Blindwells

Phase 2 Drainage Strategy

November 2020

Waterman Infrastructure & Environment Limited
Third Floor, South Suite | The Athenaeum Building | 8 Nelson Mandela Place | Glasgow G2 1BT
www.watermangroup.com

Client Name: Hargreaves Services (Blindwells) Limited
Document Reference: WIE17684-101-R-1-1-3-DS
Project Number: WIE17684

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2008, BS EN ISO 14001: 2004 and BS OHSAS 18001:2007)

Issue	Date	Prepared by	Checked by	Approved by
P01 - DRAFT	18/12/20	Paul McCluskey [redacted]	Barry Gibson [redacted]	Tom Hall [redacted]
P02 – Planning	20/01/21	Paul McCluskey [redacted]	Barry Gibson [redacted]	Tom Hall [redacted]
P03 – Planning	01/04/21	Paul McCluskey [redacted]	Barry Gibson [redacted]	Tom Hall [redacted]

Comments

Comments

Disclaimer

This report has been prepared by Waterman Infrastructure & Environment Limited, with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Contents

Contents

Figures

Contents
Blindwells
Project Number: WIE17684
Document Reference: WIE17684-101-R-1-1-3-DS

1. Executive Summary

Waterman Infrastructure & Environment Ltd have been appointed by Hargreaves Services (Blindwells) Limited to produce a strategy for the main drainage in support of the proposed Phase 2 development of land at Blindwells, Tranent. This report will be used to support the planning application for Phase 2.

This report presents the assessment of the existing conditions and outlines the proposals which will be implemented to ensure that there is no flooding within the Phase 2 developed area, or increased risk of flooding downstream as a result of an increase in surface water runoff.

The proposed Phase 2 development will comprise the construction of a mixed-use development split up into individual development plots, with associated infrastructure, and landscaping. The development plots consist of 7 residential plots (4A, 5A, 5B, 6A, 6B, 9A & 9B) and 3 Commercial plots (C1, C2 & C3) with mixed uses proposed. Finally, there is a proposal to construct a large landscaping area including a loch (Princes Loch) as a main feature in the phase 2 development. The school site, whilst being within the AMSC Planning boundary, will have its own drainage strategy and application separate from the rest of Phase 2.

There are no Scottish Water foul, combined or surface sewers within the vicinity of the Phase 2 area. New onsite surface water and foul drainage networks will therefore be required to drain the site.

A new surface water drainage network is required, which should discharge via gravity to the realigned Mill Lade which flows along the northern boundary of the site. It is proposed that for all residential plots, roof and paved areas, runoff is collected and treated within each plot and conveyed in a pipe network to downstream basins and pond, located within topographic lows at the northern edge of Phase 2. The main road network will be served by a series of swales and filter drains which connect into the main surface water pipe network. The basins will provide further treatment and attenuation of flows up to the 1:30 year + 35% climate change storm events. All flows from the 1:30 year up to 1:200 year +35% climate change storm events will be attenuated in the Princes Loch.

Attenuated runoff from the basins and loch will drain, at a controlled discharge rate of 2.6 l/s/ha on a pro-rata basis, via surface water network outfalls which discharge into the re-aligned watercourse. The restricting discharge rate from the site has previously been agreed with ELC during the Phase 1 drainage strategy for the site. Discharge of surface flows to the existing watercourse will be controlled by a series of flow control measures, such as Hydrobrakes. The proposed limiting discharge rate is 145.60 l/s.

The commercial plots will treat and attenuate their surface water within their plot extents and then discharge at greenfield rate to a separate outfall on the Mill Lade.

The drainage strategy takes cognisance of the surface water run-off from the proposed impermeable areas within each development area, with an additional allowance of 10% for surface water run-off in the form of hardstanding expansion (urban creep).

All flows from the development plots in Phase 2 will discharge via an outlet to the existing Mill Lade watercourse.

The plot drainage will be determined by each developer individually and designed to the discharge criteria set out within Watermans drainage strategy.

Modelling results of the main drainage indicate that the design will contain all flows up to and including the 1 in 30-year plus climate change event within the basins whereafter the exceedance flows will be stored within the Princes Loch.

Foul flows will require connection to an existing combined sewer located in the excess of 600m west of the Phase 2 development. Therefore, Phase 2 will require a new onsite foul water network, which will convey foul flows via gravity to two proposed pumping stations. The two proposed pumping stations will convey foul flows via the new Phase 1 foul drainage system, which will move flows westerly towards the existing combined sewer.

Foul and surface water pipe networks will be designed in accordance with Sewers for Scotland 4th Edition with pipework being vested by Scottish Water upon construction. Surface water pipework will be designed to accommodate flows up to 1in30yr below ground.

2. Introduction

2.1 Background

Waterman Infrastructure & Environment Ltd. have been appointed by Hargreaves Services (Blindwells) Limited to produce a drainage strategy in support of the proposed Phase 2 development of land at Blindwells, Tranent.

The purpose of the Drainage Strategy report is to present detailed drainage proposals to meet the surface water treatment requirements of SEPA, and attenuation requirements of the East Lothian Council and Scottish Water (where applicable). The report also outlines the foul drainage proposals.,

The report should be read in conjunction with the site-wide FRA report, with reference WIE11853-105-R-4-2-4-FRA.

2.2 Limits of Report

The report does not consider flooding from the water supply network such as water mains, and associated infrastructure, however a high-level review of existing water supply infrastructure plans indicates that a Trunk Main intersects the site toward the northern boundary, with a distribution main toward the north-western site boundary. As such, it is assumed that the proposals will ensure that the required stand-off distances to any developed area will be observed during the detailed design and/or water supply infrastructure will be relocated within proposed access roads, in-line with the latest design standards and best practice guidance.

2.3 Approach

The report shall determine surface water management requirements, in terms of treatment of surface runoff. The assessment will be carried out in line with the specific requirements of current Scottish planning policies. SuDS proposals will be developed in line with guidance set out in CIRIA C753 – The SuDS Manual and in compliance with the East Lothian Council, SEPA, and Scottish Water guidance. This report shall outline conclusions and recommendations.

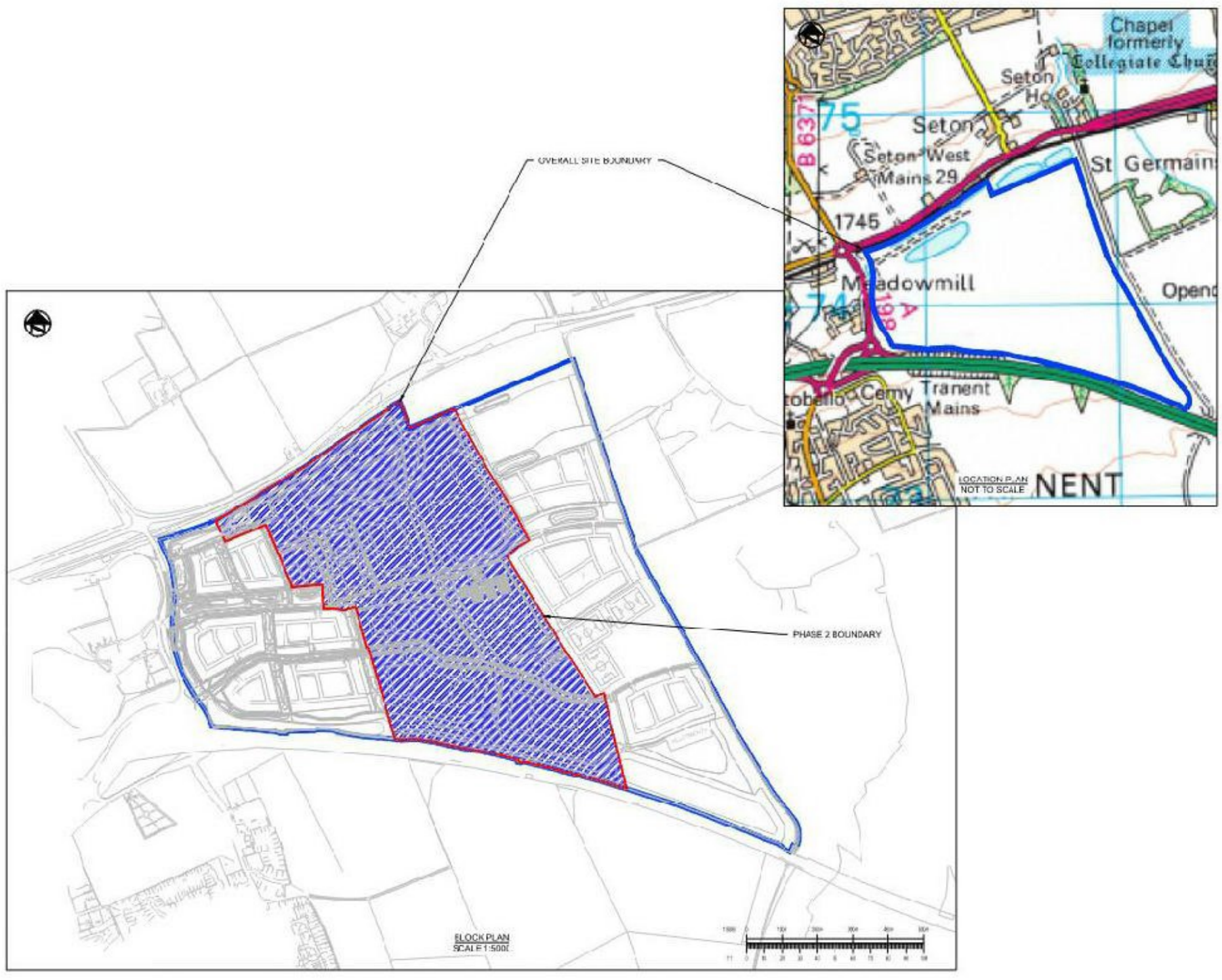
3. Development Site

3.1 Location & Description of Site

The proposed Phase 2 development is located within the central third of the total development site, located north-east of Tranent, East Lothian. The Phase 2 development covers an area of approximately 56Ha and is bound to the north by the A198 road and a railway line, to the west and east by the Phases 1 and 3 (respectively) of the Blindwells development area and to the south by the A1 road The grid reference for the centre of the Phase 2 development is: 341450, 674115.

An extract of the location plan is provided in **Figure 1** below and the full Site Location Plan can be found in Appendix C.

Figure 1:Site Location Plan



Contains Ordnance Survey data © Crown copyright and database right 2019.

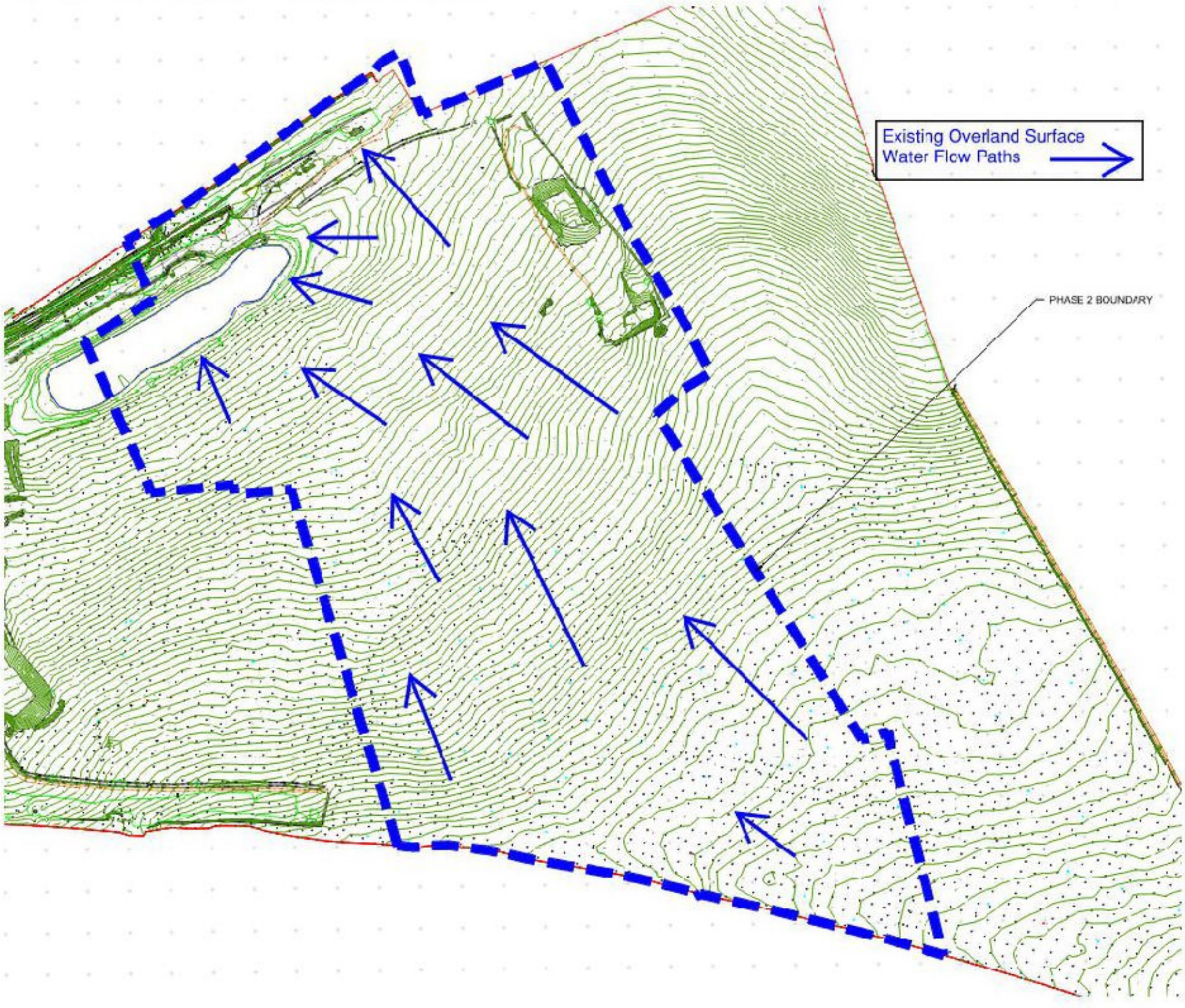
3.2 Topography

Various topographical surveys have been undertaken at the site between 2017 and 2019 (refer to **Appendix A**) and were carried out to Ordnance Survey National Grid, with heights relative to Ordnance Datum. The topographical survey scope included the ownership boundary and the immediate surrounding area.

Prior to excavation works within the Phase 2 development, ground levels undulated across the site but generally sloped towards the north. Existing ground levels within the Phase 2 development range from highs of 70.2m AOD, in the south-east corner of Phase 2, to lows of approximately 29.5m AOD at the northern edge of Phase 2 where the Mill Lade Burn lies. A marshy pond area can be seen on the survey to the North of Phase 2, this topographic survey is outdated as it does not take into account the work already carried out through Phase 1. This area has now been infilled as part of the Phase 1 works.

The topographical survey was used as the base for assessing the existing directional surface water run-off from the proposed Phase 2 development and remaining development site, which is provided in **Figure 2** below.

Figure 2: Existing surface water flow paths



3.3 Historic Land Use

Historical maps and information were interrogated to establish the historic land use of the Phase 2 development and the remaining development site.

Historic maps dated in 1907 indicate that the development is largely undeveloped greenfield, with impassable marshy ground in the northern pocket of the development. A small watercourse, named as the Mill Lade, is located within the northern pocket of Phase 1 and flows in a west to east direction through the northern edge of Phase 2. A railway line, named as the North British Railway, is adjacent within the northern Phase 1 boundary. A school, named as St. Joseph's RC Industrial School, is located out with the western Phase 1 boundary. The Tranent Mains is also located with the south-west Phase 1 boundary.

By 1932, no significant changes are noted within the development. However, the railway line that runs adjacent with the northern boundary, has changed ownership to London & North Eastern Railway.

By 1967, the school located out with the western Phase 1 boundary, is now named as St. Joseph's Boys School and has playing fields located to the north of the school building.

Historical maps dated in 1991 notes changes to the boundary and surrounding area. The roads south, west and north of the Phase 2 development are now named as the A1 and A198 respectively. The railway line, north of the Phase 2 boundary, is now a mineral railway. The Mill Lade watercourse is now disused.

No measurable change to the site or surrounding area is highlighted in subsequent historical map issues.

3.4 Existing Drainage Features

Scottish Water infrastructure plans for the entire site, including the Phase 2 boundary, are provided in **Appendix B**. The plans indicate that there is a combined sewer flowing from south to north, approximately 300m west of the site, along the Sport Centre access road. The St Joseph's School on the opposite side of the A198 is served by a private combined pumped system which discharges to the combined sewer in the Sport Centre access road.

A series of drainage ditches are located toward the north-western corner of the site, originating from 2 x 750mm pipe culverts on the western boundary (known as Culvert 6) which convey flows from the upstream watercourse below the A198 into the site. The ditch then flows in a northerly direction before flowing under the railway via an outlet known as Culvert 4. A small ditch also flows from south to north along the A198 boundary of the site, which appears to accept runoff from adjacent ground.

3.5 Proposed Development

The proposed Phase 2 development will comprise the construction of a residential developments split up into individual development plots, with associated infrastructure, landscaping and access roads works. There are also 3 commercial plots within Phase 2 which will have a separate drainage strategy from the residential and infrastructure areas which will be detailed in **Section 4** below.

Finally, there is the Proposed Blindwells School plot. Even though this sits within the Phase 2 boundary, this is part of a separate planning application and the drainage strategy is separate from the rest of the phase, with the schools drainage already incorporated into the Phase 1 drainage and SuDS design. Therefore, the school plot will not be covered in this report.

An indicative plan, highlighting the plot names and locations within the Phase 2 development, is provided in **Appendix C.**

4. Drainage Assessment

4.1 Drainage Strategy

The Drainage Assessment will deal with flood risk from surface water, ensuring that runoff from the development will not increase the risk of flooding on site or elsewhere. To comply with Scottish Planning Policy (SPP, 2014), and East Lothian Council and Scottish Water guidelines, surface water runoff from the development should be treated and attenuated prior to discharge from the site via a suitable outfall.

Surface water runoff from the residential and infrastructure sections of the Phase 2 development will discharge via a series of SuDS basins and pond (Princes Loch) to the realigned Mill Lade. Source control treatment will be provided within each development plot, with a further level of treatment being provided within the downstream basins via a filtered low flow channel. All adoptable roads will be treated via roadside filter drains before receiving further treatment by the basins.

Attenuation will ensure that the Phase 2 development should be protected up to the 1 in 200-year (0.5% AEP) rainfall event including a 35% allowance for climate change along with a 10% allowance for urban creep (later unforeseen additions of impermeable areas) in all residential areas. The multi-Basin system will attenuate the residential and infrastructure areas up to the 1 in 30-year event (30% AEP) + climate change. All surface water will be contained below ground in line with current guidance with exceedance flows stored via overland flows into the adjacent Princes Loch where the remainder of the 1 in 200-year + climate change attenuation volume will be provided. The restricting discharge rate from the site has previously been agreed as 2.6 l/s/ha with ELC during the Phase 1 drainage strategy for the site. The discharge from each SuDS feature will be controlled accordingly. Discharge rate have been determined based on the area of each development plot and its intended use.

The areas marked for commercial development will provide all the necessary pollution mitigation indices as noted in CIRIA C753 via SuDS treatment at source within the plot boundaries. All required attenuation will also be provided within the plot. The discharge rate from the plots will be prorated to same agreed figure as the rest of the development, 2.6 l/s/Ha. These plots will also outfall to the Mill Lade but via a separate outfall from the aforementioned Phase 2 surface water network.

4.2 Sewerage

The proposed sewerage network should be designed as a separate system in accordance with building Regulations and Sewers for Scotland, 4th Edition, and modelled using a suitable hydraulic modelling software package.

The surface water pipes are designed with a minimum velocity of 1m/s at pipe full flow and with a roughness of 0.6mm. The pipe should provide enough capacity to convey all the surface runoff flows to attenuation and treatment facilities.

The foul pipes should be designed to provide a self-cleansing regime with a minimum flow velocity of 0.75m/s at one-third design flow. Gradients should be restricted to no steeper than 1:10 to comply with safety standards.

Both surface water and foul sewers should preferably be laid with a minimum cover of 1.5m to avoid interference with other underground utility pipes and cables, and have a minimum diameter of 150mm. If it is not possible to meet the minimum cover requirements, sewers should be protected in line with Sewers for Scotland requirements.

4.3 Drainage Proposals

4.3.1 Pre-Planning Runoff Assessment

At the Planning Permission in Principle (PPP) stage, prior to detailed of the earthworks and ground improvements, it was considered that there was a risk of inundation collapse of the open cast backfill material if surface water was allowed to infiltrate into the backfill through permeable surfaces. To mitigate against this risk, it was assumed that all surfaces of the site would be impermeable and as a result 100% of all surface water would run-off the surface of the site and be collected by the below ground drainage system and conveyed to the attenuation Ponds / Basins. The Blindwells Drainage Strategy report dated October 2017 which was submitted in support of the PPP application reflected the foregoing.

The detailed design of the earthworks and ground improvement strategy was concluded in May 2018. The strategy includes for consolidating the open cast backfill materials to depth through a rolling surcharge and then on completion of the surcharge further densification of the upper deposits of the open cast backfill material using High Energy Impact Compaction (HEIC) techniques. The HEIC techniques will comprise the excavation and re-compaction of the surface deposits to a depth of 1.5m. The HEIC technique has an effective depth of treatment in excess of 1m and therefore the effective depth of treatment will extend to a depth of between 2.5m and 3m below formation level. The densified upper layers which will be achieved by the HEIC technique are not receptive to surface water infiltration and hence the risk of inundation collapse has been removed.

The formation level is not receptive to surface water infiltration. This “impermeable” formation level is at a depth of 450mm below the proposed finished ground levels. A 450mm capping layer comprising sub-soil and topsoil will be placed over the impermeable layer on soft and landscaped areas. The sub-soil and topsoil will be receptive to infiltration and the water which does infiltrate these surface deposits will be taken up by planting and by evaporation. Any excess surface water not taken up by planting and evaporation which flows across the surface of the densified formation level will be intercepted by drainage tracks at various locations. Therefore, some of this surface water which infiltrates the capping layer may find its way into the drainage system. However, the time of entry for such surface water entering the drainage system will be significantly longer than the storm duration and it will not occur at the same time as the peak surface water flows and is therefore not a factor in terms of the surface water drainage design or the attenuation volumes.

The controlled surface water discharge rates which were agreed with ELC at and accepted during the Phase 1 detailed planning application remain the same for Phase 2. The receptors i.e. the water course along the northern boundary of the site, Culvert 4 which conveys the flows across the railway line and the watercourse to the north of the railway which conveys flows to sea are at no greater risk, and probably less risk, of flooding post development than they were pre development.

4.3.2 Surface Water Attenuation and Treatment Requirements

The proposed Phase 2 development covers an approximate area of 56ha in total. This area will be broken down into the 2 proposed surface water networks (1 & 2). Each surface water network will then be further broken down into their individual areas and plots. Refer to **Appendix D** for details on the Drainage Strategy across Phase 2.

Surface Water Network 1 : Residential and Infrastructure (Plots 4A, 5A, 5B, 6A/B, 9A/B, Road Network)

As mentioned in **Section 3.5** of this report, the Phase 2 development is divided into individual residential development plots, with each plot being attenuated and treated by SuDS features located within the Phase 2 development at the Princes Loch Area to the north of the development. The Princes Loch will be a body of water with a pool of permanent water and the proposal is to use the top 275mm for attenuation purposes.

Plot 4A

Plot 4A is the smallest residential development plot within Phase 2 and centres on NGR: 341317, 674238 with an approximate area of 3.38Ha. This proposed plot is 60% impermeable +10% urban creep (2.37Ha). During a 1 in 200-year rainfall event plus an allowance for 35% climate change, Plot 4A requires an attenuation storage of 1650m^3. The 1-year greenfield runoff rate for the entire development site is 2.6 l/s/ha. Therefore, Plot 4A requires a restricted discharge rate of 9.46 l/s. The details of the treatment proposals within the plot will be provided by the developer.

Plot 5A

Plot 5A is adjacent to the central most residential plot of Phase 2, sitting alongside the School development and centres on NGR: 341382, 674021 with an approximate area of 3.81Ha. This proposed plot is 60% impermeable + 10% UC (2.67Ha). During a 1 in 200-year rainfall event plus an allowance for 35% climate change, Plot 5A requires an attenuation storage of 1727m^3. The 1-year greenfield runoff rate for the entire development site is 2.6 l/s/ha. Therefore, Plot 5A requires a restricted discharge rate of 9.9l/s. The details of the treatment proposals within the plot will be provided by the developer.

Plot 5B

Plot 5B lies on the South West boundary of Phase 2, adjacent to Phase 1 and Plot 9. Plot 5B centres on NGR: 341416, 673847 with an approximate area of 4.46Ha. This proposed plot is 60% impermeable + 10% UC (3.12Ha). During a 1 in 200-year rainfall event plus an allowance for 35% climate change, Plot 5B requires an attenuation storage of 2021m^3. The 1-year greenfield runoff rate for the entire development site is 2.6 l/s/ha. Therefore, Plot 5B requires a restricted discharge rate of 11.58l/s. The details of the treatment proposals within the plot will be provided by the developer.

Plot 6A / 6B

Plot 6A / 6B is the largest residential plot within Phase 2 and centres on NGR: 341518.893, 674356 with an approximate area of 6.75Ha. This proposed plot is 60% impermeable + 10% UC (4.72Ha). During a 1 in 200-year rainfall event plus an allowance for 35% climate change, Plot 6A / 6B requires an attenuation storage of 3059m^3. The 1-year greenfield runoff rate for the entire development site is 2.6 l/s/ha. Therefore, Plot 6A / 6B requires a restricted discharge rate of 17.54l/s. The details of the treatment proposals within the plot will be provided by the developer.

Plot 9A / 9B

Plot 9A / 9B is situated in the South East corner of Phase 2 and centres on NGR: 341780, 673741 with an approximate area of 5.10Ha. This proposed plot is 60% impermeable + 10% UC (3.57Ha). During a 1 in 200-year rainfall event plus an allowance for 35% climate change, Plot 9A / 9B requires an attenuation storage of 2314m^3. The 1-year greenfield runoff rate for the entire development site is 2.6 l/s/ha. Therefore, Plot 9A / 9B requires a restricted discharge rate of 13.27l/s. The details of the treatment proposals within the plot will be provided by the developer.

Road network

The road network and accompanying infrastructure will be treated at source via roadside filter drains before connecting to the mainline drainage systems. The roads were assumed to have 100% impermeability and therefore are not subject to an urban creep factor as this would take the total % impermeability above 100%. The surface water from these areas will be attenuated in the same way as the residential plots above, with the 30 year event being stored in the basins and the surplus flow upto the 1:200 year in the loch.

The key information for the road areas can be found in **Table 1** below, alongside the information for the residential plots.

It should be noted that a small amount of storage has been provided for the landscaped areas across Phase 2. A 10% saturated runoff value was selected in order to provide a further factor of safety against downstream flooding during extreme events. Cut-off drains, or similar measure, will be incorporated into the design to capture any potential overland flows from high ground around the Phase 2 boundary and at the toe of any slopes/embankments constructed within the site boundary. Flows will then be conveyed to landscaped areas and existing boundary ditches.

The attenuation calculations to support the above figures can be found in Appendix F

Table 1: Network 1 Summary of Attenuation information

Plot / Road / Area	Impermeable Plot Area (Ha)	Required Attenuation Storage 1:30yr (m^3)	Required Attenuation Storage 1:200yr (m^3)	Provided Attenuation Storage (m^3)
4A	2.55	868	1650	-
5A	2.67	909	1727	-
5B	3.12	1063	2021	-
6A / 6B	4.72	1609	3059	-
9A / 9B	3.57	1217	2314	-
Road between 5A / 5B	2.55	28	1650	-
Road between 6A / 6B	2.67	30	1727	-
Road between 5A / School	3.12	15	2021	-
Road between 5A / 5B	4.72	27	3059	-
Landscapes Areas	0.3	159	302	-
Adopted Basins	-	-	-	5926
Princes Loch	-	-	-	5824
Total		**5926**	**11265**	**11750**

Surface Water Network 2 : Commercial Plots

As noted previously the commercial plots will have a separate outfall and all of the relevant treatment and attenuation must be provided within the plot boundaries. All of the commercial plots have an assumed 100% impermeability and are therefore not subject to urban creep. There are also sections of private roads that serve only the private commercial plots which will be included in this network. They will be noted in the summary table. Although it is up to the developer, we envisage the commercial plots to be treated and attenuated via features such as porous paving, filter trenches and underground attenuation tanks.

Plot C1

Plot C1 centres on NGR: 341163, 674468 with an approximate area of 2.03Ha. During a 1 in 200-year rainfall event plus an allowance for 35% climate change, Plot C1 requires an attenuation storage of 1318m^3. The 1-year greenfield runoff rate for the entire development site is 2.6 l/s/ha. Therefore, Plot C1 requires a restricted discharge rate of 5.29l/s. The details of the treatment and attenuation proposals within the plot will be provided by the developer.

Plot C2

Plot C2 centres on NGR: 341057, 674189 with an approximate area of 1.02Ha. During a 1 in 200-year rainfall event plus an allowance for 35% climate change, Plot C2 requires an attenuation storage of 664m^3. The 1-year greenfield runoff rate for the entire development site is 2.6 l/s/ha. Therefore, Plot C2 requires a restricted discharge rate of 2.66l/s. The details of the treatment and attenuation proposals within the plot will be provided by the developer.

Plot C3 (East)

Plot C3 is split by a private road and will likely require separation of the attenuation and treatment. The Eastern Portion of Plot C3 centres on NGR: 341169, 674214 with an approximate area of 2.16Ha. During a 1 in 200-year rainfall event plus an allowance for 35% climate change, Plot C3 (East) requires an attenuation storage of 1401m^3. The 1-year greenfield runoff rate for the entire development site is 2.6 l/s/ha. Therefore, Plot C3 requires a restricted discharge rate of 5.62l/s. The details of the treatment and attenuation proposals within the plot will be provided by the developer.

Plot C3 (West)

Plot C3 (West) centres on NGR: 341017, 674298 with an approximate area of 0.70Ha. During a 1 in 200-year rainfall event plus an allowance for 35% climate change, Plot C3 (West) requires an attenuation storage of 455m^3. The 1-year greenfield runoff rate for the entire development site is 2.6 l/s/ha. Therefore, Plot C3 (West) requires a restricted discharge rate of 1.83l/s. The details of the treatment and attenuation proposals within the plot will be provided by the developer.

Table 2: Network 2 Summary of Attenuation information

Plot / Road	Impermeable Plot Area (Ha)	Required Attenuation Storage 1:200yr (m^3)	Restricted Discharge Rate (l/s)
C1	2.03	1318	5.29
C2	1.02	664	2.66
C3 (east)	2.16	1401	5.62
C3 (west)	0.70	455	1.83
Road behind Commercial	0.12	79	0.32
Road area through commercial	0.11	70	0.28

The Wallingford Procedure calculations are detailed in **Appendix F.**

4.3.3 Surface Water Treatment Requirements (Network 1 Only)

Scottish Planning Policy guidance requires surface water to be treated prior to discharge from the proposed site. Proposed uses within the network 1 site are classified as building roof areas, access roads and medium traffic roads. Therefore, in accordance with the CIRIA C753 Manual, the attributed pollution 'hazard' levels associated with building roof and pedestrian areas is typically 'very low; to 'low', with low traffic access roads also categorised as 'low' and medium traffic roads categorised as medium.

Each proposed land use has been numerically categorised based on the susceptibility of producing a pollution risk to receiving surface waters (following discharge of surface water run off). To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each pollution type). Where the mitigation index of an individual component is insufficient, two components (or more) in series will be required. In this case, the Total SuDS Pollution Mitigation Index can be calculated by the following equation;

$$\textbf{\textit{Total SuDs Mitigation Index}} = \textit{mitigation index}_1 + 0.5\ \textit{mitigation index}_2$$

Where: mitigation index_n = mitigation index for component n

The proposed land use and associated hazard levels are detailed in **Table 3**, below.

Table 3: Pollution Hazard Levels

Proposed Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Pedestrian areas and Residential Roofs	Very Low	0.2	0.2	0.05
Low Traffic Access Roads	Low	0.5	0.4	0.4
Medium Traffic Roads	Medium	0.7	0.6	0.7

The proposed SuDS components and total mitigation indices are detailed in **Table 4**, below.

Table 4: Proposed SuDS and Associated Pollution Mitigation Indices

Proposed Land Use	Level of Treatment	Proposed SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	1	Detention Basin	0.5	0.5	0.5
(Minimum) SuDS Pollution Mitigation Index			**0.5**	**0.5**	**0.5**
Access Roads	1 **OR**	Detention Basin	0.5	0.5	0.6
(Minimum) SuDS Pollution Mitigation Index			**0.5**	**0.5**	**0.5**
Medium Traffic Roads	2 **AND**	Detention Basin	0.5	0.5	0.6
		Filter Trench/Drain	0.4	0.4	0.4
(Minimum) SuDS Pollution Mitigation Index			**0.7**	**0.7**	**0.8**

The above tables demonstrate that sufficient treatment will be provided for surface water run off occurring from all areas of the site. It is recommended that the plot developers provide suds at source as is best practice, with the minimum requirements being the removal of silts and solids at source.

4.3.4 Foul Water Proposals

Scottish Water infrastructure plans have indicated that there are no foul or combined sewers within or adjacent to the boundary of the site. The closest public sewer is a 1m diameter concrete combined sewer which is located approximately 400m west of the western boundary of the site and varies in depth between 3m and 5m. The sewer is noted to convey flows from the Tranent catchment, under the East Coast Railway, towards Prestonpans. The flows are then conveyed to the Edinburgh PFI Wastewater Treatment Works, approximately 14km to the west of the site.

In order to achieve a connection to the existing combined sewer, The Blindwells Phase 1 foul strategy proposes the construction of a new onsite foul water network to the above Scottish Water combined sewer. The Phase 2 foul drainage will look to extend this Phase 1 foul network upstream to the east into Phase 2 and use the same gravity-based system for the main run of foul drainage.

The foul strategy for Phase 2 will include two proposed pumping stations (WWPS No3 & WWPS No4), which will collect foul flow from the northern half of the development which sits topographically lower than the proposed gravity sewer. These pumping stations will convey the flow via new onsite rising mains to the gravity sewer. All developments in the southern half of the development will use a gravity system to connect to the extend main foul line. These pumping stations will be designed to Sewers for Scotland 4th Edition and be vested by Scottish Water.

Table 5 below shows the proposed developments and how the connect to the foul sewer.

Table 5 : Foul Network Proposals

Plot	Proposed Method of Foul Connection
C1	WWPS No 3
C2	WWPS No 3
C3 (east)	WWPS No 3
C3 (west)	WWPS No 3
4A	WWPS No 3
5A	Gravity Sewer
5B	Gravity Sewer
6A / 6B	WWPS No 4
9A / 9B	Gravity Sewer

4.4 Construction

CIRIA Interim Code of Practice for Drainage Systems recommends that SuDS are de-silted during the construction phase of new developments to remove blockages which are caused by siltation. This is common with SuDS features which have an infiltration component such as porous paving.

Silt runoff from construction sites is much greater than that from normal uses and should be controlled effectively during construction by temporary treatment systems. SEPA guidelines state that during the construction phase, temporary treatment systems should be provided.

Construction work should be phased to ensure that mud from vehicles or roads or surface water run-off, from areas under construction does not pollute water courses or surface water drainage of areas already completed.

4.5 Maintenance

A private inspection and maintenance agreement will be required for the on-site drainage.

Regular SuDS scheme inspections will:

- Help determine future maintenance activities
- Confirm hydraulic, water quality, amenity and ecological performance
- Allow identification of potential system failures, e.g. blockage, poor infiltration, poor water quality etc.

During the first year of operation, inspections should ideally be carried out after every significant storm event to ensure proper functioning.

Typical routine inspection questions that will indicate when occasional or remedial maintenance activities are required, and/or when water quality requires investigation include:

- Are inlets and outlets blocked?
- Does any part of the system appear to be leaking?
- Is there evidence of sedimentation build-up?
- Is there evidence of ponding above an infiltration surface?
- Is there evidence of structural damage which requires repair?

All those responsible for maintenance should take appropriate health and safety precautions and risk assessments should always be carried out.

Table 6 indicates the maintenance requirements for the key SuDS components.

Table 6: Typical SuDS operation and maintenance activities. (Adapted from the CIRIA SuDS Manual).

O&M activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter trench	Modular storage	Pervious pavement	Swale/bioretention/green roofs	Filter strip	Sand filter	Pre-treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter/debris removal	■	■	■	■	□	■	■	□	■	■	■	■	■
Grass cutting	■	■	■	■	□	■	■	□	□	■	■	□	□
Weed/invasive plant control	□	□	□	□		□	□		□	□	□	□	□
Shrub management	□	□	□	□					□	□	□		□
Shoreline vegetation management	■	■	□										□
Aquatic vegetation management	■	■	□										□
Occasional maintenance													
Sediment management (*)	■	■	■	■	■	■	■	■	■	■	■	■	■
Vegetation/plant replacement	□	□	□	□						□	□		□
Vacuum sweeping and brushing										■			
Remedial maintenance													
Structure rehabilitation/repair	□	□	□	□	□	□	□	□	□	□	□	□	□
Infiltration surface reconditioning				□	□	□	□		□	□	□	□	

■ Will be required □ May be required

5. Conclusions and Recommendations

5.1 Surface Water

To comply with current policy, surface water runoff from the developed site will be treated and attenuated in a series of SuDS features prior to discharge to the realigned Mill Lade. The surface water runoff from the Phase 2 development will discharge via a series of SuDS basins and loch area to the realigned Mill Lade.

Source control treatment will be provided within each plot, with a further level of treatment being provided within the downstream basins. The road network will receive a further level of treatment via filter drains.

Attenuation will ensure that the Phase 2 development should be protected up to the 1 in 200-year (0.5% AEP) rainfall event including a 30% allowance for climate change. The restricting discharge rate from the site has previously been agreed as 2.6 l/s/ha and the discharge from each SuDS feature will be controlled accordingly. Discharge rates have been determined based on the area of each development plot.

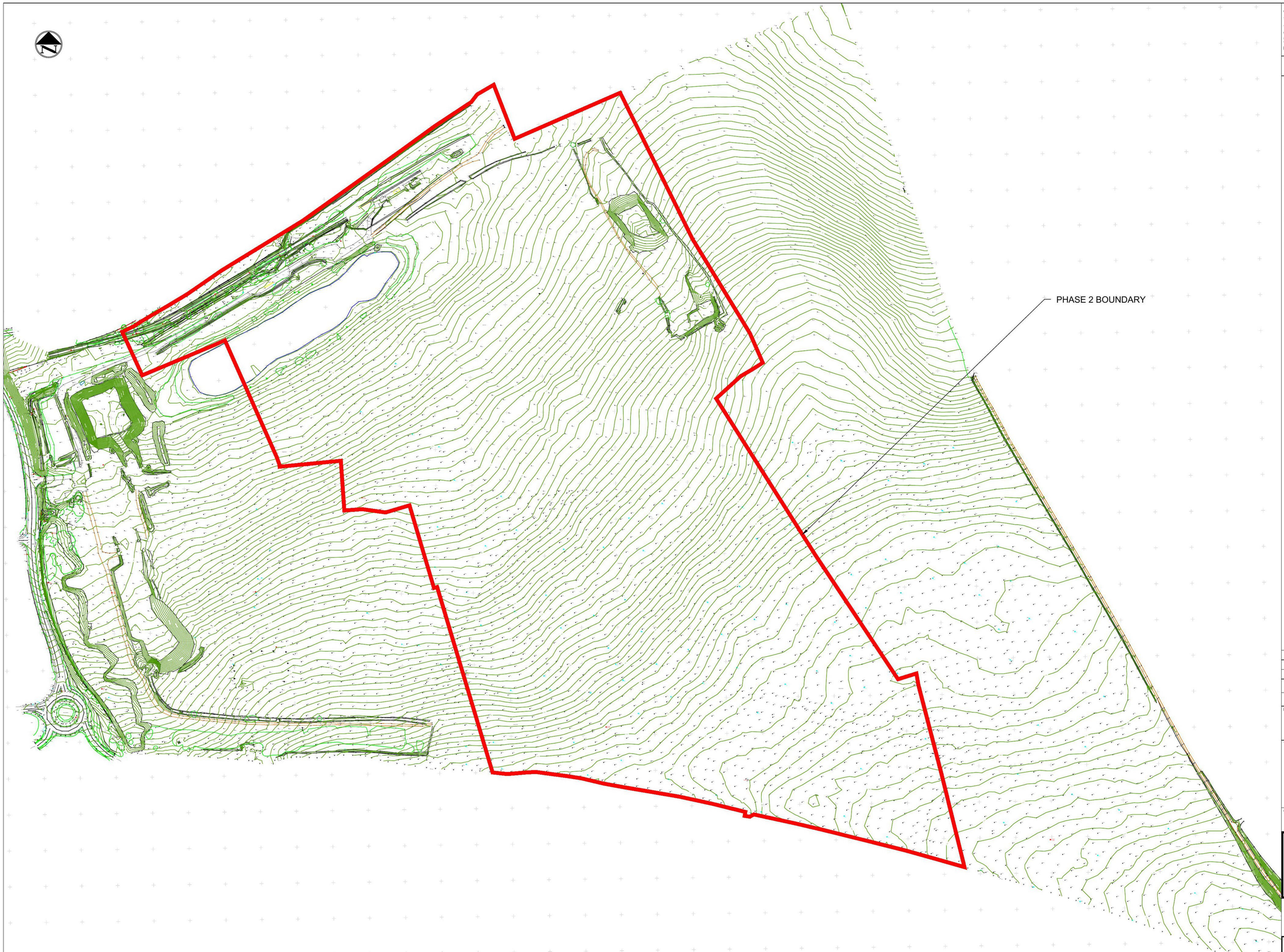
5.2 Foul Water

There are no Scottish Water foul, combined or surface sewers within the vicinity of the site. A new surface water drainage network is therefore required, which should discharge, via gravity, to the nearest suitable watercourse.

Foul flows will require connection to an existing combined sewer constructed for Phase 1 of the Blindwells development. Therefore, Phase 2 will require a new onsite foul water network, which will convey foul flows via gravity to two proposed pumping stations. The two proposed pumping stations will convey foul flows to the Phase 1 development.

APPENDICES

A. Topographical Survey



1:25000 0 500m 1000m 1500m 2000m 2500m

1:1 0 10 20 30 40 50 60 70 80 90 100

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEER'S, ARCHITECT'S OR OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
3. THE CONTRACTOR MUST ENSURE AND WILL BE HELD RESPONSIBLE FOR THE OVERALL STABILITY OF THE BUILDING/STRUCTURE/EXCAVATION AT ALL STAGES OF THE WORK.
4. ALL WORK BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
5. ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES AND REGULATIONS.
6. TOPOGRAPHICAL INFORMATION TAKEN FROM AIRD SURVEYS DRAWING DATED 18/04/2019.

Rev	Date	Description	By
P03	14/01/21	AMENDED AS PER ARCHITECT COMMENTS	PM
P02	08/01/21	REVISED AS PER CLIENTS COMMENTS	PM
P01	03/11/20	DRAFTED FOR PLANNING	CON

Amendments

Project

BLINDWELLS

Title

TOPOGRAPHICAL SURVEY

Client

HARGREAVES SERVICES (BLINDWELLS) LTD

waterman

South Suite 8 Nelson Mandela Place Glasgow G2 1BT
t 0141 418 1900
mail@watermangroup.com www.watermangroup.com

Status

PLANNING

Designed By	Checked By	Waterman Ref
PM	TH	WIE17684
Drawn By	**Date**	**Scales @ A1**
CON	03/11/2020	1:25000

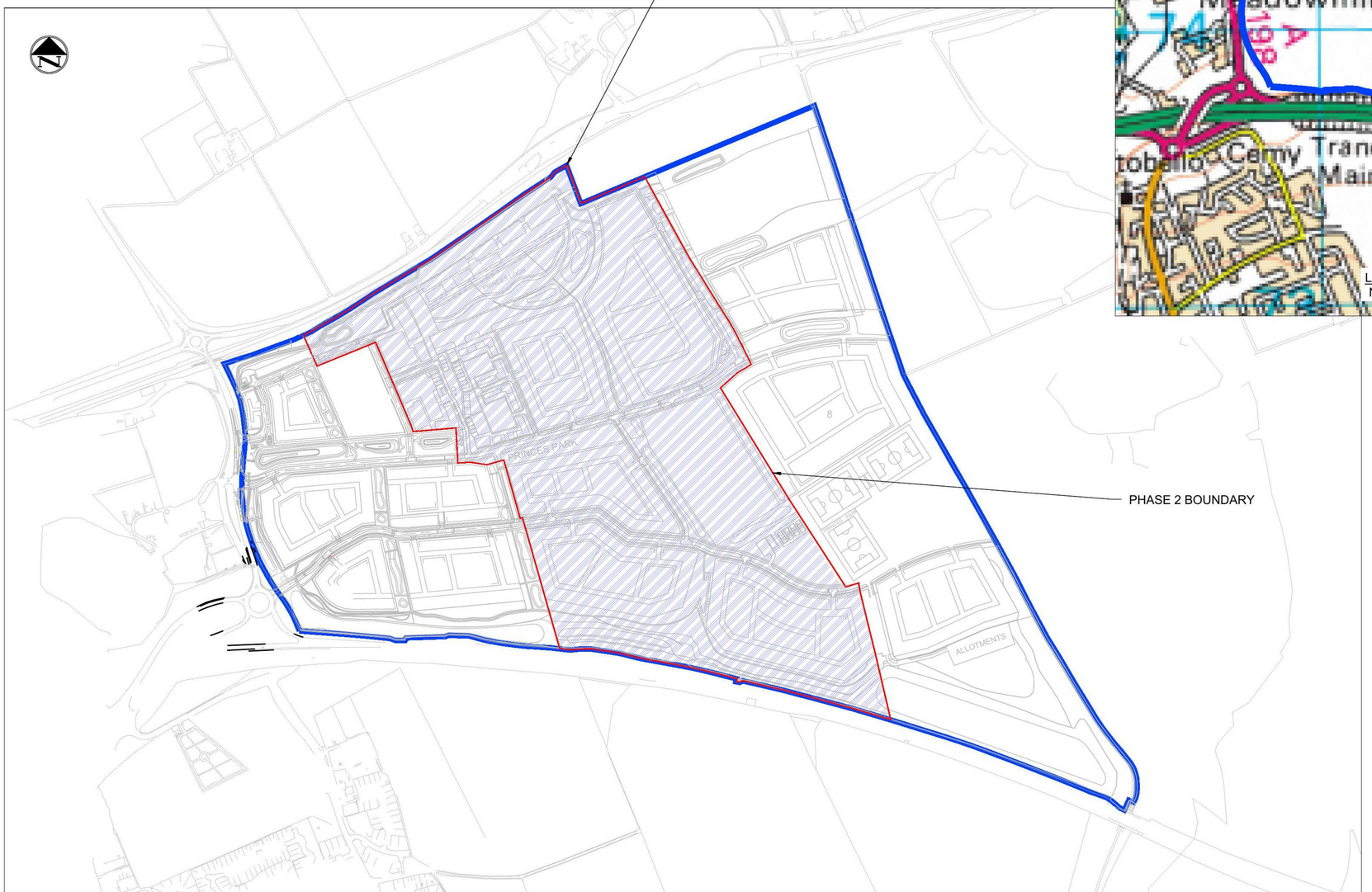
Project - Originator - Volume - Level - Type - Role - Number	Revision
17684-WIE-02-ZZ-DR-C-00001	P03

File Path N:\Projects\WIE17684_Blindwells_Ph2\100 Overall Phase 2 Road Scheme Design\7_CAD\02_Survey Information\

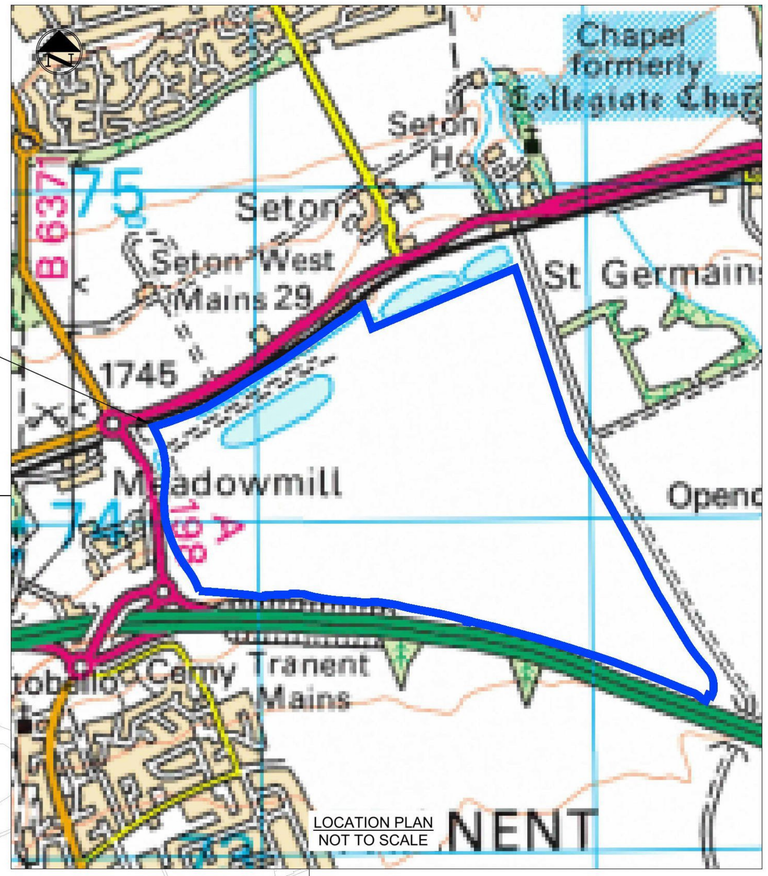
B. Scottish Water Infrastructure Plan


Football Ground
Pavilion
PRESTON
Battle of Prestonpans
21st September 1745
Mast
Dismantled Railway
Track
Pond
Drain
Memorial
Meadowmill
Meadowmill Cottage
Sinks
Potterie
(Childrens Respite Centre)
Athletics Ground
Depot
Sports Facility
Bowling Club
Sub Sta
Golf Range
BANKTON JUNCTION
A 1
Belvedere
Bankton House
(formerly Col Gardiner's House)
Underpass
Mast (Telecommunication)
Dovecot
Tranent Parish Church
Plotted by:
gisadmin
N
SCALE: 1:2500
Date Plotted: 30/06/2017
The representation of physical assets and the boundaries of areas in which Scottish Water and others have an interest does not necessarily imply their true positions. For further details contact the appropriate District Office.
Scottish Water
Castle House,
6 Castle Drive,
Dunfermline,
KY11 8GG

C. Proposed Site Layout Plan



BLOCK PLAN
SCALE 1:5000



LOCATION PLAN
NOT TO SCALE

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEER'S, ARCHITECT'S OR OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
3. THE CONTRACTOR MUST ENSURE AND WILL BE HELD RESPONSIBLE FOR THE OVERALL STABILITY OF THE BUILDING/STRUCTURE/EXCAVATION AT ALL STAGES OF THE WORK.
4. ALL WORK BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
5. ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES AND REGULATIONS.

Rev	Date	Description	By
P04	30.03.21	AMENDED TO SUIT NEW BASIN LAYOUTS	KK
P03	14.01.21	OVERALL SITE BOUNDARY COLOUR AMENDED TO BLUE AS REQUESTED	PM
P02	08.01.21	AMENDED AS PER CLIENT COMMENTS	PM
P01	03/11/20	DRAFTED FOR PLANNING	CON

Amendments

Project
BLINDWELLS

Title
SITE LOCATION PLAN

Client
HARGREAVES SERVICES (BLINDWELLS) LTD

waterman
South Suite 8 Nelson Mandela Place Glasgow G2 1BT
t 0141 418 1900
mail@watermangroup.com www.watermangroup.com

Status
PLANNING

Designed By	Checked By	Waterman Ref
PM	TH	iles\Aut
Drawn By	**Date**	**Scales @ A1**
CON	03/11/2020	AS SHOWN

Project - Originator - Volume - Level - Type - Role - Number	Revision
17684-WIE-90-ZZ-DR-C-00001	P04

File Path C:\Program Files\Autodesk\AutoCAD 2021\

D. Proposed Drainage Strategy