JBA consulting

Kilkee Flood Relief Scheme

Buildability Report

Final Report

July 2024

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COMHAIRLE CONTAE AN CHLÁIR
CLARE COUNTY COUNCIL

OPW Oifig na nOibreacha Poiblí Office of Public Works

Tionscadal Éireann Project Ireland 2040

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Revision History

Revision Ref/Date	Amendments	Issued to
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Contract

This report relates to the Kilkee Flood Relief Scheme commissioned by Clare County Council on behalf of the Office of Public Works. Michael O'Donoghue of JBA Consulting carried out this work.

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Purpose

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Contents

1 Introduction

1.1 Overview

This draft Buildability report provides a constructability assessment of each of the proposed measures which form part of the preferred fluvial option for the Kilkee Flood Relief Scheme. The document will remain live until the finalised detailed design is complete. The buildability report assesses each measure under the following headings:

- Construction Methodology
- Temporary Works Requirements
- Traffic Management Requirements
- Impact on existing properties and infrastructure

The buildability of the scheme is sub-divided into both Victoria Stream and Atlantic Stream areas:

1. Victoria Stream
    a. Well Stream Culvert and Embankment
    b. Well Stream Upgrade
    c. Crescent Place Culvert
    d. Victoria Court Wall re-build
    e. Victoria Court Embankment
    f. Victoria Stream walls
    g. Carrigaholt Road Field
    h. Tributary Field Storage
    i. Carrigaholt Road Drainage
2. Atlantic Stream
    a. Kilkee Bay Hotel Embankment
    b. Dún an Óir Walls
    c. Sandpark embankment
    d. Atlantic Stream Screen
    e. Atlantic Stream Outfall
    f. Meadow View Court

This buildability report is to be read in conjunction with the following drawings:

- 19109-JBAI-XX-XX-DR-C-02102_Flood_Defences_Well_Stream
- 19109-JBAI-XX-XX-DR-C-02105_Flood_Defenses_Atlantic_Stream_Outfall_Culvert
- 19109-JBAI-XX-XX-DR-C-02106_Flood_Defences_Victoria_Court
- 19109-JBAI-XX-XX-DR-C-02107_Flood_Defences_Sandpark_Dun_An_Oir
- 19109-JBAI-XX-XX-DR-C-02108_Flood_Defences_Kilkee_Bay_Hotel
- 19109-JBAI-XX-XX-DR-C-02109_Flood_Defences_Meadow_View_Court
- 19109-JBAI-XX-XX-DR-C-02111_Flood_Defences_Victoria_Court_Cross_Sections
- 19109-JBAI-XX-XX-DR-C-02112_Flood_Defences_Well_Stream_Cross_Sections
- 19109-JBAI-XX-XX-DR-C-02114_Flood_Defences_Sandpark_Dun_An_Oir_Cross_Sections

- 19109-JBAI-XX-XX-DR-C-02115_Flood_Defences_Kilkee_Bay_Hotel_Cross_Sections
- 19109-JBAI-XX-XX-DR-C-02120_Flood_Defences_Atlantic_Stream_Outfall_Culvert_Screen
- 19109-JBAI-XX-XX-DR-C-02124_Flood_Defences_Adverse_Flood_Risk
- 19109-JBAI-XX-XX-DR-C-02145_Construction_Access
- 19109-JBAI-XX-XX-DR-C-02167_Well_Road_Property_Permanent_Access
- 19109-JBAI-XX-XX-DR-L-02121_Flood_Defences_Western_Tributary_Victoria_Stream
- 19109-JBAI-XX-XX-DR-L-02122_Flood_Defences_Western_Tributary_Cross_Sections
- 19109-JBAI-XX-XX-DR-L-02123_Flood_Defences_Victoria_Stream_Cross_Sections

The works will require a number of site compounds to be established throughout the works area to serve the multiple works locations. These are defined in the following section.

2 Site Compound Proposals

The works areas are quite confined and located amongst dense housing or holiday parks. Thus, there isn't a suitable location for a site compound in close proximity to the works areas. It is recommended, therefore, that a site compound with adequate material storage space be established adjacent to the N67 on the outskirts of the town. This can provide safe access for delivery materials and minimise frequent plant movements within narrow streets where pedestrian access is often not provided.

A final location for this compound will have to be agreed with CCC and the prospective contractor. The location below may not be the final location of the compound. A suggested location is shown in Figure 2-1.

Figure 2-1 Main Site Compound on N67

In addition to this main compound, smaller welfare compounds will be established in closer proximity to the works locations. This will provide welfare and refuelling services for the works, removing the need to track or return machinery to the main compound at the end of each shift. The compound will be located in the south-east of the land parcel to sit outside the 1% AEP baseline flood extents. A minimum of two welfare compounds should be established.

2.1 Victoria Stream Compound

A separate welfare compound can be established in the existing Clare CC compound on the Well Road. This will serve all staff operating on the Well Stream and Victoria Stream works. Some of the pluvial works require this area to be excavated to install an underground tank, therefore the location of any compound needs to take cognisance of this. In addition, a

proposed traffic diversion is proposed through this location, therefore the overall footprint will need to be carefully considered. The welfare compound location is shown in Figure 2-2

Figure 2-2 Well Stream Welfare Compound

2.2 Western Tributary Compound

A compound will be established just off the Old Carrigaholt Road. This will serve both the development of the Western Storage area and the Well Road embankment. This could potentially serve as the main project compound given the size of land available. The approximate location of this is shown below in Figure 2-3.

Figure 2-3 Carrigaholt Road Compound

2.3 Atlantic Stream- Waterworld

The Atlantic Stream has a relatively minor scope of works compared to the Vic/Well Stream. However, a welfare compound is nonetheless necessary.

The existing space behind Waterworld may also provide a suitable location for a welfare compound. Access to this would be through the existing access point at the rear of the Waterworld building. The welfare compound would also double as access to the trash screen unit on the Atlantic stream. This location is shown in Figure 2-4. This location will require a coordination plan with Waterworld to ensure their operations are not impacted.

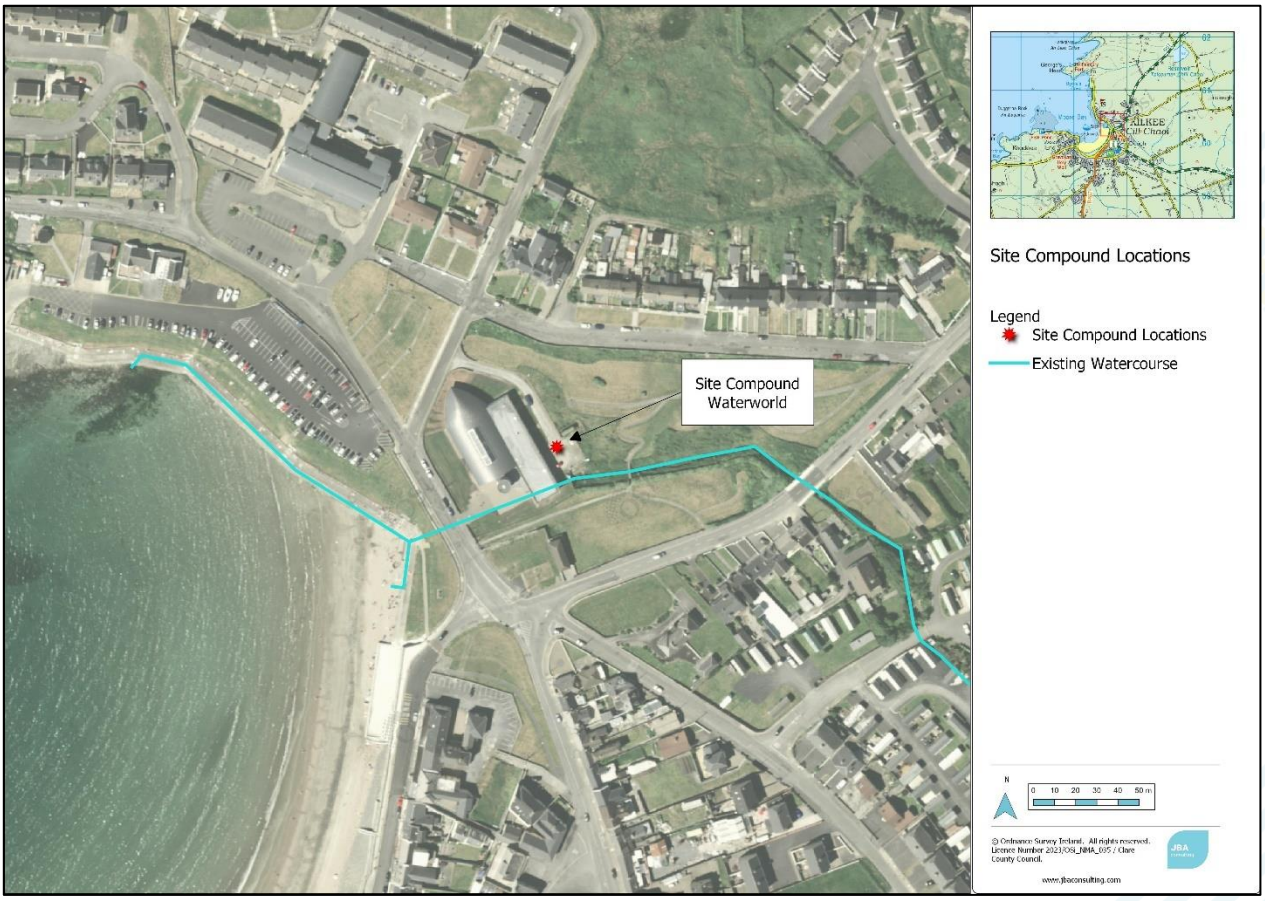

Figure 2-4 Waterworld Welfare Compound

2.4 Atlantic Stream- Sandpark and Dún an Óir estate

There will be a welfare compound located at both Sandpark and the rear of Dún an Óir estate. Figure 2-5 below shows the locations of these welfare compounds respectively.

Figure 2-5 Sandpark and Dún an Óir Welfare Compound

3 Construction Sequencing

A suggested construction sequencing is presented hereunder. Whilst the final construction sequencing will be defined by the prospective contractor, there are some key timeline constraints that need to be factored into any construction sequencing. Some of these are ecological, whilst others consider the potential disruption to the town's amenity value.

The following time constraints have been considered on the construction sequencing:

- No in-stream works between July and September.
- No works within or adjacent to carriageways during June – August. This is to minimise disruption to the tourism season.

These dates are not absolutes and some derogations on these may be attainable closer to the construction phase. They are imposed here purely to garner a "worst-case" scenario in terms of construction sequencing.

The indicative sequencing has been broken up into four distinct phases.

1. Phase 1 – In-stream works 1
2. Phase 2 – Winter Works 1
3. Phase 3 – In-stream works 2
4. Phase 4 – Winter Works 2

3.1 Phase 1 – In-stream works 1

The first in-stream works phase will see the undertaking of:

- Atlantic Stream trash screen construction (Aug – October)
- Kilkee Bay Hotel realignment (Aug – October)
- Victoria Court wall re-construction (Aug – October)
- Tributary Stream realignment (Aug – October)

These works are scheduled to begin in late August and conclude in mid-October. It is acknowledged that these works move beyond the baseline in-stream works calendar (July-September). Due to lack of presence of salmonids within the watercourses, it is intended to apply for a derogation to work in-stream outside of this window.

3.2 Phase 2 – Winter Works 1

There are two phases that are referred to as "winter works" as they are centred on the construction period between October and May. Phase 2 involves the following activities:

- Completion of Victoria Court walls from the landward side of the Victoria Stream (Oct – Jan)
- Construction of the Victoria Crescent walls on the RHB of the Victoria Stream (Oct – Jan)
- Dun an Oir wall upgrade (October – December)
- Sandpark embankment construction (October – December)
- Victoria Road LHB Defences (Feb – April)
- Crescent Place foul diversion (October – November)
- Well Stream pluvial works (Nov – Feb)
- Well Stream embankment (Feb – Mar)
- Trib Storage works (Mar – June)
- Church Road Field (April – June)

Following the completion of the works of phase 2, there will be a required demobilisation phase. This will be to accommodate the tourism season within the town.

3.3 Phase 3 – In-stream works 2

The second in-stream works will primarily centre on the works associated with the Well Stream culvert and channel upgrade. The in-stream works will involve:

- Construction of the Well Stream culvert outlet
- Diversion of Well Stream into overflow network in Well Road (previously constructed in Phase 2)

3.4 Phase 4 – Winter works 2

Following the in-stream works undertaken in phase 3, the remaining key infrastructure elements can be constructed. These are:

- Crescent Place culvert construction and pluvial overflow works (Oct – Dec)
- Well Stream channel installation (Dec – Feb)

4 Victoria Stream

The following section describes in detail the methodologies required for each of the Victoria Stream measures.

a. Well Stream Culvert and Embankment
b. Well Stream Upgrade
c. Crescent Place Culvert
d. Victoria Court Wall re-build
e. Victoria Court Embankment
f. Victoria Stream walls
g. Carrigaholt Road Field
h. Tributary Field Storage
i. Carrigaholt Road Drainage

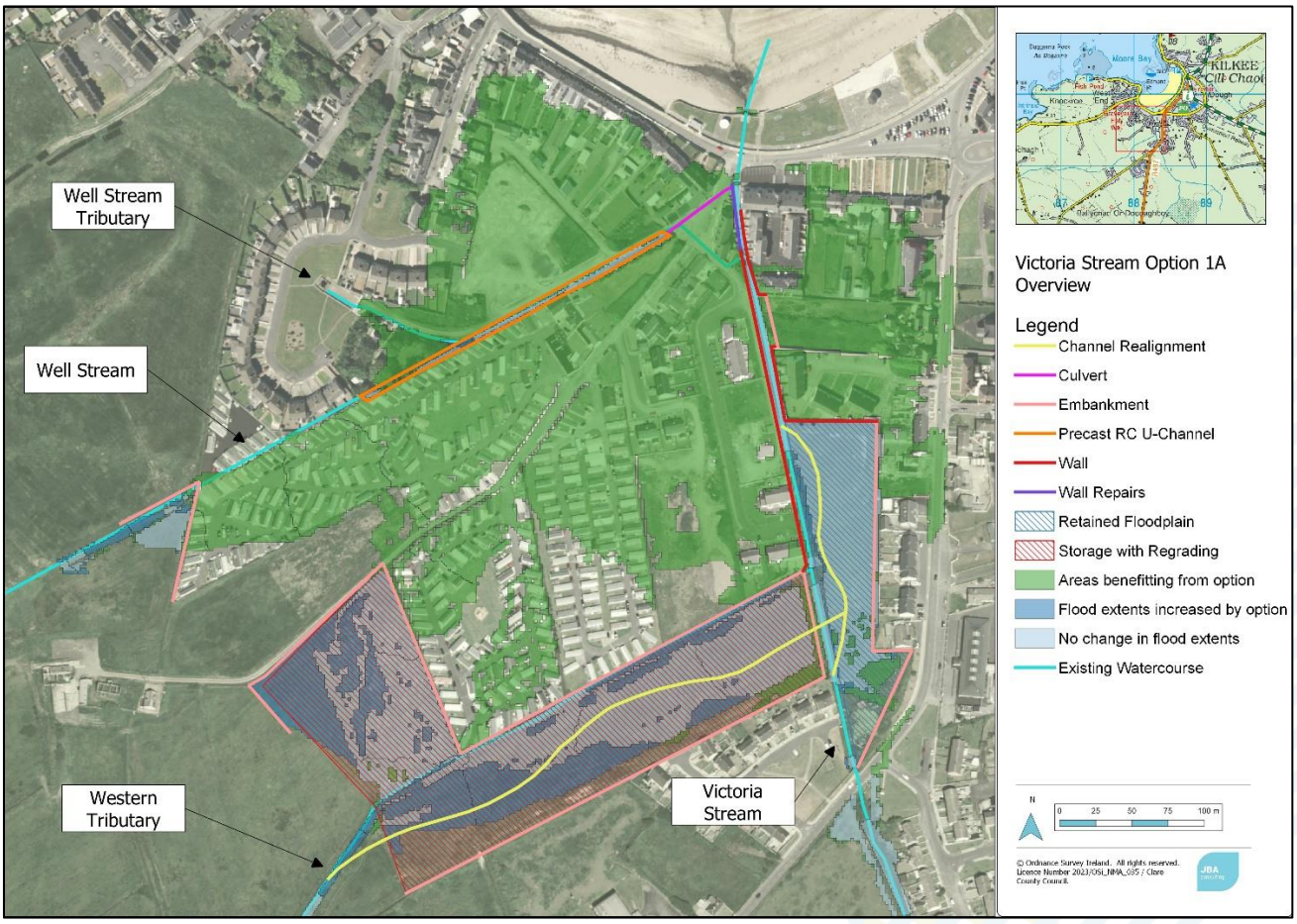

Figure 4-1 Victoria Stream Measures

4.1 Well Stream Culvert and Embankment

4.1.1 Works Description

The flood relief works for the Well Stream culvert and embankment will consist of:

- Install a western extension to the existing culvert currently located to the north of Cunningham's Holiday Park including the construction of a new headwall.
- Replace existing screen with upgraded screen.
- Construction of c. 146m long embankment c. 1.1m high upstream of Cunningham's Holiday Park with inclusion of new headwall and 1050Ø inlet culvert to existing culvert downstream.

The works location is shown below in Figure 4-2, and its access routes and existing overhead cables locations are shown in Figure 4-3.

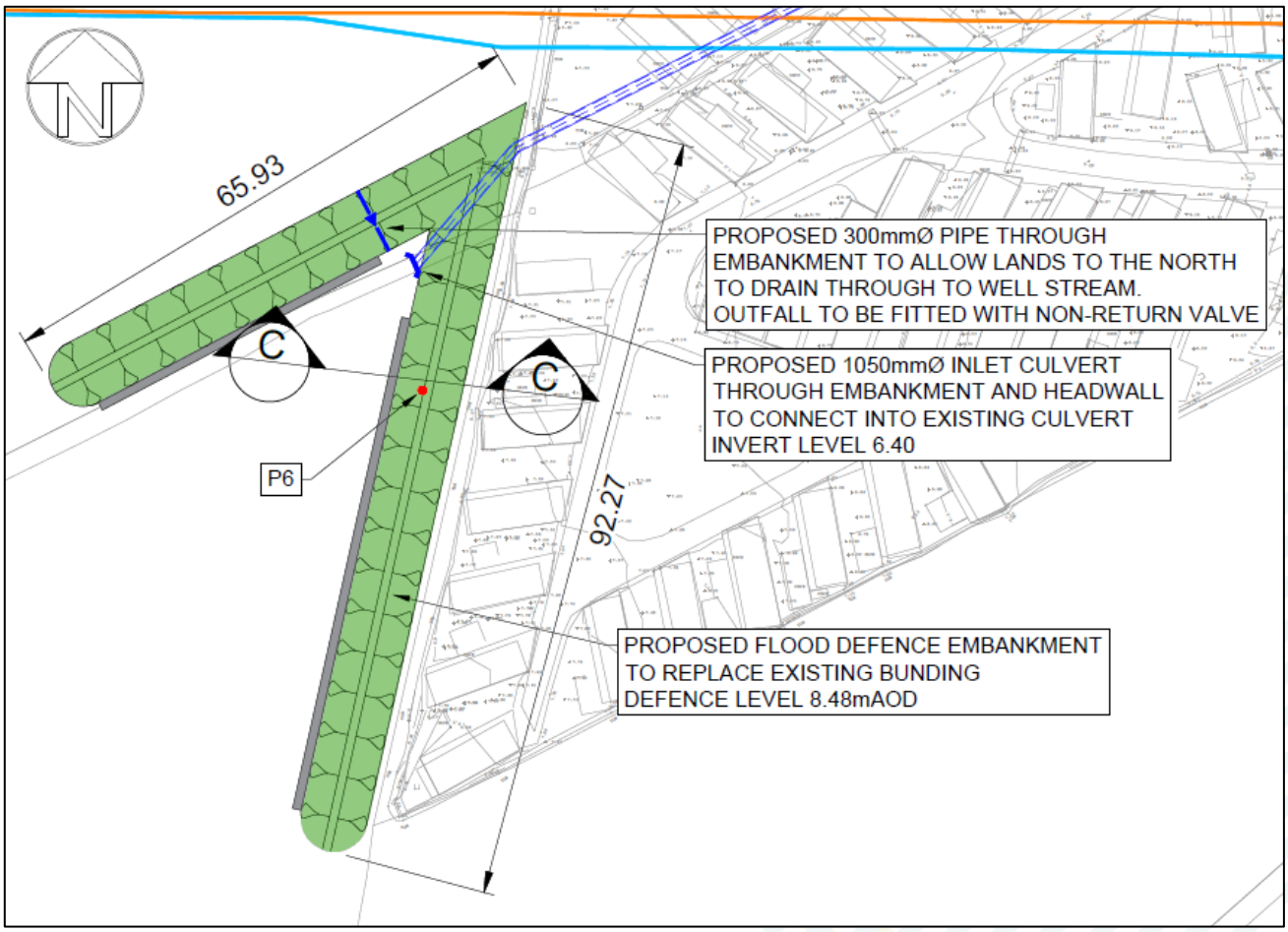

Figure 4-2 Well Stream Embankment

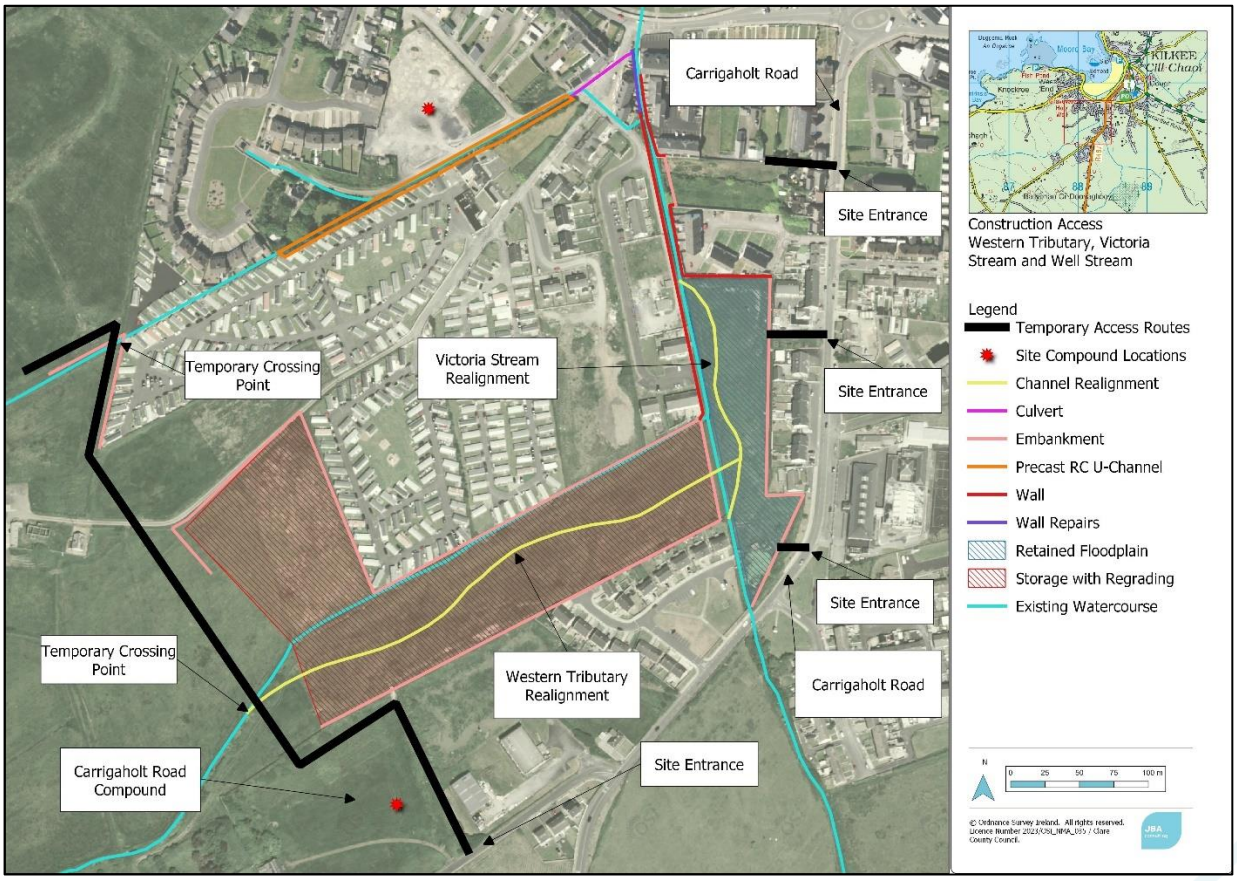

Figure 4-3 Well Stream Embankment Access Routes

4.1.2 Construction Methodology

The construction works of the new 1050Ø culvert will be sequenced to occur in advance of the construction of either the new u-channel (downstream) or the proposed embankment. Access to the embankment will be provided through the Western Tributary with access from the Old Carrigaholt Road. This access would also be used for the provision of materials to the tributary storage area. Further details on the traffic management requirements are set out in 2.4 below.

Whilst vegetation clearance isn't included as a specific step in the works, it will be required to be undertaken as per the environmental windows.

The final construction methodology will be subject to the completion of detailed design and the contractor's desired approach.

A possible construction sequence is proposed as follows:

1. Establish traffic management requirements as detailed in 3.4, including any localised signage and advanced advertisement.
2. Install a temporary access road from the Old Carrigaholt Road to the Well Stream embankment.
3. The existing culvert inlet is to be exposed any headwall and screen details are to be removed. The new 1050 culvert is to be connected and extended beyond the proposed footprint of the embankment. A further extension of the 1050 culvert should be installed to allow for a temporary crossing to be installed over the Well Stream. This will be required to be construct the north section of the embankment.
4. The extent of the proposed embankment footprint will be stripped of topsoil, with the topsoil being retained on site for reuse. Excavation to foundation depth will then proceed. The excavated material will be taken from site as it is currently deemed unsuitable for embankment construction.
5. Engineered fill will be placed up to ground level.
6. The embankment will then be constructed using a suitable clay material at its core, with general fill used to complete its necessary profile. This is currently assumed to be imported material. The final embankment will be dressed with excavated topsoil.
7. On completion of the northern embankment, the haul road across the Well Stream can be removed, the culvert reduced back to its permanent location and its new headwall installed. The banks are to be dressed as required to marry into the existing bank profile upstream.
8. The southern embankment section will be constructed with a similar procedure as the north.
9. On completion of the embankment, the temporary access road will be removed, and the existing lands will be reinstated.

4.1.3 Temporary Works Requirements

The main temporary works requirements identified in this element are:

- Hoarding and fencing enclosing the works are from the adjacent caravan parks.
- Temporary lighting as required.
- Access/haul roads to the site from the Carrigaholt Road to the embankment.

The proposed excavations are not anticipated to require temporary support, as access into the excavations will not be required.

These works will be undertaken over the recently installed drainage as part of the Kilkee WWTP project. Details of the depth of the main will be sought prior to construction.

4.1.4 Traffic Management Requirements

Both the tributary storage works, and the Well Stream embankment will require use of the Old Carrigaholt Road located near the Brooks estate. No road closure will be required during the works. A temporary access route will be provided from this road.

4.1.5 Impact on existing properties and infrastructure

There is an existing property at the end of Caravan Park Road. Land ownership with respect to the last section of road is uncertain, as is the land where an access road will be required. A

temporary way leave, and a road crossing will be required through these lands during the works.

No impacts are anticipated on any existing utilities. The Old Carrigaholt Road will require increased maintenance during the works due to the volume of large axle loads.

4.1.6 Impact on existing flood risk

The watercourse will be maintained throughout the construction phase, and as such the works do not increase the flood risk downstream.

4.1.7 Sequencing consideration

These works are intended to be undertaken during Phase 2 – Winter Works 1. It will be necessary to undertake the temporary crossing works during Phase 1. It is not necessary hydraulically to be in place in advance of the Well Stream works, but in doing so, the storage area can be utilised to reduce flows entering the Well Stream when the upgrade in that location is taking place. Please see 4.2 for more details.

4.1.8 Material to be excavated

For the construction of the embankment a depth of 0.5m will have to be excavated alone the proposed alignment. The volume of material to be excavated for the construction of the embankment is approximately 690m³.

4.2 Well Stream Upgrade

4.2.1 Works Description

The existing 240m open channel section of the Well Stream on the Well Road is to be upgraded to increase its capacity. The following elements of work are included:

- Upgrade of existing Well Stream with precast concrete u-channel
- New 38m x 38m x 1m attenuation tank and stormwater pump station to be installed on the Well Road.
- Install new 300Ø pipe sealed interceptor network and 450Ø pipe gravity sewer along the Well Road
- Install new headwall connection from Well Stream trib. to new Well Stream culvert.
- Resurfacing of Well Road

The works location is shown in Figure 4-4. The traffic management requirements are identified within each phasing methodology.

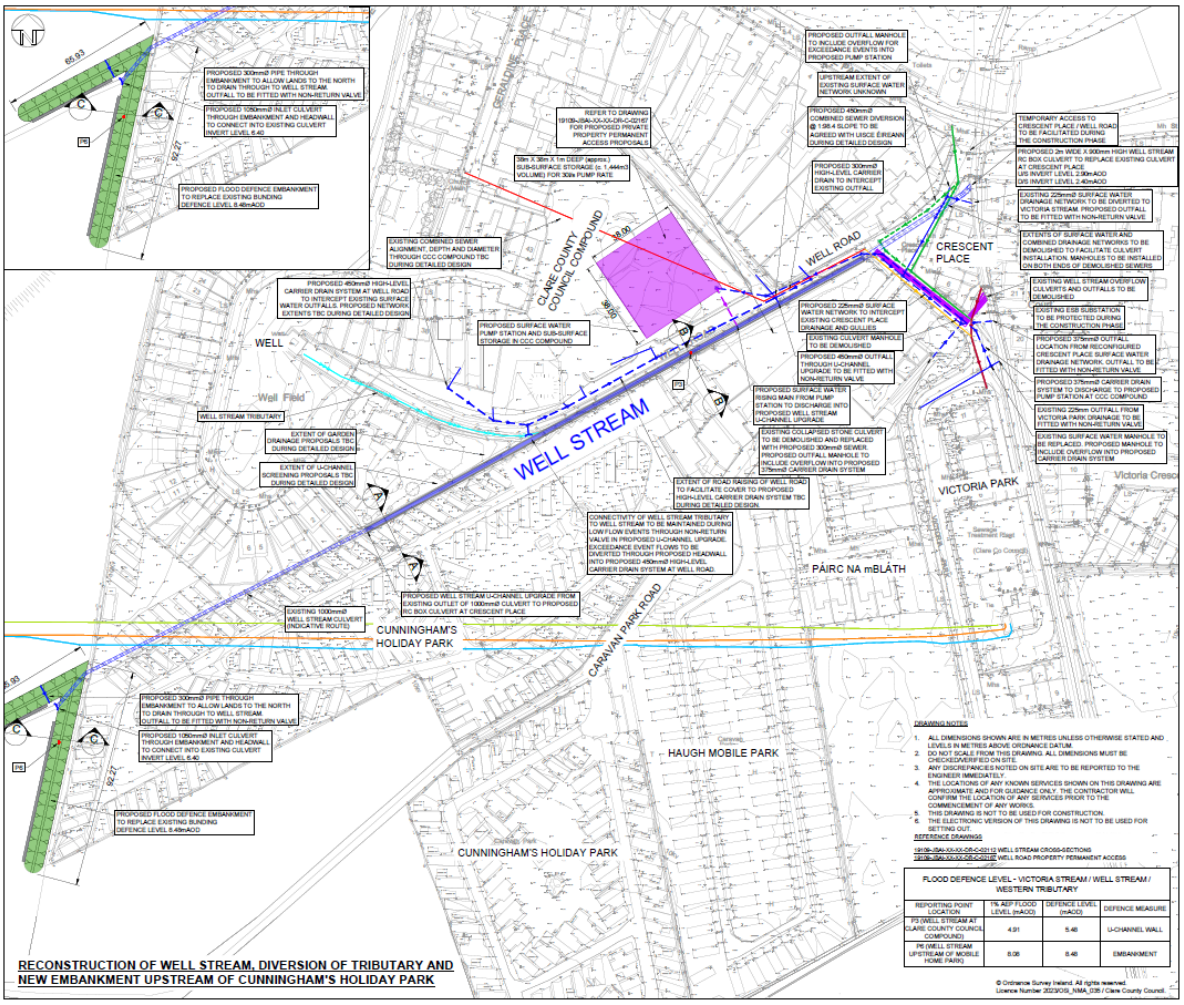

Figure 4-4 Well Stream Upgrade

4.2.2 Construction Methodology

The key elements to be considered in the methodology for the Well Stream upgrade works is to maintain pedestrian and vehicular access, and maintain positive flow through the stream network.

Note, these works can only be undertaken following the Crescent Place Culvert works. The TM diversion (Figure 4-10) in place for the Crescent Place works will be kept in place for the Well Stream works and amended as required. These works can also only be undertaken following the construction of the storage area upstream of the Well Field.

To maintain access to all properties throughout the duration of the works, a phased approach is required. There are three phases in total. The phases will work from downstream to upstream. Phase 1 is set out in Figure 4-5.

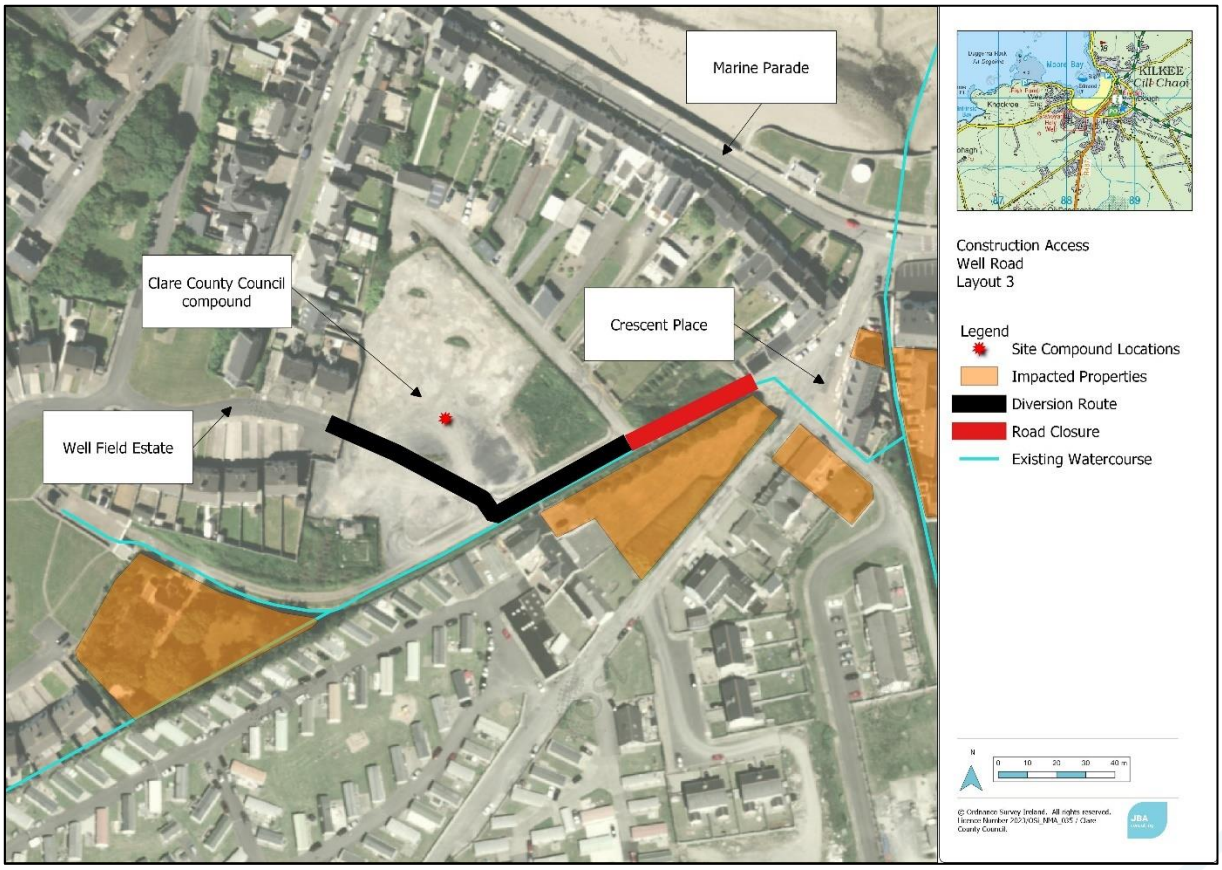

Figure 4-5 Phase 1 Well Stream TM

Phase 1

This is the most downstream section of the proposed Well Stream culvert. This phase involves the extension of the pluvial overflow drainage towards the attenuation tank, construction of the tank itself, and the first stages of the culvert installation.

A dry bed is required to build the u-channel. Therefore, the flows are to be first reduced by availing of the storage area upstream, with throttled flows reduced within the storage area. Once in place, the Well Stream is then to be bunded upstream of the intended works location. From this point flows are to be pumped through to the new Crescent Place culvert. The phasing of the works are as follows.

1. The Phase 1 TM diversion from the Crescent Place culvert works is to remain in place. These works should be undertaken sequentially so as to minimise disruption.
2. The attenuation tank and pluvial drainage are to be constructed first and complete before the construction of the culvert.
3. Once the bund is installed within the Well Culvert, it can be pumped through to the new Crescent Place Culvert.
4. The existing culvert once dry is to be excavated to receive the new culvert.
5. Each culvert section is to be delivered through Crescent Place via Marine Parade.
6. A crane or suitable excavator will lift each section into place.

7. Once the extent of culvert for this phase is complete, the culvert will be backfilled on its outside. The bund can then be removed to allow flow through the new Well Stream culvert.
8. The road is to be reinstated up to binder course through this phased section.
9. TM Phase 1 can then be removed.

Phase 2:

1. TM Phase 2 is then to be established as per Figure 4-6.
2. Again, the pluvial drainage is to be constructed first. This is to be extended upstream to allow for the construction of the inlet into the proposed attenuation tank.
3. On completion of the pluvial drainage, the Well Stream is to be once again dammed and a pumping system established as per Phase 1.
4. Now that the pluvial drainage is in place, this can be availed of for the purposes of pumping. The residual flows can be pumped into the attenuation tank and then will return to the Well Stream Culvert downstream within the completed Phase 1 section.
5. Once a dry bed is established, the u-culvert section installation can continue upstream.
6. Once the extent of sections within Phase 2 has been completed, the bund can be removed.
7. Similar to Phase 1, the road will be reinstated to binder course, and TM Phase 2 will be removed.

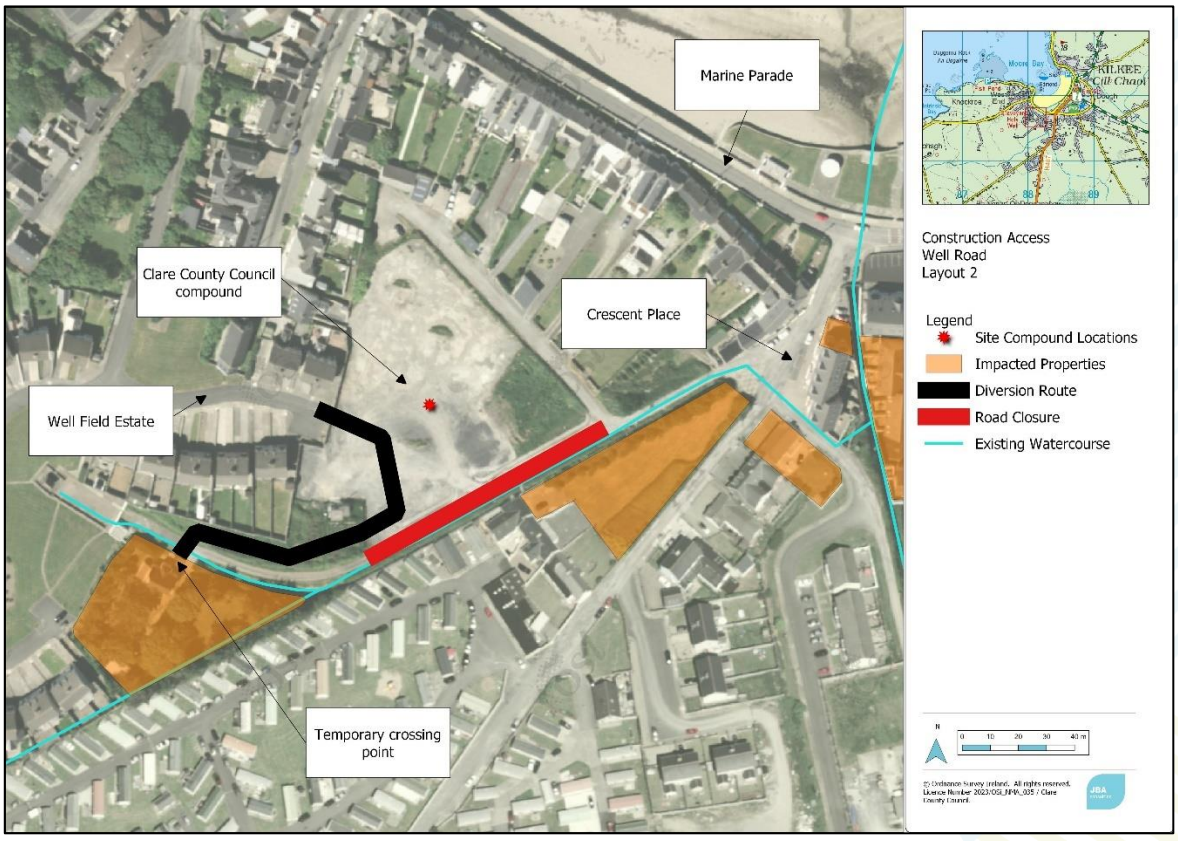

Figure 4-6 Phase 2 TM

Phase 3:

1. TM Phase 3 is then to be established as per Figure 4-7. This final TM Phase removes the need for the Well Field diversion. This diversion can be reinstated once Phase 2 is removed.
2. There are three elements to this final phase. As with the previous two phases, the pluvial drainage should be constructed first. This includes the new overflow detail of the Well Stream trib.
3. Once in place, the remaining section of concrete u-channels can be installed. The first section to be installed should be continued upstream beyond the Well Stream trib. connection.
4. The works then move into the garden of the upstream property (see Figure 4-8).
5. The overflow diversion in this case can pump flows into the Well Stream trib. in order to create a dry channel for the u-channel construction.
6. In advance of constructing the channel, a temporary crossing as shown on Figure 4-8 will be required. Following this, some vegetation clearance is required to expose the channel.
7. The remaining channel needs then to be excavated and the u-channels installed.
8. Full reinstatement of the garden will then follow this, coupled with a removal of the temporary crossing over the Well Stream trib.

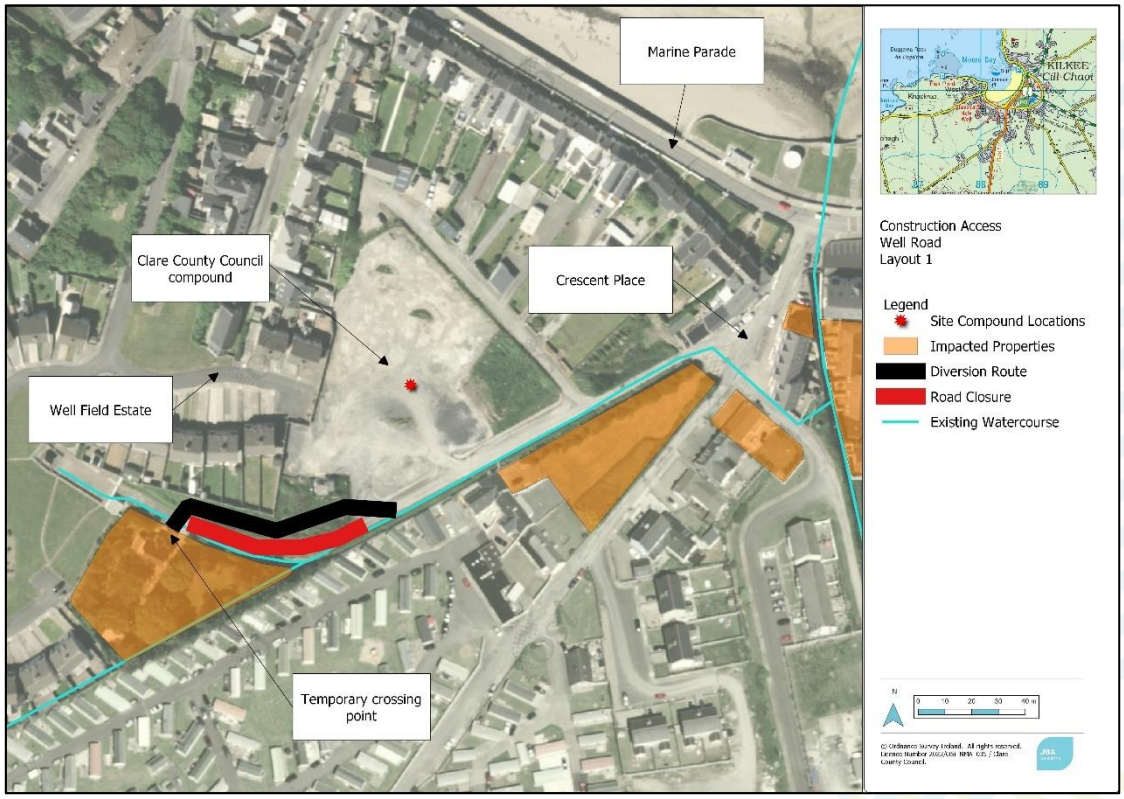

Figure 4-7 Phase 3 TM

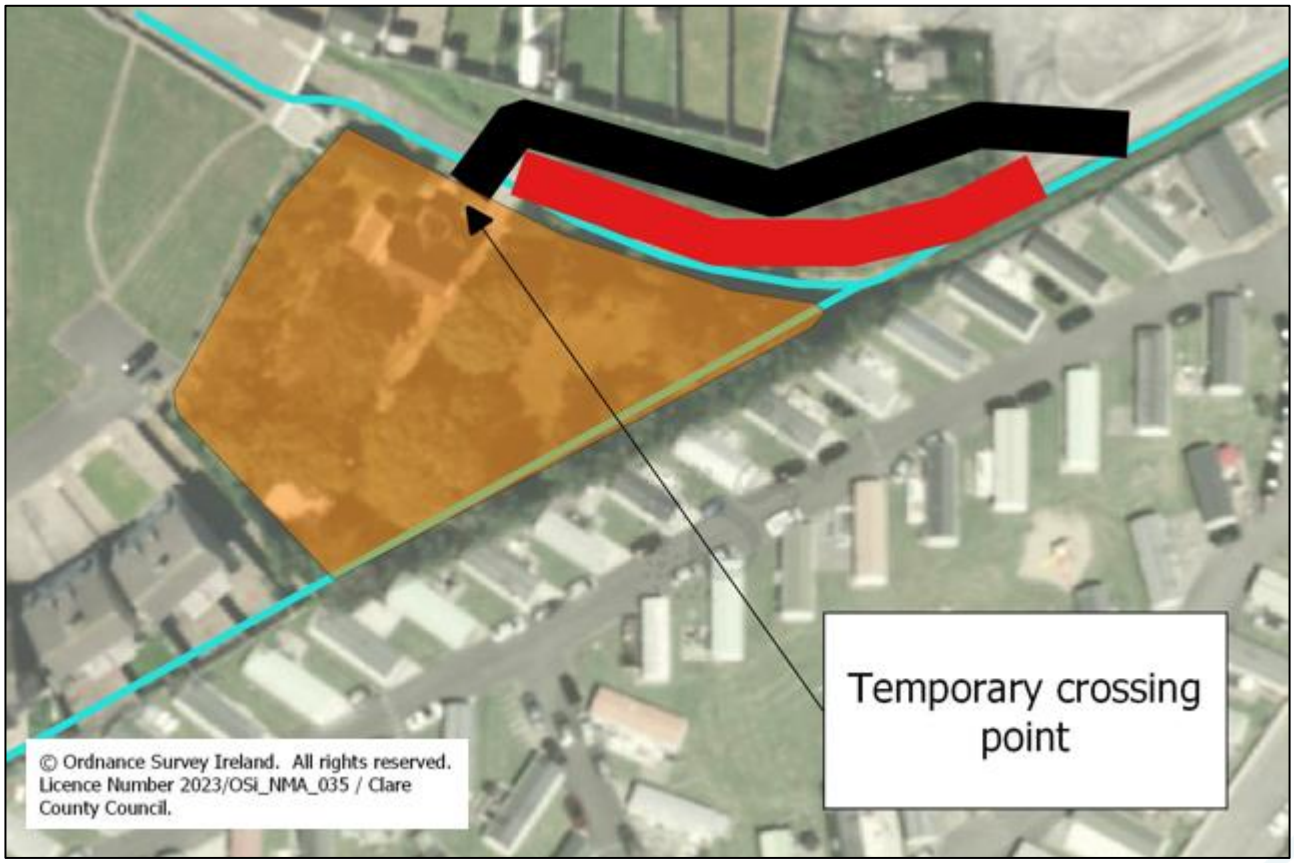

Figure 4-8 Phase 3 Works Area

4.2.3 Temporary Works Requirements

The main temporary works that need to be considered for this element of work are:

- Hoarding and fencing enclosing the works from the adjacent caravan parks.
- Installation of warning signage surrounding the site.
- Temporary lighting as required.
- Temporary handrail around the top of the culvert prior to installation of permanent fixture.
- Stream diversion pipework required to maintain dry bed during foundation installation.
- Potential requirement for temporary support of excavated face prior to installation of u-shaped channel.
- Support of existing internal services: Temporary support of any internal services identified within the construction as required.

4.2.4 Traffic Management Requirements

To avoid excessive traffic movements in the area, the works will be phased with the Well Stream U-channel and the Marine Parade culvert. The road is not sufficiently wide to allow for a passing point around the works when the culvert is being installed. The road itself will require to be closed during the main installation of the u-channel. The road only serves one property owner, the same landowner that will require the culvert to be installed on their own land. Therefore, extensive engagement with them will be required from the outset. Given the road itself will be retained throughout the works, it is recommended that the road be closed during the working day shift hours, providing local access to that property owner only. The road can be made safe and re-opened outside of the working hours.

4.2.5 Impact on existing properties

As referenced in 4.4, there is only one property that will be directly affected by these works. This will involve a temporary land take for construction of the channel on their lands, and an agreed access arrangement when the road is closed for the channel installation adjacent to the public road. It may be possible to provide access to this property and other pedestrians via the existing CCC compound.

A secondary rear access to one property also exists over the existing Well Stream. This access will be closed during the works and a new access installed as part of the permanent works. A temporary access will not be provided.

A third property at the eastern extent of the Well Road will require a temporary fence line to be established within their property, but no material changes are planned.

4.2.6 Volume of material to be excavated

The construction of the u-channel will require an estimation of 476m³ of material to be removed. This will be along the proposed 238m alignment of the u-channel.

4.2.7 Impact on existing flood risk

The works avail of scheme defences as part of the construction process. The flow will be reduced through the Well Stream as part of the works; therefore, the existing flood risk is not increased as a result of the works.

4.2.8 Sequencing consideration

These works need to be constructed after the upstream embankment has been completed, and sequentially after the Crescent Place and Well Stream pluvial works. The works will be undertaken during Phase 3 & Phase 4 of the works sequencing.

4.3 Crescent Place Culvert

4.3.1 Works Description

The flood relief works at the Crescent Place culvert on the Well Stream will consist of:

- Decommissioning of existing Well Stream box culvert and circular overflow culverts at Crescent Place. Installation of new RC box culvert (c. 1.6m wide x 900mm high) c. 55m long under Crescent Place.
- Resurfacing and regrading of Well Road (c. 300m long x 5.5m wide x 300mm high).
- Part of the left-hand bank walls of the Victoria Stream will require demolition and reinstatement to facilitate the installation of the new culvert.
- The existing culvert and overflow pipes will be decommissioned.
- A 250Ø surface water sewer and a 450Ø foul main run over the footprint of the proposed culvert. These will need to be temporarily diverted/incorporated into the works.
- Full reinstatement of the surface carriageway will be undertaken as part of the works.

The works location is shown in Figure 4-9.

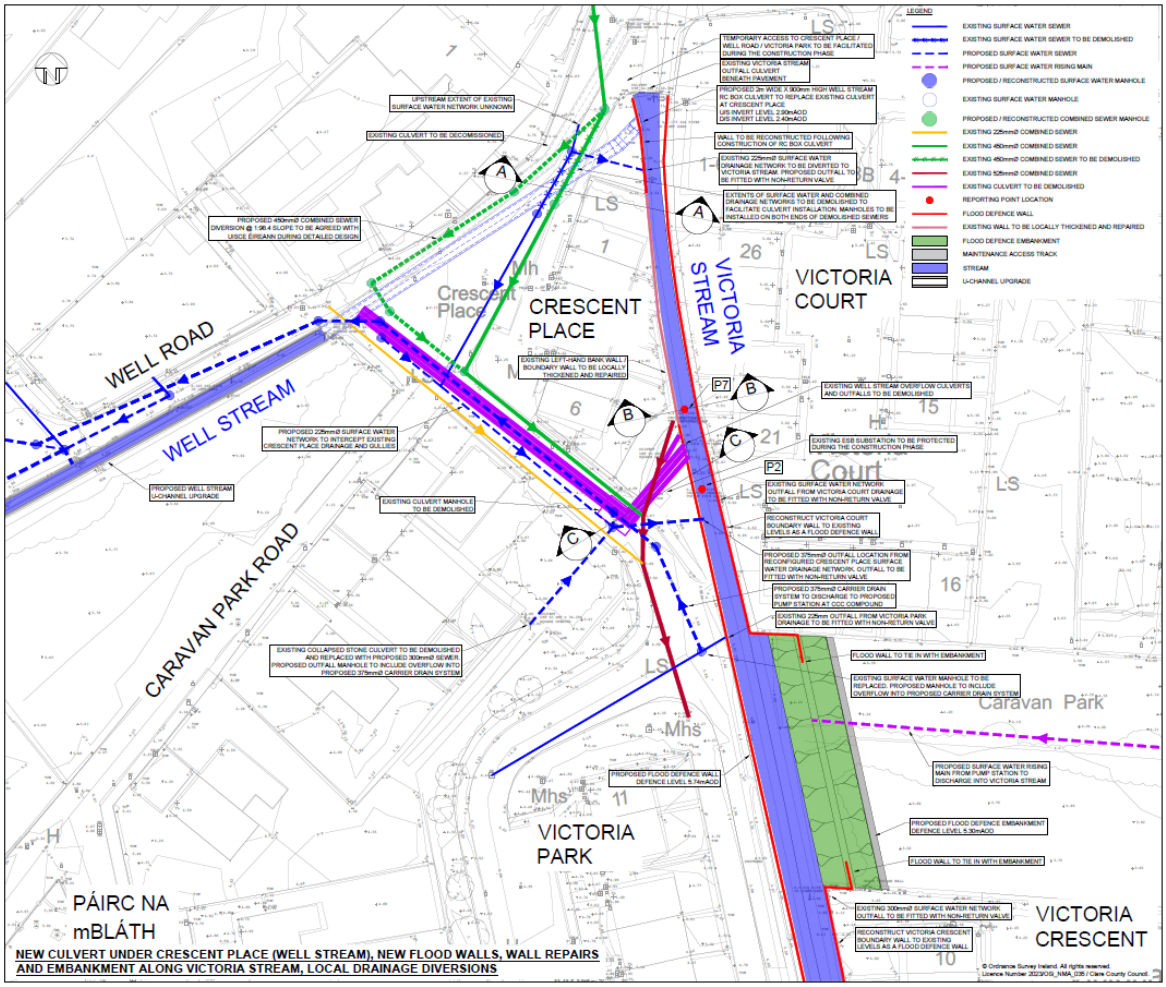

Figure 4-9 Well Stream Culvert

4.3.2 Construction Methodology

These works will cut off access to Well Road, the ESB sub-station and the IW facility. No other measures should be sequenced in parallel with these works in the area.

The works will require a road diversion for the duration of the works. A possible sequence is as follows:

1. Establish a temporary access road. The most suitable diversion is through the existing Well Field Estate. This estate is not currently in the ownership of CCC, and therefore agreement on land-use would be needed prior to commencement. This is shown in Figure 4-10.
2. This temporary traffic diversion would need to be complemented by access arrangements for the residents in Cardinal Place. The works will temporarily remove their parking spaces outside their properties, and their ability to gain vehicular access to their properties. Pedestrian access will be retained at all times.
3. Vibration monitoring on the existing properties, including tell tales on any cracks, are to be installed prior to any excavation work.
4. The works will be required to be constructed in two halves, splitting Crescent Place in two. This is necessary to facilitate vehicle access when the tie-in to the Well Stream section is being excavated.

Phase 1 – Outlet to centre of Crescent Place.

1. The excavation works should commence by first exposing all known services along the route of the culvert across Crescent Place.
2. Necessary protections are to be put in place to maintain these services during the first half of the culvert installation.
3. Following exposure of all the utilities, the outlet demolition can commence. The existing Victoria Stream wall should be demolished. This will include the temporary demolition of the boundary wall of one property in Crescent Place, to allow room for culvert installation.
4. These works will need to be taken with a dry stream in place. The same protocols for the Victoria Court wall re-build will be applied here. The Victoria Stream will be dammed upstream of Victoria Court during the installation of the new outlet.
5. Some utilities will require shut-off of service to allow safe installation of the culvert sections. This includes the foul and water mains. Agreement on the time and nature of these temporary shut-offs will be agreed with Uisce Éireann in advance.
6. Once the boundary wall is demolished, the channel excavated to depth, and services isolated, the culvert sections can be installed. The culvert sections will be installed using a 10t excavator, installing the sections as they are delivered to site.
7. The outlet section is to be installed first, and the boundary wall reconstructed. This will involve scaffolding within the Victoria Stream. This scaffolding can remain in place for the works being undertaken further upstream on the Victoria Court property. Note, the reconstruction of the boundary wall to the Victoria Stream is not required to be completed prior to the switch to Phase 2.
8. Once all the culvert sections have been installed, and all service isolations have been reconfigured, the backfilling of the culvert and reinstatement of the carriageway can commence.
9. Once complete, the second half of the culvert can proceed. This involves a separate traffic management installation.

Phase 2 – Centreline to Well Stream Inlet.

1. The second half of the culvert installation requires a variation on the traffic management for Phase 1. The diversion through the Well Field will be retained for this phase. This will be required for the property to the western extent of the Well Road. This diversion will also retain the rear access to the properties that face onto Marine Parade.
2. For those properties in Crescent Place and Victoria Park, access will be available through Crescent Place, with a stop-go system in place with traffic travelling over the recently installed section of the new culvert.
3. Once the temporary traffic management is in place, excavation for the remaining section of culvert will commence. The existing inlet from the Well Stream will be exposed, along with the watermain that crosses the face of the existing culvert. The connectivity between the Victoria Stream and the Well Stream will be retained until all sections of the culvert have been installed and the new culvert can be made live.
4. The method of installation will mimic that of the first phase, with full reinstatement of the carriageway required on completion.

4.3.3 Temporary Works Requirements

The main temporary works that need to be considered for this element of work are:

- Hoarding and fencing enclosing the works from the adjacent caravan parks.
- Temporary lighting as required.
- Temporary traffic management.
- Scaffolding requirement at the outlet wall re-build

4.3.4 Traffic Management Requirements

There are three compound arrangements for the installation of the culvert. The first TM set-up is in Figure 4-10. The first stage requires diversion through the rear of the CCC compound.

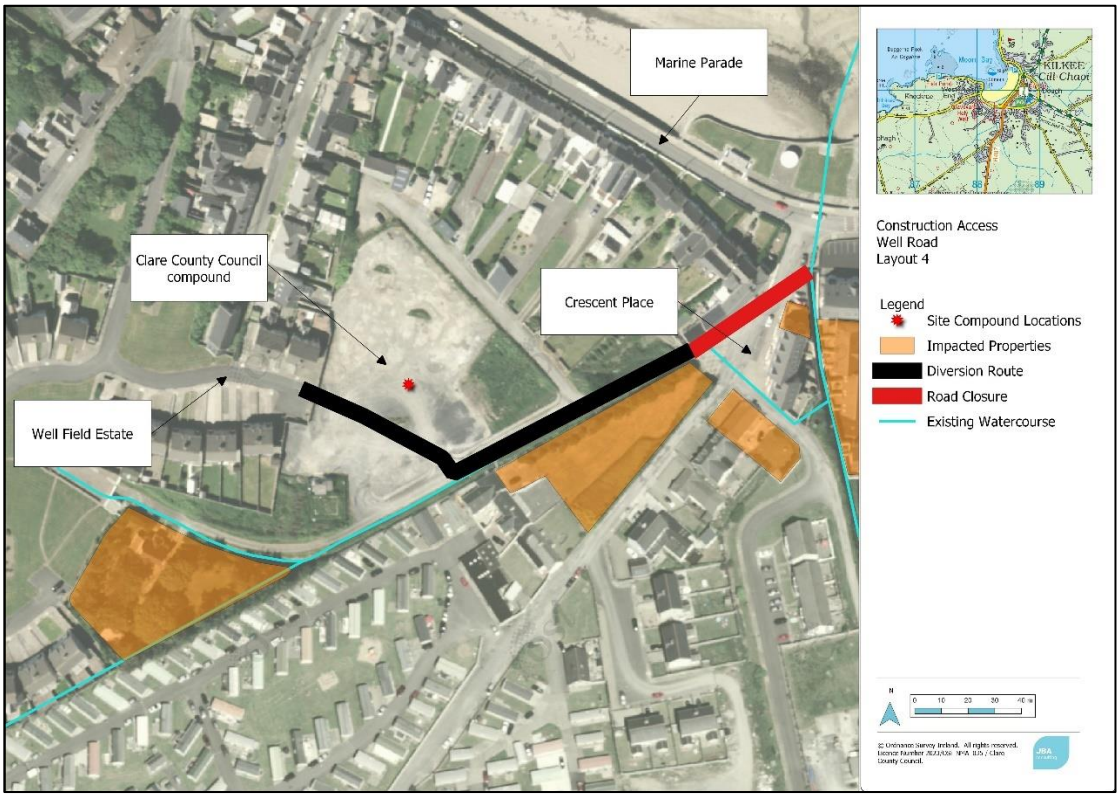

Figure 4-10 TM Phase 1 (Same as TM Phase 1 for the Well Road Culvert)

This stage also requires a diversion through the Well Field estate. This is to allow access to Victoria Park properties, IW assets and the caravan parks south of Crescent Place. The diversion through the compound and the Well Field estate will have previously been established during the Well Stream upgrade works presented in Section 3.2.

The second TM stage is shown below in Figure 4-11. This retains the diversion through the Well Field Estate. This will be required to allow the Well Road property and Marine Parade properties to retain access during the works.

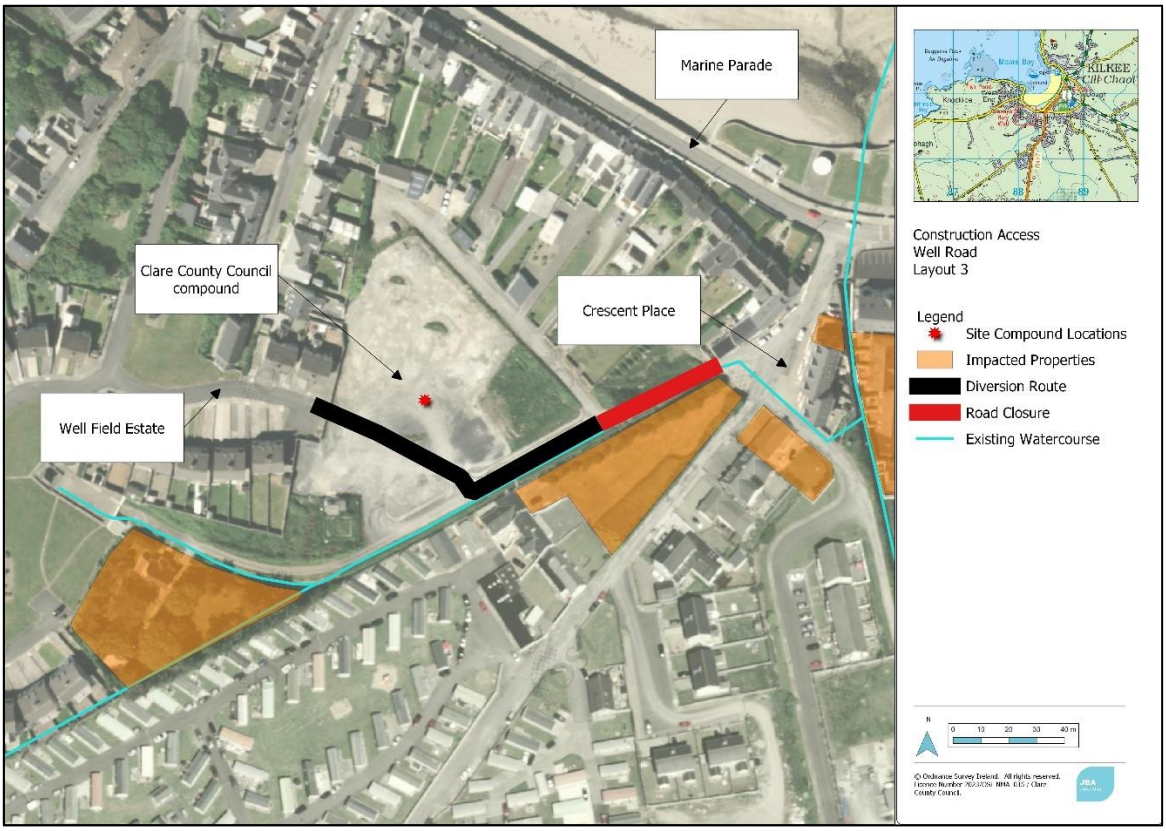

Figure 4-11 TM Phase 2

4.3.5 Impact on existing properties

The temporary traffic management will have a significant impact on properties access during the construction phase. It won't, however, require any temporary or permanent land take. The only property that will require temporary land-take will be the No. 1 Crescent Place property. The works will require part-removal of their boundary wall to provide sufficient excavation space for the culvert installation. The permanent culvert will not be located beneath their wall. Temporary hoarding and fencing may be required in the properties adjacent to the interface between the Well Stream and the new culvert.

During the works, there may also be periodic shut-offs of water services and foul services. The sequencing of these will have to be agreed with Uisce Éireann and the local authority.

4.3.6 Impact on existing flood risk

The proposed culvert will be installed "off-line" with the existing Well Stream flow regime in place until the new culvert is in place. Therefore, there will be no flood risk during the construction phase.

4.3.7 Sequencing consideration

These works need to be carefully considered in the context of the Well Stream upgrade and the Victoria Court wall repair. The new culvert needs to be in place before the Victoria Court wall repair and will need to have the pluvial drainage within Crescent Place constructed in tandem with it. These works also need to be undertaken before the Well Stream upgrade. The foul main diversion will take place during Phase 2 of the sequencing. The outlet will be constructed during Phase 3 & Phase 4 of the construction sequencing.

4.4 Victoria Court wall re-build

4.4.1 Works Description

The flood relief works at Victoria Court wall consists of:

- Removal of existing garden shed within No. 21 Victoria Court.
- Demolition and reconstruction of Victoria Court boundary wall as a flood defence wall for 36m.
- Reinstatement of all Victoria Court rear gardens.
- Local repointing and thickening of existing left bank wall behind Crescent Place properties. Replacement of c. 3m section of wall to facilitate Well Stream RC box culvert installation at Crescent Place.
- Existing surface water outfall to be fitted with non-return valve.
- Reconstruction of Victoria Court boundary c. 130m long wall as a flood defence wall.

The location of these works are shown in Figure 4-12.

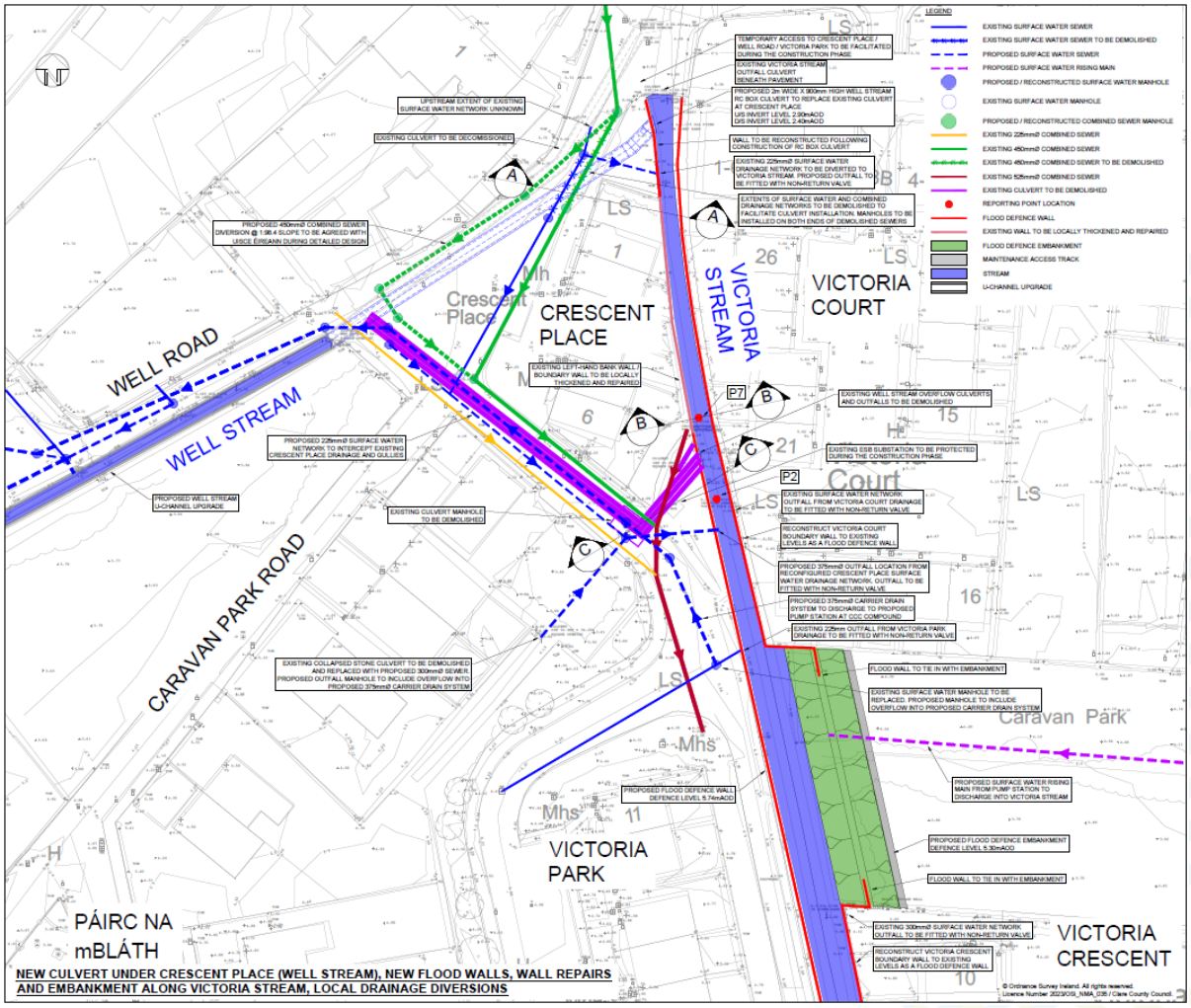

Figure 4-12 Victoria Court Wall Repair

4.4.2 Construction Methodology

4.4.3 Victoria Court wall rebuild:

Access to the works area will be from the field between Victoria Crescent and Victoria Court.

The final construction methodology will be subject to the completion of detailed design and the contractor's desired approach.

A possible construction sequence is proposed as follows:

1. Liaise with owners of properties No. 20 and 21 regarding potential access to their rear gardens.
2. Install required signage and warnings in the Victoria Court estate.
3. A dry bed will be required to construct the scaffolding needed to demolish and re-build the wall. This will be done so by creating a full dam across the Victoria Stream. These in-stream works will be undertaken when the stop logs are in place. Therefore, the baseline hydraulic conditions will not be impacted.
4. Construct scaffolding within Victoria Stream, outside the wall to be demolished.
5. Place temporary hoarding/fencing in the public area in front of house No. 20 and beside No. 21.
6. Remove any garden furniture etc. in the construction area.
7. Install hoarding/fencing at the rear of the properties to enclose the working area.
8. Clear vegetation around the existing wall.
9. Carefully remove the proposed area of the existing wall down to the top of the old rubble stone wall. This includes the returning walls between each Victoria Court property.
10. Construction waste is to be taken from site via the adjacent Victoria Crescent field or through Victoria Court.
11. Excavate/clean off material to the base of the wall.
12. Pour RC ground beam over the top of the existing rubble wall. This will form the new wall foundation.
13. Construct masonry boundary wall for entire length of Victoria Court down to return wall on No. 21.
14. Following construction of the wall, it is to be rendered as agreed.
15. Utilising the reduced flow regime, the coffer dam is to then be amended to allow scaffolding be constructed at the outlet of the Well Stream culvert.
16. Left hand bank wall to be demolished and reconstructed to facilitate Well Stream culvert outlet.
17. Scaffolding will then be removed, and full reinstatement of the flow regime will be reinstated.
18. Remove site compound, temporary fencing, and signage from area.

4.4.4 Victoria Stream wall repair

This work involves a local thickening and repair of the left bank wall of the Victoria Stream. Access to this work will be at two locations. The repair work will be via the scaffolding established for the Victoria Court works. The thickening works will be undertaken within the existing laneway behind the properties. The following is a suggested methodology for undertaking this work.

1. Install required signage and warnings in the rear of the Crescent Place estate.
2. Clear any vegetation from face of wall.
3. Identify and agree repair locations.
4. Repoint stone wall where required.
5. Within the laneway, the existing surface is to be scabbled to the door of the second property.
6. The lane surface is to be raised by pouring concrete up to the threshold of the rear laneway accesses.
7. At the base of the steps within the laneways, the foundation of the wall is to be exposed down to foundation level. The foundation is to be widened by 100mm, dowelling into the existing foundation.
8. Masonry ties are to be shot-fired into the existing masonry wall, and a 100mm masonry thickening is to be constructed onto the face of the existing wall.
9. The footpath through this area is then to be reinstated.

4.4.5 Temporary Works Requirements

- Warning signage around site compound
- Barricades/hoarding at the entrance and all-around site.
- Scaffolding within the Victoria Stream to access the wall for pointing

A review of available utility records information has identified the following services:

- An existing foul sewer located beside property No. 21 in Victoria Court
- Streetlight located between properties No. 20 and 21 in Victoria Court
- ESB substation located in the vicinity of wall in Victoria Park

Details of the depth of these utilities will be sought prior to construction.

4.4.6 Traffic Management Requirements

No road closures or diversions are required for this element of this work.

4.4.7 Site Compound and Access Routes for Construction

The access points to the Victoria Crescent wall will be from the rear of the Victoria Court estate and the field located south of the estate.

For the Victoria Park wall, access can be got from the back of the estate.

4.4.8 Impact on existing properties

The rear of the properties of all Victoria Court owners will be effected during the works, with no access to their rear gardens.

On completion, the wall will become a flood defence asset, thus under the ownership of the OPW.

4.5 Victoria Court embankment

4.5.1 Works Description

The flood relief works for the Victoria Court embankment consist of:

- Construction of a c.37m long embankment, c.800mm high.
- This is to be located between Victoria Court and Victoria Crescent boundaries.
- The embankment ties into both boundary walls to the north and south. This will require additional masonry links to be constructed.
- The pluvial system to the east of this embankment will discharge beneath this embankment, thus pipework for the pumping system will need to be installed as part of this measure.

The works area is shown in Figure 4-4-13.

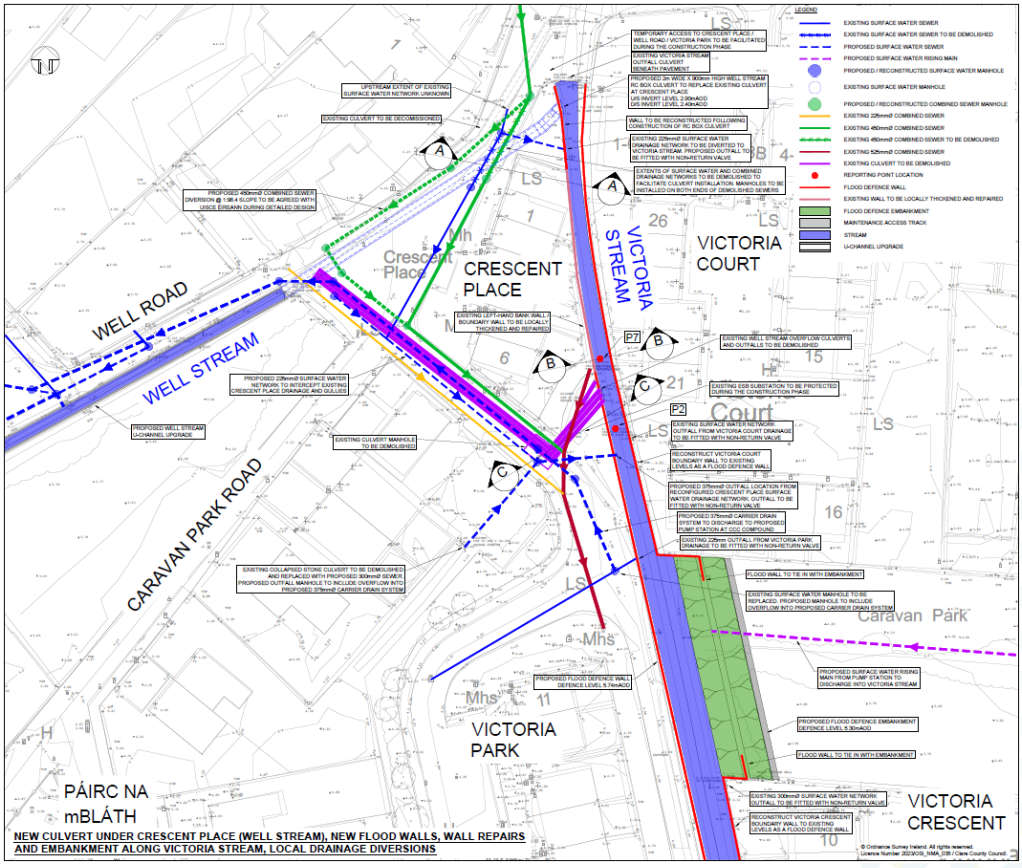

Figure 4-4-13 Victoria Court Embankment

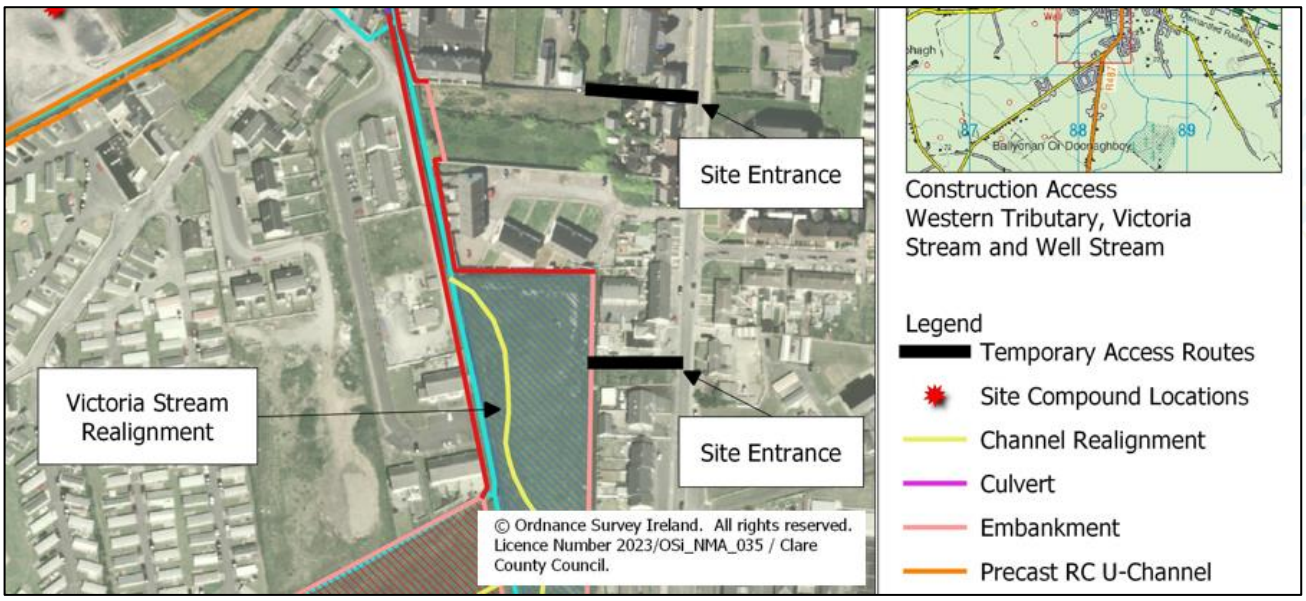

Figure 4-14 Victoria Court Temp Access

4.5.2 Construction Methodology

The final construction methodology will be subject to the completion of detailed design and the contractor's desired approach. However, certain limitations to the site dictate much of the construction methodology. A suggested construction sequence is as follows:

1. Access to the site is only possible through the existing entrance from Carrigaholt Road.
2. A segregation zone within this site must first be established identifying the extent of the Japanese Knotweed present. An agreed methodology around working in proximity to this is to be agreed with the Environmental Engineer.
3. Install temporary access roads to embankment.
4. Excavate to the required depth of embankment foundation.
5. Engineered fill will be placed up to ground level.
6. Install new rising main to Victoria Stream from attenuation tank.
7. The embankment will then be constructed using a suitable clay material as its core, with general fill used to complete its necessary profile. The final embankment will be dressed with excavated topsoil.
8. The embankment will tie in with the newly constructed flood walls at Victoria Court and Victoria Crescent.
9. Remove site compound and any warning signs after construction.
10. On completion of the embankment the field and road access will be reinstated.

4.5.3 Temporary Works Requirements

The main temporary works that need to be considered for this element of work are:

- Site compound
- Warning signage around site compound.
- Barricades/hoarding at the entrance and all-around site to ensure site segregation is maintained.

- Access roads to works location.

A review of available utility records information has identified the services in this area.

- Low voltage overhead line at the entrance to the field.

4.5.4 Traffic Management Requirements

The construction of this embankment will not require any road closures.

The proposed road access from Carrigaholt Road will however require regular cleaning due to hauling material in and out of the site.

4.5.5 Site Compound and Access Routes for Construction

The embankment is located in a field between Victoria Court and Victoria Crescent. Access to this field can be got from the Carrigaholt Road. It is unsure if this is a private road or not so regular maintenance/cleaning of this road is essential during the construction of this embankment.

4.5.6 Impact on existing properties

Pre-construction surveys of the nearby properties will be undertaken as required.

The embankment will tie into the 2 newly constructed walls at Victoria Crescent and Victoria Court.

4.5.7 Material to be excavated

For the construction of this embankment a 0.5m depth will have to be excavated along the proposed alignment. This will mean a total of approximately 148m³ of material will have to be excavated.

4.6 Victoria Stream Walls

4.6.1 Works Description

These walls are constructed on the left and right-hand banks of the Victoria Stream, adjacent to Victoria Park and Victoria Crescent. The works involve:

- Local repointing and thickening of existing left bank wall behind Crescent Place properties. Replacement of c. 3m section of wall to facilitate Well Stream RC box culvert installation at Crescent Place.
- Construction of c. 280m long embankment behind Carrigaholt Road c. 1.2-1.4m high above ground level.
- Construction of new flood defence wall c. 230m long along in-filledleft hand bank from Victoria Park to Crescent Place c. 1.2-1.8m high above ground level.
- Diversion of c. 170m of open channel to centre of floodplain. Existing open channel to be filled in.
- Reconstruction of Victoria Crescent boundary wall c. 130m long.
- Construction of c. 37m long embankment c. 800mm high north of Victoria Crescent.

The works area is shown in Figure 4-15.

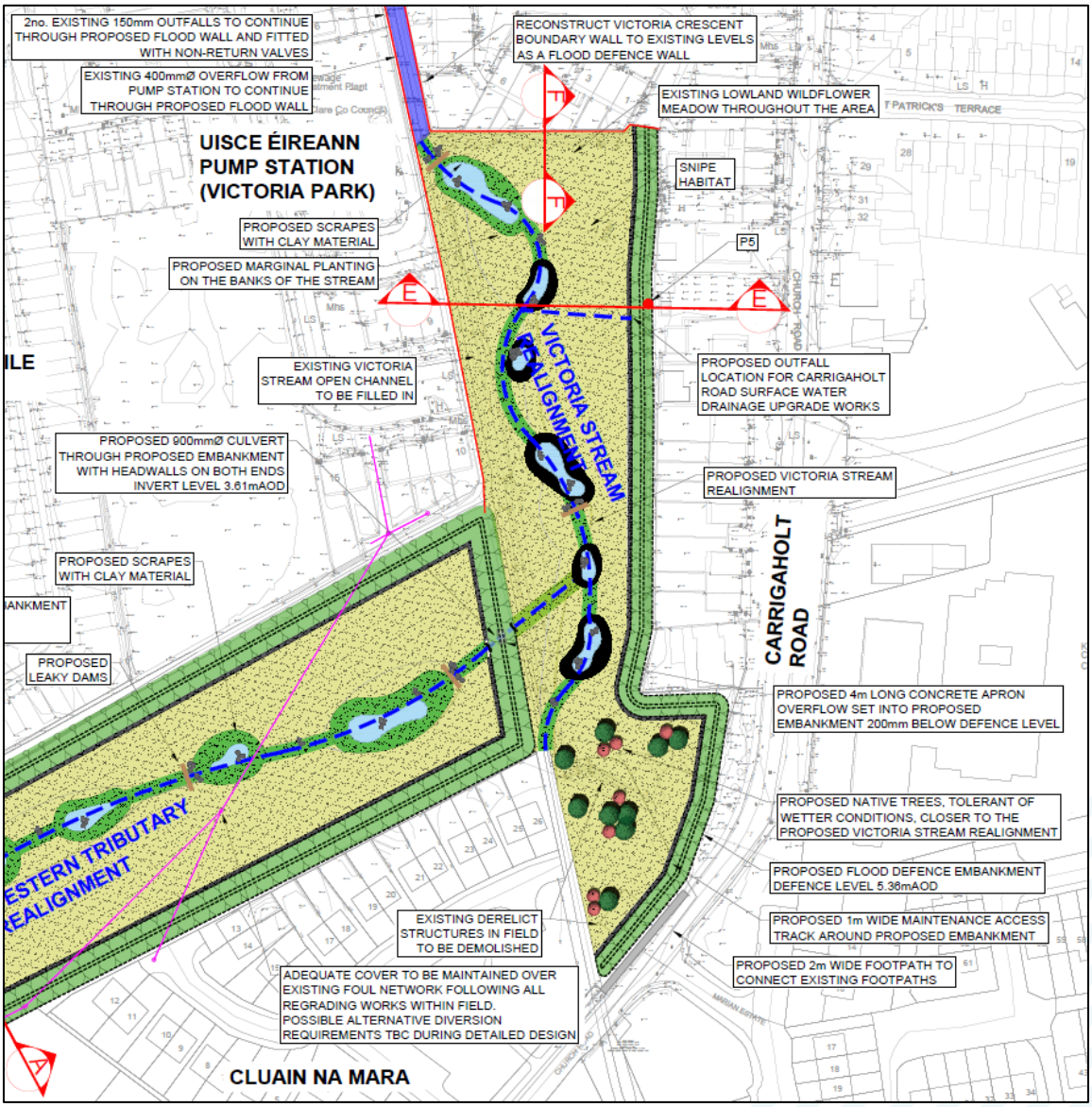

Figure 4-15 Victoria Stream walls (LHB) South

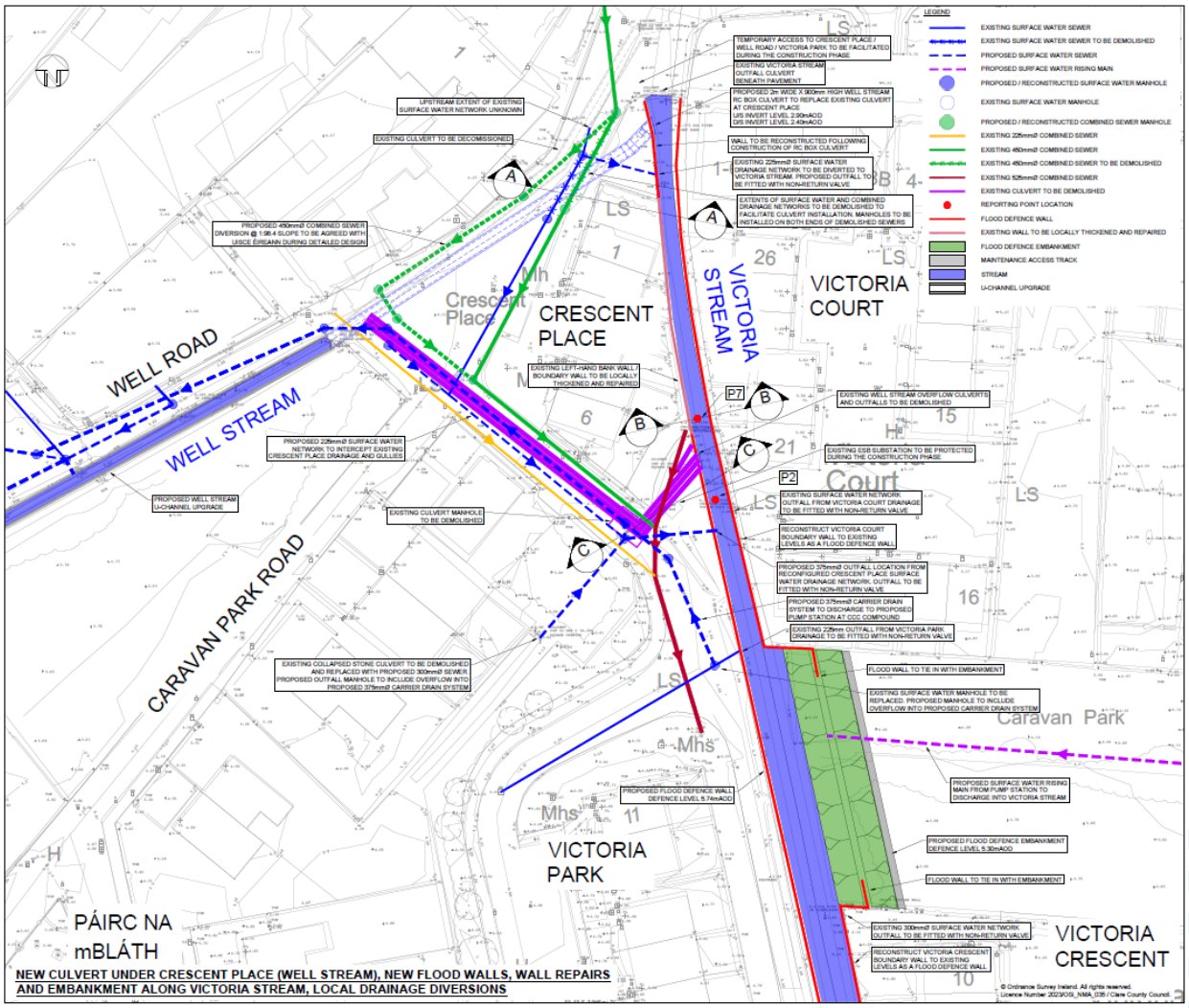

Figure 4-16 Victoria Stream walls (LHB) North

4.6.2 Construction Methodology

Both banks will have two different access arrangements. The LHB will be accessed via Marine Parade. The RHB should be accessed from the Carrigaholt Road field worksite.

The proposed construction sequence for the **LHB** is as follows:

1. Install temporary traffic management measures, including localised signage and advanced advertisement and site accommodation works. This element of works will disrupt the access for Uisce Éireann. It is proposed that the access here be widened to the right-hand side green area, to maintain access whilst the wall is being constructed.
2. Excavate along the proposed flood wall alignment up to the required foundation depth.
3. The northern tie-in point for this wall is to an existing masonry structure. A vertical water bar detail is to be included at this point.
4. The RC foundation is to be poured in-situ. In-situ concrete works adjacent to the stream need to be carefully considered in the context of the EIAR mitigation.
5. The alignment of the new wall will be running from the corner of the new embankment on the Western Tributary to the existing wall located south of Crescent Place. It will run adjacent to the old Victoria Stream.

6. The alignment of the Victoria Crescent wall will follow the boundary of the properties at Victoria Crescent. Remove any construction waste to an approved location.
7. Undertake the ground preparation works to accommodate the new flood wall. The final excavation depth is dependent on the depth of the suitable in-situ bearing stratum.
8. Construct the reinforced concrete flood walls by means of in-situ concrete casting. The use of precast sections as a construction alternative will be evaluated and considered in the detailed design stage and may be dependent on the Contractor's preferred approach. No in-stream construction anticipated.
9. The Uisce Éireann overflow connection between Victoria Stream and the Uisce Éireann pump station will need to be incorporated into the flood wall.
10. Backfill the excavated area surrounding the flood wall in accordance with material notes in the design specification.
11. Reinstate the rear property gardens and any other developments effected by the construction.

4.6.3 Temporary Works Requirements

The main temporary works requirements identified are:

- Site compound
- Warning signage around site compound.
- Barricades/hoarding at the entrance and all-around site to ensure site segregation is maintained.
- Warning goal posts for all overhead cables in proximity to site.
- Access roads
- Formwork/falsework for in-situ concrete

A review of available utility records information has identified the following services:

- A foul sewer pipe across both walls
- A medium-voltage ESB overhead cable across Victoria Park wall.
- A low/medium-voltage ESB underground cable running beside Victoria Park wall.

Details of the depth of these utilities will be sought prior to construction.

4.6.4 Traffic Management Requirements

Temporary closure of a private road used to access Uisce Éireann at the rear of Victoria Park will be required to construct this wall. Maintenance is therefore critical to this road during construction.

4.6.5 Site Compound and Access Routes for Construction

Both walls can be accessed from inside the field however due to the stream external access is more practical and can be sought as follows:

Access to the Victoria Park wall will be from a small road located at the back of the Victoria Park estate. This road is however partially private, and permission may have to be sought from Uisce Éireann. Other access to this wall can be reached from the estates common area between properties No. 9 and No. 10 of Victoria Park.

The Victoria Crescent wall can be accessed from the rear of the Victoria Crescent estate and rear gardens of houses No. 1-10 of Victoria Crescent.

4.6.6 Impact on existing properties

Pre-condition surveys of the properties nearby the works will be undertaken as required.

Temporary restricted access will be given to Uisce Éireanns road.

4.6.7 Material to be excavated

For the construction of the 305m wall located beside the Victoria Park estate, a trench of depth 1.1m and depth 1.2m will be required. Therefore, the total volume of material to be excavated will be 403m^3.

For the Victoria Crescent a similar trench will have to be excavated along a 163m wall alignment. A total of 215m^3 of material will therefore have to be excavated.

4.7 Carrigaholt Road field

4.7.1 Works Description

The Carrigaholt Road field will involve the realignment of the existing Victoria Stream and the introduction of boundary flood retention structures. The following works are involved:

- Realignment of existing 170m long section of Victoria Stream
- Infill of existing Victoria Stream
- Upgrade of boundary walls on 4 no. Victoria Crescent properties
- Construction of new flood defence wall along the boundary of Victoria Court
    - Construction of new c. 280m flood embankment along north and eastern boundary of Carrigaholt Road field.

The works area is shown in Figure 4-18.

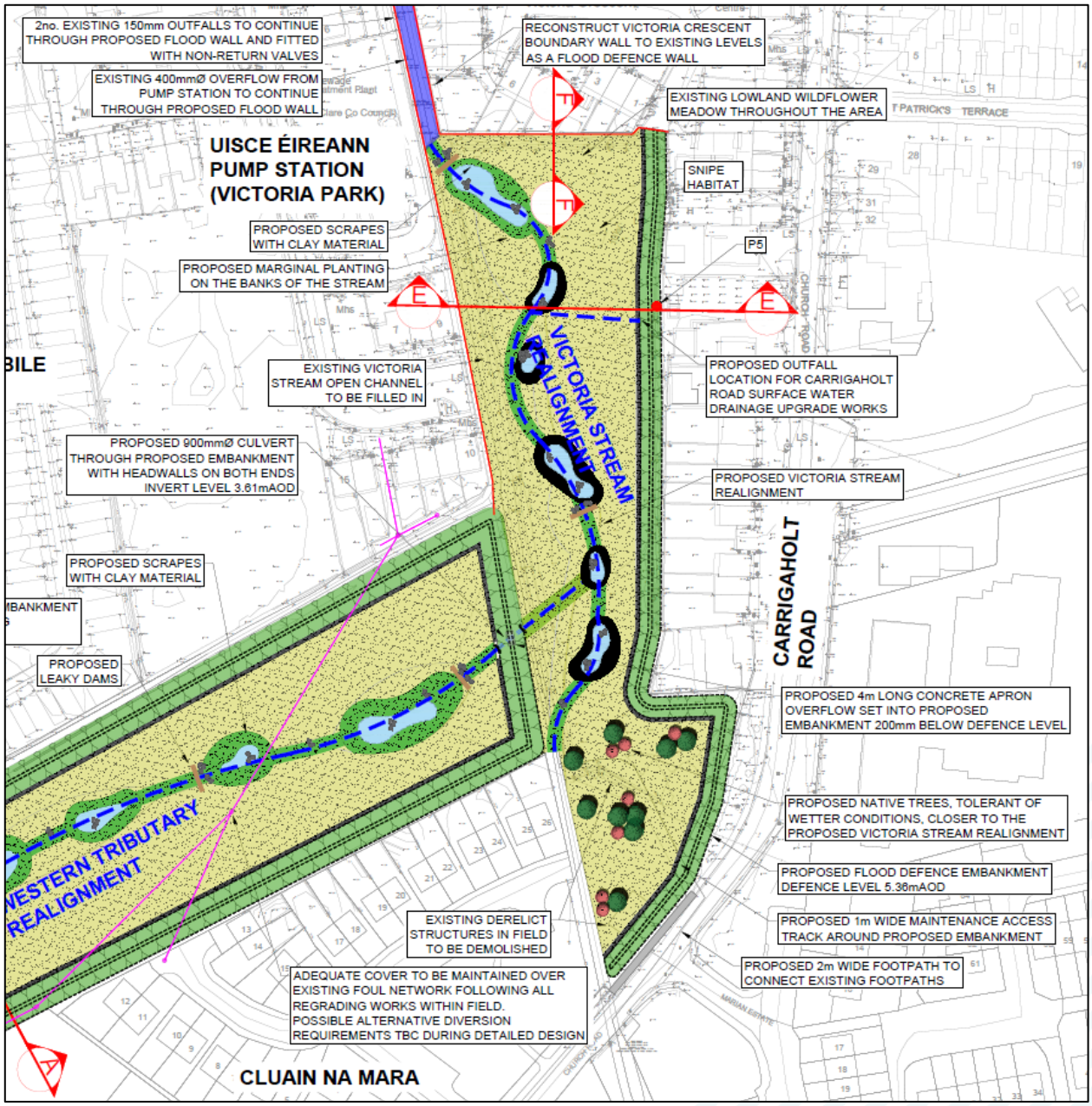

Figure 4-18 Carrigaholt Road Field Works

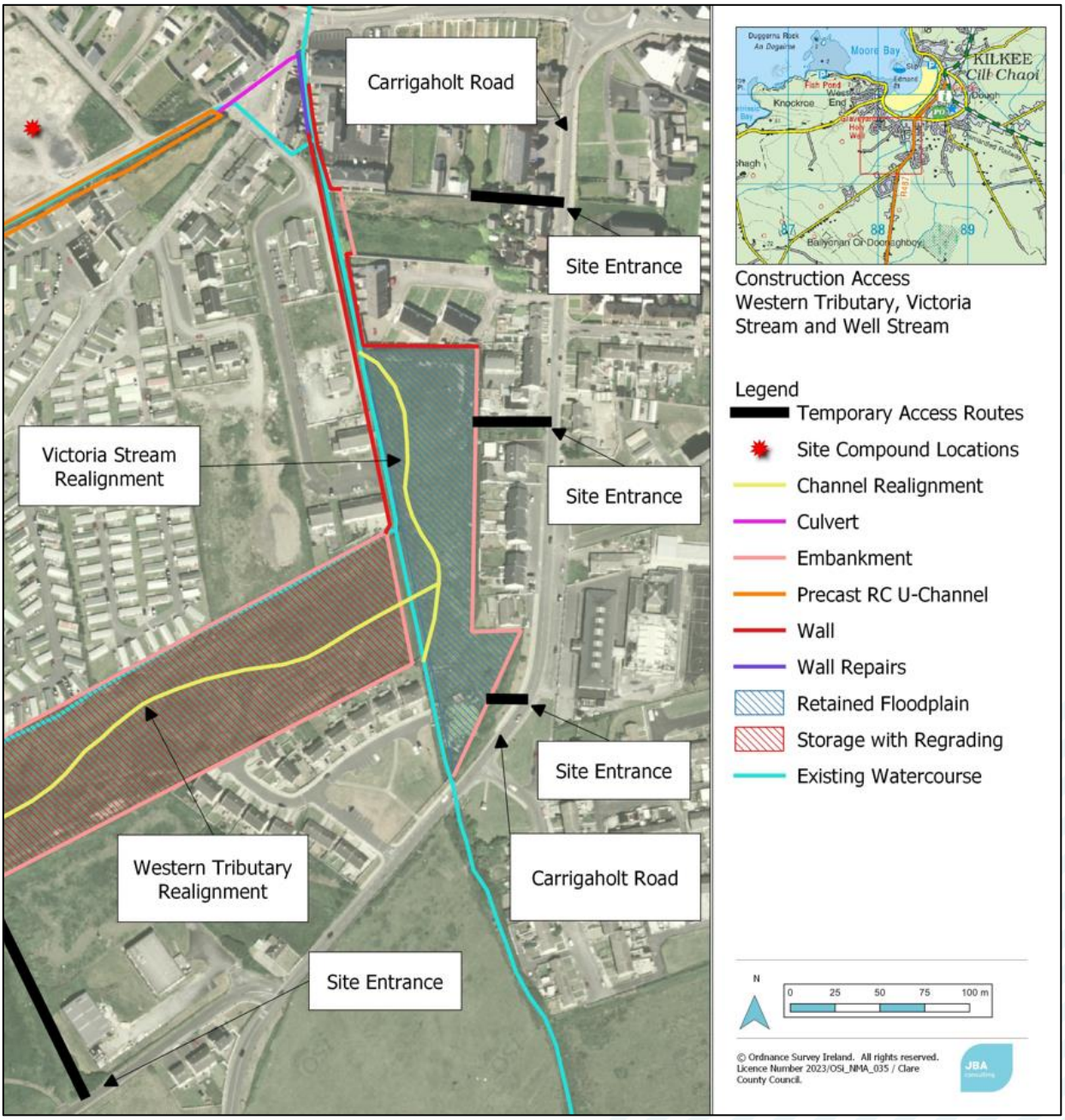

Figure 4-19 Carrigaholt Road Field Access

4.7.2 Construction Methodology

The sequence of construction is important in this location, as it is environmentally sensitive and involves a number of access points via private land.

The overall sequence is suggested to be:

1. Victoria Crescent boundary walls
2. Victoria Stream diversion
3. Temporary crossing installation

4. Infill of existing Victoria Stream
5. Construction of Victoria Court wall
6. Construction of perimeter embankment

Access to the works area will be from an access route on the Carrigaholt Road, located across from St. Josephs College. A temporary access haul road will need to be constructed from this point, and then be installed around the eastern perimeter of the site. This haul road should follow the footprint of the proposed perimeter embankment, with the foundation excavated to depth during the construction of the haul road. It should also be constructed wide enough so that it can be repurposed as the maintenance footpath when the embankment has been completed.

4.7.3 Victoria Crescent boundary walls

The following is a suggested sequence for the Victoria Crescent boundary walls. This sequence assumes the haul road has been installed and that vegetation clearance has been undertaken. The construction of the tie-in of the embankment into the flood walls proposed at Victoria Crescent will be phased appropriately as required once the flood walls have been constructed.

1. A temporary land take is to be agreed with the landowners of the properties where walls are being upgraded.
2. The existing boundary walls, including their foundations, are then to be carefully demolished.
3. The new foundations are to be excavated to depth.
4. Foundations, with concrete delivery access from the Carrigaholt Road haul road, will be poured in-situ.
5. The lower section of the wall that acts as a flood defence is to be constructed as an RC wall. The remaining height, brought to match the existing boundary heights, are to be constructed in masonry.
6. All garden furniture and structures are then to be reinstated.

4.7.4 Victoria Stream Diversion

1. Excavate the proposed diverted two stage channel. The alignment of this diverted stream will run slightly East of the existing stream. The Western Tributary will join up to this diverted stream through the new culvert located under the Western Tributary embankment. The two-stage channel will re-join to the existing stream at the north-west corner of the Carrigaholt Road field.
2. Excavate the proposed scrapes along the two-stage channel.
3. A temporary crossing will need to be installed across this diverted route. This will be for material access for the infill of the existing stream.
4. The existing stream will be infilled using an engineered fill. This is required as the flood defence wall along this route will be founded within this material. This will be imported material, brought to location by the Carrigaholt Road haul road.

4.7.5 Victoria Road wall

1. This wall will be an extension of the wall constructed on the LHB downstream of the UE compound. It will be constructed on the bank and will not require any in-stream diversion.
2. The foundation is to be excavated within the previously placed engineered fill on the existing stream's footprint.
3. The wall is an RC structure, up to flood defence height. This will be constructed in-situ, with concrete deliveries via the Carrigaholt Road haul road. It is not anticipated that the Victoria Road estate roads will be used for site access.

4. A handrail is then to be installed on top of this wall up to guarding height.
5. Once this wall is complete, the temporary crossing previously installed over the Victoria Stream can be removed.

4.7.6 Perimeter embankment

1. The embankment core is to be constructed with imported impermeable clay material. The remaining body of the embankment is to be completed using general fill.
2. Tie the embankment in with the Victoria Crescent wall and boundary at Cluain na Mara.
3. Construct the 1m maintenance footpath around western side of the embankment.
4. A permanent access ramp to the Carrigaholt Road field will be placed over the embankment beside Garvey's Fuels on the Carrigaholt Road.
5. Place topsoil and grass seedling on the embankment.

4.7.7 Temporary Works Requirements

The main temporary works requirements identified are:

- Welfare facilities where required.
- Warning signage around site compound.
- Barricades/hoarding at the entrance and all-around site to ensure site segregation is maintained.
- Warning goal posts for all overhead cables in proximity to site.
- Access roads
- Barricades/hoarding around deep excavations.
- Temporary bridge over existing Victoria Stream
- Protection of existing surface water outfall from Carrigaholt Road drainage.
- Shuttering as required for RC structures.

A review of available utility records information has identified the following services:

- A medium-voltage ESB overhead cable to the western side of the field.
- A medium-voltage ESB overhead cable to the southern side of the field
- A low/medium-voltage ESB underground cable south of field.
- A foul sewer pipe across north of field.
- An Eir cable near southern part of the embankment.

4.7.8 Traffic Management Requirements

The proposed works will not directly impact on public road networks. The proposed road access from Carrigaholt Road will require regular cleaning.

4.7.9 Site Compound and Access Routes for Construction

Road access is proposed on Carrigaholt Road at the southern end of the field. This is located just across from St Joseph's College and will be located just off the road.

4.7.10 Impact on existing properties

Pre-condition surveys of the properties nearby the works will be undertaken as required.

There is an existing property ruins on the southern end of the storage field where ownership is uncertain. A temporary site entrance will be required on the Carrigaholt Road during the works across from St. Joseph's College. Regular road sweeping/maintenance will be required due to the importing/exporting of material during the construction.

A temporary land take will be required for the boundary wall construction to the Victoria Crescent walls. These will become flood defence assets once constructed.

The Victoria Road wall will result in a small laneway between the properties and the flood defence wall. This will be required for maintenance, and access will be via the Victoria Road estate.

Protection of utilities during construction is essential. Adequate cover and protection of underground cables and underground sewage pipes is critical. Protection of overhead cables and posts is also critical during the construction.

4.7.11 Material to be excavated

For the construction of the perimeter embankment a depth of 0.5m and width of 8m will be required. This will stretch the whole length of the embankment measuring approx. 274m. Therefore, the total volume of material to be removed for the embankment is 1096m³.

4.8 Tributary Field Storage

4.8.1 Works Description

The flood relief works at the Tributary Field storage consists of:

- Construction of embankment c. 980m long and c. 1.3-1.8m high around Western Tributary floodplain.
- Diversion of c.400m of open channel to centre of floodplain and filling in of existing channel.
- Regrading of floodplain in field north of Cluain na Mara estate by c. 700mm max.
- Regrading of floodplain in field west of Cunningham's Holiday Park (north of existing alignment of in-filledWestern Tributary) by raising to 6.70mOD for the northern two-thirds section and lowering to 6.40mOD for the southern third section.
- Installation of 900mmØ culvert under Western Tributary embankment to link to diverted Victoria Stream alignment. Inclusion of headwalls on inlet and outlet of culvert.
- Headwalls to be constructed on either end. This will link up to diverted Victoria Stream in the Carrigaholt Road field.

The works in this area is shown in Figure 4-20.

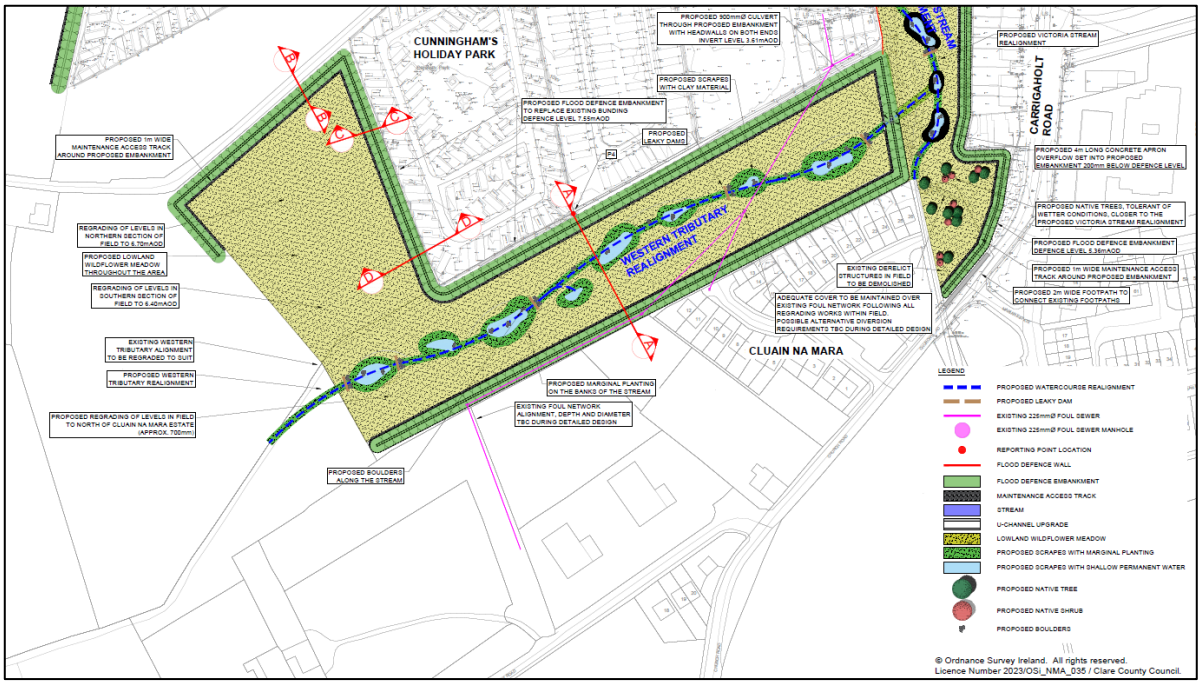

Figure 4-20 Tributary Field Works

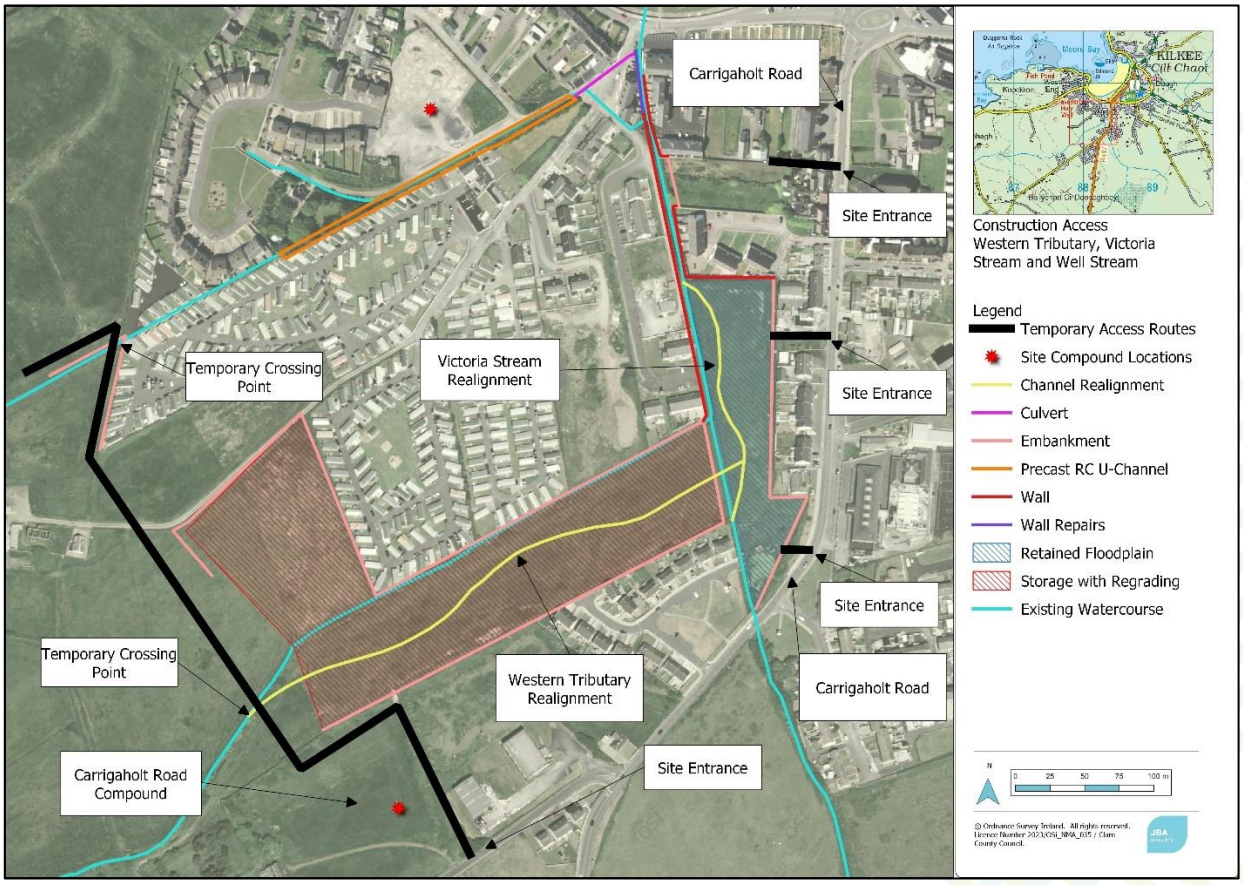

Figure 4-21 Tributary Field Temporary Access

4.8.2 Construction Methodology

The final construction methodology will be subject to the completion of detailed design and the contractor's desired approach. A possible construction sequence is proposed as follows:

1. Construct temporary access roads to the field from the old Carrigaholt Road beside the Brooks estate.
2. Liaise with ESB and erect warning goal posts beneath all overhead cables in proximity to site.
3. A welfare compound will be established adjacent to the road at the point of entry into the works area.
4. Construct temporary crossing over Western Tributary and another over the Well Stream located adjacent to the proposed embankment.
5. Ensure position of foul main is known and adequate cover is maintained throughout works.
6. Construct access roads from temporary crossing to the culvert construction point parallel to the proposed embankments.
7. Excavate for new culvert and headwalls.
8. Construct new culvert and headwalls.
9. Excavate Western Tributary two stage diversion channel.
10. Import and place boulders along diversion channel at required positions.
11. Construct leaky dams and scrapes.
12. Divert Western Tributary.
13. Excavate redundant Western Tributary open channel to a suitable depth.
14. Excavate existing bunding around caravan parks. Material to be retained on site if suitable for re-use.
15. Excavate ground beneath proposed embankments to a suitable depth.
16. Replace excavated material with imported impermeable engineered material.
17. Fill in Western Tributary open channel with imported impermeable engineered material.
18. Construct proposed defence embankment with imported impermeable engineered material as per design.
19. Place retained topsoil on the embankment and plant grass.
20. Construct 1m maintenance path around interior of the embankment.
21. Regrade storage area to design levels and contours.
22. Remove access roads and temporary bridge over Western Tributary and Well Stream.
23. Plant proposed wildflower meadow throughout the area and marginal planting on the banks of the newly formed diversion channel.
24. Remove site compound and reinstate area used for site compound and site access to a condition similar to that prior to the commencement of construction works.
25. Reinstate fences to a condition similar to that prior to commencement of construction works.
26. Remove all warning signage from the Old Carrigaholt Road.
27. Remove warning goal posts from beneath all overhead cables in proximity to site.

4.8.3 Temporary Works Requirements

The main temporary works requirements identified are:

- Warning signage on the Old Carrigaholt Road.
- Warning goal posts beneath overhead cables including 3 no. MV ESB lines crossing proposed storage field.
- Welfare facilities
- Access / haul roads
- Temporary crossing over Western Tributary and Well Stream.
- Barricades / hoarding around excavation for culverts.
- Maintenance of adequate cover over 2 no. existing foul sewers crossing the proposed storage field.

4.8.4 Traffic Management Requirements

The proposed works will not directly impact on public road networks, with no diversions or closures required. Proposed access road from the Old Carrigaholt Road entrance to the proposed site compound location is an unpaved narrow private lane which is single vehicle width.

4.8.5 Site Compound and Access Routes for Construction

Site access will be via the Old Carrigaholt Road, to the proposed compound location at the north-western end of the proposed embankment. The final circa. 250 metres of Well Road is unpaved and private and landowner permission to use this road as an access route will be required prior to commencement of the proposed works.

4.8.6 Impact on existing properties and infrastructure

There is an existing property at the end of Well Road. Land ownership with respect to the last section of Well Road is uncertain. A temporary way leave will be required on this road during the works.

The existing carriageways from the Old Carrigaholt Road to the site will require increased maintenance during the works due to the volume of large axle loads. Regular road sweeping during large scale export / import of material to / from site will be required.

No impacts are anticipated on any existing utilities, but maintenance of adequate cover over 2 no. existing foul sewers crossing the proposed storage field is critical. Details of the depth of the foul sewer will be sought prior to construction.

4.8.7 Material to be excavated

The Western Tributary will require a 940m embankment around the whole field. This will require a total of 4446m³ of material to be excavated.

5 Atlantic Stream Measures

The following section describes in detail the methodologies required for each of the Atlantic Stream measures.

a. Kilkee Bay Hotel Embankment
b. Dún an Óir Walls
c. Atlantic Stream embankment
d. Atlantic Stream Screen
e. Atlantic Stream Outfall
f. Meadow View Court

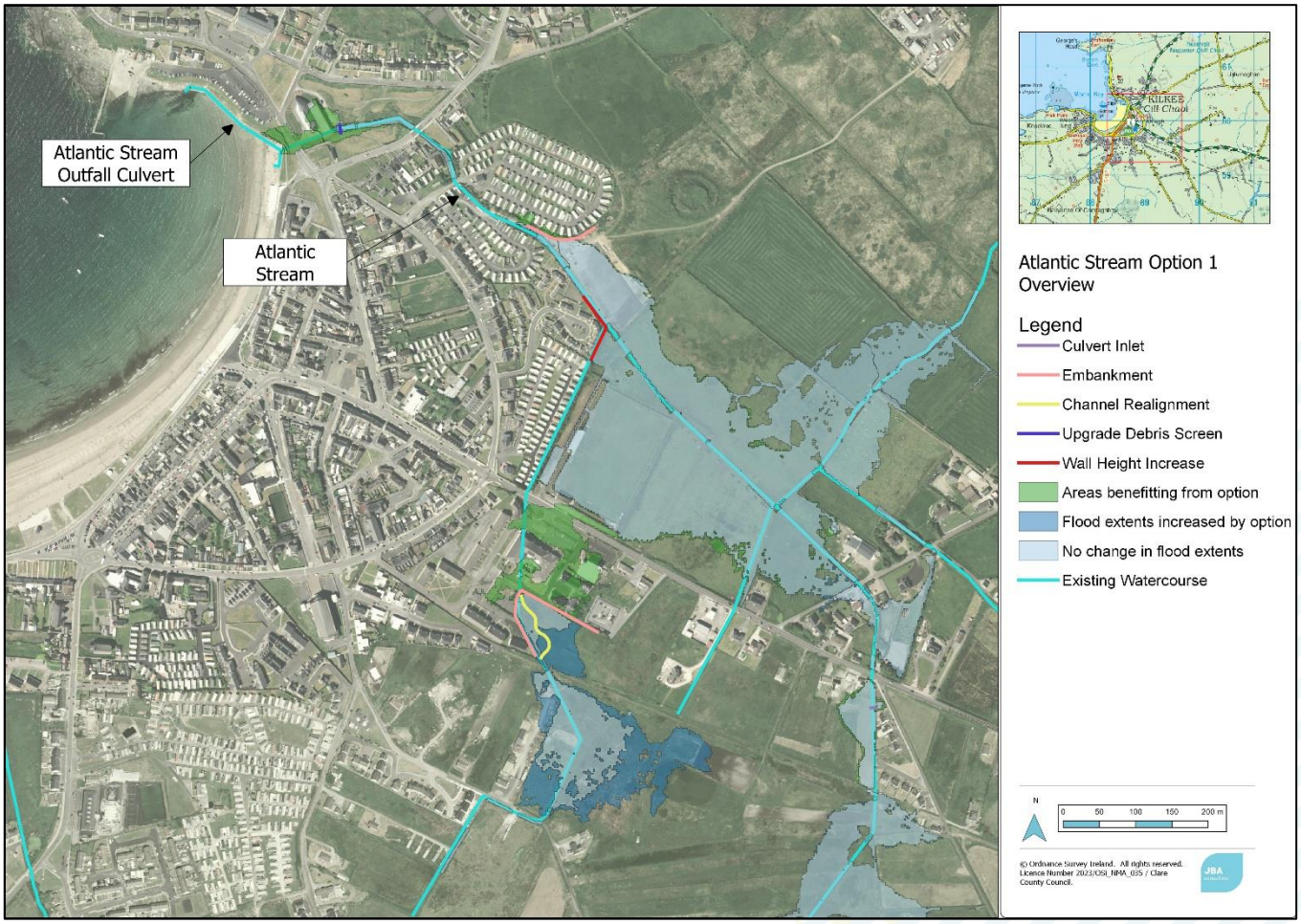

Figure 5-1 Atlantic Stream Measures

5.1 Kilkee Bay Hotel Embankment

5.1.1 Works Description

The flood relief works at the Kilkee Bay Hotel consists of:

- Construction of c. 200m long embankment c. 1.3-1.6m high.
    - This will include filling in the existing stream and constructing a maintenance footpath along the inside of the embankment.
- Realignment of c. 110m of open channel into centre of floodplain.
    - Installation of new headwall and 600mmØ inlet culvert under embankment to link with existing culvert.

The realigned stream will join into the existing 750Ø culvert under old west Clare railway route and continue onto the existing Atlantic Stream.

The works in this area are shown in Figure 5-2.

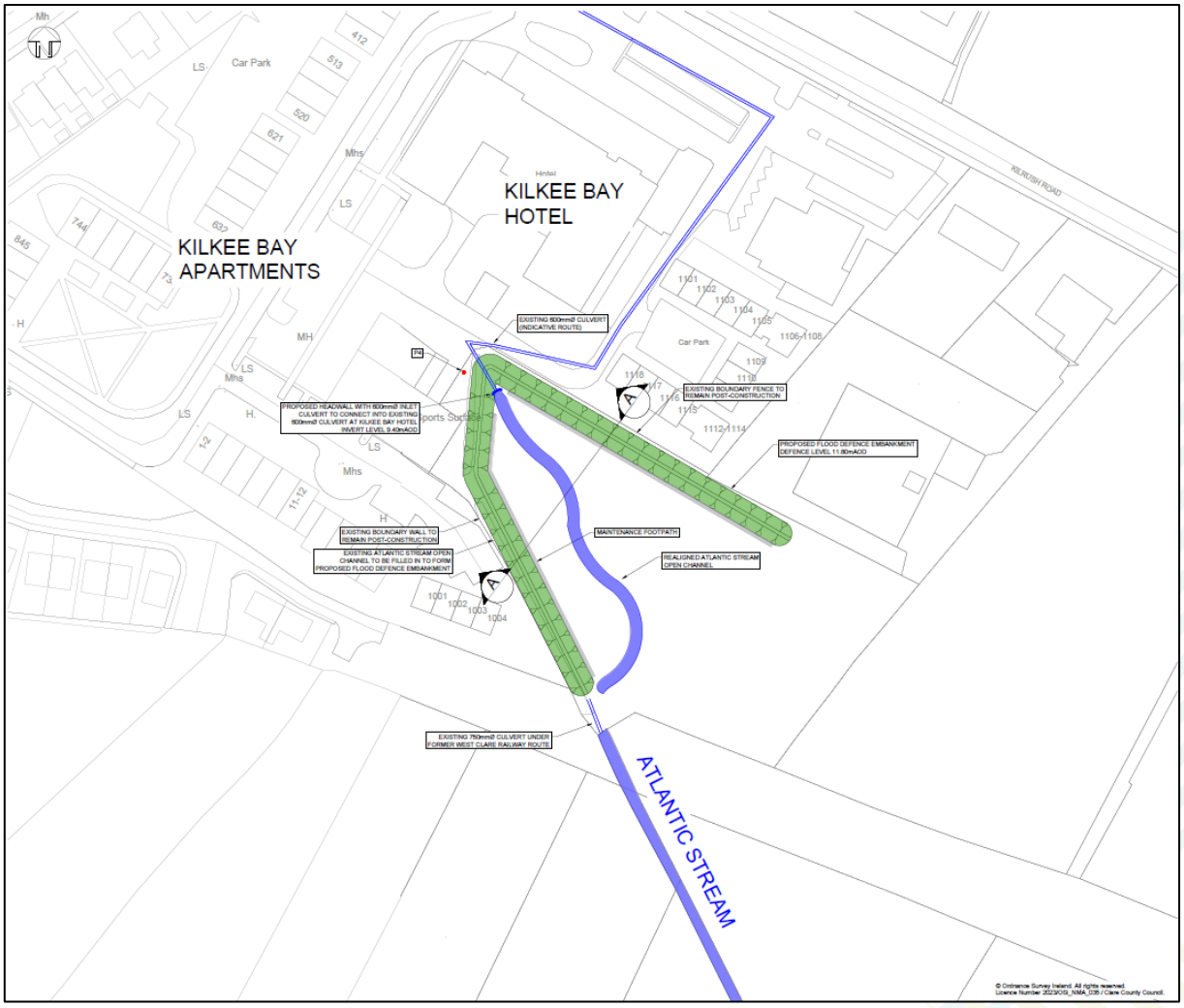

Figure 5-2 Kilkee Bay Hotel Storage Location

5.1.2 Construction Methodology

The final construction methodology will be subject to the completion of detailed design and the contractor's desired approach. A possible construction sequence is proposed as follows:

1. Erect required warning signage on the N67 Kilrush Road.
2. Erect warning goal posts beneath all overhead cables in proximity to site.
3. The works will be accessed from the N67 adjacent to the existing ESB substation.
4. Upgrade ESB substation access road including widening of entrance from the N67.
5. Construct access road from site compound to point downstream of Atlantic Stream diversion point.
6. Construct access road from site compound to headwall construction point.
7. Excavate new realigned Atlantic Stream route, retaining flow within existing Atlantic Stream. Substrate from existing channel is to be translocated into new realigned stream if possible.
8. Banks to be vegetated within existing turves or biodegradable matting for the prevention of soil erosion.
9. Excavate for new headwall and culvert.
10. Construct new headwall, culvert and connect into existing culvert.
11. Construct temporary crossing over newly excavated stream realignment.
12. Existing Atlantic Stream is to be gradually diverted into new alignment. Silt fencing/coir logs to be put in place to avoid any siltation due to excavation of embankment foundations.
13. Fill in Atlantic Stream open channel with imported impermeable engineered material.
14. Excavate ground beneath proposed embankments to required foundation depth.
15. Export excavated material to a licensed facility.
16. Replace excavated material with imported engineered foundation material.
17. Construct proposed defence embankment with imported impermeable engineered material as per design.
18. Place topsoil on the embankment and seed as required.
19. Construct the 1m maintenance footpath around interior of embankment.
20. Remove temporary bridge over diversion channel.
21. Remove access road east of temporary crossing over diversion channel to site compound.
22. Reinstate area used for site compound and site access to a condition similar to that prior to commencement of construction works.
23. Reinstate fences to a condition similar to that prior to commencement of construction works.
24. Remove all warning signage from the N67 Kilrush Road.
25. Remove warning goal posts from beneath all overhead cables in proximity to site.

5.1.3 Temporary Works Requirements

The main temporary works requirements identified are:

- Warning signage on N67 Kilrush Road
- Warning goal posts beneath 2 no. MV ESB overhead cables crossing proposed storage field.
- Site Compound with required warning signage
- Welfare facilities
- Access / haul roads
- Temporary bridge over Atlantic Stream diversion channel

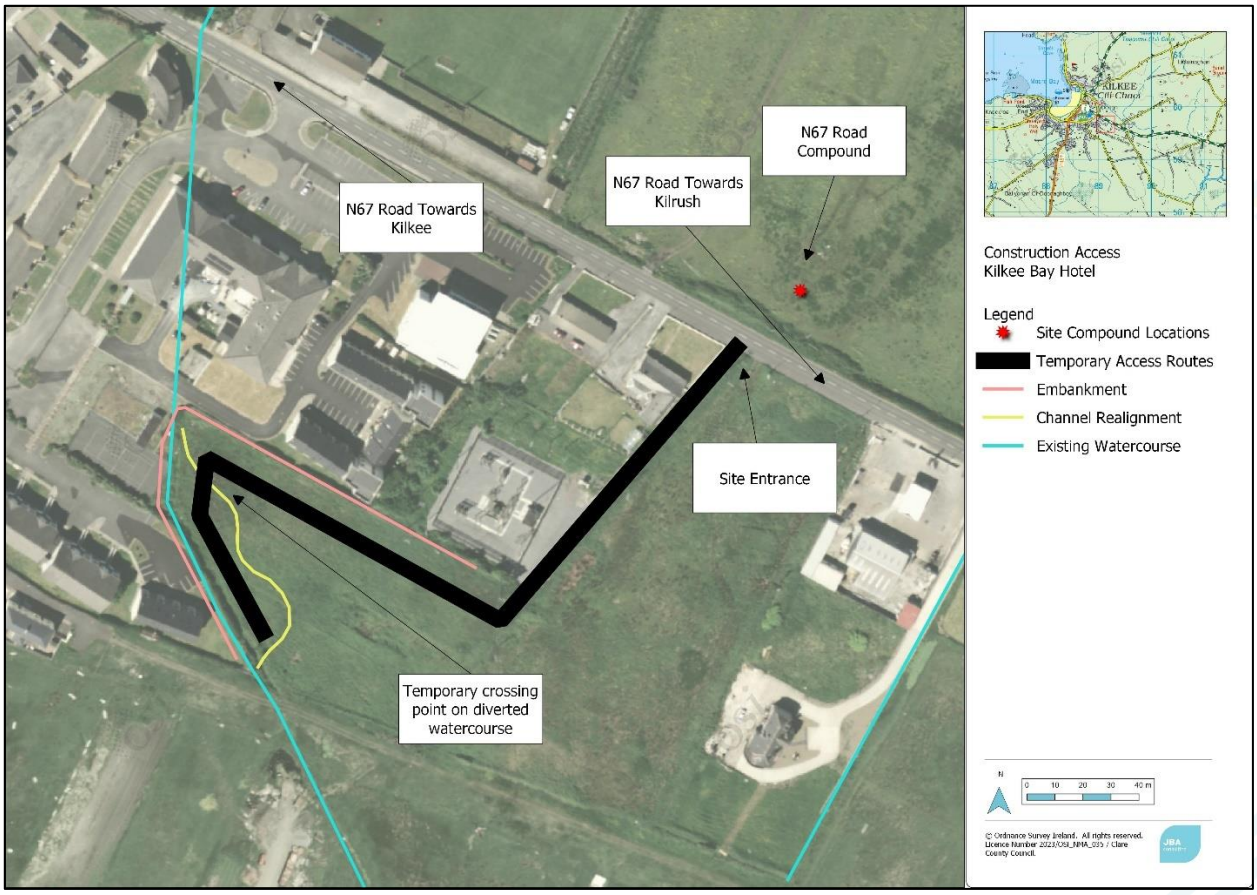

Figure 5-3 Kilkee Bay Hotel Access

5.1.4 Traffic Management Requirements

The proposed works will not directly impact on public road networks.

5.1.5 Site Compound and Access Routes for Construction

Site access will be via the ESB substation access road directly off the N67 Kilrush Road, to the proposed compound location at the north-eastern end of the proposed embankment. The c. 125 metre substation access road is in private ownership and landowner permission to use this road as an access route will be required prior to commencement of the proposed works. Widening of the access road entrance off the N67 will be required to facilitate HGV access.

5.1.6 Impact on existing properties and infrastructure

There is an ESB substation at the end of the proposed access road. Land ownership with respect to this access road is uncertain. A temporary way leave will be required on this road during the works.

The N67 will require increased maintenance during the works due to the volume of large axle loads. Regular road sweeping during large scale export / import of material to / from site will be required. No impacts are anticipated on any existing utilities.

5.1.7 Impact on existing flood risk

The watercourse will be maintained throughout the construction phase, and as such not increase the flood risk up or downstream.

5.1.8 Sequencing consideration

These works are at the upstream extent of the catchment and as no flow increase is anticipated, consideration of other downstream measures do not need to be considered in terms of construction sequencing. The works can be constructed in isolation.

5.1.9 Volume of material to be excavated

The embankment at the rear of the Kilkee Bay hotel spans a total length of 200m. It will require an excavation to a depth of 0.5m and width of 8m under the proposed alignment. Therefore, the total volume of material to be excavated is 800m³.

5.2 Dún an Óir Walls

5.2.1 Works Description

The flood relief works at Dún an Óir estate consist of:

- Raising of a boundary wall.
- Increase the height of the existing boundary wall by c. 300mm over c. 103m length.

The works in this area are shown in Figure 5-4.

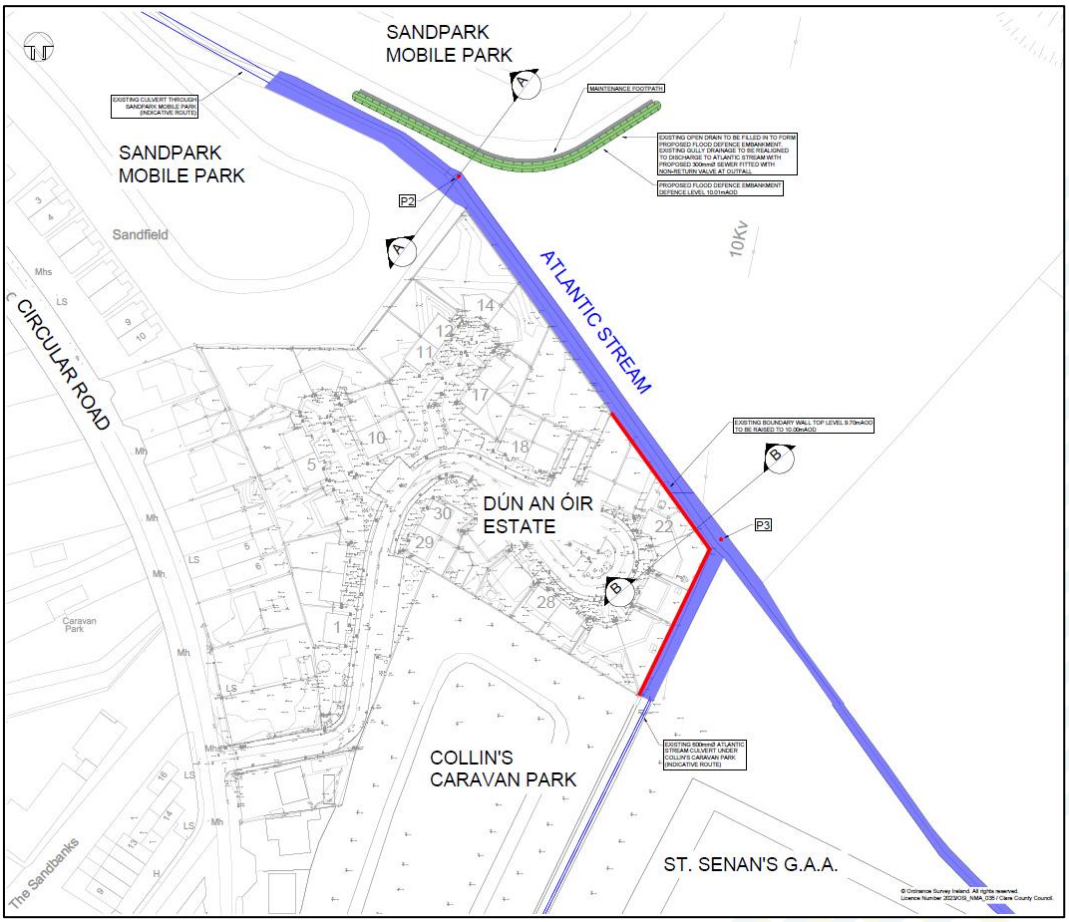

Figure 5-4 Dún an Óir Walls

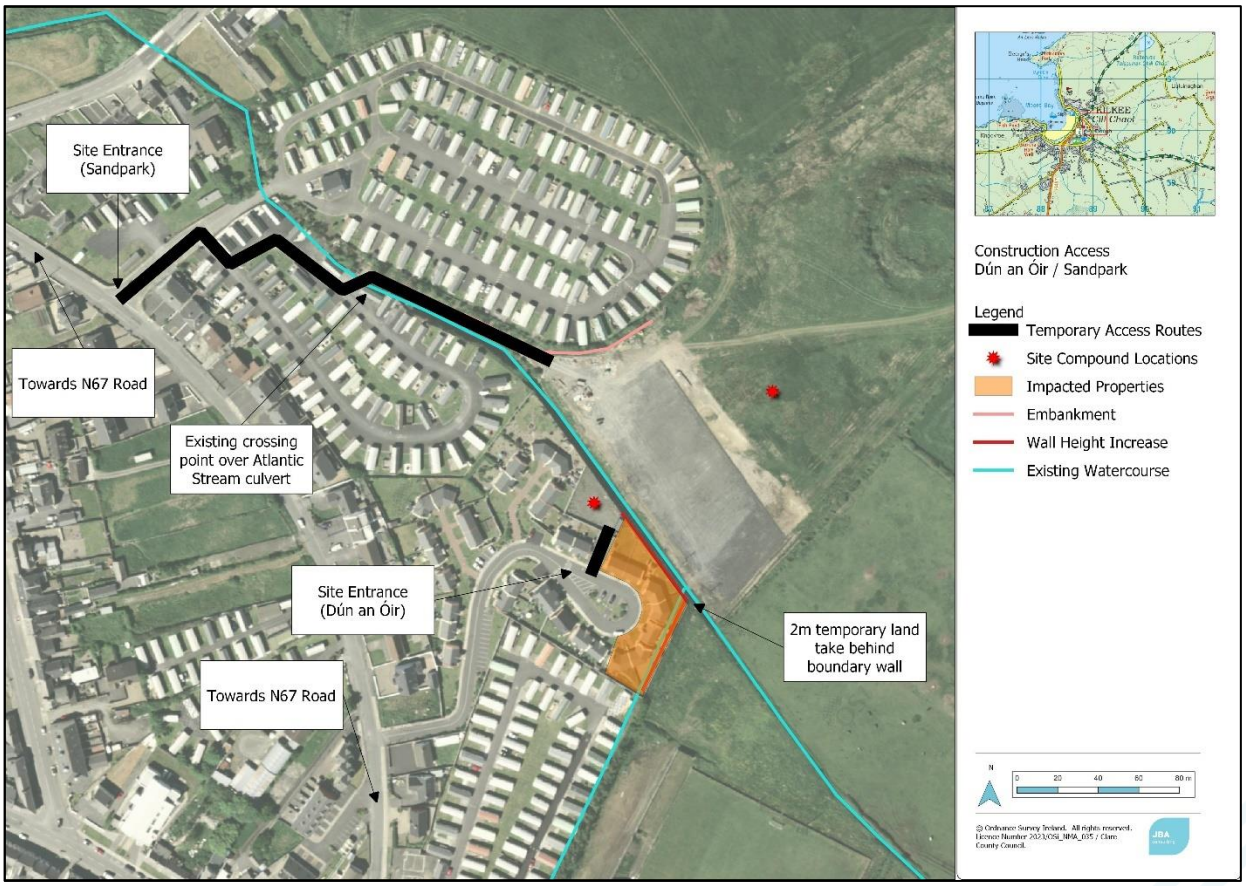

Figure 5-5 Dun an Oir Walls - Temporary Works Requirements

5.2.2 Construction Methodology

The final construction methodology will be subject to the completion of detailed design and the contractor's desired approach. A possible construction sequence is proposed as follows:

1. Liaise with the owners of properties No. 20-25 regarding access to rear gardens.
2. Erect required signage on approach road in the Dún an Óir estate.
3. Form site compound in the public area in front of property No. 20 with temporary fencing/hoarding.
4. Ensure protection to lawns and in situ trees in private and public spaces.
5. Access rear garden of property No. 20 by removing required number of timber fence panels on northwest boundary.
6. Relocate home heating oil tank adjacent to northwest boundary fence if necessary.
7. Remove required number of boundary timber fence panels between subsequent properties to gain access to properties No. 21-25.
8. Remove garden furniture and other obstacles from works area.
9. Install temporary fencing with signage to enclose works area, minimum 2 metres from rear boundary.
10. Remove existing timber fence panels from the boundary wall, for reuse if suitable. If unsuitable remove offsite to an approved location.

11. Import required building material through the rear garden of property No. 20 and construct 300 mm wall extension on top of the existing boundary wall. All deliveries to be brought via the estate entrance and Circular Road.
12. Reinstate 1.8 metre high timber fence panels on top of raised boundary wall.
13. Remove any construction waste to an approved location.
14. Reinstate all removed boundary timber fence panels to a condition similar to that prior to construction works commencement.
15. Remove temporary fencing from works area.
16. Remove site compound and all signage from public area.
17. Reinstate private and public areas to a condition similar to that prior to commencement of construction works.

5.2.3 Temporary Works Requirements

The main temporary works requirements identified are:

- Warning signage on approach roads in Dún an Óir estate
- Barricades / hoarding within properties No. 20-25 to ensure adequate site segregation is maintained.
- Site Compound with required warning signage
- Welfare facilities
- Scaffolding
- Formwork/falsework

5.2.4 Traffic Management Requirements

- Public parking area may be reduced during implementation of the works.
- Loop road width may be reduced during implementation of the works.

5.2.5 Site Compound and Access Routes for Construction

Site access will be via Circular Road and the Dún an Óir estate road, to the proposed compound location in the public area of the Dún an Óir estate.

5.2.6 Impact on existing properties and infrastructure

Dún an Óir estate road will require regular road sweeping during the duration of the works.

No impacts are anticipated on any existing utilities. Rear gardens of properties No. 20-25 will be reduced with temporary fencing / hoarding for the duration of works but will be reinstated prior to completion of works.

5.2.7 Impact on existing flood risk

The increase in wall height will have no impact on existing flood risk during construction.

5.2.8 Sequencing consideration

No sequencing considerations are required in the context of flood relief mechanisms. In order to manage siltation within the stream, these works should be undertaken in parallel with the Sandpark embankment so as to have access to both banks of the stream during the works.

5.2.9 Material to be excavated

The wall is to span 103m. The foundation is estimated to reach a depth of approx. 2.38m below the ground level and will be 1.2m wide. This will require a total volume of 275m³ to be excavated.

5.3 Atlantic Stream embankment

5.3.1 Works Description

The flood relief works at the Atlantic Stream embankment consists of:

- Construction of c. 110m long embankment c. 700mm high.
- Installation of non-return valve onto existing drainage exiting from the eastern boundary of Sandpark Mobile Park

The works in this area are shown in Figure 5-6.

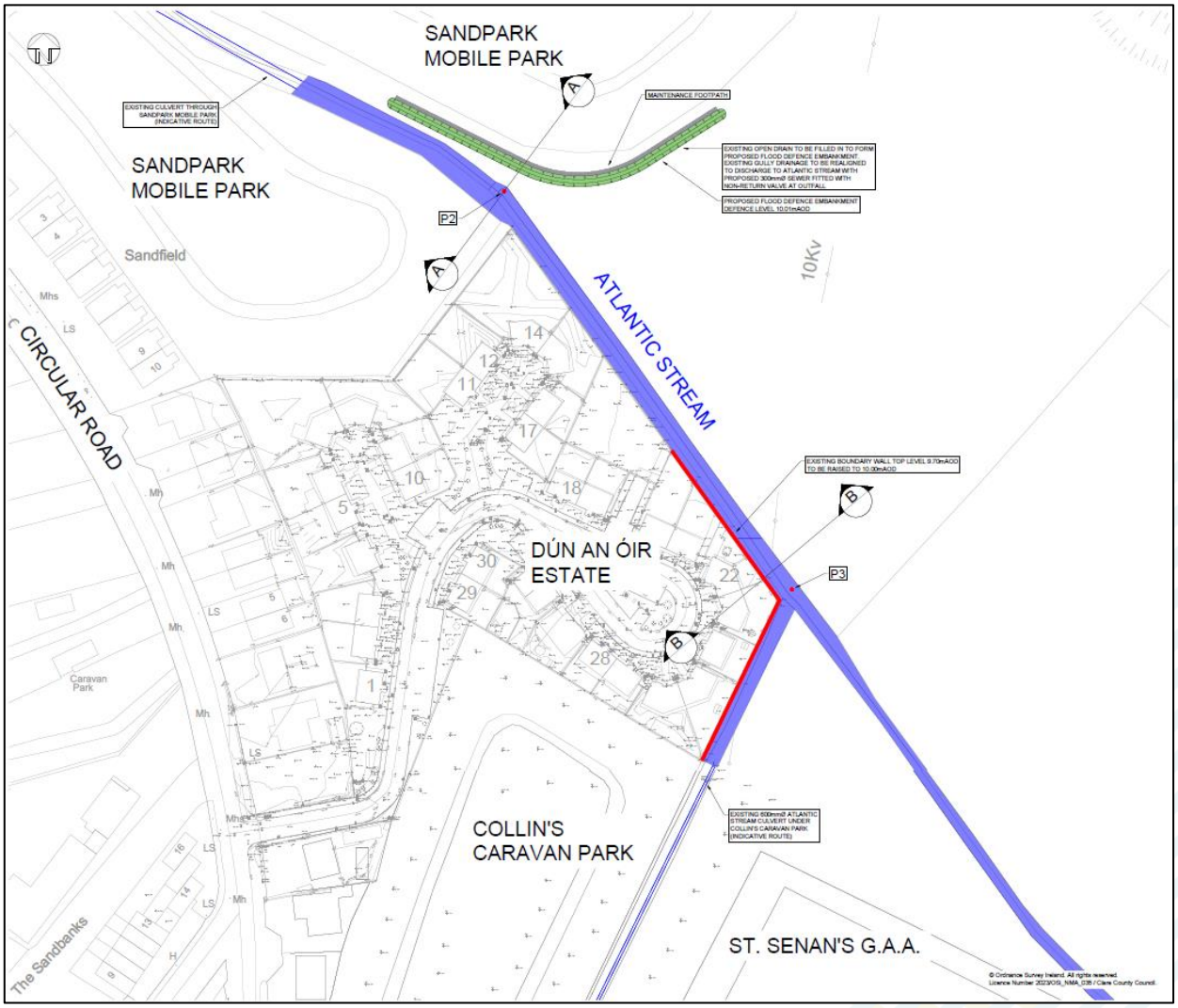

Figure 5-6 Sandpark embankment location

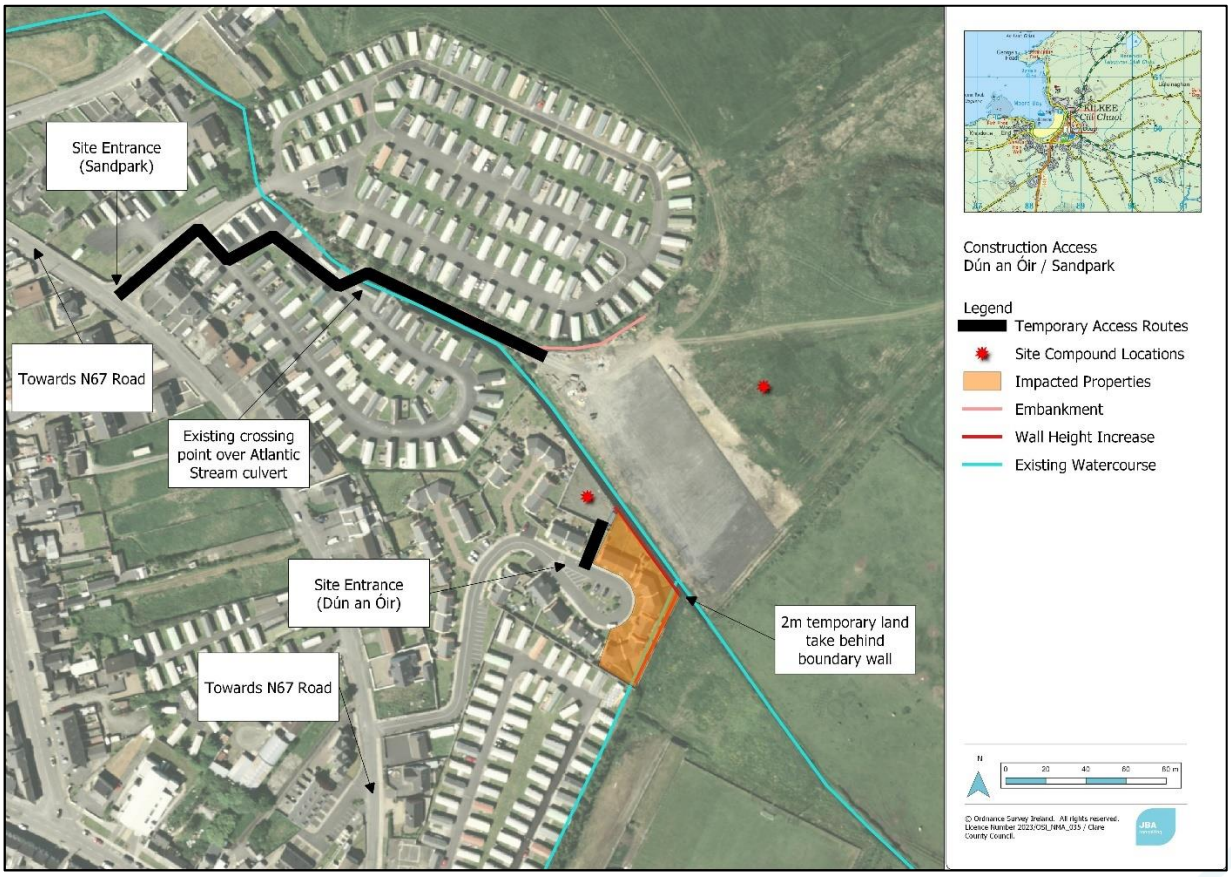

Figure 5-7 Sandpark access route

5.3.2 Construction Methodology

It is noted the final design and proposed construction methodology of the proposed flood wall and embankment is subject to the completion of the additional Site Investigation and the detailed design.

Ensure that permission is received from Sandpark mobile home park for access routes prior to commencement.

The proposed construction sequence is as follows:

1. Install localised signage, advanced advertisement and site accommodation works (i.e. hoarding around the construction area).
2. Ensure protection to mobile homes and lawns during construction.
3. Undertake ground preparation works to accommodate the new embankment.
4. Excavate topsoil beneath the footprint of the proposed embankment. The final excavation depth will be dependent on the ground conditions. The alignment of the embankment will be along part of the boundary of the Sandpark mobile home site.
5. Remove any construction waste to an approved location.
6. Construct the embankment by importing and placing impermeable clay.
7. Construct the 1m maintenance footpath around the north side of the embankment.
8. Place topsoil on the embankment and grass seeding.
9. Install non-return valve on existing drainage outlet.
10. Reinstate anything disrupted by the construction stage.

5.3.3 Temporary Works Requirements

The main temporary works requirements are:

- Installation of warning signage surrounding site.
- Installation of barricades/ hording around mobile home area.
- Welfare facilities
- Support of existing internal services: Temporary support of any internal services identified within the construction as required.

A review of available utility records information has identified the following services:

- A low/medium-voltage underground cable
    - A medium-voltage overground cable located in vicinity of site.

5.3.4 Traffic Management Requirements

- The proposed works will not directly impact on public road networks.

5.3.5 Site Compound and Access Routes for Construction

- A private road will need to be used for access during the construction of the embankment. This is located at the rear of the lower section of the Sandpark mobile home park. Suitable permission will therefore have to be sought from the road owner. Maintenance for the mobile home park is essential during the development especially during the haulage of material to and from the site.

5.3.6 Impact on existing properties

Pre-condition surveys of the access road serving the works will be undertaken prior to commencement. Access may be disrupted during the works, and arrangements are to be agreed prior to commencement.

5.3.7 Impact on existing flood risk

The construction of the embankment will be on the dry bank, and as such create no increased flood risk for up or downstream receptors.

5.3.8 Sequencing consideration

The embankment can be constructed in isolation and without either up or downstream measures in place.

5.3.9 Material to be excavated

This embankment will require a width of 3m along a proposed alignment of 100m. A 0.5m excavation will be required along the embankment. This will mean a total volume of 150m³ of material will have to be removed.

5.4 Atlantic Stream Screen

5.4.1 Works Description

The flood relief works on the Atlantic Stream at Waterworld consists of:

- Installation of new debris screen at upstream culvert headwall.

The works in this area are shown in Figure 5-8.

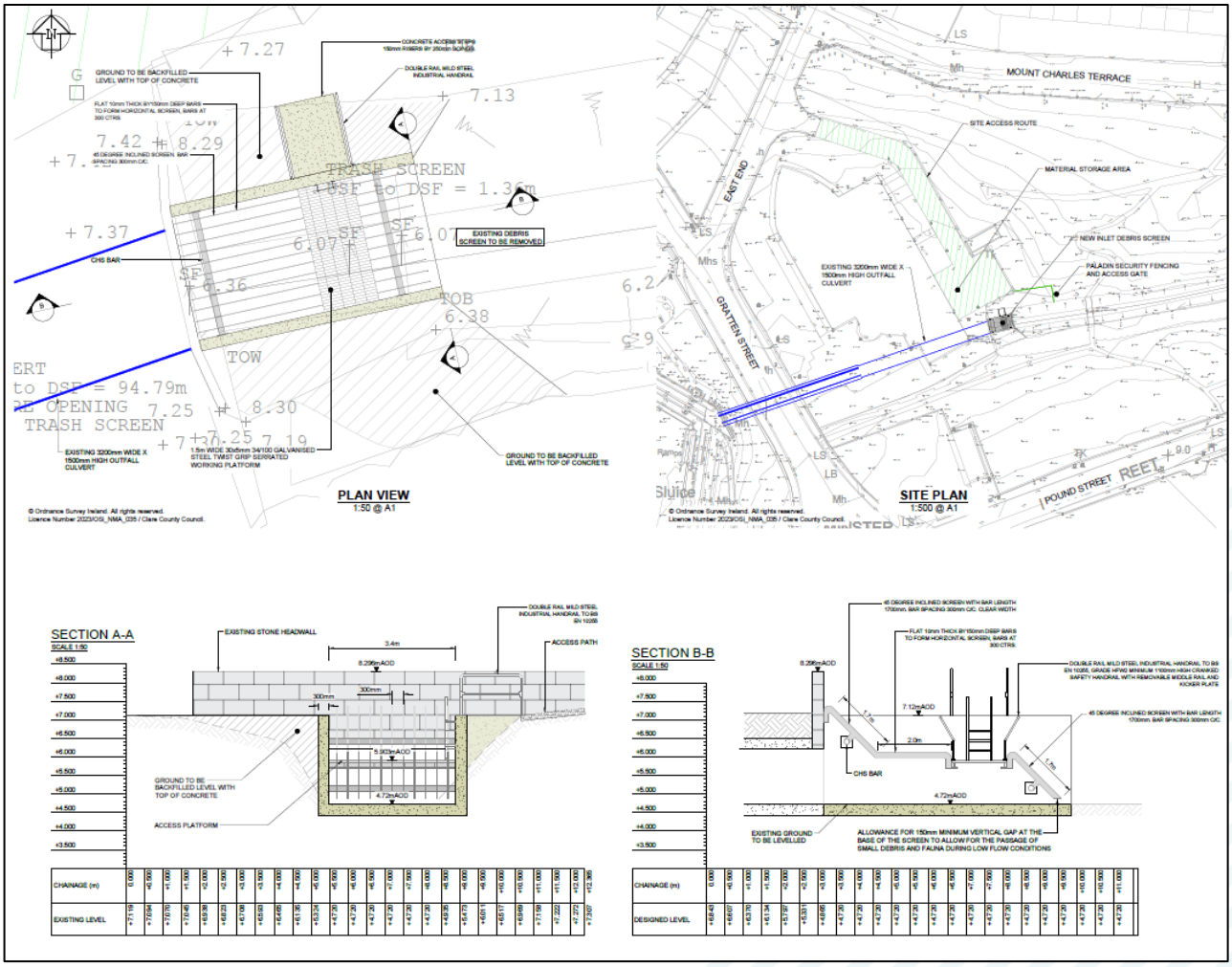

Figure 5-8 Atlantic Stream Screen

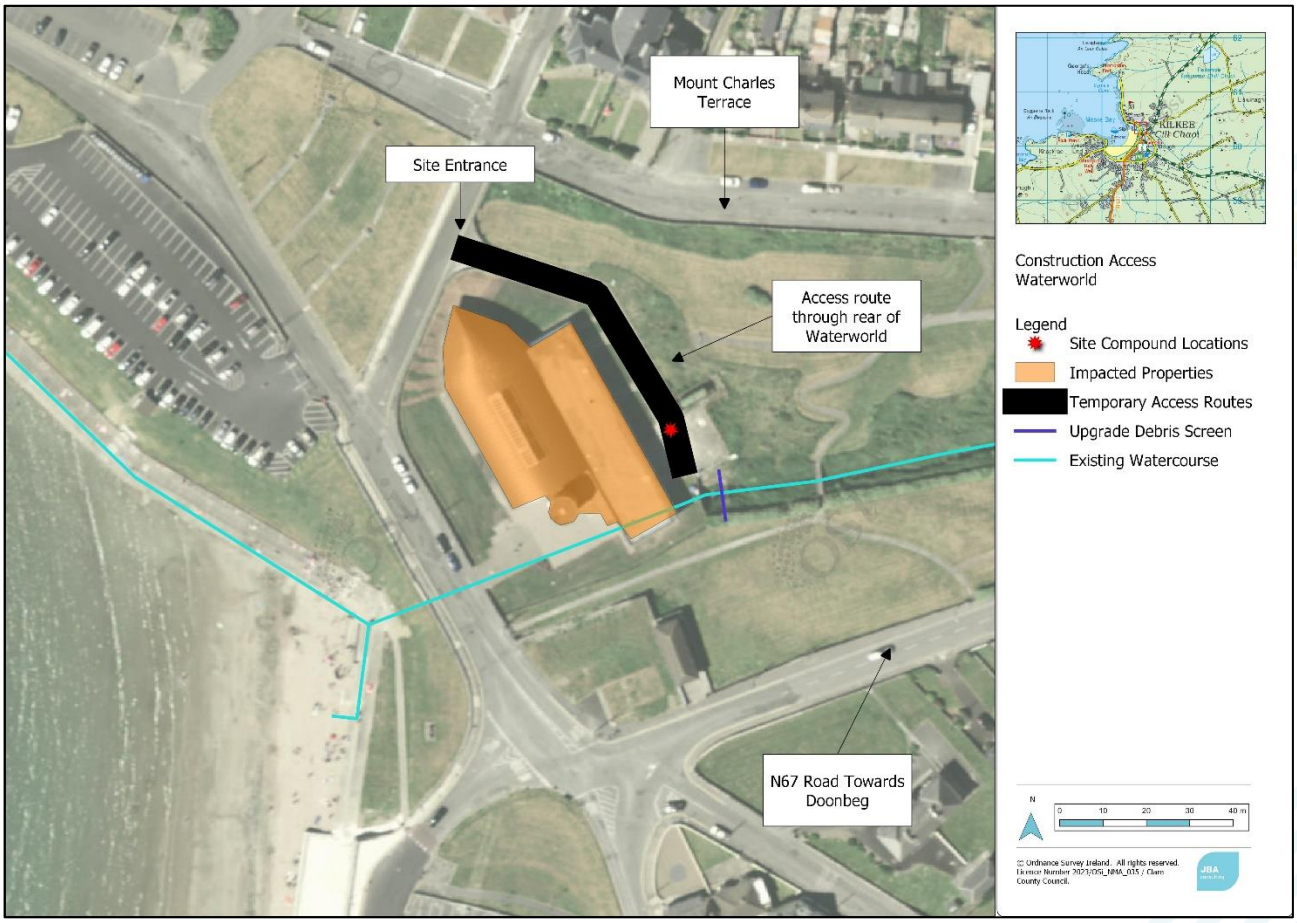

Figure 5-9 Atlantic Stream screen temporary works

5.4.2 Construction Methodology

The following is a suggested methodology for the construction of the Atlantic Stream Screen.

1. Temporary access will be required to be established. The first option is to temporarily locate the site compound to the rear of Waterworld, where an existing area for a site compound is readily available. This would be the preferred option. The entrance to this site would also be through the rear Waterworld entrance. Exit points from the building, through the fire door for example will need to be fully maintained throughout the works. The second option will require a temporary land-take within the adjacent green space, including provision of a temporary access for vehicles. Given the screen elements are of a significant weight, it is likely a 10t excavator will be required to lift them into place. The temporary land take will also need to provide sufficient access for the screen element delivery vehicle. Access to this will be provided through the existing rear Waterworld entrance.
2. A Section 50 will be required for partial damming of watercourse prior to works.
3. The temporary lay down area will require a layer of geogrid to be placed on the existing surface. A stone layer as detailed by the temporary works designer should be placed over this.
4. The works will require extensive in-stream works. Silt mitigation measures need to be established prior to the excavation within the stream. These details will be set out within the EIAR.
5. The existing gabion baskets are to be removed.
6. The banks and foundations are to be excavated to the extent and depth required.

7. The foundations for both wing walls will then be installed. Any in-stream placement of fresh concrete will require mitigation measures, which will be set out in the EIAR and CEMP.
8. The wing walls themselves are proposed to be precast structures. These will be lifted into place using an excavator or crane.
9. The steel elements will be assembled in-situ, due to the nature of the confined site. An element of scaffolding will need to be constructed in-stream to allow access to each wall. This access will be required to install the horizontal support beams for the screen and permanent platforms.
10. Once the horizontal supports are installed, the lower access platform will be installed, and the scaffold removed.
11. The remaining screen elements will be installed from the lower access platform.
12. Once all elements are in place, the screen walls can be backfilled, and the handrails established.
13. Full re-establishment of the site following completion will also be required, including full re-build of the boundary wall.

5.4.3 Temporary Works Requirements

The main temporary works requirements for the screen construction are:

- Scaffold access
- Temporary laydown area
- Crane mat
- Shuttering for any placed concrete
- Sheet piling
- Over-pumping system
- Hoarding and fencing as required to secure the site.

5.4.4 Traffic Management Requirements

No road closures will be required to install the screen. The access to the works area will be from the existing western entrance to the rear of Waterworld.

5.4.5 Site compound and Access Routes for Construction

A temporary welfare compound will be established adjacent to the worksite. All materials will be stored in the main compound. See Chapter 2 for details.

5.4.6 Impact on existing properties

Kilkee Waterworld and the Kilkee SubAqua club are adjacent to the worksite. The rear of Waterworld will be temporarily closed and used as access point and site compound.

5.4.7 Impact on existing flood risk

The construction of the screen requires a temporary damming of the Atlantic Stream, with an over-pumping system in place. This will need to be carefully monitored in the context of upstream flood risk. A stand-by pump should be in place at all times.

5.4.8 Sequencing consideration

The screen works should be considered after the implementation of all works upstream. This allows opportunity to avail of the floodplain upstream in an effort to slow flows if needed at the screen location.

As this installation process will significantly reduce downstream flows, it is recommended that the works to the manhole and non-return valve at the promenade be undertaken when the temporary damming of the Atlantic Stream is in place.

5.5 Atlantic Stream Outfall

5.5.1 Works Description

The flood relief works on the Atlantic Stream Outfall consist of:

- Upgrade existing overflow chamber with raised cover (c. 2.7m long x 2m wide x 400mm high) with flap valves.
- Install non-return valves to existing 750mmØ main outfall and overflow outfall manhole.
- Seal existing cover of manhole downstream of overflow chamber on main outfall culvert at existing ground level.

The works in this area is shown in Figure 5-10 and Figure 5-11.

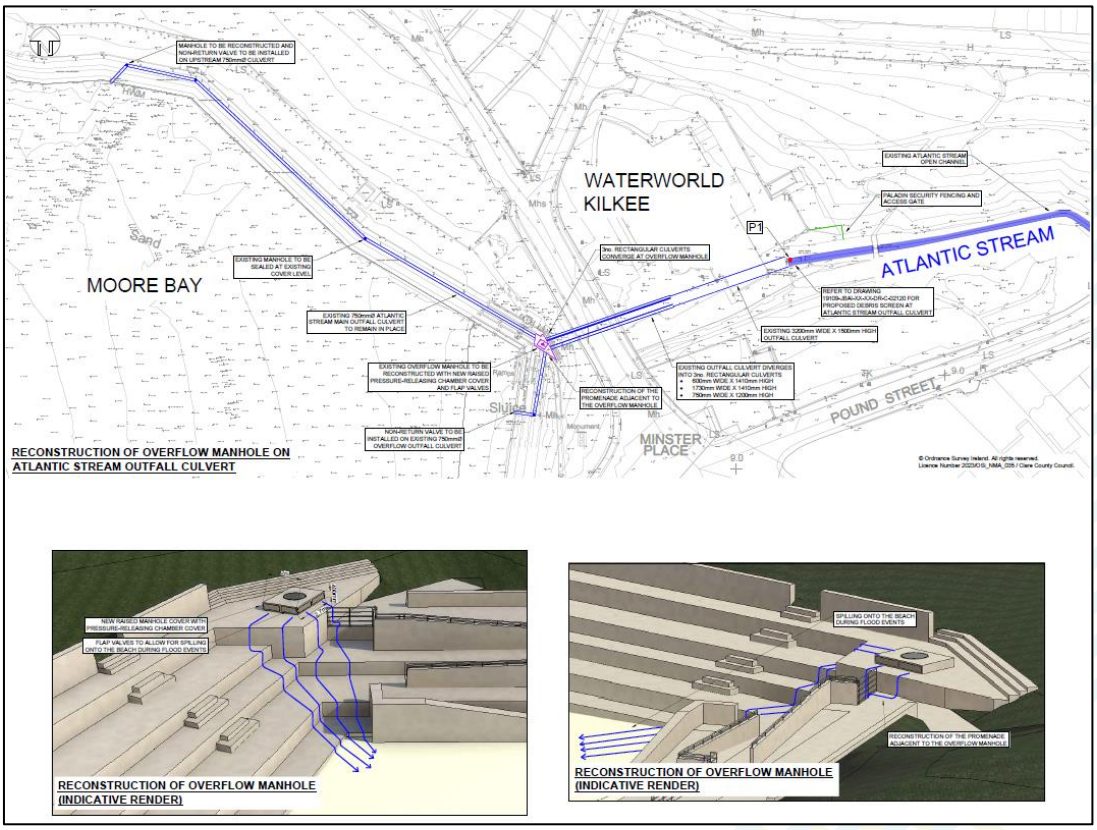

Figure 5-10 Atlantic Stream outfall location

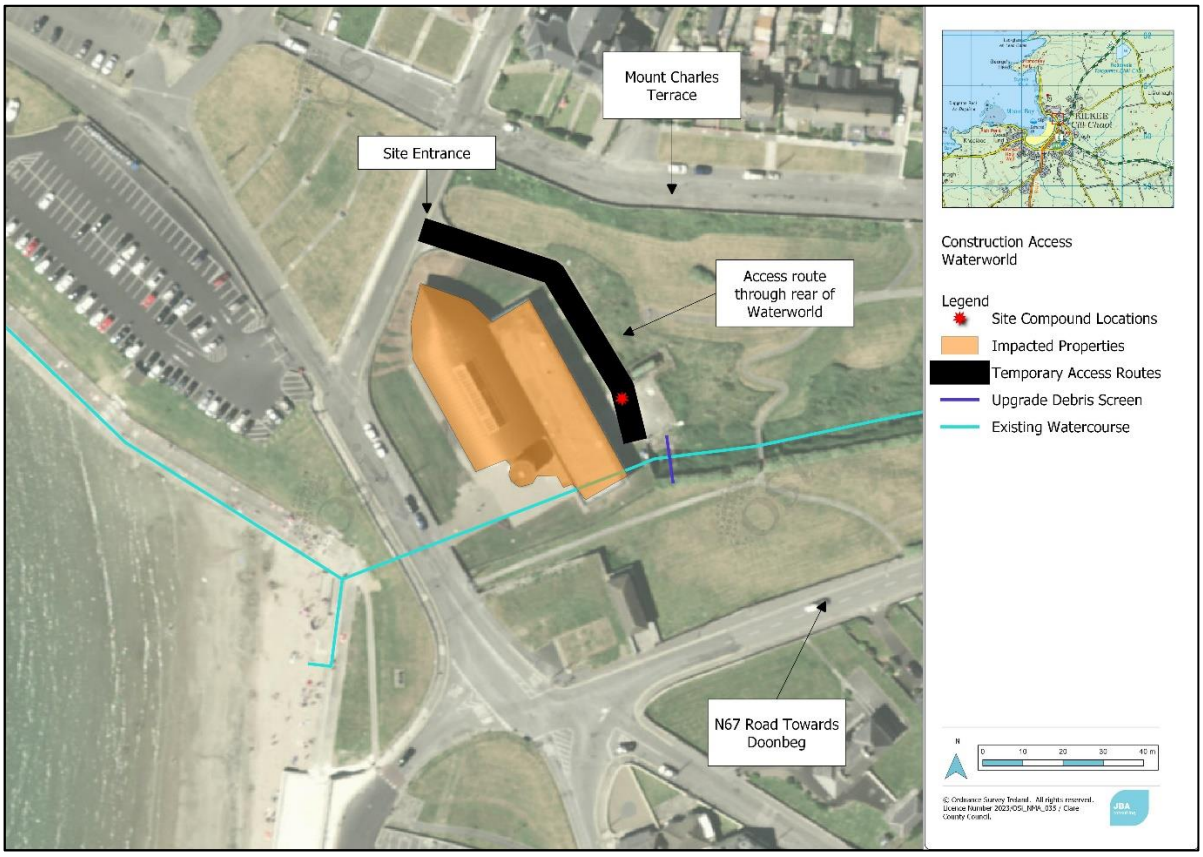

Figure 5-11 Atlantic Stream outfall access

5.5.2 Construction Methodology

These works pose a direct connectivity risk to the SAC, therefore need to be considered in parallel with the mitigation measures set out in the EIAR. The following details the access and sequential requirements for the upgrade of the outfall manhole.

Overflow Manhole

1. A temporary compound is to be established around the manhole in question using heras fencing.
2. The site will be served by the welfare compound established for the Atlantic Stream (See Section 2).
3. The existing manhole cover and frame will be broken out of its concrete surround. Care is to be taken not to damage the biscuit below. An area 2m x 2m centred on the lid is to be broken out and exposed down to the manhole biscuit.
4. A new rising shaft is to be installed with masonry, constructed off the surface of the biscuit. Using concrete lintels, openings are to be left in the masonry wall.
5. Additional manhole steps are to be installed as required.
6. The manhole lid is to be bedded back onto the new rising shaft, with bolted fixings through the masonry.
7. Non-return valves are to be fixed to the external face of the elevated faces of the manhole.

8. The entire external surface is then to be rendered and the existing promenade surface is to be reinstated.

Non-return valves

1. Two no. non-return valves are required. One at the main beach outfall, and one within the second to last manhole on the overflow system.
2. A clean surface is to be prepared on the existing headwall of the outfall.
3. The non-return valve will be bolted to the existing headwall using chemically anchored bolts.
4. The non-return valve in the manhole on the overflow system is to be fixed to the inside of the manhole inlet. This will require the casting of a partial headwall around the existing inlet pipe to receive the fixings of the non-return valve. The non-return valve will be bolted directly to this new headwall within the manhole.
5. While these works are being undertaken within the manhole, the outfall flows should be diverted during the duration of the works to prevent stream flows entering the system. This can be diverted into the overflow outfall.

5.5.3 Temporary Works Requirements

The main temporary works requirements for the screen construction are:

- Temporary fencing to secure works area
- Temporary void protection over the manhole opening during period manhole cover has been removed.
- Over-pumping.
- Formwork/Falsework

5.5.4 Traffic Management Requirements

No temporary traffic management requirements are necessary for these works.

5.5.5 Impact on existing properties

The works will require closure of part of the promenade during the works. This should extend to ensure that all seating areas immediately below and beside the works area are temporarily closed off for the duration of the works.

5.5.6 Impact on existing flood risk

These works do not impact on the existing flood risk as they are not impeding flows from the system.

5.5.7 Sequencing consideration

These works should be undertaken when the damming is in place for the Atlantic Stream culvert. This will help minimise flows through the system during the works.

5.6 Meadow View Court

5.6.1 Works Description

The flood relief works at Meadow View Court are:

- Upgrade of 2 no. existing inlets to the existing culvert

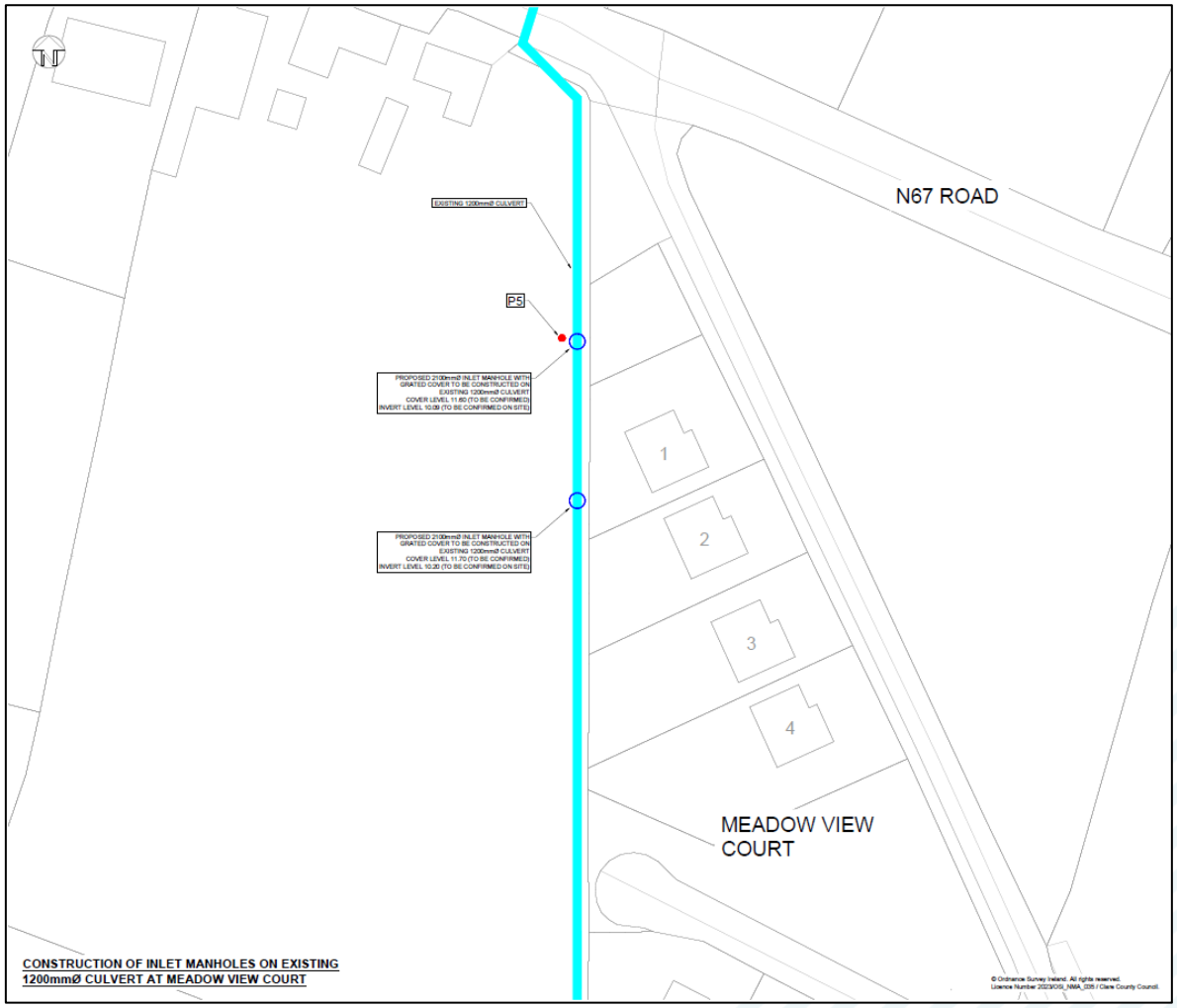

Figure 5-12 Meadow View Court Works

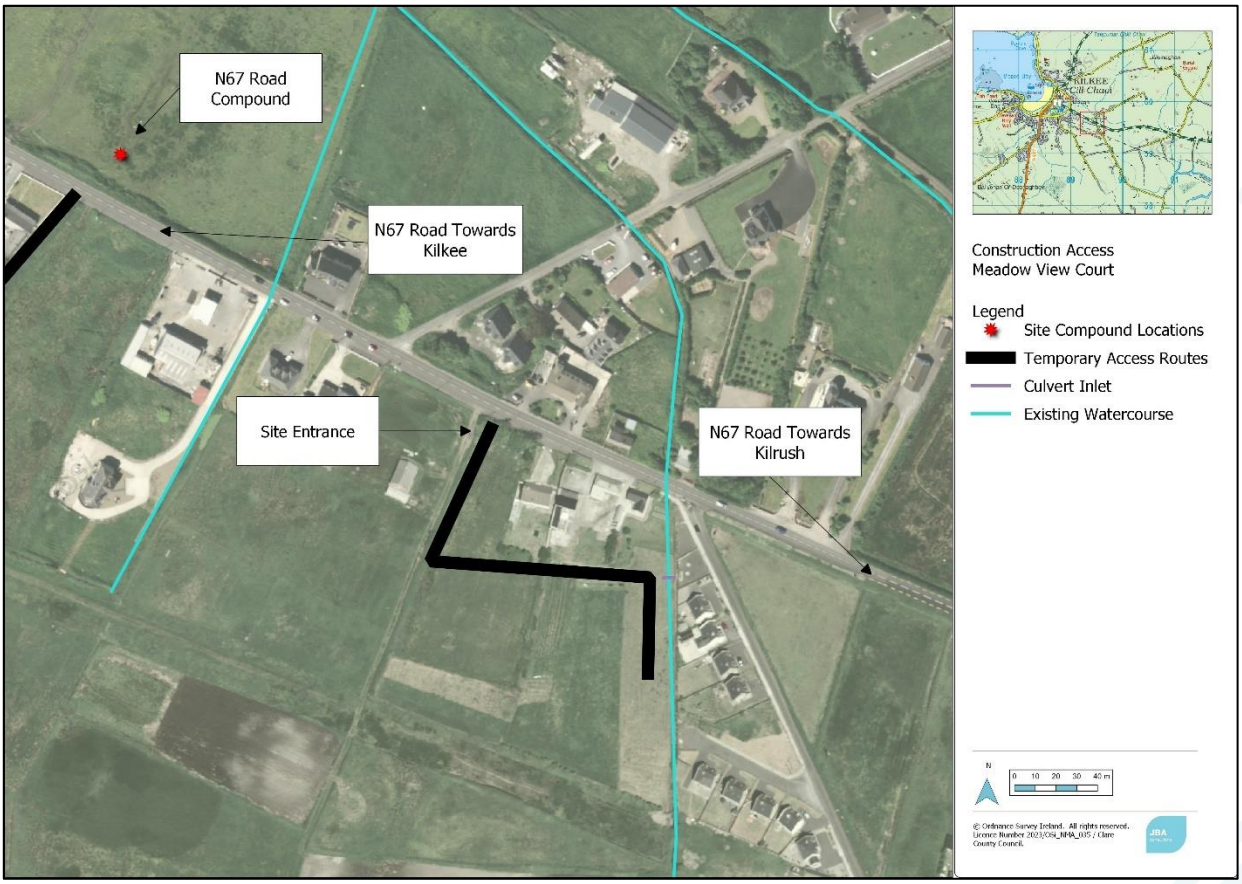

Figure 5-13 Meadow View Court Construction Access

5.6.2 Construction Methodology

These works involve the construction of 2 no. manholes on the line of the existing culvert.

Overflow Manhole

1. A temporary compound is to be established around the manhole in question using heras fencing.
2. The site will be served by an existing entrance from the N67, utilising the existing farmland access.
3. The existing outlet drainage that exists at both locations will be removed and the pipe cut back to allow for the new manhole to be constructed. A reduction in flow and over-pumping will be required during these works.
4. A new 2.1m dia. manhole will be constructed on the line of the new manhole.
5. The area will then be reinstated, with the land shaped to allow a low point at each outfall location.

5.6.3 Temporary Works Requirements

The main temporary works requirements for the screen construction are:

- Temporary fencing to secure works area
- Temporary works to retain the excavation walls during the installation of the manhole
- Over-pumping.
- Formwork/Falsework

5.6.4 Traffic Management Requirements

No temporary traffic management requirements are necessary for these works. Signage will be placed at the entrance during the works.

5.6.5 Impact on existing properties

The works will be on private land and utilise existing private land access. Therefore, these property owners will require liaison during the works.

5.6.6 Impact on existing flood risk

These works do not impact on the existing flood risk as they are not increasing flows downstream.

5.6.7 Sequencing consideration

These works do not influence the sequencing of other measures being constructed.

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