

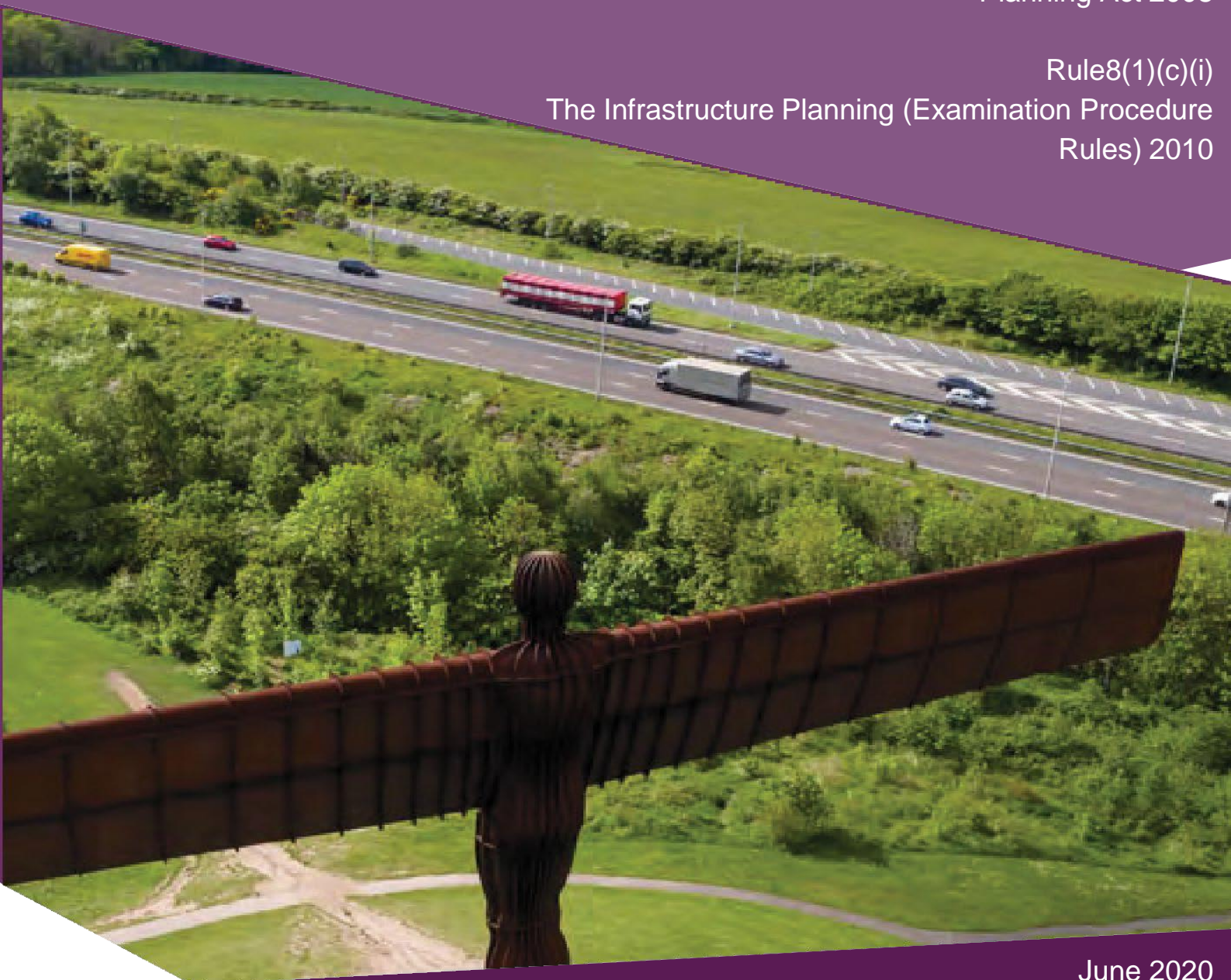
A1 Birtley to Coal House Scheme Number: TR010031

Allerdene Burn – Channel Design Concept

Planning Act 2008

Rule8(1)(c)(i)

The Infrastructure Planning (Examination Procedure
Rules) 2010



Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning
(Examination Procedure Rules) 2010**

**The A1 Birtley to Coal House
Development Consent Order 20[xx]**

**Allerdene Burn – Channel
Design Concept**

Rule Number:	Rule 8(1)(c)(i)
Planning Inspectorate Scheme Reference	TR010031
Application Document Reference	Allerdene Burn – Channel Design Concept
Author:	A1 Birtley to Coal House Project Team, Highways England

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1. INTRODUCTION

- 1.1.1. This assessment has been prepared to provide Gateshead Council with additional details as to how the reach of the Allerdene Burn which is impacted by the Scheme could be returned to a more naturalised state as part of the realignment works to facilitate the Scheme.
- 1.1.2. The Applicant had provided a commitment within **Paragraph 13.9.18.c** of **Chapter 13: Road Drainage and the Water Environment** of the Environmental Statement (ES) **[APP-034]** to undertake this aspect of the works during detailed design, however, Gateshead Council via their Written Responses have requested that this information is provided prior to determination of the Scheme.
- 1.1.3. The additional details that Gateshead Council require is particularly focused on the naturalisation and habitat aspects and is detailed within the Deadline 1 (4 February 2020) submission, Written Representation **[REP1-005]** which stated:

“Other Design Issues

The new SUDS basin and realigned watercourse should be of naturalistic appearance with varied shape, multiple pools, varied side-slope gradients and channel profile, to create an attractive appearance and develop diverse habitats.

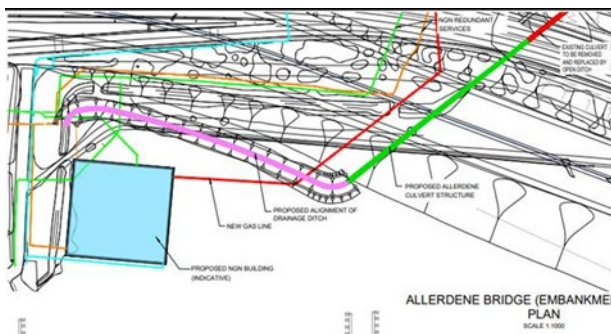
***Allerdene Burn:** The re-aligned and opened-up sections of the Allerdene Burn shown on the General Arrangement drawings (all 3 options) are over-engineered, with not enough variation in form or profile. It goes against good flood risk management principles with an engineered design and disconnect from its floodplain. The drawings should be modified to show a more naturalised channel that would conform with paragraph 5.2.3 of the WFD Assessment (Appendix 13.2). There is space to incorporate some areas of widened channel with slackened bank profiles, pools, and possibly some connected floodplain areas. Although the Environmental Statement suggests that naturalised features could be considered at detail design stage, a firm commitment to them should be made now, to avoid them being overlooked or value-engineered out at detail design stage.”*

- 1.1.4. This assessment provides the conceptual design of the naturalisation of the Allerdene Burn through the following aspects:
- A review of the baseline conditions
 - Provision of the concept channel design (both plan and long sections)
 - Assessment of the design

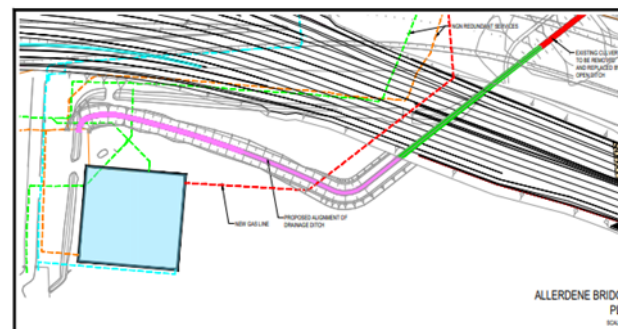
2. BASELINE CONDITIONS

- 2.1.1. The reach of the Allerdene Burn which will be realigned to facilitate the Scheme is shown in **Figure 2-1**, which is an extract of the Structures Engineering Drawings and Sections [APP-011], as there are three options under consideration as part of the Scheme for the crossing of the Allerdene Burn, each of the options are shown, given that there are differences in the length of the channel impacted.
- 2.1.2. The Allerdene Burn is not a designated Water Framework Directive (WFD) waterbody, it falls within the Team from Source to Tyne surface waterbody (ID: GB103023075670), further information is provided in the WFD assessment [APP-164].

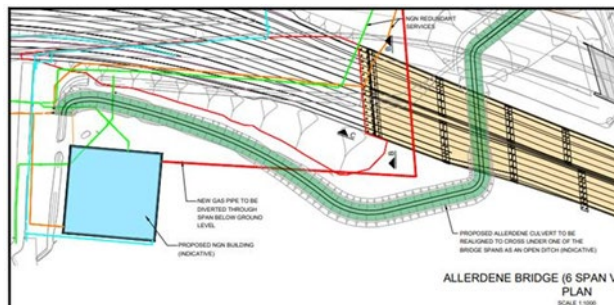
Allerdene embankment option



Allerdene viaduct option - 3 span



Allerdene viaduct 6 span option



Allerdene viaduct option - 7 span

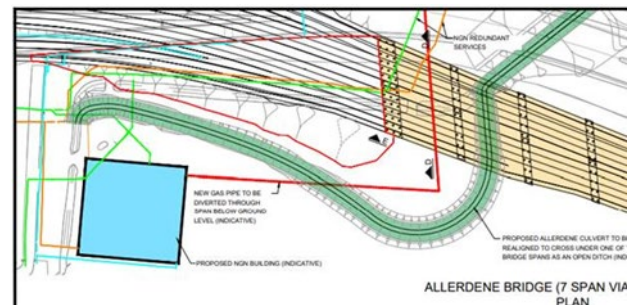


Figure 2-1 - Location of the reach of the Allerdene Burn

- 2.1.3. The baseline conditions of this reach of the Allerdene Burn are detailed in **Table 2-1** and are shown in a series of photographs in **Figure 2-2**.

Table 2-1 – Baseline WFD Quality Elements for the Allerdene Burn

WFD Quality Elements for Consideration	Baseline Condition (Including Pressures)
Hydromorphology	Description
<ul style="list-style-type: none"> ● Quantity and dynamics of flow ● Connection to ground waters ● River continuity ● River depth and width variation ● Structure and substrate of the river bed ● Structure of the riparian zone 	<p>The current hydromorphological condition of Allerdene Burn is poor. The channel is straight and situated within a deeply incised, artificial trapezoidal ditch. Longitudinal continuity is severely disrupted by the upstream and downstream culverts along with the watercourse's setting within a steep-sided channel, this means that both the lateral and longitudinal ecological, hydrological and geomorphological connectivity is limited.</p>
Physico-chemical	Description
<ul style="list-style-type: none"> ● Thermal conditions ● Oxygenation conditions ● Salinity ● Acidification ● Nutrient conditions ● Specific pollutants 	<p>The current condition of physico-chemical elements is likely to be poor to moderate. The channel is shaded by deciduous trees which will limit the amount of direct sunlight reaching the water, and thus will serve to regulate water temperature. The channel's setting immediately downstream of the East Coast Main Line (ECML) and the A1 carriage way (under both of which the watercourse is conveyed via a culvert) is likely to result in increased salinity from road washings. Moreover, road silts, oils and other harmful materials are likely to contribute to poor water quality within the channel. Upstream of the East Coast Mainline the watercourse is entirely in culvert.</p>
Biological	Description
<ul style="list-style-type: none"> ● Fish (composition, abundance, age) ● Benthic invertebrates (composition and abundance) ● Aquatic flora (composition and abundance) 	<p>The current condition of the reach, in terms of fish habitat, is very poor. The upstream culverts likely mean that there are no fish in the Allerdene Burn upstream of the A1 culvert, and in any case, in-stream fish habitat is essentially non-existent. Similarly, the fine sediment pressures currently</p>

WFD Quality Elements for Consideration	Baseline Condition (Including Pressures)
<ul style="list-style-type: none"> • Phytoplankton 	<p>impacting the channel means that potential benthic invertebrate habitat is largely smothered in silt. Aquatic flora is moderate with some macrophyte growth; however, the structure and composition is fairly homogenous and limited to discrete patches.</p>



Figure 2-2 - Photographs showing the baseline condition

3. CONCEPT DESIGN

- 3.1.1. The concept design of the naturalisation of the Allerdene Burn has been prepared for Allerdene viaduct three span option only given the similarities between the options: there is a minor difference in channel length between Allerdene embankment option and Allerdene three span viaduct option with the three span option being marginally longer; all other features remain the same. In relation to Allerdene viaduct option (6 and 7 span options), the channel dimensions remain similar, the channel lengths increase to obtain the required angle to cross beneath the viaduct between the supporting piers. It should also be noted that for Allerdene viaduct option (6 and 7 span options) and Allerdene three span viaduct option there is also the potential to incorporate a flood spillage area on the bank adjacent to the viaduct, subject to detailed design and scour risk.
- 3.1.2. The concept design is an indicative channel design concept which would be adjusted to suit the selected option and suitably refined at detailed design as detailed within reference [W10] of **Table 3-1 Register of Environmental Actions and Commitments (REAC)** of the **oCEMP [REP6-08]**.
- 3.1.3. The concept design is based upon the cross sections that were incorporated within the hydraulic model to determine the flood risk, with the bed levels, channel width and cross-section width remaining the same. Therefore, no change to flood risk as a result of this concept channel design is anticipated, however, it will be confirmed within the hydraulic model as part of the detailed design, if appropriate. This hydraulic model has been approved by the Environment Agency in the Statement of Common Ground (SoCG) [**REP2-054**].
- 3.1.4. It is noted that ground re-profiling in the vicinity of Cross Section ARD2 (the location of the cross section is shown on **Figure 3-2** and the ground levels are shown in **Figure 3-3**) would need to be undertaken during the construction works to facilitate the construction of the channel, this is subject to detailed design.
- 3.1.5. The Scheme will help to reduce the sediment load from road silts (along with oils and other harmful materials) within the Allerdene Burn through the use of a Sustainable Drainage System (SuDS) pond upstream of the outfall (Outfall 8), this has been re-designed to route flows through the pond as detailed in the Vortex Separators Assessment [EXA/D8/005] submitted at Deadline 8 (09 June 2020), this will help prevent sedimentation of the features that could be incorporated in this reach.

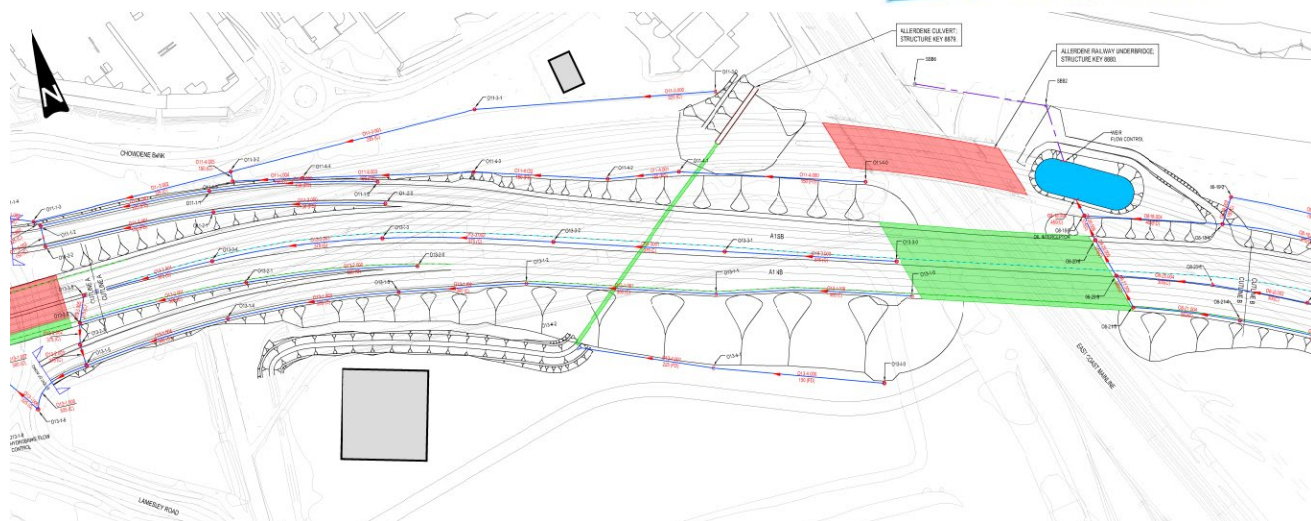


Figure 3-1 - Extract of the Preliminary Surface Water Drainage Strategy (Sheet 1 of 4, Appendix D: Surface Water Drainage Strategy Figures of Appendix 13.1: Flood Risk Assessment of the ES [APP-163])

3.1.6. The concept design is shown in both plan and cross section view **Figure 3-2** and **Figure 3-3** respectively.

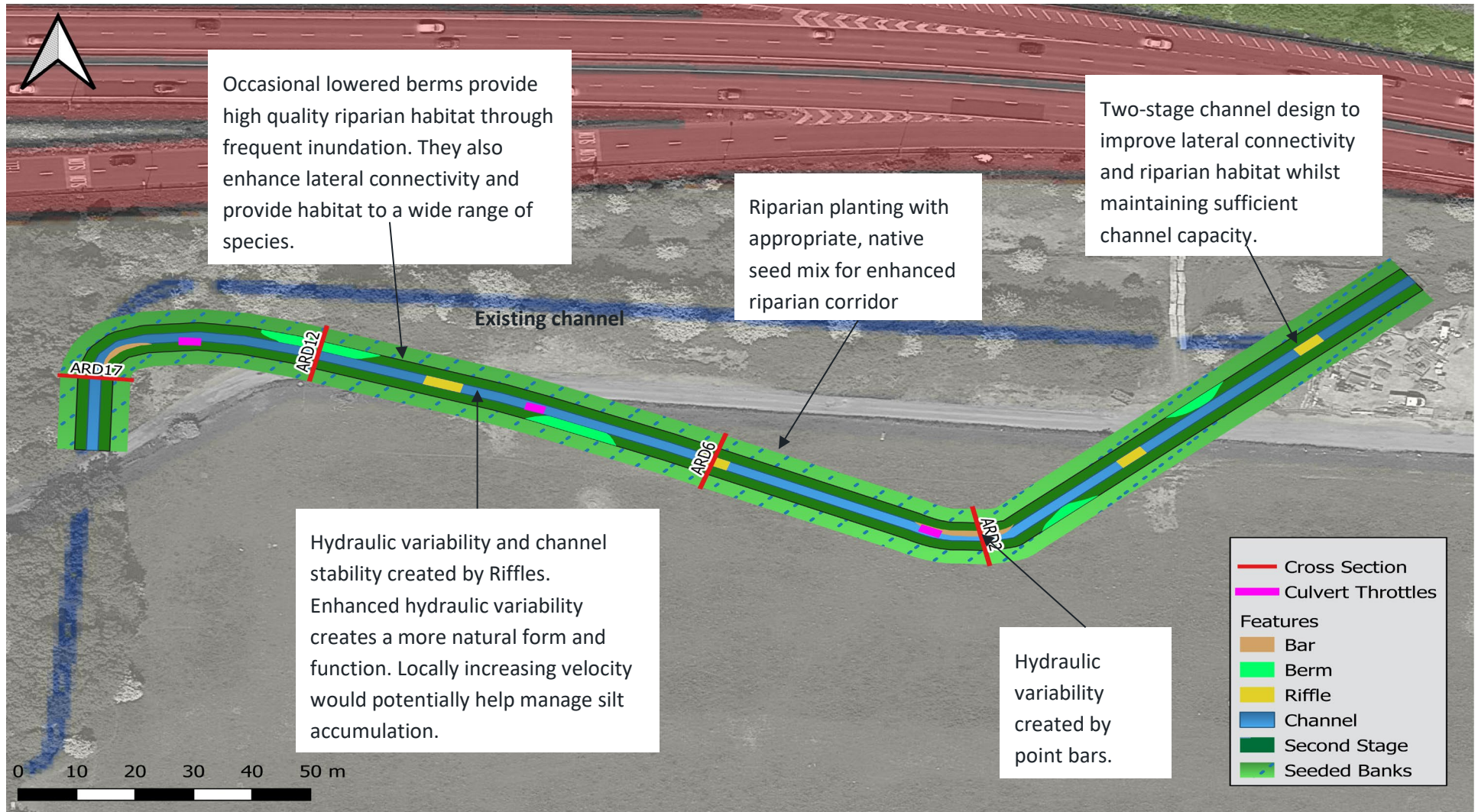
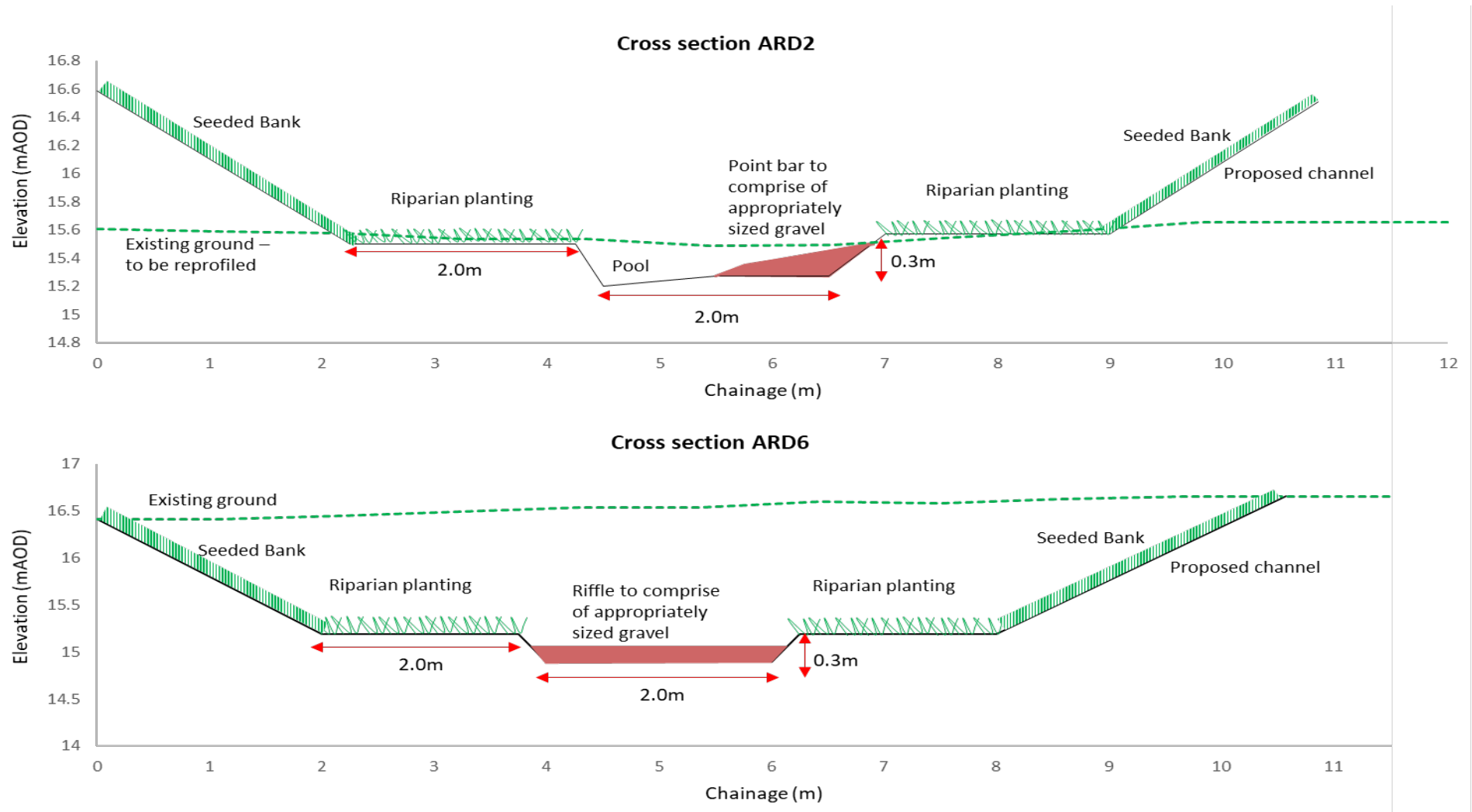
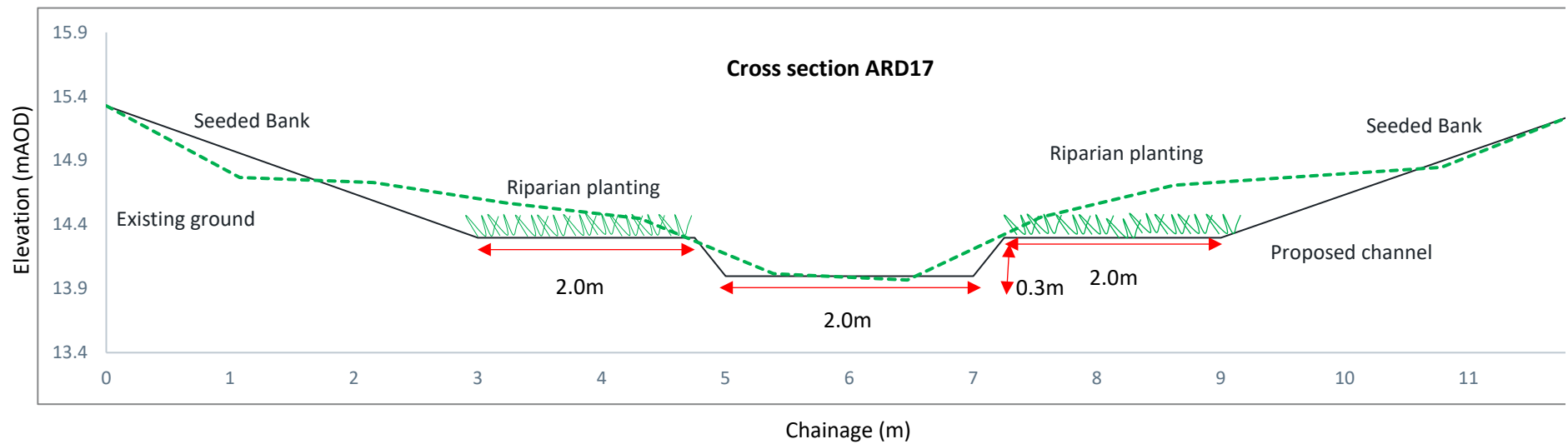
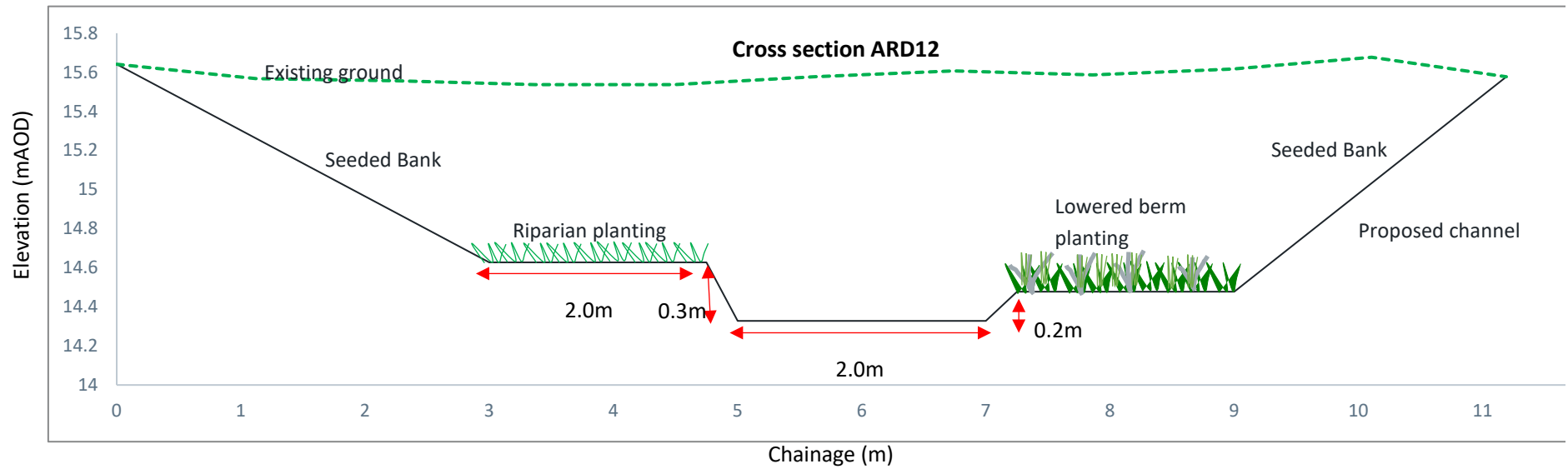


Figure 3-2 – Channel Design Concept - Plan

Figure 3-3 - CHANNEL DESIGN CONCEPT- INDICATIVE CROSS-SECTIONS





4. ASSESSMENT

- 4.1.1. An assessment of the concept design has been undertaken to demonstrate how the WFD parameters are improved as a result of the incorporation of the naturalisation of this section of the Allerdene Burn, this is detailed in **Table 4-1**.

Table 4-1 - Mitigation to Achieve WFD Objectives

WFD Quality Elements for Consideration	Mitigation to Achieve WFD Objectives
Hydromorphology	Description
<ul style="list-style-type: none"> ● Quantity and dynamics of flow ● Connection to ground waters ● River continuity ● River depth and width variation ● Structure and substrate of the river bed ● Structure of the riparian zone 	<p>The proposed lowered berms would create varied hydraulic environment that would enhance the dynamic of flow within the channel. Connection to any locally perched groundwater bodies would potentially be improved by removing silt accumulations that presently smother the channel substrate, this would also enhance the substrate condition. River continuity would be enhanced both longitudinally and laterally by the proposed inset and lowered berms which would also provide important marginal habitat for various fauna and flora. The riparian zone would be enhanced through appropriate planting of native wild flowers and grasses, and shrubs. Width and depth variation would be introduced through the riffle and point bar features – these would also create additional hydraulic variability and help to enhance quantity and dynamics of flow.</p>
Physico-chemical	Description
<ul style="list-style-type: none"> ● Thermal conditions ● Oxygenation conditions ● Salinity ● Acidification ● Nutrient conditions ● Specific pollutants 	<p>Removing the existing silt accumulations (and installation of measures to reduce silt conveyance from the highway) and incorporating the various in-channel and riparian enhancements would improve the physico-chemical elements of the site: riparian planting, for example, would provide shading, thereby keeping the water cool, whereas the riffles features would create areas of increased flow turbulence, helping to oxygenate the water.</p> <p>The planting plans submitted at Deadline 4 (20/04/2020) in Appendix D of the Environmental Statement Addendum -</p>

WFD Quality Elements for Consideration	Mitigation to Achieve WFD Objectives
	Allerdene Three Span Viaduct Option [REP4-060] show that species rich grass land is proposed to the south of the channel whilst, woodland is proposed to the north to reduce shading of the channel.
Biological	Description
<ul style="list-style-type: none"> ● Fish (composition, abundance, age) ● Benthic invertebrates (composition and abundance) ● Aquatic flora (composition and abundance) ● Phytoplankton 	<p>The proposed design concept would improve fish habitat; however, this would not change the fact that the reach is cut-off by culverts upstream and downstream as agreed with the Environment Agency in the SoCG [REP4-026]. Nevertheless, improving the physical habitat would potentially improve the abundance and composition of benthic invertebrates. The proposed mitigation concept would significantly improve habitat for benthic invertebrates and aquatic, marginal and riparian plant species.</p>

5. CONCLUSIONS

- 5.1.1. This assessment has been undertaken to provide Gateshead Council with additional details as to how the reach of the Allerdene Burn which is impacted by the Scheme could be returned to a more naturalised state as part of the realignment works to facilitate the Scheme.
- 5.1.2. It is demonstrated that a varied hydraulic environment could be created that would enhance the dynamic of flow within the channel along with enhancements that would improve the physico-chemical elements of the site:

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