisited and updated as the scheme progresses to detailed design and construction.

2.1.4 The key function of this site is to provide a high quality residential development, which serves the needs of the inhabitants and visitors to the site. In an urban environment, with excellent accessibility to the public transport network, it should be expected that movements to and from the site should be less car dominated, and the overall site layout should therefore be designed to address this urban context, with a focus on increased priority and accessibility for all VRUs.

2.2 NON MOTORISED USER (NMU) AUDIT

2.2.1 The NMU Audit considered the existing and potential patterns of use by pedestrians and cyclists within and on approaches to the site, and potential measures which may improve their amenity and safety. Many of the issues identified through the NMU Audit process have been reiterated within Section 3 of this report, in accordance with standard Road Safety Auditing procedures.

This preliminary walking and cycling audit has been undertaken to provide community stakeholders with the information they need to analyse the design and condition of the transportation network, and to provide a synopsis of facility and operational information to enable transportation planners and engineers to develop optimal walking and cycling routes to the site, target areas where changes are needed, and identify physical and policy solutions to improve the walking and cycling environment in the locality.

Existing patterns of NMU activity on the site were identified and observed at the time of the site visit (evening), and the Audit Team concluded that this site exhibited a moderate level of usage by NMUs at this time. It was deemed highly likely that NMU usage of the links surrounding the site is likely to increase significantly during peak times due to the urban nature the surrounding environment. The site development proposals show significantly more bicycle parking spaces on the site (580) compared to vehicular carparking (100). The final site layout should therefore ensure that accessibility is maximised and roadspace reallocated for the benefit of cyclists.

Multiple desire lines and movements were observed for pedestrians, on both sides of the carriageway on the links surrounding the site, which are generally well catered for in the existing layout, as outlined below. In terms of road hierarchy, the current road layout within the existing Grange development site is predominantly designed in favour of shared usage for vehicles and VRUs.

There is an existing history of collision risk for cyclists in the locality (see paragraph 3.1.3 of the Road Safety Audit report for further details), most notably at the intersection of Brewery Road and St Brigid's Church Road, with the rate of collisions appearing to increase significantly in recent

years, which demonstrates that the local environment has not historically been particularly safe for cycling. As the site is located in the transition between the urban speed limit of 50 km/hr and the 60km/hr transition zone, a higher collision rate would be expected, typically due to inconsistent road user behaviour and significant speed differentials in the locality, and on the network surrounding the site. Further details of these NMU collisions have been provided in the Road Safety Audit section of this QA report.

2.2.2 Key Issues Identified – Walkability Audit

In terms of walkability, the following observations were made on existing pedestrian facilities on approaches to the site from all directions, along with walkability issues arising as a result of the proposed site redevelopment:

- There was no information provided on current or anticipated pedestrian volumes, including trip numbers and desire lines, which should be considered as part of the site design process, particularly as a large proportion of the trips to and from the site will be on foot.
- Existing provision for pedestrians surrounding the site is generally good, with continuous footways at most locations. These footways were generally considered to be of adequate width to cater for observed demands, and to cater for any demands likely to arise as a direct result of the proposed development, with minor improvements necessary, as outlined in this report.
- There are currently no formal pedestrian crossing facilities on the N31 in the vicinity of the proposed site access. Controlled pelican crossings are located on three arms of the adjacent signalised junction with the N11 (all but the northern arm).
- Pelican crossings are accompanied by dropped kerbs, tactile paving and push button units, however crossing widths are narrower than advisable on some of the arms, and PBUs are dated. Long crossing distances were also noted, with non-staggered layouts crossing opposing traffic streams.

- Staging sequence and timings on the signalised junction at the N11/N31 intersection is configured in favour of motorists, and pedestrians have to cross and wait between stages to complete their journey, incurring significant delay if their origin/destination requires crossing two or more arms.
- Provision has been made for informal raised crossing points on the existing access road to the site, and on the proposed layout, which should assist with maintaining low site speeds and enhancing site walkability.
- Observed vehicle speeds and traffic volumes on the N11 and the N31 were relatively high at the time of the site visit, particularly on the N11 dual carriageway, hence risks to pedestrians are considered significantly higher at these locations. General walkability on these links is therefore considered poor due to the vehicular dominance of the cross sections, and the severance presented by the wide carriageways and heavy traffic volumes, as well as the relatively long waiting times for the pedestrian green phase to cross the dual carriageway.
- Poor surface condition was noted at some locations on the current pedestrian access routes to and from the site, as shown in photos in figures 4 - 6. The extent of new surfacing is not clear from the plans supplied. Poor uneven surfaces can lead to trip hazards and ponding, which can lead to an increased risk of pedestrians slipping during wet and icy conditions.



Figure 4



Figure 5



Figure 6

- Pedestrian desire lines were noted in the locality, which were not catered for in the current or proposed layout, as shown in figure 7, which represents the most direct desire line to the bus stop located on the western side of the N11, which caters for all citybound bus routes.



Figure 7

- Current accessibility on foot to and from the N11 to the site is relatively restricted. Although the N11 creates severance and limits VRU accessibility, there is provision for pedestrian crossings at the signalised junction, as outlined previously. A full Audit of the layout at this junction was outside the scope of this current Stage 1 QA, however it is recommended that the layout and safety of this junctions should also be considered as the site design progresses, due to the proximity to the site and anticipated ongoing use of this junction by a high proportion of development related traffic, including VRUs.
- The site and the surrounding road network are relatively level, however steps and ramps were provided at some locations within the site. Levels should be investigated further at detailed design to ensure that an absolute maximum gradient of 1 in 12 has been provided on ramps, over a maximum distance of 2m, and that gradients throughout and surrounding the site should generally not exceed 4%.
- A number of large chamber covers were noted on pedestrian desire lines within footways surrounding the site, and on the proposed layout, which can present a slip hazard.
- Intervisibility between pedestrians and motorists is poor at some locations surrounding the site, and there are no proposals for improvements on the preliminary design layout. Potential intervisibility issues were also noted on the proposed layout, including at an existing access on the eastern side of the site, which is shown in figure 8, and at crossing points adjacent to hoarding surrounding the site, as shown in figure 9.



Figure 8



Figure 9

- A number of isolated pinchpoints were also noted on the footways surrounding the site, including on new footways, as detailed further in the RSA section of this report.

- Trees within the verges on the existing layout present a good separation distance between pedestrians and motorists on the N31, however issues may arise in respect of tree roots damaging pavements and creating trip hazards on the footways surrounding the site, with shedding leaves and shadowing creating potential slippery conditions. A number of the trees on the routes to the site may present overhead hazards, as shown in figure 10. As these are general maintenance issues they will require monitoring by the Local Authority, and are unlikely to cause any significant increase in risks to pedestrians accessing the development site from these directions.

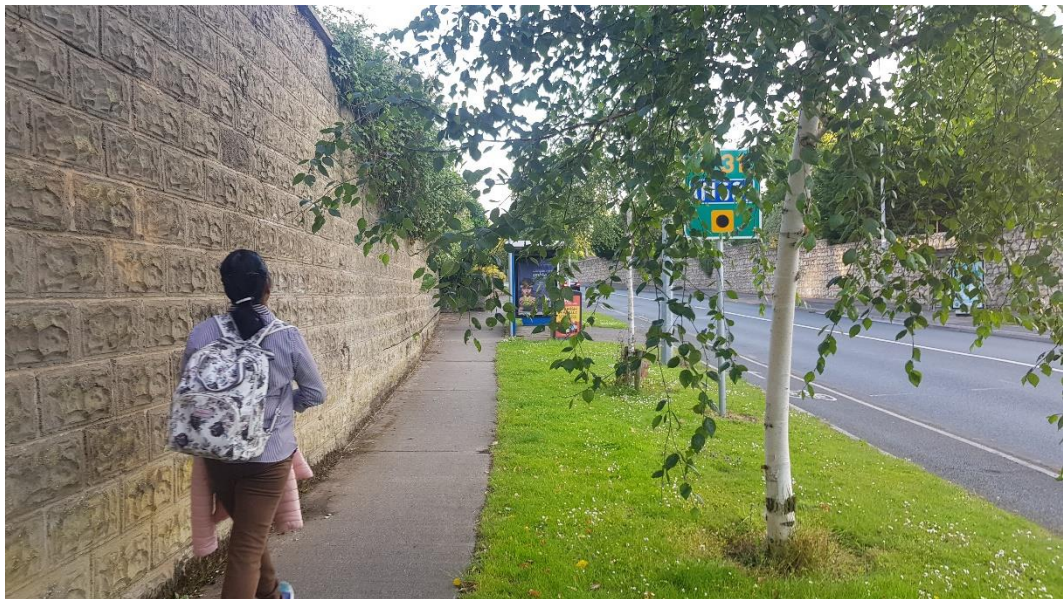


Figure 10

- A number of issues have been raised in respect of proposals for trees and landscaping within the site, with similar risks arising to those outlined above in respect of existing trees surrounding the site, and as detailed further in the RSA section of this report.
- Internal site speeds are expected to be low on the approach roads and within the basement car park, however the provision for pedestrian accessibility through the car park areas and on the access ramp is not clear from the plans supplied. There were no long sections or cross sections provided within the site, hence it was not possible to fully assess any internal site safety issues in terms of walkability. An Audit of the internal site layout and accessibility within the building and basement car park was

outside the scope of this Stage 1 QA, however general walkability should be considered in more detail as the site development progresses.

2.2.3 Key Issues Identified – Cycling Audit

A number of cyclists were observed on the network surrounding the site, using cycle tracks along each side of the N11, some using the carriageway shared with traffic and others using footways. The condition of the existing cycling facilities was generally good to the northeast of the site, and on the N31 Brewery Rd along the northwestern side of the site, however there were gaps and discontinuities of the cycling network noted on both the existing and proposed layout, with the key issues observed as follows:

- There was no information provided on current or anticipated cyclist volumes, including trip numbers and desire lines. There is no provision for dedicated cycling facilities on the internal network, and cyclists must share the carriageway with motorised traffic or footways with pedestrians, on a limited space.
- There is a comprehensive cycling network with a cycle lane/cycle track provided along both sides of the N11 to the east, which is of reasonable quality, with cyclists generally segregated from fast moving, heavy volumes of traffic.
- Provision has been made for a segregated cycle track on approaches to the reconfigured site access junction from both directions, as shown in figures 11 and 12. The proposed design has included for continuity of this facility across the mouth of the reconfigured access junction with transition from off to on road facility with highlighted surfacing, which should assist in highlighting the presence of these vulnerable road users at this location. The Audit team noted that the provision of markings and coloured surfacing at this location is likely to require ongoing maintenance due to ongoing vehicular overrun, and it was noted that existing cycle lane markings across the existing junction mouth are very well worn and virtually illegible.



Figure 11



Figure 12

- The off road cycle track is currently discontinuous opposite site, with large manhole covers also presenting slip hazards at this location and elsewhere on the cycling network. There is no provision for cyclists to cross the N31 carriageway at present to turn right from the site to connect to the one way off road cycle track on the opposite side of the carriageway, and there is no provision for this within the proposed design.



Figure 13

- A total of 580 spaces will be provided at basement level for residential use. This is significantly higher than the proposed number of car parking spaces for the site (approximately 480% more bicycle parking spaces), however there is no clear provision for safe cyclist access to and from the site, and it appears that cyclists will be expected to share the ramped entries/exits to/from the basement carpark on relatively narrow lanes, where the risk of conflict is higher. There was no information provided on the ramp gradients, however they appear to exceed 3%, and are therefore unsuitable for cycling access.
- The provision for safe connectivity to the proposed cycle parking at street level on the preliminary design layout is also unclear. Cyclist routes should be clearly signed at the start and end of all facilities, with provision for dropped kerbs where necessary to facilitate transfer from on to off road cycling.
- Uneven surfacing and hazards were noted within cycle lanes and adjacent footways on the surrounding network, and markings are very well worn and illegible. Surface condition within the lanes is also poor and slippery at some locations. Examples of some of the hazards have been shown in photos presented in figures 14-21.



Figure 14



Figure 15



Figure 16



Figure 17



Figure 18



Figure 19



Figure 20: Trip hazards and poor surfacing within VRU facilities



Figure 21

- On the N11 and N31, whilst cycling facilities were considered generally good, it was noted that there was a limited amount of red coloured surfacing and road markings to distinguish the cycle track from the traffic lanes and/or the off road shared VRU facility. Cycling symbology was very well worn, and coloured surfacing is also in a state of disrepair at many locations. The coloured surfacing highlights the presence of cyclists

and gives them a greater degree of security, hence it is highly recommended that all likely cycling routes to and from the site should be clearly marked out, signed, lined and maintained, due to the high proportion of anticipated trips to and from the site by this mode.

- Figures 22 -24 show the current arrangements for cyclists at the intersection with the N31 and St Brigid's church Rd and the connectivity towards the signalised crossroads at the N31. There are no proposed changes to the design at this location arising as a direct result of the development proposals, however it is recommended that the layout be reviewed at detailed design stage to determine the need for any remediation, bearing in mind the proportion of collisions at this location involving cyclists, as detailed further in the RSA section of this report.



Figure 22



Figure 23



Figure 24



Figure 25

- There is no provision for suitable tactile paving to warn pedestrians and cyclists within the site regarding the potential for conflict.
- An Audit of the layout at the signalised junction of the N11 was outside the scope of this Stage 1 QA, however it was noted that all controlled crossing points adjacent to the site are currently configured for use by pedestrians only, i.e. pelican crossings rather than toucan crossings. Due to the high anticipated number of cycling trips to and from the development, and the residential nature of the development, consideration should be given to the provision of controlled crossing points for less experienced or older or younger cyclists using the footways on a shared basis, to ensure appropriate time and space is given to enable them to share crossing phases with pedestrians at this junction. This would entail upgrading all crossings from pelican or puffin to toucan.
- With flow shared bus and cycle lane signs have been provided on the N11, as well as advisory cycle lanes, however there is no provision for advanced cycle stop lines at the signalised junction to facilitate cyclists turning right, and as crossings have been configured for pedestrian use only, i.e. are not toucans, as mentioned previously, cyclists wishing to turn right from any arm of the junction will be particularly vulnerable.

- There were no details provided on public lighting proposals, nor any potential impact on existing lighting around the site perimeter. Dark conditions on approaches to the site may reduce conspicuity of VRUs/NMUs. The location of public lighting columns and street furniture can also obstruct the safe passageway of pedestrians and cyclists, hence all new street furniture throughout and on approaches to the site should therefore be placed in a location which does not obstruct NMUs/VRUs.
- Based on observations made on the site visit, and a review of the preliminary design proposals, the Audit Team concluded that overall cycling connectivity to the site is reasonably good, however more vulnerable cyclists such as children and older pedestrians may have difficulty navigating the crossing points on adjacent links and junctions, and a more coherent access strategy for cyclists is highly recommended.

2.2.4 Recommendations for NMUs

Given the likely increase in pedestrian and cyclist volumes arising directly as a result of the proposed development, due to the residential nature of the development, it is recommended that NMU usage on the local road network should be reviewed and monitored to address all issues raised in the previous sections.

Most of the issues identified in this QA are existing network safety issues, which should be addressed by the Local Authority in line with standard planning for network connectivity for all road users, as well as routine monitoring of the public road network. Given the evidence of higher collision risks for NMUs on the local roads, it is highly recommended that the local road network layout adjacent to and within the site should be reviewed to reverse the current road hierarchy patterns, and provide a layout which gives higher priority to NMUs to include reallocation of roadspace where possible. It is notable that there is no current or proposed provision for traffic calming measures on the network surrounding the site, which would assist greatly in minimising risks arising from inappropriate vehicle speeds in the locality, and reinforce the message that VRUs should be given priority in the urban/town centre environment.

In addition to recommendations made previously in Sections 2.2.2 and 2.2.3, the following should also be considered as the site design progresses, with a view to enhancing site walkability and cycle-ability:

- NMU demands and desire lines to and from the site should be closely examined, and additional facilities provided to cater for these demands where necessary. In particular, consideration should be given to more controlled crossings to cater for any demands for pedestrians and/or cyclists to cross the carriageway on desire lines around the site perimeter where necessary.
- Consideration should be given to upgrading all current crossing facilities in the locality to toucan crossings, to facilitate safer cyclist connectivity and crossing.
- Narrow footway widths should be increased where necessary to ensure there is sufficient unobstructed space for shared use, to cater for more vulnerable cyclists and pedestrians using the same space.
- The condition of the pavement on all footways and cycle lanes/tracks should be assessed and repaired where necessary surrounding the site. All debris and trip hazards should also be cleared from pedestrian desire lines.
- Controlled pedestrian crossing facility widths should be increased where necessary, including the width of refuge facilities, with staggered sheep pen arrangements to be provided where pedestrians/cyclists need to cross wide carriageways in stages. Crossing widths should be a minimum 2.4m to be increased to 4m where shared with cyclists, and crossing distances should be 10m maximum to cater for older pedestrians. Where this is not possible, provision should be made for suitable refuge.
- Clear lining and signing guidance should be provided throughout all VRU facilities, to include signs and dropped kerbs where necessary at the start and end of all cyclist routes, with provision for suitable tactile paving (ladder and tramline) at all potential conflict points between cyclists and pedestrians.
- As it is a residential development site there may be relatively high proportions of child pedestrian activity within the site, with intervisibility issues caused by street furniture, landscaping, boundary treatment and parked cars. This should be taken into account when finalising internal site layout.

- Levels within the underground car park should be examined to ensure safe accessibility for VRUs is not compromised, with maximum gradients of 3-5% to be provided on all routes used by VRUs throughout the site.
- The condition and width of all pedestrian routes to and from the nearby bus stops should also be considered as the design progresses, as well as the configuration of the stops.
- The development of a safe cycling and walking strategy to the site is recommended, as advocated in the Mobility Management Plan produced for the site, together with a green travel plan to promote alternative modes of transport to and from the site (i.e. not car dominated trips), particularly to and from neighbouring schools and leisure facilities. Safe access to the site by foot from all directions should be considered, and any opportunity to segregate NMUs from motorised traffic should also be encouraged where possible, and to minimise potential conflict points, particularly at busy junctions.

2.3 ACCESSIBILITY AUDIT

2.3.1 This preliminary Accessibility Audit considered access to the site by a variety of transport modes, and also considered any potential difficulties disabled pedestrians/road users may have in accessing the site, along with potential measures which may improve their amenity and safety. The scope of the Accessibility Audit was confined to the external environment surrounding the site, and did not address any potential internal accessibility issues within the buildings on the site.

Some of the issues identified through the Accessibility Audit process have been reiterated within Section 3 of this report, in accordance with standard Road Safety Auditing procedures.

2.3.2 Key Issues Identified – Multi Modal Accessibility

It was found that the site is well served by public transport, with the Stillorgan Quality Bus Corridor (QBC) running immediately adjacent to the east of the site. The Sandyford Luas stop on the green line is approximately 25 minutes walk, at a distance of approximately 1.45km

from the proposed site. The site is located within 30 minutes walking distance or a 9 minute cycle to the closest train station in Blackrock, which receives Commuter and Dart Train Services. The Blackrock Train Station can be reached via Dublin Bus 17 and 46a within 15-20 minutes. The location of the bus stops and the Luas/Dart stops are as shown in the Mobility Management Plan and DMURS Statement produced for the site.

Continuous footways are provided facilitating access to and from nearby bus stops on the N31 and the N11, with the closest existing bus stop located on the N31 to the east of the access junction. Figures 26-29 show the location and configuration of the closest bus stops to the site. Footway widths and waiting areas at bus stops in the vicinity of the site were deemed to be good quality and of sufficient width to cater for observed demands at the time of the site visit. All bus stops had shelters however seats were missing at some locations, and some of the bus stops were configured for disabled user access, with kassel kerbing, whilst others were not.

There is no provision for bus laybys on the N31, and stopped buses will obstruct the path of though traffic on this link, which leads to a risk of inappropriate overtaking manoeuvres, as well as potential for blocking back to junctions and pedestrian crossing points, which can present additional safety risks.



Figure 26: Closest Bus Stops to site (N31)



Figure 27: Closest Bus Stop to site (N11 southbound)



Figure 28: Layout at Bus Stop on Brewery Rd, N31



Figure 29: Layout at Bus Stop on Brewery Rd, N31 (Note No kassel kerbs)

Connectivity to the Stillorgan Luas Station, which is located less than 2km to the west of the site, is generally good, with a network of continuous footways provided on the local road network and access also possible by private car, with parking options in the locality of the Stations. Likewise, the connectivity to Blackrock and Seapoint Dart stations is good, both of which are located approximately 2.5km to the northeast of the site, however the N11 dual carriageway is considered to present a barrier for safe continuous NMU accessibility between the site and the coastal areas of Blackrock and Monkstown.

In terms of access by private car, a number of other general vehicular accessibility issues were noted on the surrounding road network, and on the proposed site layout, some of which present significant safety risks and have been outlined further in the Road Safety Audit section 3 of this report. Some of the key issues noted are as follows:

- Access to the site by motorised vehicles (private cars and service vehicles – e.g. emergency access and refuse vehicle access) will be provided via the proposed access Junction, which will be reconfigured. Issues were noted in respect of the

provision of two exit lanes and limited safe gap seeking opportunities for vehicles waiting to pull out.

- The width of the access and egress lanes on the ramp to the basement car park is relatively narrow, taking into account minimum required clearance to the solid boundary walls. As these ramps may be used by cyclists to access the basement bicycle parking spaces, provision should be made for safe cyclist access on the cross section also, with provision for cyclists dismount signs and warning signs as necessary, particularly if ramp gradients are too steep. The movements of pedestrians should also be prioritised at all times at this and all other locations throughout the site where conflict with moving vehicles may occur.
- It was noted that current carriageway condition in the vicinity of the site was in a state of disrepair at a number of locations, as shown in figure 30. Any increase in levels of traffic using the surrounding links as a direct result of the development may increase risks to all road users arising from defective pavement conditions. There was no information provided on the skid resistance of the existing surfaces surrounding the site, particularly on approaches to controlled crossing points. Insufficient surface friction will increase the risk of vehicles overshooting the stopline at crossings, and a resultant pedestrian/vehicular conflict. Insufficient skid resistance also increases rear shunt collision risk.



Figure 30

- It was noted on the site visit that some of the street furniture is located too close to the kerb edges, presenting an increased risk that the hazard will be struck by passing vehicles. Figure shows a lighting column located immediately adjacent to the carriageway edge. There are no proposals for relocation of this street furniture on the preliminary design plans for the site, and the provision for location of other street furniture such as signage and lighting columns, which may also obstruct footways as well as present a hazard to passing or turning vehicles, is not clear from the design plans supplied. It was noted that a number of existing signs are located too close to the carriageway edge at some locations, with evidence that signs have already been struck by passing vehicles, e.g. figures 31 and 32. Guardrails have also been struck at the signalised crossroads, as shown in figure 33. The geometry and layout should therefore be reviewed at this location, in conjunction with a swept path analysis and examination of all damage only records at the site.



Figure 31



Figure 32



Figure 33: Signs and Guardrails Struck

2.3.3 Recommendations to enhance multi-modal Accessibility to the site

Pedestrian routes to and from the nearby bus stops should be examined, and access to the site by public transport should be monitored to ensure that safe routes can be maintained to and from the site and all nearby bus stops to cater for observed and likely demands, ideally on the most direct routes with short crossing distances. All potential conflict points with motorised vehicles should be minimised through provision of segregated facilities or suitable separation distance where possible. Any increase in demand to use the stops arising directly from the proposed development may necessitate provision of controlled or uncontrolled crossing points to cater for anticipated desire lines, along with an increase in footway widths at some locations. . The layout at all bus stops should also be reviewed to ensure they cater adequately for the needs of mobility and visually impaired pedestrians. The capacity of the bus stop waiting areas may also need to be reviewed in line with forecast passenger numbers as the local environment undergoes further development.

All parking demands for the site and existing landuses should be considered to ensure parked vehicles do not restrict vehicular low or obstruct visibility splays. Such measures will assist in addressing current road hierarchy levels and provide a greater degree of protection to VRUs

in line with DMURS principles in an urban environment, subject to a review of speeds and intervisibility requirements along each link.

All general vehicular accessibility issues raised in the Road Safety Audit section of the report should also be considered as the site design progresses, with the design proposals to be accompanied by swept path analysis for all movements throughout the site, for vehicles accessing the site on the most frequent basis, to ensure the proposed geometry will safely accommodate all vehicle sizes with two way movement. The location of all existing and proposed street furniture should be reviewed, to ensure there is sufficient clearance to the carriageway edges (450mm minimum in an urban environment). Sufficient clearance should also be provided to all solid walls and columns within the basement car park, to minimise the risk of a vehicle strike, with suitable gradients and overhead clearances to be provided. The existing carriageway surface should also be reviewed surrounding the site, with remediation and repair where necessary to ensure all hazards have been removed.

2.3.4 Key Issues Identified –Site Accessibility by mobility/visually impaired

The site visit carried out for the purposes of the Accessibility Audit identified minimal patterns of disabled user activity on the site, however observations have been made on standard requirements nonetheless. Facilities for pedestrians were generally good, but substandard at some locations surrounding the site, as outlined in the NMU Audit, Section 2.2.2, and in the Stage 1 Road Safety Audit, Section 3, with trip hazards and uneven pavement surfaces present, which can be particularly hazardous for mobility and visually impaired pedestrians. The following summarises some of the other key issues identified for mobility and sensory impaired VRUs:

- No provision was made for facilities for pedestrians to cross safely at some key pedestrian desire lines, which would present additional difficulties for mobility and visually impaired pedestrians in accessing the site.
- At the adjacent signalised junction with the N11, long waiting times were noted at the crossings, and this combined with long crossing distances and greater potential for conflict with multiple lanes will lead to increased risks for mobility and visually impaired pedestrians.

- There is no provision for tactile paving at the mouth of the existing access junction into the site, as shown in figure 34, however this has been addressed on the proposed layout.



Figure 34

- Access to the site from the N11 through the existing completed Grange development is highly likely. There is no provision for tactile paving at the top and bottom of a number of existing steps, as shown in figures 35 and 36.



Figure 35



Figure 36

- Dropped kerbs and tactile paving are absent from junction mouths and many other potential points of conflict with vehicles both on the existing layout, and on the proposed layout for the redeveloped site. The lack of suitable dropped kerb facilities, and lack of informal / formal tactile guidance would create additional barriers to accessibility for disabled road users on the approaches to and adjacent to the site.



Figure 37: Tactile Paving Absent



Figure 38: Tactile Paving Absent

- There are a number of proposed steps within the site, which do not appear to be accompanied by handrails, and tactile guidance has not been provided on all steps at the

top and bottom to denote the presence of the hazard to mobility / visually impaired pedestrians.

- Crossing widths were too narrow at a number of locations, and trip hazards were noted on some pedestrian desire lines, which will not cater adequately for the demands of an urban environment, and may create obstructions on movement of wheelchairs and buggies.
- Audible and tactile signals were provided at the push button units (PBUs) on the signal head poles at the signalised crossroads at the intersection of the N31/N11, along with tactile mapping to provide guidance on the lane structure at each conflict point, however tactile guidance was misleading and incorrect on a number of the PBUs, and audible signals from PBUs in close proximity were occurring simultaneously and may present confusion for hearing or visually impaired pedestrians.
- large chamber covers were also noted within pedestrian desire lines at some locations, which can create a trip/slip hazard particularly for mobility impaired pedestrians.
- Levels within and surrounding the site may present difficulties for wheelchair access or for access for those with buggies or for elderly pedestrians, and an investigation into regrading or provision of high friction surfacing may be necessary at detailed design stage.
- Proposed landscaping may obstruct VRU movement and compromise intervisibility, which presents a risk for all VRUs, but particularly those who are mobility or visually impaired.
- The provision for ramped access adjacent to steps throughout the site is unclear, to cater for wheelchair users, those with buggies or those with bicycles, to ensure such road users can safely access all levels and entrance points to and from the development.

2.3.5 Recommendations for Site Accessibility by mobility/sensory impaired

A detailed review of finished surface levels is recommended to identify any potential issues arising with gradients, with suitable crossfalls to be provided on all pedestrian circulation areas to minimise the risk of standing water and slip hazards, or varying crossfalls over a short section which might present difficulties for mobility impaired pedestrians, with drainage paths and potential for ponding at the base of ramps to be monitored, to minimise surface water accumulation and runoff from the adjoining ramped section. The footway and ramp surfaces should not become slippery and difficult for pedestrians to walk on when wet.

Any proposed steps within the site should be accompanied by handrails, with tactile guidance provided at the top and bottom to denote the presence of the hazard to mobility / visually impaired pedestrians. A general review of the requirements of disabled road users on the approaches to and within the site is recommended at detailed design stage, in conjunction with a review of observations made above, to identify and mitigate against any factors which may present a barrier for accessibility.

The proposals for ramped access to all sections of the site should be clarified. All ramps should have a maximum gradient of 1:20 (preferable) or 1:12 (absolute maximum over short distances only) at all locations. An alternative means of access for wheelchair users must be provided e.g. a platform lift, where ramp gradients of 1:20 or greater is provided, with a total ramp rise greater than 2m, with platform lifts to conform to BS 6440:1999. Appropriate dwell/landing areas should be provided where lengths of gradient require it. Individual sloped sections should not be greater than 9m (@ slope of 1 in 20). Steeper slopes require shorter lengths, with minimum landing lengths of 1m.

3. ISSUES RAISED BY THE STAGE 1 ROAD SAFETY AUDIT

3.1 GENERAL

- 3.1.1 The designers have not advised of any departures from standard.
- 3.1.2 There was no information provided relating to long sections or cross sections.
- 3.1.3 No information was provided on any existing collision statistics in the vicinity of the site. A review of the Road Safety Authority online collision database indicates that there are records of a significant number of collisions occurring on the road network immediately adjacent to the site between 2005 and 2015 inclusive, with two collision clusters noted at nearby junctions. The location of these collisions has been shown in Figure 39, with the collision characteristics summarised in Table 1. As mentioned previously in the NMU Audit Section of this QA report, a significant number of collisions occurring at the junction of Brewery Rd/St Brigid's Church Rd involved cyclists (4 collisions occurring at one location over a two year period, one resulting in a serious casualty), which conflicts with the aspirations of an urban area where VRUs should be at the top of the road user hierarchy. The Audit Team considered it likely that a statistically significant increase in collision risk has occurred at this junction in recent times, and further detailed collision investigation into the contributory factors and patterns within these collisions is therefore highly recommended before site development progresses to detailed design stage, particularly since such a high proportion of trips to and from the development are expected to be made by cyclists. The site design should therefore include for remediation and layout improvements where necessary to address the existing collision risks on the approaches to the site.

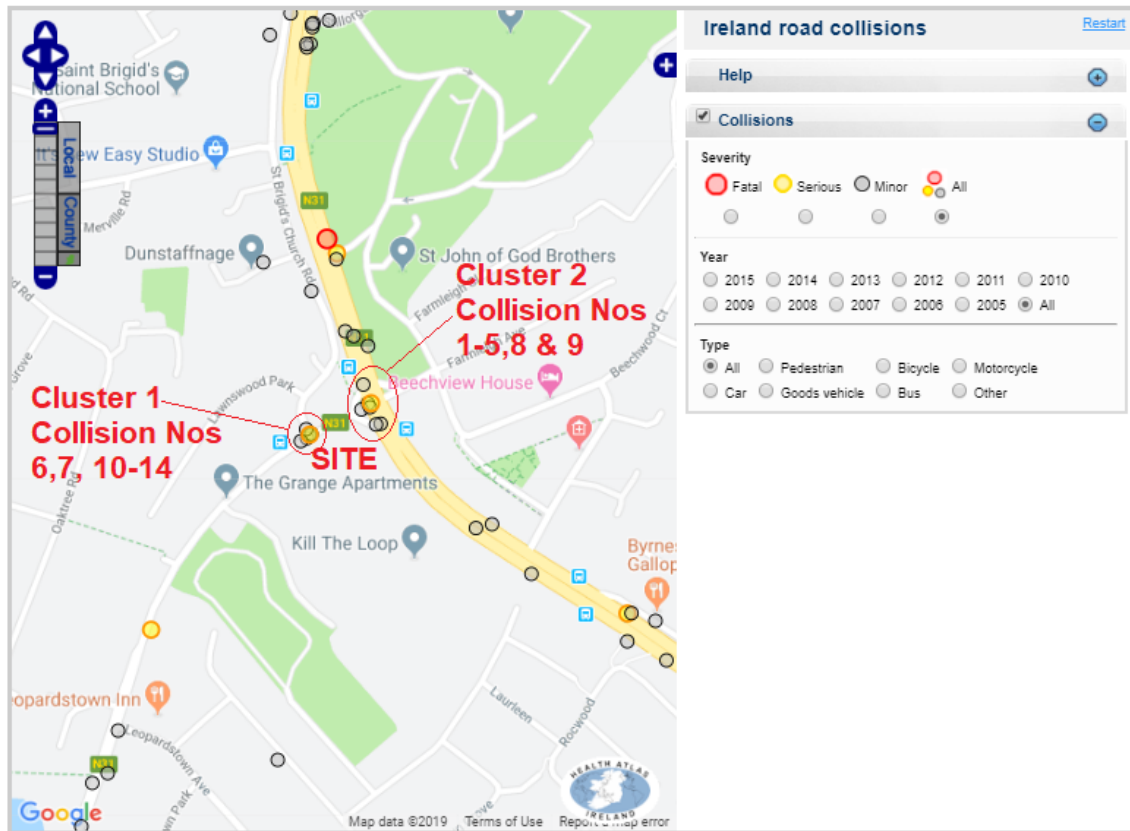


Figure 39: Collision Plot for Road Network Surrounding Site

Table 1: Summary of Collision Characteristics							
	SEVERITY	YEAR	VEHICLE	CIRCUMSTANCES	DAY	TIME	CASUALTIES
1	Minor	2007	Motorcycle	Angle, Right Turn	Friday	1900-2300	1
2	Minor	2011	Undefined	Pedestrian	Wednesday	0700-1000	1
3	Minor	2012	Motorcycle	Other	Friday	0700-1000	1
4	Minor	2012	Car	Rear End Straight	Monday	1000-1600	2
5	Serious	2013	Car	Other	Thursday	0700-1000	1
6	Minor	2013	Car	Other	Thursday	0700-1000	1
7	Minor	2013	Car	Other	Wednesday	2300-0300	2
8	Minor	2014	Car	Other	Sunday	2300-0300	2
9	Minor	2014	Bus	Other	Sunday	2300-0300	1
10	Minor	2014	Bicycle	Other	Tuesday	1900-2300	1
11	Minor	2014	Bicycle	Other	Friday	0700-1000	1
12	Minor	2015	Bicycle	Other	Monday	0700-1000	1
13	Minor	2015	Goods Vehicle	Rear End Straight	Friday	1000-1600	1
14	Serious	2015	Bicycle	Other	Sunday	1000-1600	1

It should be noted that the RSA database is not a comprehensive record of collisions, and does not include damage only collisions or any collisions recorded since 2015 (or before 2005), hence should be reviewed in conjunction with the Local Authority / Gardaí records for the site.

Additional summary data was obtained for the period 2015 to 2017 inclusive, which shows that 21 material damage only collisions and 7 collisions resulting in a minor casualty were recorded over a 1km (approximately) stretch of the N31 to the northwest of the site, which gives this section of the N31 a collision rate which is above the National Average rate for similar links (urban two lane), in accordance with TII GE-STY-01022, as shown in figure 40. To the northeast of the site, there were 24 material damage only collisions, 3 minor collisions and one serious collision recorded over a 1km (approximately) stretch of the N11, which gives this section of the N11 a collision rate which is below the National Average rate for similar links (urban dual carriageway), in accordance with TII GE-STY-01022.



Figure 40: TII GE-STY-01022 Collision Rates 2015 to 2017 adjacent to Site

3.1.4 Problem - Drainage Generally

The details for treatment of existing drainage and gullies along realigned sections of kerb within the site is not clear from the plans supplied. Kerb realignment and setback will impact on the location of existing gullies. Insufficient surface water drainage can increase the risk of ponding which can present a hazard to motorised and non-motorised road users, particularly two-wheeled vehicles, and a potential trip/slip hazard for pedestrians. It was noted that all gullies on the N31 on the approach to the site were blocked, with examples shown in the photos in figures 41-44, which is likely to lead to an increased risk of ponding and skidding and loss of control collisions on the approaches to the site access junction, with higher risks for two-wheeled vehicles.



Figure 41



Figure 42: Blocked gully adjacent to Bus Stop on Brewery Rd N31



Figure 43: Blocked Gully on N31 adjacent to site



Figure 44: Blocked Gully on N31 adjacent to site

Recommendations

Drainage proposals to be clarified at detailed design stage, to include a review of existing drainage on the links surrounding the site. All new gullies and drainage channels to be kept out of the desire line for two-wheeled vehicles and pedestrians where possible. Any amendments to existing kerblines should be accompanied by gully relocation where necessary. The finished levels of all gullies, and manhole covers, should be flush with the surrounding surface.

3.1.5 Problem – Carriageway Proposals Generally

The full extent of new surfacing and the treatment of different surface types throughout the site was unclear from the plans supplied. The existing carriageway condition was generally good in the vicinity of the site and on the existing access roads to the grange development,

however poor surfacing was noted at some locations. Further carriageway deterioration is likely during construction on the site. Poor carriageway conditions can cause hazards for all road users, and lead to an increase in the risk of ponding.

Vehicular access to the basement car park will be provided via an existing pedestrianised area where vehicular access is currently restricted by bollards, as shown in figure 45. A similar arrangement is currently provided at the proposed access to the car parking area for the proposed creche, with the existing layout in this area shown in figure 46. It is unclear if this existing paving surface on the site will be sufficient to withstand loading from ongoing vehicular access, as pavements typically exhibit greater settlement over a shorter space of time than full depth standard carriageway construction and flexible pavement.



Figure 45: Existing Access towards proposed ramp to basement car park



Figure 46: Existing Layout at location of proposed creche car park

Joints were noted within the carriageway on the access road at present, as shown in figure 47, which are prone to cracking and ingress of water. Realignment of the access road is likely to create new longitudinal joints and potential hazards in the carriageway, which should be considered at detailed design stage. It was noted that a number of existing manhole covers at the site will be displaced by the access proposals and will be in the centre of the realigned road, which may present a hazard in the vehicle wheel tracks, particularly for two-wheeled vehicles.



Figure 47: Existing Joints unravelling on Access Road

Recommendations

The condition of the carriageway surrounding the site should be reviewed at detailed design stage, with remediation and new pavement overlay to be provided where necessary, including on existing paved sections of the site to be used by vehicular traffic. Details of the treatment of joints between old and new surfacing should be provided at detailed design stage. Resurfacing should be provided across the full width of carriageway to prevent joints in vehicular wheel tracks. The location of all services should be reviewed with gullies and manhole covers to be kept out of vehicular wheeltracks, with finished levels of all covers and gullies to be flush with the surrounding pavement.

3.1.6 Problem - Parking Generally

The parking management strategy produced for the site indicates that 100 spaces will be provided for the 287 proposed apartments and creche. Parking will be provided at basement level, however there were no details provided for gradients, clearance, or VRU accessibility to and from basement car park, to determine any safety issues arising. The internal car park layout was outside the scope of this Stage 1 QA.

There was no information provided on cumulative parking demand for the site, however the Audit Team are concerned that any demand exceeding the provision outlined above may result in on street parking demands, which are likely to create a number of safety issues. Inappropriately parked vehicles can cause obstruction to VRUs and can also potentially compromise visibility to and from junctions and access points, as well as potentially restricting safe two-way traffic movement. Obstructions within visibility splays can increase the risk of nose-to-tail collisions, pulling out type incidents and right-angled collisions.

Recommendations

Existing parking demands and patterns should be monitored in the vicinity of the site and the total cumulative parking demand for the site should be assessed. All parking should ideally be removed from the location of junctions and access points, with visibility splays to be clear and unobstructed at all times in accordance with traffic speeds. Appropriate lining and signing to be provided where necessary throughout the site (double yellow lines, clearways, flexible bollards etc), along with appropriate parking enforcement. Visibility splays to be clear and unobstructed at all times in accordance with traffic speeds.

3.1.7 Problem – Landscaping / Boundary Treatments Generally

The proposals for boundary treatments surrounding the site are unclear. The landscaping drawings supplied to the Audit Team show provision of trees/landscaping at locations where they may present a hazard to pedestrians and passing traffic, with potential for compromised intervisibility between pedestrians and motorists, as detailed further in section 3.3 of this report. Inappropriately placed landscaping may also obstruct visibility splays at junctions and conflict points. Figure 48 shows an example of a location where landscaping (and a proposed sculpture) may cause an obstruction within the visibility splay at the egress from the set down area, resulting in an increased risk of pulling out type collisions. Figure 49 shows a location where trees will be located too close to the carriageway edge, where the risk of being struck by passing vehicles is increased. Trees at this location are also likely to reduce the effectiveness of street lighting and lead to slippery conditions on the adjacent footways due to fallen leaves. As gradients are relatively steep at this location (5%) cyclists may be particularly vulnerable to the potential slip hazards arising. Tree roots can also potentially

effect pavement stability, creating trip hazards and uneven / broken surfaces, thus increasing safety risks for VRUs / NMUs.



Figure 48: Trees located too close to carriageway edge

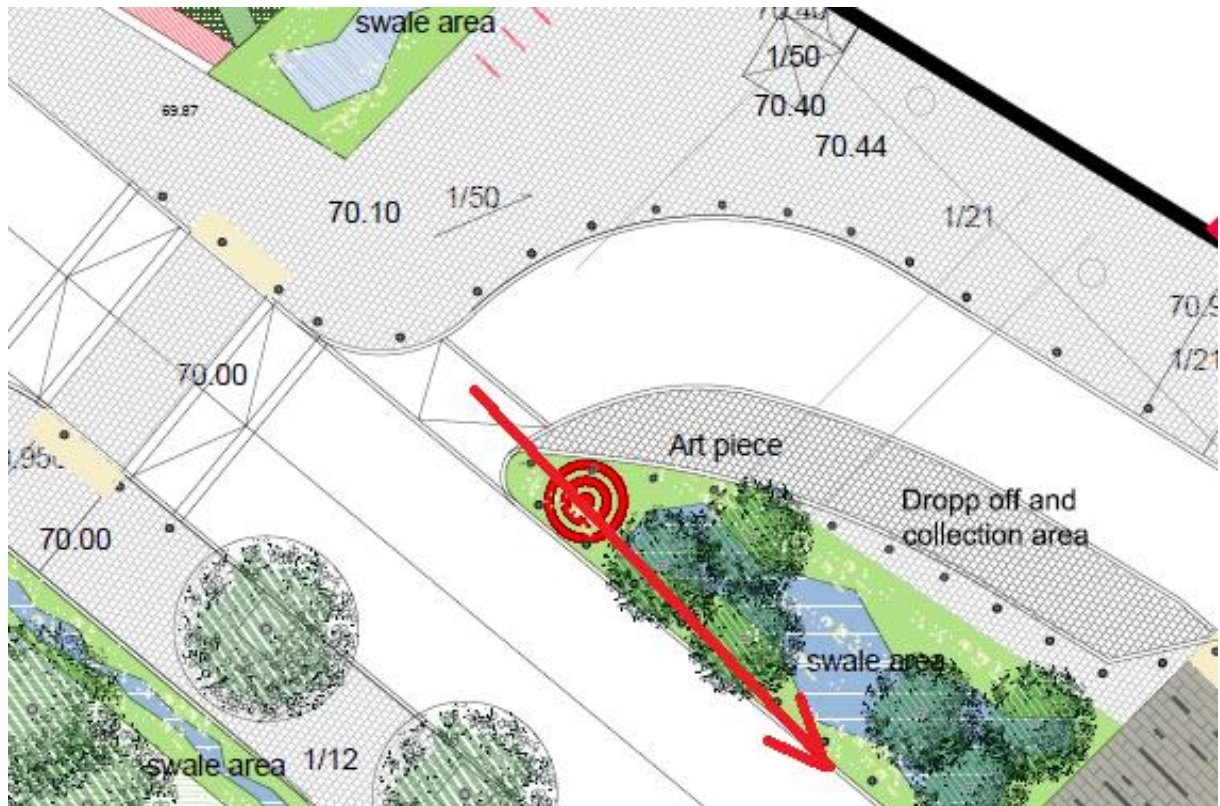


Figure 49: Landscaping/Sculpture potentially obstructing visibility

Recommendations

Landscaping proposals and boundary treatments for the internal site, to include heights and specification, to be clarified at detailed design stage, along the site peripheral, as well as internally within the site at potential conflict points, with a maximum height of 1.05m to be provided where possible. Visibility splays should be clear and unobstructed at all times in accordance with traffic speeds, and landscaping should be removed from all locations where intervisibility between motorists and VRUs may be compromised. All trees and landscaping should be set back a sufficient offset from the carriageway and away from areas where VRUs will be circulating.

3.1.8 Problem – Speeds Generally

There were no 85th percentile speed surveys provided to the Audit Team, however some vehicle speeds on the N11 and the N31 appeared to exceed the posted speed limits, which may present risks for VRUs accessing the site from these directions. There is a mixture of speed limits in place surrounding the site, with the 60 km/hr speed limit applicable on the Stillorgan Dual Carriageway adjacent to the site. The speed limit changeover from 60 to 50 is located immediately southwest of the signalised junction with the N11. Collision risks tend to be higher within transition zones and at locations where the function of neighbouring links differs.

There were no details provided on proposed internal site speed limits, however advisory reduced speed limit signage is advisable throughout the carpark area and access roads, particularly as large proportions of VRUs should be expected to circulate within these areas. It was noted that existing raised crossing points, and proposed raised crossing points on the access roads to and from the site, which are shown in figures 50 and 51, are likely to have a positive impact on vehicle speeds within the site. Provision has been made for speed bumps at the existing basement car park access, as shown in figures 51 and 52. There is no provision for speed control measures on the proposed ramped access to the new basement car park for the development.

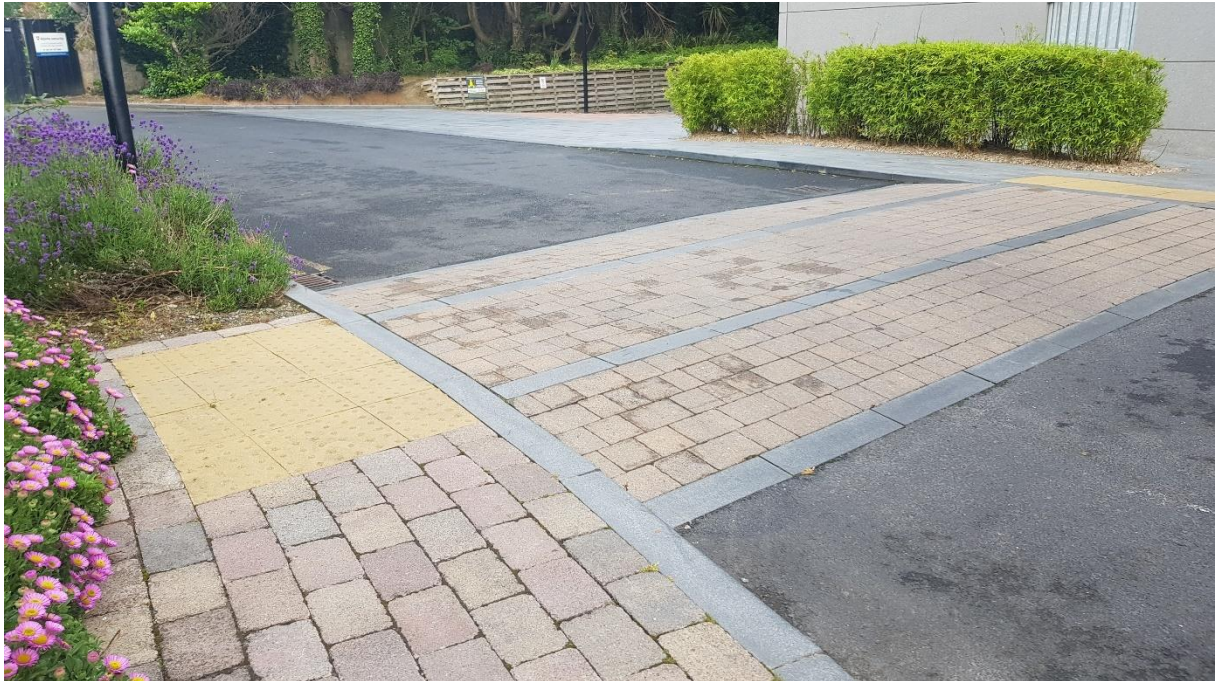


Figure 50: Existing raised crossing on access to the Grange



Figure 51: Existing raised crossing & Speed Bump at Car Park Access



Figure 52: Existing Speed Bump at Car Park Access

Recommendations

Freeflow vehicle speeds should be considered in provision of sufficient visibility and SSD, including towards the rear of any vehicles turning into the site. Additional traffic calming measures should be considered where necessary to ensure consistent traffic speeds and road user behaviour throughout the site. Advisory reduced internal speeds limits would also be recommended within the site.

3.1.9 Problem – Traffic Volumes

The Traffic and Transportation Assessment (TTA) provided for the site concluded that the reconfigured access junction will operate with sufficient capacity in the future design year. It was noted that there is no provision for a right turn reservoir into the Grange development, and there is insufficient room in the carriageway at present to accommodate waiting vehicles without obstructing through traffic on the N31, as shown in figure 53. Significant difficulties were also observed in terms of gap acceptance when exiting the site, despite the site visit occurring at off peak times. This may increase the risk that motorists will become impatient

and may attempt to egress with insufficient gaps, leading to an increased risk of right angled collisions and rear shunt collisions on the major road.



Figure 53: Limited Space for right turning vehicles into site



Figure 54: Limited Gaps in Traffic for right turning vehicles out of site

For high volumes of traffic on the major road, which would be the case with the N31, priority controlled junctions are generally deemed inappropriate for Annual Average Daily Traffic (AADT) flows in excess of 2,000 vehicles, which would equate to an approximate peak hour flow in the region of 200 vehicles. Figure 55 shows an extract from the TTA provided for the site which shows that anticipated AM peak hour flows will exceed 200 vehicles in the design year.

Figure 8: 2038 Design Year Traffic Flows

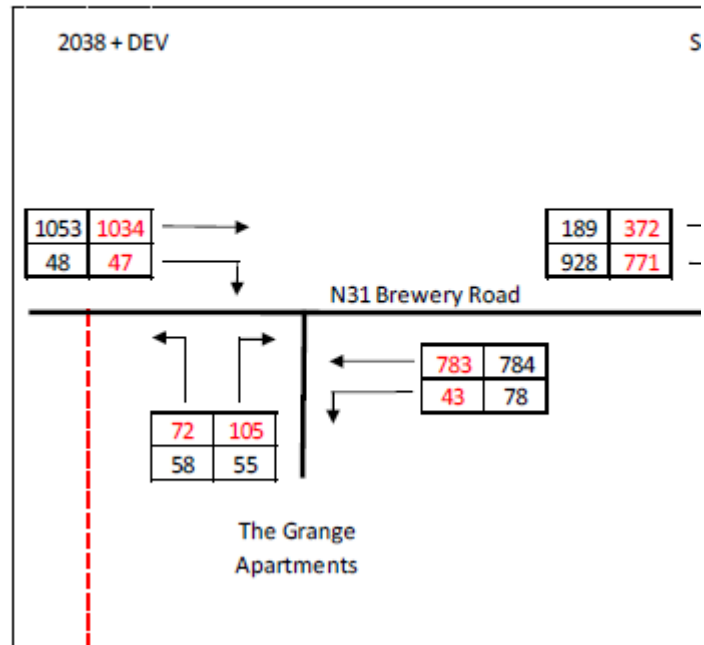


Figure 55: Anticipated peak hour traffic volumes at site access

Recommendations

The Designer should demonstrate that the proposed junction form will safely accommodate all anticipated traffic volumes and speeds. Caution should be exercised when considering capacities at the upper end of each junction type (with reference to the diagram presented in Figure 56) due to the high likelihood of an increase in collision risk and safety concerns. A conservative approach, on safety grounds, is therefore recommended in the determination of the appropriate junction form in the medium to long term.

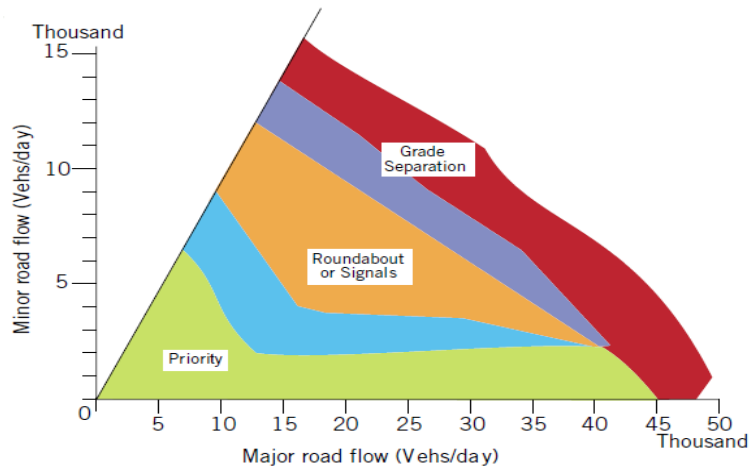


Figure 56: Major and Minor Flow Ranges for Different Junction Forms

3.1.10 Observation – Site Clearance

Proposed design will impact on signage, walls, lighting columns, mature trees, bollards, utilities and buildings within the existing site.



Figure 57: Items displaced by design proposals

Recommendations

Provision should be made for site clearance to indicate the treatment of all existing features and boundaries to be removed to facilitate the development, with details to be included on detailed design plans for the site. Any relocated signage must be placed in a position where the sign face can be clearly seen by approaching motorists, and which does not obstruct clear forward visibility towards other relevant signage, with all displaced features to be placed outside the desire lines for VRUs, at a location which does not obstruct footway widths.

3.2 JUNCTION LAYOUT AND LOCAL ALIGNMENT

3.2.1 Problem – Junction Geometry Generally

The design appears to include for retention of a two lane egress from the site, with carriageway widening and kerb setback on the nearside, as shown in figure 58. Provision of two lanes of egressing traffic at the stop line on the minor arm of the access junction will increase the number of simultaneously turning traffic streams at the junction, with vehicles queuing in the adjacent lane also potentially reducing visibility to and from traffic approaching from each direction on the N31, as indicated in figures 59 and 60, leading into an increased risk of pulling out type collisions, right angled collisions and rear shunt collisions. Two wheeled vehicles are also more vulnerable on this arrangement, particularly those wishing to turn right, with insufficient space to queue and move alongside larger vehicles in particular.

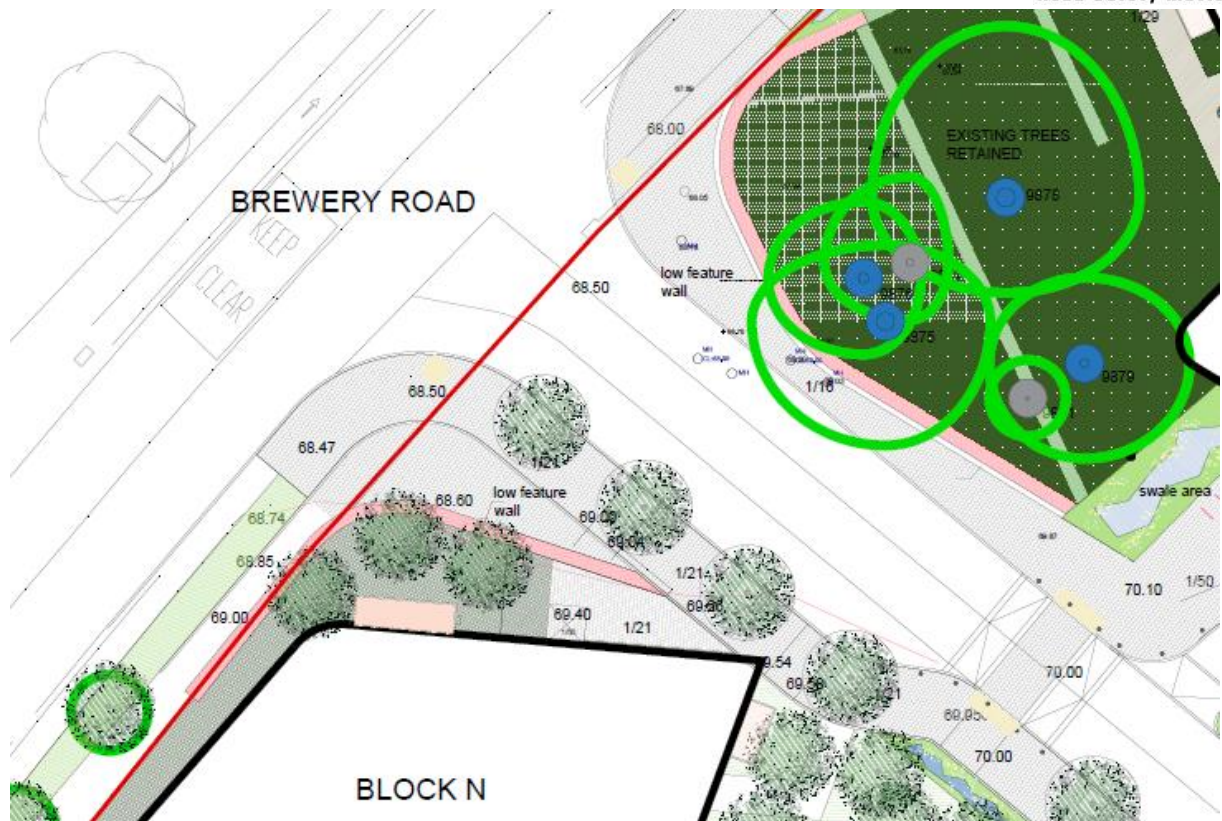


Figure 58: Proposals for two lane egress from site



Figure 59: Waiting Vehicle potentially obscuring visibility to right



Figure 60: Waiting Vehicle potentially obscuring visibility to left

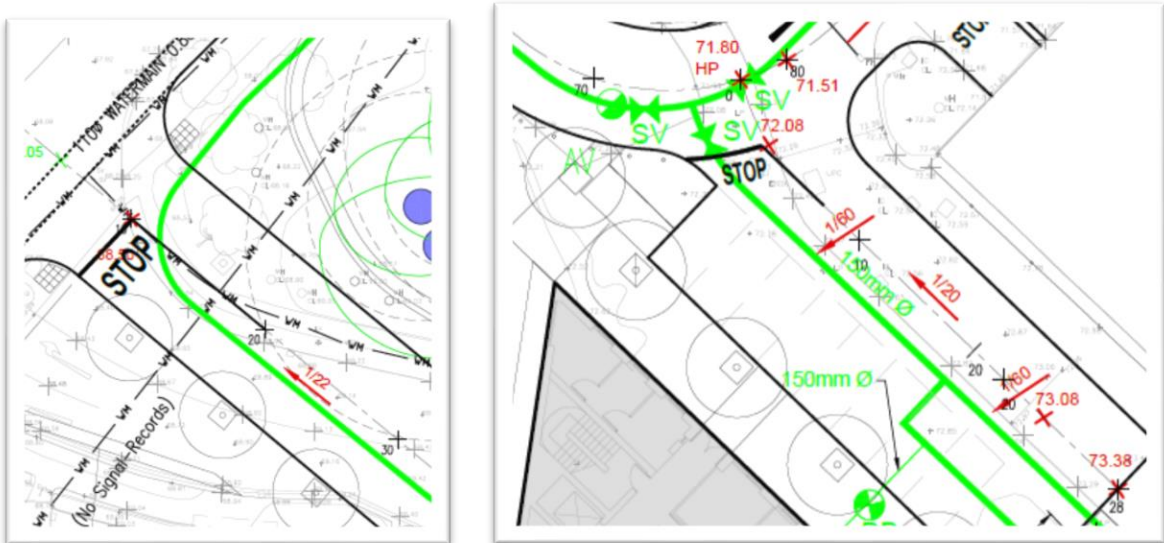
Recommendations

Visibility should be clear and unobstructed at all times in accordance with traffic speeds. Ideally the egress from the junction should be configured to allow for one lane of egressing traffic only, with sufficient lane width to accommodate cyclists on the carriageway as necessary, due to the limited widths available on the adjacent footway and the lack of safe cycling crossing facilities on the adjacent links at present, or advanced cyclists stop lines. All proposed lane widths at the access junction and throughout the site should be sufficient to accommodate anticipated traffic volumes for all vehicle sizes, inclusive of two-wheeled vehicles.

3.2.2 Problem – Gradients and Level Dwell Areas

Relatively steep gradients have been provided on a number of sections of the access roads, including the approaches to stop lines at junctions, as shown in figures 61 and 62. There were no details provided on proposed vertical design or longitudinal profiles, hence it is

unclear if sufficient dwell area has been provided to minimise the risk of overshooting the stoplines, and collision with passing traffic. There were no gradients provided for the ramped access to the basement car park, to determine any potential safety issues arising.



Figures 61 & 62: Step Gradients on Approaches to Stoplines

Recommendations

It is recommended that long and cross sections be provided at detailed design stage, with a maximum gradient of 4-5% to be provided at all locations. A level waiting area should ideally be provided over a suitable distance back from the stop lines at each junction and conflict point within the site.

3.2.3 Problem – Layout of Set Down Area

It was noted that there is insufficient space on the footway adjacent to the drop off and collection point, on the passenger side, to accommodate safe waiting or alighting for passengers, and there is insufficient space for disabled passengers and wheelchair users at this location. A number of bollards at this location are likely to present a hazard, and the adjacent swale may also present a hazard. The connectivity to the surrounding network of footways from this point is also unclear.

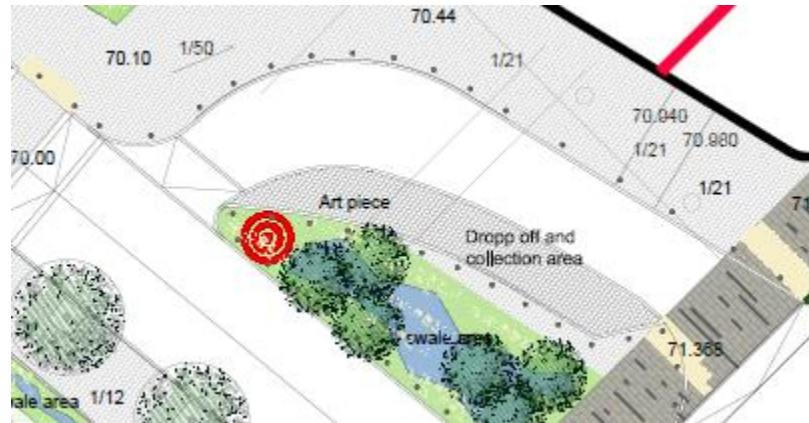


Figure 63: Drop Off Area

Recommendations

The layout of the drop off area should be examined to take into account issues raised above. The final layout should also be subject to swept path analysis to ensure vehicles will be able to make all required manoeuvres in this area with adequate margins of safety, and the permissible directions of travel and entry/exit points should be clear to all road users.

3.2.4 Observation – Proximity of Internal Junctions

A number of the internal junctions are very closely spaced, as shown in figure 64. Closely spaced junctions can lead to increased conflict due to simultaneous turning manoeuvres occurring in close proximity, and the lack of clarity regarding rights of way and priority. In the case of these junctions, it is acknowledged that traffic movements to and from the creche and set down areas are likely to be low, hence the level of risk is also likely to be low, however the provision of landscaping between the access points may reduce intervisibility and increase risks arising.

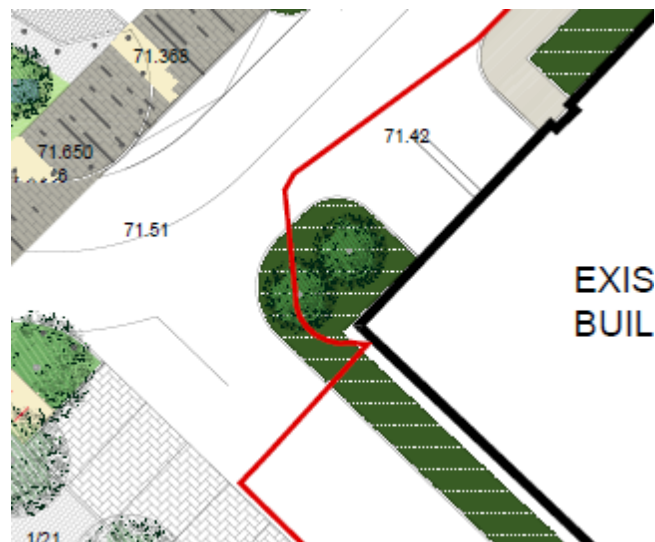


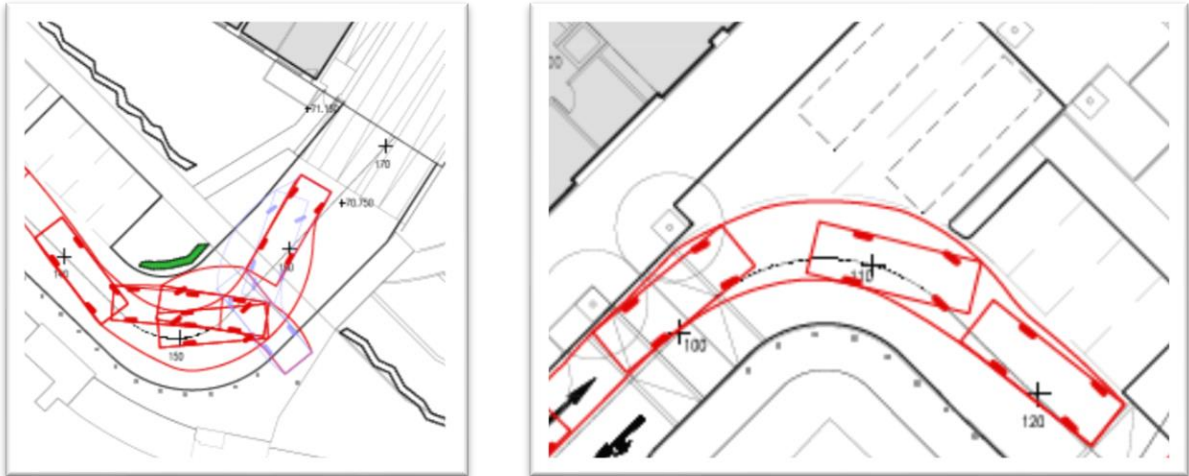
Figure 64: Closely Spaced Junctions with trees compromising intervisibility

Recommendations

All junctions and access points throughout the site should operate safely and independently, taking into account all anticipated peak hour flows. Visibility should be clear and unobstructed at all times, as should rights of way and priority, with landscaping to be removed where necessary to enhance intervisibility.

3.2.5 Observation – Geometry of Internal Layout

The swept path analysis supplied for the site demonstrates that the proposed geometry is somewhat restrictive for emergency vehicles on the tight turns on the access route to and from the basement car park, as shown in figures 65 and 66. It is unclear if these turns will be possible for more frequent vehicle types, such as SUVs, in the event of a demand for simultaneous two way traffic movements, which is likely, particularly at peak times. Insufficient space for vehicle manoeuvres will lead to an increased risk of side swipe and head on collisions, with turning vehicles also more likely to strike street furniture or encroach into the VRU zones, increasing risks for such road users.



Figures 65 and 66: Tight radii on access route to site

Recommendations

Swept path analysis should be carried out for more frequent vehicle types to demonstrate that the proposed geometry will accommodate the swept paths and turning movements of all anticipated vehicle sizes with adequate margins of safety.

3.3 NON-MOTORISED USER PROVISION

3.3.1 Problem – Pedestrian Facilities Generally

There was no information provided on likely pedestrian volumes to and from the site, however the Mobility Management Plan for the site advocates that more sustainable transport modes should be encouraged, with less reliance on the private car, hence relatively high levels of VRU activity should be anticipated to and from the site, and the final layout on all surrounding links should therefore prioritise VRU movement at all times.

The Walkability and Accessibility Audit have outlined some of the key issues to be considered to enable safe access to be provided on foot to the site from all directions. The QA concluded that pedestrian accessibility to the site is generally good, with improvements to be made in a number of areas. The following issues should also be considered within and on immediate approaches to the site, as the site design progresses:

- A number of bollards have been provided at locations which are likely to obstruct pedestrian movement, including at raised ramps. The bollards are also located too close to the carriageway edges where they will present an increased risk of being struck by passing vehicles, particularly on the tight radii on the access road.

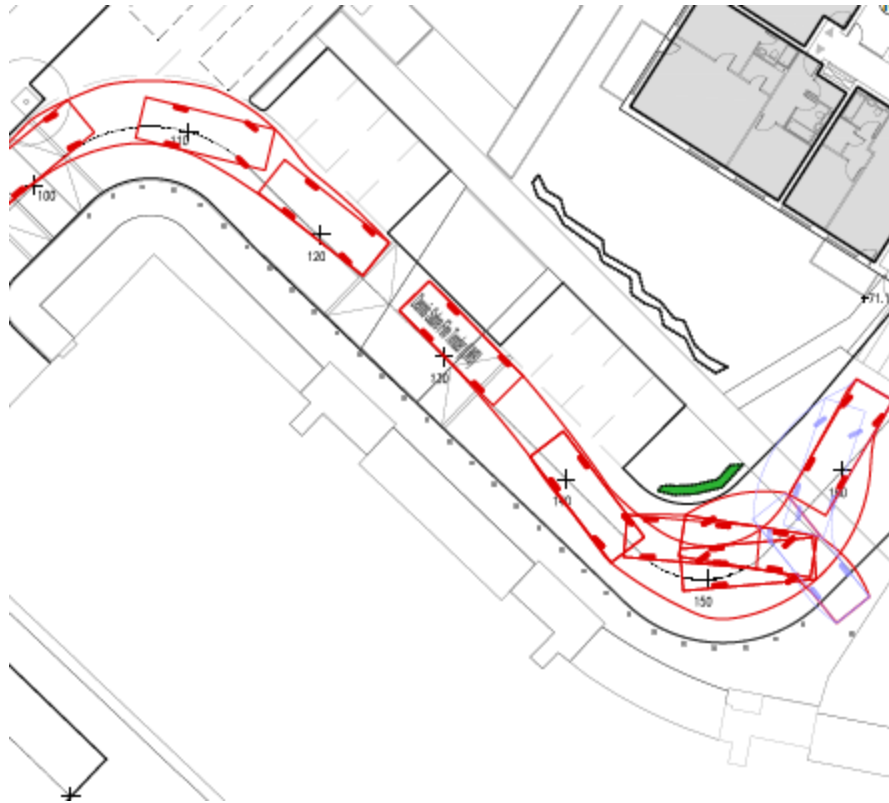


Figure 67: Bollards Adjacent to Carriageway at Crossing Points

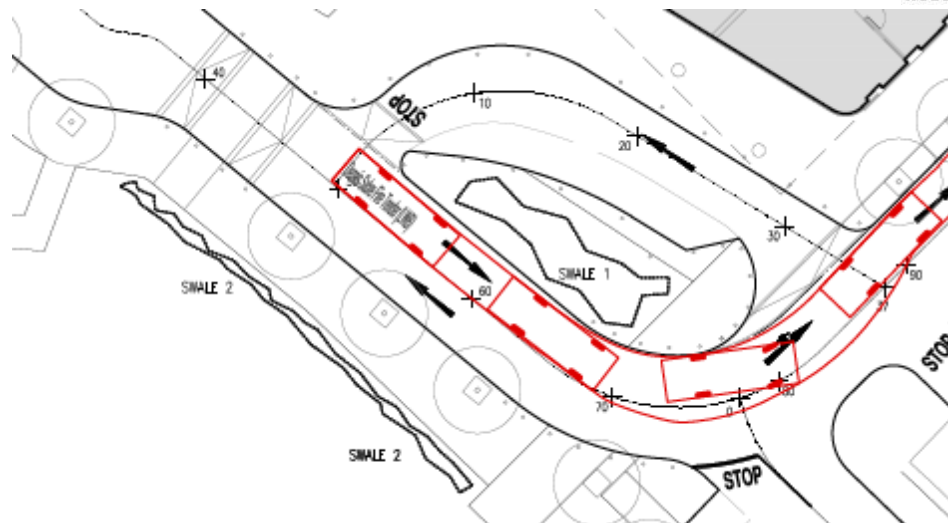


Figure 68: Bollards Adjacent to Carriageway at Crossing Points

- A number of potential pinch points were noted on footways, including adjacent to proposed landscaping and trees, which are likely to obstruct movement for pedestrians, particularly if spaces are to be shared with cyclists.

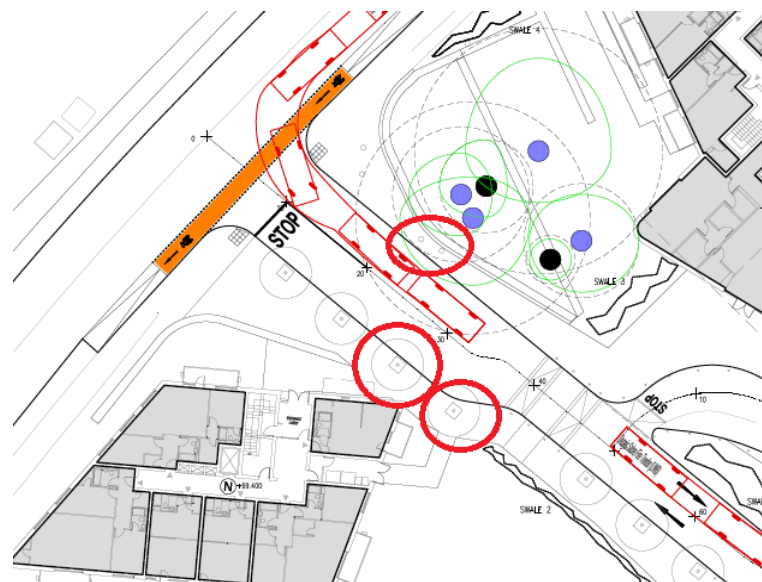


Figure 69: Potential Pinch Points on Footways

- It was noted that existing footway widths are relatively narrow, and connectivity to the existing footways and verges is not clear from the plans supplied.



Figure 70: Connectivity to narrow Existing Footways Unclear

- The potential for poor Intervisibility was also noted at some locations within the site, including at the tie-ins on the N11, where pedestrians egressing the site will be brought directly out into a junction where there is no current footway provision, and where the risk of conflict with turning and waiting vehicles will be higher, as shown in figure 71. There are a number of locations throughout the site where landscaping is proposed in close proximity to crossing points and potential desire lines, with examples shown in figures 74-76. Insufficient intervisibility can increase the risk of pedestrian/vehicular conflict.

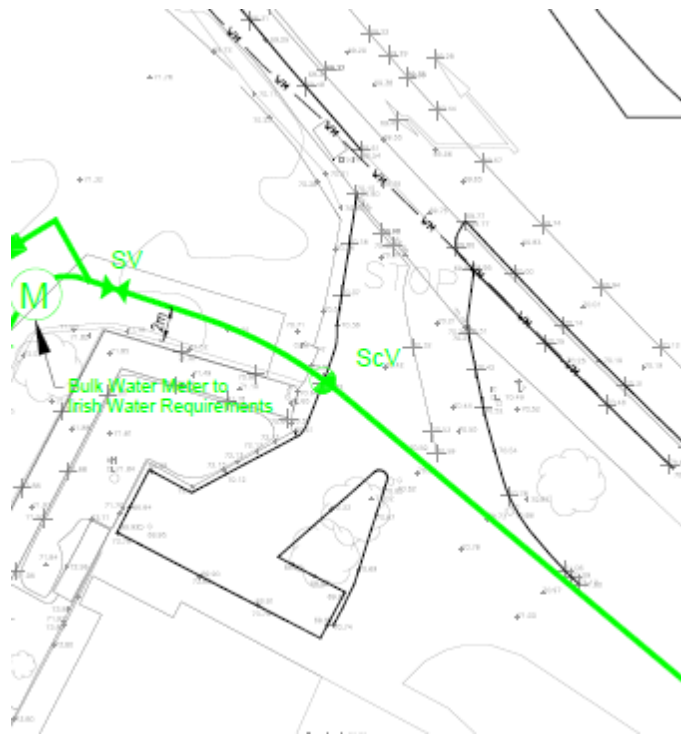


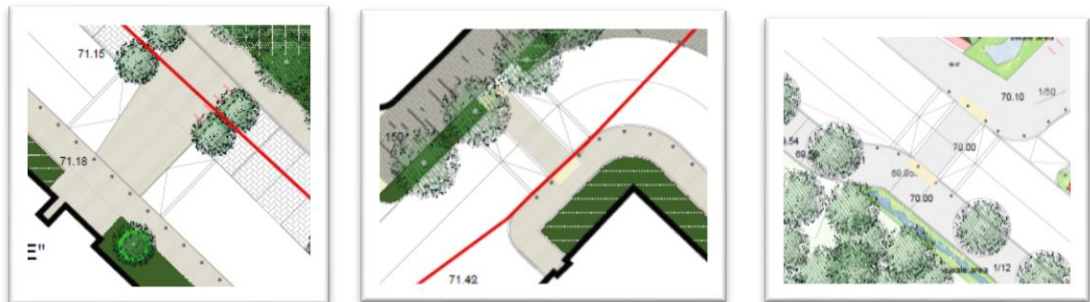
Figure 71: Connectivity to Footways on the N11 Unclear



Figure 72: Connectivity to Footways Unclear



Figure 73: Lack of Safe connectivity to footways on N11



Figures 74, 75 and 76: Landscaping compromising Intervisibility

- Continuity and connectivity to the northwest and northeast of the site is unclear, and no provision has been made for desire lines to cross the carriageway to and from the bus stop on the opposite side of the N31 to the site.

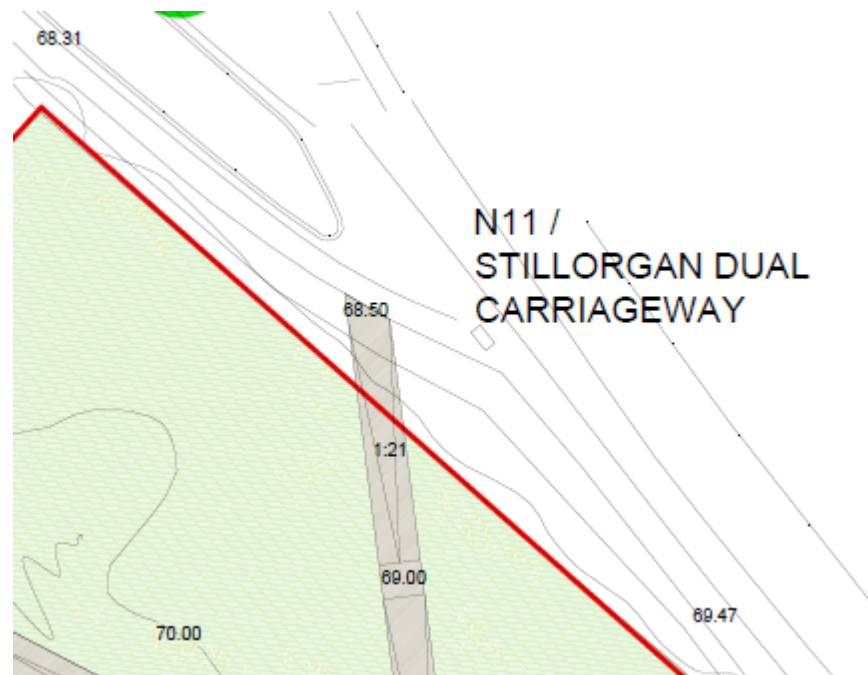


Figure 77: Connectivity at ramp unclear

Recommendations

Pedestrian demands, desire lines and volumes should be closely examined within and on all approaches to the site with safe facilities provided to cater for demands where necessary, taking into account all issues raised above, along with all observations made on the surrounding road network within the NMU Audit. A continuous unobstructed footway width of an absolute minimum 1.2m must be provided at isolated points only surrounding the site, with a minimum 2m width footway advisable elsewhere (ideally wider), including at all scheme tie-ins, to be increased to a minimum 3m where the space is to be shared with cyclists.

Intervisibility at all relevant access points / junctions along most likely pedestrian desire lines and access routes to/from the site should be clear and unobstructed at all times in accordance with traffic speeds, with appropriate forward visibility and Stopping Sight Distance (SSD) to be provided on all approaches to crossings. Pedestrians should have a good view of approaching motorists from both sides of all crossing points throughout the area from a distance 2m back from the kerb edges. Attention should be paid to likely routes and desire lines to and from bus stops and to and from entrance points to buildings and steps/ramps.

3.3.2 Problem – Accessibility for Visually and Mobility Impaired Pedestrians

Design plans show steps at a number of locations throughout the site where there is no provision for tactile paving at the top and bottom to alert visually impaired pedestrians to the presence of the hazards. Ramps have also been provided at some locations, however the ramps widths appear narrow, and the provision for ramped access for wheelchair users, buggy users or other mobility impaired pedestrians throughout the site is not clear from the plans supplied. Tactile paving has been provided across the mouth of the reconfigured access junction, however is absent at crossing points at other locations throughout the site, as highlighted in figure 78.

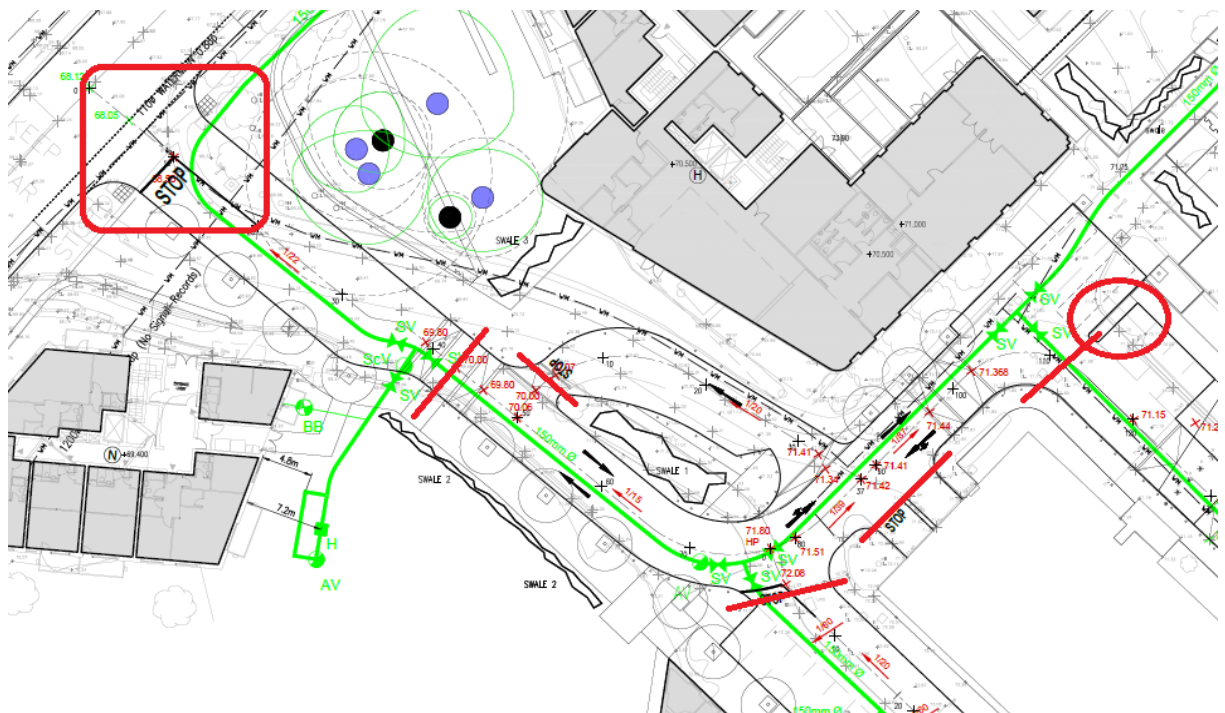


Figure 78: Lack of tactile paving across internal access points

Recommendations

Suitable tactile paving should be provided where necessary throughout the scheme, to be configured in accordance with the requirements of 'Guidance on the use of Tactile Paving Surfaces', with tactile paving to be provided on both sides of a carriageway, and correctly

aligned to ensure the crossing distance is minimised. Proposals for crossings at this location should be clarified, and the final layout at this location should be subject to separate auditing procedures.

Provision should also be made for suitable ramped access throughout the site, in line with recommendations made in the QA section of this report. Appropriate tactile guidance to be provided, including at the top and bottom of all steps within the site, with all dropped kerbs at crossing points to be flush with the carriageway (or to a maximum kerb upstand of 6mm) at all locations where pedestrians will cross the path of motorised traffic, to minimise risks to mobility and visually impaired pedestrians.

3.3.3 Problem – Cyclist Facilities Generally

There was no information provided on likely cyclist demands and desire lines to and from the site to determine any specific risks arising. Section 2 of the Quality Audit has outlined some of the key issues to be considered to enable safe access to be provided by bicycle to the site from all directions. The QA concluded that accessibility to the site for cyclists is generally good. The following summarises the key issues to be considered for cyclists as detailed design progresses for the site;

- A number of potential conflict points between pedestrians and cyclists were noted throughout the site, and there is no provision for suitable warning paving at these locations (ladder and tramline).
- Gradients throughout the site and on the ramped access to the basement car park are likely to create difficulties for cyclists. Bike storage and parking will be provided at a number of locations throughout the site, however there is no provision for safe access and egress for cyclists to and from these locations, as proposed footways are predominantly insufficiently wide for shared use, and there is no provision for dropped kerbs. Carriageway widths are also narrow and geometry constrained along the access route into the site where cyclists will need to shared road space with motorised traffic, including on the ramps to and from the basement car park, where they will be more vulnerable.

- Existing signs indicate that cycling is prohibited in the Grange development, as shown in figure X, which may present difficulties, due to the high proportion of cyclists which will be expected at this site.



Figure 79

- Provision has been made for coloured surfacing and road markings for the continuity of the off road cycle track across the mouth of the access junction, as shown in figure 80, however the connectivity of the facility on the western side does not appear to line up with the existing kerbline.

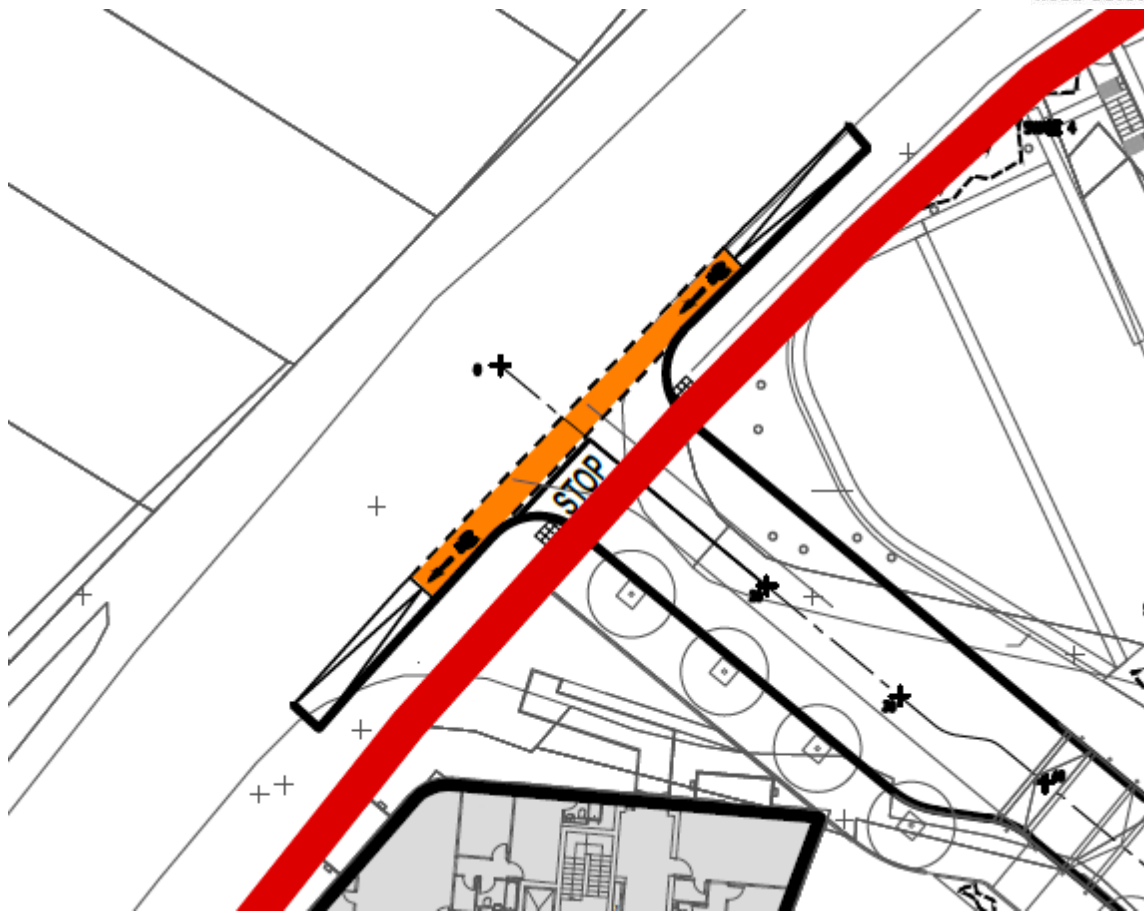


Figure 80

Recommendations

Cyclists desire lines and volumes should be considered as the site design progresses, with provision for safe routing to and from all bike parking facilities, along with dropped kerbs to facilitate transition from off to on road facilities where necessary, to be accompanied by appropriate signing and lining, including signs at the start and end of all cycling facilities. Gradients should also be shallow (ideally 3-5%) on routes to be used by cyclists. Where this cannot be achieved, for example on the car park access ramps, provision should be made for cyclists dismount signage and suitable markings to include a segregated route where possible, away from points of conflict with moving vehicles. Suitable paving (ladder and tramline) should be provided at all potential conflict points between pedestrians and cyclists, to be accompanied by suitable road markings. All tactile paving design should be provided in accordance with 'Guidance on the Use of Tactile Paving Surfaces'.

An investigation should be made into the provision of safe connectivity to the adjoining cycling network. Cyclists and motorists should be appropriately warned regarding the potential for conflict ahead at all locations where facilities terminate abruptly. Gullies and chamber covers to be located outside of the desire lines for cyclists where possible. The detailed design for the site should consider all issues raised above, and in the NMU section of this QA report to ensure safe cyclist connectivity can be provided to and from the site.

3.4 ROAD SIGNS, MARKINGS AND LIGHTING

3.4.1 Problem – Lighting Generally

There was no information provided to the Audit Team on proposed lighting within or adjacent to the site. A significant number of existing lamp columns will be displaced by the scheme proposals, and will require relocation at detailed design stage. It was noted that a number of existing columns are located close to the carriageway edges, which present an increased risk of vehicle strike. Current lighting on the network surrounding the site varies from new LED lamps to old incandescent lamps, as shown in figures 81 and 82, which may effect lighting levels in the locality. Inappropriate lighting will have an impact on the collision risk arising during the hours of darkness.



Figure 81



Figure 82

Recommendations

An appraisal of existing and proposed lighting provision is recommended at detailed design stage to ensure appropriate illumination is provided at all necessary locations, particularly in areas where pedestrians may be waiting to cross the carriageway, to maximise visibility of the access junction and access road layout, and to increase conspicuity of VRUs during the hours of darkness. All new or displaced lighting columns should be provided at safe locations with sufficient clearance from passing vehicles (i.e. minimum offset of 450mm from carriageway edge) in a position which does not cause obstruction for pedestrians or cyclists or compromise visibility splays to and from nearby junctions and access points.

3.4.2 Problem – Lining and Signing generally

There was no lining and signing schedule provided to the Audit Team, however the following observations have been made on lining and signing issues within and on approaches to the site:

- Detailed design should include clear provision for suitable road markings and arrow markings throughout the site, including centrelines and longitudinal markings adjacent to islands. Permissible movements throughout the site should be clearly marked out and signed to ensure motorists are adequately guided at each turning point, e.g. the set down area.
- Existing road markings were extremely well worn and virtually illegible at a number of locations on the network on approaches to the site, and will benefit from being refreshed.
- It may be beneficial to provide internal speed limit signage to ensure that motorists are advised to maintain low internal speeds through the car parking area, with provision for suitable traffic calming where necessary including on the ramped access to the basement car park levels.
- Provision should also be made for suitable pedestrian and cyclists road markings and signage at the start and end of all facilities.
- Detailed design should include for moving existing keep clear markings on the N31, which are highlighted in figure 83, in line with the reconfigured junction at this location.



Figure 83


- Safely located stop signs, at a sufficient offset from the carriageway edges, should be provided where necessary at the access junction and where necessary throughout the site.
- Provision should also be made for suitable parking/no parking signage and road markings where necessary.

Recommendations

A review of all existing and proposed signage and lining is advised at detailed design stage, with a lining and signing schedule to be produced, taking into account all of the issues raised above, to ensure all road users are informed of the layout and warned of all potential hazards ahead. All signs should be located sufficiently in advance of the hazard at a distance appropriate to the traffic speed, in clear view of the motorist, clear of any obstruction from vegetation or street furniture, and in a location which does not obstruct footways or visibility towards other signs. All street furniture, poles, landscaping etc to be placed a minimum distance of 450mm from the kerb edge or edge of running lane of traffic to prevent being struck by passing vehicles.

4. AUDIT TEAM STATEMENT

We certify that we have visited the site and examined the drawings and information supplied. This examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified to improve the safety of the scheme. The problems identified have been noted within the report, together with suggestions for improvements which are recommended to be studied for implementation. No one on the Audit Team has been otherwise involved with the design of the measures audited. This road safety audit has been carried out in accordance with TII GE-STY-01024 Dec 2017.

Signed: 

Date: 26/8/19

MIRIAM O'BRIEN

Signed: 

Date: 26/8/19

ANTHONY SUMNER

APPENDIX B – SITE PHOTOGRAPHS



























Road Safety Audit Feedback Form

Scheme: Access to Residential Development, The Grange, Stillorgan, Dublin 18

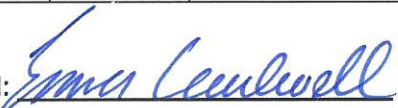
Route No. N11/N31

Audit Stage: 1


Date Audit Completed: August 2019

		To Be Completed By Designer		To Be Completed by Audit Team Leader
Paragraph No. in Safety Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Describe alternative measure(s). Give reasons for not accepting recommended measure	Alternative measures or reasons accepted by auditors (yes/no)
3.1.4	Yes	Yes. New drainage within the project red line boundary will be kept out of desire lines and any existing drainage being modified as part of the project will also comply with the recommended measures.		Yes
3.1.5	Yes	Yes. Recommendations will be adopted where possible as part of the proposed development.		Yes
3.1.6	Yes	Yes. The proposed Development is a Build to Rent Scheme and will therefore only offer apartments to those who do not need a parking space if there are no spaces available. The recommendations with regards to lining and signing will be adopted, where possible, as part of the proposed development.		Yes
3.1.7	Yes	Yes. Landscaping proposals will be outlined at detailed design stage and will ensure appropriate visibility will be maintained.		Yes
3.1.8	Yes	Yes. Reduced internal speed limits will be adopted as part of the development. Recommendations for additional traffic calming measures will be investigated further at detailed design stage and implemented where possible. Free Flow Speeds and Visibility splays will be reviewed at detailed design stage.		Yes
3.1.9	Yes	Yes. The Major road flow per day is c. 10,000 vehicles/day and Minor road flows are c.2,000 vehicles/day which puts the junction in the Priority		Yes

		Junction section of the graph. However, should the traffic volumes increase in the future a signalised junction can be incorporated at a future date.		
3.1.10	Yes	Yes. Signage will be relocated as necessary as part of the site clearance works. The details of the proposals will be provided at detailed design stage.		Yes
3.2.1	Yes	Yes. The Proposed reconfigured junction provides two exist lanes as per the existing arrangement which has no record of incident. We will review the proposed arrangement at detailed design stage and if deemed necessary, reconfigure to a single exit lane.		Yes
3.2.2	Yes	Yes. Long and cross sections will be provided at detailed design stage and recommended gradients adopted where possible.		Yes
3.2.3	Yes	Yes. We will remove the proposed bollards and increase the footpath width at this location at detailed design stage. The set down is for cars and small vans only. Turing manoeuvres have been prepared and are shown on drawing 18-093 P-151		Yes
3.2.4	Yes	Yes. Landscape proposal will be reviewed at detailed design stage to ensure appropriate visibility is maintained		Yes
3.2.5	Yes	Yes. Vehicles swept path analysis has been carried out for smaller vehicles and demonstrates that the proposed road geometry is appropriate.		Yes
3.3.1	Yes	Yes. The proposed recommendations will be investigated further at detailed design stage and incorporated where appropriate.		Yes
3.3.2	Yes	Yes. Tactile paving and dropped kerbs will be incorporated at detailed design as required.		Yes
3.3.3	Yes	Yes. Safe routing will be provided to and from all bike parking facilities across the site at detailed design stage. Appropriate signage will be incorporated to provide warning and instructions to all cyclists.		Yes
3.4.1	Yes	Yes. The lighting design will be reviewed at detailed design stage and the proposed recommendations will be considered.		Yes
3.4.2	Yes	Yes. Appropriate lining and signage will be provided at detailed design stage in line with the RSA recommendations.		Yes

Signed:  Designer

Date 26/8/19

Signed: 

Audit Team Leader

Date 26/8/19