Lossiemouth East Beach Bridge Replacement

BB2020

Options Report

For Moray Council

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1 Introduction

The existing footbridge connecting the town of Lossiemouth to the east beach has been closed since August 2019 and Moray Council has agreed to deliver a new crossing for the town and its communities. To deliver this footbridge, Moray Council has awarded a single contract to design and build the replacement, and this has been split into two stages. The first stage is to comprise of feasibility and preliminary design work in order to secure funding from Scottish Government and obtain the relevant statutory consents. Beaver Bridges have been awarded this contract following a competitive tender process.

The existing bridge was constructed in circa 1918 at its current position (grid ref. NJ 23775 70453) and has been in operation up until its closure in 2019. The closure notice issued by Moray Council at the time can be found in appendix F. The bridge is a multi-span steel through truss, supported on timber piled piers. The deck consists of timber planks spanning the narrow width of the bridge and the parapet is of simple mesh infill. Between 1913 and 1915 there was a bridge located at the projection of the Esplanade, serving as access to the beach. There are several theories to why the bridge was relocated but unfortunately these cannot be substantiated. The existing bridge is believed to contain elements of the 1913 structure as can be evidenced by comparing historic photography. It is understood to have been constructed by the Elgin Harbour Board who no longer exist. Consequently, the bridge is currently considered ownerless, but this is being investigated by Moray Council.

Beaver Bridges have started the process of investigating the feasibility of providing a replacement crossing by presentation of this options report. Initially two locations were to be investigated for potential crossing points, one local to the existing bridge and one at the location of the 1913 bridge on the Esplanade. An additional third location is also presented as a viable option; this starts at Seatown Road adjacent to the public conveniences and lands local to the 1913 bridge. Various consultations and studies have taken place to inform the options design and appraisal process, these are presented in the following sub sections.

Figure 1 – Location Plan

1.1 Consultations and Requirements

Parties to be consulted in relation to this scheme and engagement thus far:

1.1.1 Moray Council

Employer for the scheme and eventual owner of the completed structure. Also covers the local consent process including but not limited to Planning and Highways Technical Approval.

Project Managers

Moray Council Consultancy Services are fulfilling the role of client's project manager**.** They have been consulted at regular intervals throughout project and have offered valuable input on a number of items.

Planning Officer

Consulted for preliminary comment on the options to understand any likely planning issues.

Transport Development

Consulted to understand potential traffic and user interface issues at the proposed bridge locations. Also advised on mitigation to facilitate each option.

Technical Approval Authority

Consulted on technical matters, compliance of regulations and departures from standards.

Access Officer

The existing bridge forms part of a core path hence consultation required.

1.1.2 The Scottish Government

A business case (produced by Moray Council) including this options report will be submitted to Scottish Government for the purpose of securing funding to construct the proposed bridge.

1.1.3 Lossiemouth East Beach Bridge Replacement Steering Group

A group set up by Moray Council consisting of key local organisations that represent the local population. The group has been established to ensure the expectations of the local community are considered during the development of the replacement bridge scheme. They will also be utilised as a line of communication between the community and project team. The organisations involved are as follows:

Lossiemouth Community Development Trust

A registered charitable organisation which aims to represent and promote plans for residents and tourism in Lossiemouth. A Key driver for the replacement of the footbridge and also responsible for gaining funding in partnership with Highlands and Islands Enterprise for stages proceeding and including the options phase.

Lossiemouth Community Council

A community participation body that has a statutory right to be consulted on planning and licensing applications as elected representatives of the local population.

Lossiemouth Business Association
An organisation representing local business members.

Highlands and Islands Enterprise
A Scottish government development agency responsible for economic and community development for the north and west of Scotland. A partner for gaining funding for the initial stages of the scheme.

An introductory meeting was held with the steering group and Moray Council on November 3rd 2020, where progress was communicated and thoughts and desires discussed. A key action from the meeting was for the steering group to issue a survey to the community asking for a preferred location for the bridge. A similar survey had been completed previously but it was thought best to restart the process to coincide with the current options appraisal. The survey was conducted online via SurveyMonkey and by paper submission to be as inclusive as possible. Three options were presented to gauge opinion with an opportunity to include comment, these were for a replacement in the present position, a new bridge from the Esplanade, and an option for those 'on the fence' who would just like the facility of a bridge regardless of position.
The results of the survey were compiled on November 14th following a suitable consultation period. The total number of votes represents an approximate turnout of 17% for Lossiemouth, assuming a population of 7870. This is the most current available figure and was obtained from the National Records of Scotland data set 'Mid-2016 Population Estimates for Settlements and Localities in Scotland'. The results of the survey are provided below:

Table 1 - Online Survey

Location	Number of Votes	Percentage of Votes
Replacement bridge in present position	550	56.6%
Replacement bridge from the Esplanade	217	22.3%
I don't care. I just want a bridge	205	21.1%
Total	*972*	

Table 2 - Paper Survey

Location	Number of Votes	Percentage of Votes
Replacement bridge in present position	296	78.7%
Replacement bridge from the Esplanade	44	11.7%
I don't care. I just want a bridge	36	9.6%
Total	*376*	

Table 3 - Combined Survey (Online & Paper)

Location	Number of Votes	Percentage of Votes
Replacement bridge in present position	846	62.7%
Replacement bridge from the Esplanade	261	19.4%
I don't care. I just want a bridge	241	17.9%
Total	*1348*	

A total of 324 anonymous comments accompanied the online survey which have been reviewed and summarised for consideration in the development of potential options. The full list of comments has been redacted to remove any suggestion of identity and can be found in appendix G. The common issues raised are listed below:

- **Increased traffic**
  Predicted increase in traffic along Clifton Road if the bridge were to be located at the Esplanade.
- **Parking**
  Increase in walking distance from East Beach Car Park to the Esplanade location compared to the existing bridge. Also concerns that increased on street parking could cause further traffic issues on Clifton Road.
- **Increase in pedestrians at the Esplanade**
  Increase in foot traffic at the Esplanade could impact on public safety. This increase was also considered an opportunity for business on Clifton Road.
- **Access for all**
  The proposed bridge should accommodate access for all with sufficient width to allow free passage. The current bridge is noted as being narrow.
- **Access to amenities**
  Locating the bridge at the Esplande brings together the amenities of Clifton Road with the beach.
- **Exposure**
  Concern there would be an increase in weather and wave actions if the bridge is located at the Esplanade.
- **Heritage**
  The existing bridge and its location are considered aesthetically important as an iconic part of Lossiemouth's heritage.
- **Anti-social behaviour**
  Concerns about vandalism and thrill seekers using the structure to jump from into the water. Concern that the Esplanade location poses more risk to jumpers due to currents and waves.

1.1.4 Crown Estate Scotland

Manages land and property owned by the Monarch in right of the Crown. This includes the foreshore and seabed local to east beach.

According to the records of CES, the seabed below mean low water mark of spring tides at this location, which will be affected by the works, is Crown property under the management of CES.

Consent was required from CES to undertake ground investigations to inform the options appraisal. This consent was for a 4-month period starting from the 19th October 2020. Further licensing and consent will be required to construct the bridge, this will be gained through a marine works (general) application upon delivery of a finalised layout.

CES will still be consulted as part of the formal planning process.

1.1.5 Scottish Environment Protection Agency (SEPA)

Environmental regulator and national flood forecasting organisation.

The construction will be below the National Tidal Limit (NTL) hence it is understood that no authorisation or licensing will be required from SEPA for the works. The SEPA document 'The Water Environment (Controlled Activities) (Scotland) Regulations 2011 – A Practical Guide Ver. 8.4' states 'Engineering works in coastal and transitional waters are not regulated by SEPA under the Controlled Activities Regulations (CAR), but by Marine Scotland'.

SEPA are a statutory consultee in the planning system hence will be engaged as part of the formal planning process.

1.1.6 NatureScot (Formerly Scottish Natural Heritage)

Scotland's nature agency.

Consultation of SiteLink and Magic Map shows no areas of interest within the proposed scheme boundary although the seas around Lossiemouth form part of the following protected areas:

- Moray Firth Special Area of Conservation (SAC)
- Moray Firth Special Protection Area (SPA)

The SAC is designated for its bottlenose dolphin population and subtidal sandbanks whilst the SPA is designated for a number of bird species.

NatureScot have been consulted and have provided information on local protected areas, species and access. The main points of note from the correspondence are:

'Any bridge works at the site of the existing bridge or the previous bridge site will have to be carried out to the satisfaction of SEPA [sic]. This will ensure that there is no adverse impact on water quality. Subject to there being no adverse effect on water quality, my advice is that no qualifying interest of the SAC or pSPA will be affected either directly or indirectly'.*

'The River Lossie is used by otters but it is unlikely that they will rest up local to the sites of the existing and previous bridges, given the amount of human (and dog) activity. Nonetheless, it may be prudent to establish if there is any use of the immediate area by otters or any other protected species which may be affected by proposed works.'

We are supportive of the intention to make public access to Lossie East Beach as inclusive to as many user groups as possible'.

NatureScot will be consulted as part of the formal planning process.

* Engineering works in coastal and transitional waters are not regulated by SEPA under CAR, but by Marine Scotland.

1.1.7 Marine Scotland

Responsible for the licensing of marine activities to protect the marine environment.

A marine license will be required as the proposed bridge is to be constructed in/over the marine environment. In addition, Marine Scotland – Licensing Operations Team (MS-LOT) is of the opinion that the marine activity is of a class or description prescribed in Regulation 4 (c) of The Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013 ("the Regulations") and as such will require pre-application consultation. The pre-application consultation is similar to that involved in a typical planning application and requires a number of elements to be satisfied. These include notification to stakeholders of the intention to apply for a marine license including a published notice within a local newspaper, holding at least one consultation event, and finally producing a pre-application consultation report. MS-LOT have confirmed that the pre-application consultation can be encompassed within the planning consultation if their requirements are met.

1.1.8 Historic Environment Scotland

Public body responsible for the care of and promotion of Scotland's historic environment.

Consultation of PastMAP reveals the area local to the scheme has a Historic Environment Record reference NJ27SW0011, relating to Lossiemouth Old Harbour. There are also Canmore records relating to the Promenade, Quay, existing footbridge, and a maritime listing documenting shipwrecks. There are several listed buildings in the locality including the masonry bridge crossing the outfall of the Spynie Canal.

Lossiemouth is not a Conservation Area and the coastal waters where the works will take place is not a Historic Marine Protected Area. A HES representative has verbally confirmed that there are no particular items of interest within the area of the scheme, hence no objection or restrictions.

HES will only be consulted as part of the formal planning process if the Planning Authority deem it necessary.

1.1.9 The Findhorn, Nairn and Lossie Fisheries Trust

A registered charitable organisation that promotes sustainable management of river resources and fish populations through research, restoration and education.

The Fisheries Trust will be consulted at planning and detailed design stage to seek views on construction practice and potential effect of the permanent works on migratory fish.

1.1.10 Existing Utilities

A Statutory Undertakers search was conducted by Moray Council and the findings included within the works information. An interpretive drawing can be found in Appendix A and the returns are as follows:

- Openreach – No apparatus within the immediate vicinity
- SGN (Gas) – Medium and low-pressure gas supply is indicated within road opposite the existing bridge approach.

- SSE (Electric) – Buried cable indicated within road opposite the existing bridge approach.
- Scottish Water – Water main indicated within road opposite the existing bridge approach. Stormwater outfall indicated to the east of the esplanade projection. Storm sewer runs parallel with harbour wall to outfall.

1.1.11 Proposed Utilities

It is not planned to incorporate any utilities into or onto the proposed structure.

The provision for any illumination on the bridge will be considered at detailed design.

1.1.12 Health and Safety

Under Construction Design and Management regulations 2015 Moray Council will take on the role of the Client, whilst the Contractor will be expected to take on the roles of Designer/Principal Designer and Principal Contractor. The Contractor will be appointed at Stage 2 of the project.

1.2 Geology

The Ground Investigation report can be found in appendix B and is summarised as follows.

The exploratory excavations encountered the following geological profile, in order of superposition:

- Made Ground (Land side only) to depths of 0.8m to 0.9m from ground level.
- Marine Beach Deposits (Beach side only) from ground level to termination depth of 5.1m.
- Storm Beach Deposits (Land side only) from underside of made ground to 6.50m at the Esplanade position and 9.65m to the south of the existing bridge.
- Burghead Sandstone Formation (Land side only) from 6.5m at the Esplanade position.

The naturally deposited Marine Beach Deposits and Storm Beach Deposits are theoretically capable of supporting the proposed bridge structures on ground bearing foundations at a reasonably shallow depth. However, forming excavations on the beach and within the river channel would involve significant temporary works to keep out the tidal waters. Additionally, a large mass of concrete within the flow of water presents a heightened scour risk, something that would require significant consideration at detailed design. To alleviate these risks a piled solution that also incorporates the role of the in-channel piers would be more practical and beneficial, particularly for long term stability.

The exact piling method will be determined at detailed design stage when all the loading conditions are better understood.

1.3 Hydrology

The combined Hydrology and Flood Risk Assessments can be found in appendix C and are concluded as follows:

'This preliminary flood risk assessment has demonstrated a range of events which could be used to assess flood risk to the proposed footbridges. These water levels combine both fluvial and coastal flooding for a number of events with differing likelihood. A fully comprehensive FRA would be needed to identify which values are to be used at detailed design stage, however, it is believed that the existing bridge location would be the preferential location when considering flood risk. As the design is for a footbridge there will be no change to flood risk from surface or ground water and although the bridge will cross the River Lossie, due to the location of the design and fact there is an existing bridge in its location, it is not expected to have any differing effects on fluvial or coastal flood risk.'

This conclusion offers the theoretical best location for the bridge with reference to two key points, these being the effects of wave action and water velocities. The Esplanade location is more exposed to the sea and is positioned over a narrower section of the river so inherently will see the worst of these two factors. For example, the maximum velocity at low tide and 200 year + climate change fluvial event (critical condition) is 1.10 m/s at the existing bridge and 2.50 m/s at the proposed Esplanade bridge location. The difference in these velocities should not draw particular favour to one option as the upper value can be suitably accommodated with considered design.

The FRA also provides a maximum flood level of 4.24m Above Ordnance Datum (mAOD) which is attributed to the '200-year Return Period tidal/storm Still Water Level plus climate uplift' flood condition, see figure 2 for extents. The advice within the report is that the soffit of the bridge should be above this level plus the SEPA recommended freeboard of 600mm, this equates to a clear height of 4.84mAOD. To position the soffit above this level would require the use of long approach ramps to maintain accessibility, increasing cost and the overall footprint of the bridge. In addition, this specific event would flood the whole low level lying area of Lossiemouth, hence the structure would be an insignificant factor overall and is highly unlikely to hinder any receding flow. For robustness, the bridge and its supports will be designed to resist this event, but for the purpose of clearance to the soffit of the main river channel, it is proposed to adopt a more pragmatic approach. The '200-year Return Period fluvial plus 37% climate change plus High Astronomical Tide plus climate change' flood condition will be proposed in this instance as the 2nd highest but more likely flood event. This gives a level of 3.55mAOD as a worst case at the existing location, and with a 600mm freeboard gives a soffit clearance of 4.15mAOD. For reference, the soffit of height of the existing bridge over the main channel is approximately 4.00mAOD.

The proposed clearance and alignment of the chosen bridge will need to be agreed with Marine Scotland and additionally SEPA if required.

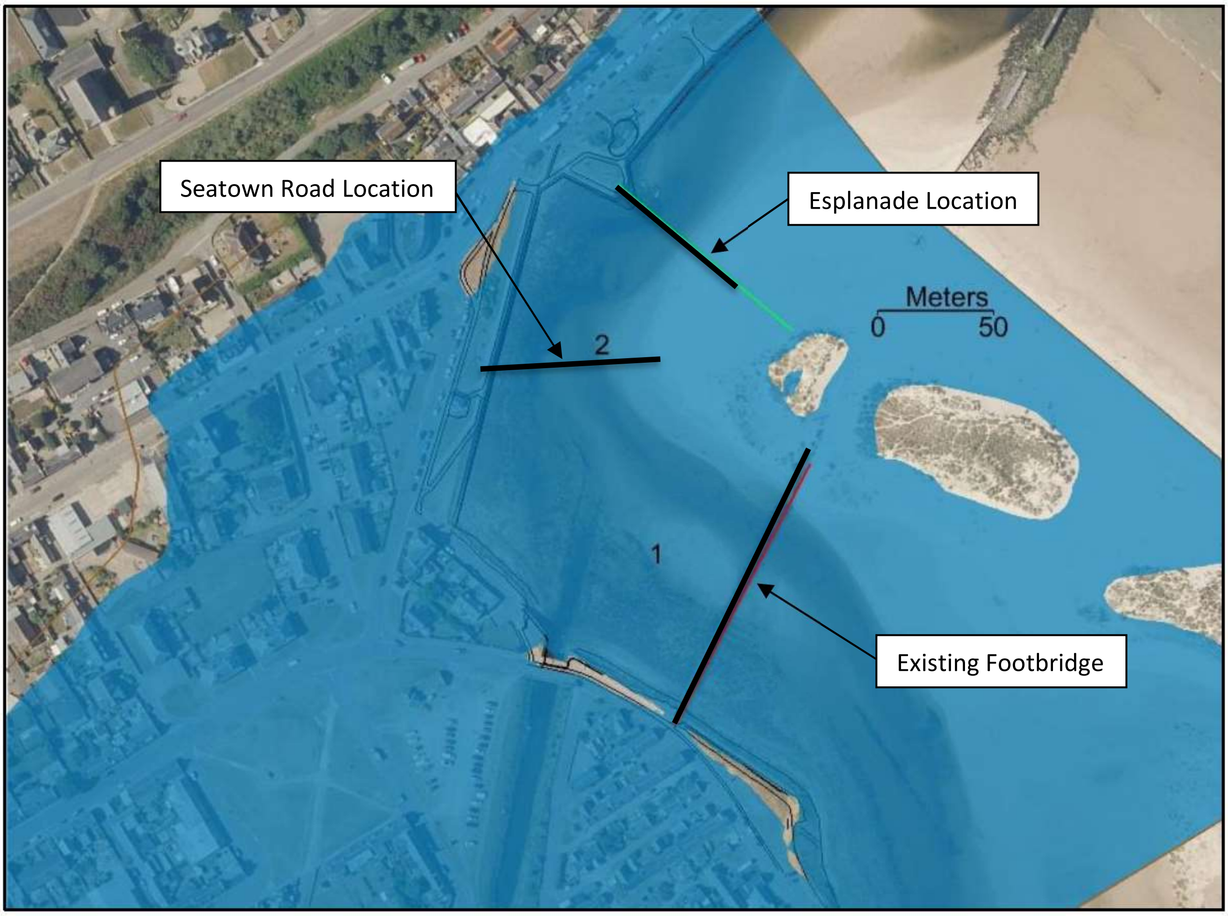


Figure 2 - 200-year Return Period tidal/storm Still Water Level plus climate uplift' flood condition (4.24mAOD)

A sediment movement study has also been conducted as part of the works and can be found in appendix D It is concluded as follows:

'In addition to the potential influence of fluvial scour in undermining the bridge piers, sand accumulation (overloading) has likely been an active factor in the River Lossie outlet as whole. However, overall, in evaluating the dynamic nature of both the dunes and riverbed within the area of the proposed footbridge relocation (Esplanade), there appears to be a lower risk of failure due to sediment dynamics at the site of the existing footbridge than the alternative one. This conclusion is based on apparently lower rates of channel migration and a wider channel that appears to facilitate broader rather than more focused scour associated with tidal fluctuations.'

As per the FRA conclusion, this preference for location should not rule out the other but the findings must be considered in the design and weighed up against all other factors when choosing a location.

1.4 Environment

1.4.1 Ecology and Habitat

A Preliminary Ecological Appraisal (PEA) survey has been conducted and can be found in appendix E. The report concludes as follows:

The proposed works are in an area which has significant human disturbance. The dune and saltmarsh grasslands are an important habitat, and damage to these areas should be kept to a minimum. A range of bird species use the area but are relatively unlikely to nest close to the bridge. However, any disturbance of breeding should be avoided by either timing the works out with the breeding season or checking the ground prior to commencing work.

Constraints culminating from the PEA:

- Efforts should be made to limit the footprint of the proposed footbridge works within the saltmarsh and dune habitats.
- To avoid disturbance to traveling Otter, works local to the river should not take place during the hours of darkness.
- Any works that could cause entrapment (trenches, pipes etc.) should be covered or have an allowance for escape.
- Construction should avoid the main bird breeding season (Feb – July). However, if this is not possible, the site should be checked for the presence of nesting birds before works commence.
- If piling is to be conducted a risk assessment should be undertaken to understand the potential disturbance to fish and marine mammals.
- During construction, work should stop if seals come close to the site or start to use it to haul out. Work should only resume once the seal has left the area, to avoid any risk of accidental injury.

A Habitats Regulations Appraisal (HRA) should be conducted for any projects which affect Natura sites, such as Special Areas of Conservation (SAC), or Special Protection Areas (SPA). The project is not within a Natura site but is local to both the Moray Firth SAC and SPA. The Moray Firth SAC is designated for its subtidal sandbanks and bottlenose dolphins and the SPA for its bird species hence it is unlikely that a link can be formed between the proposal and those specific features. Therefore, it is assumed a HRA is not required but this could change should a piling assessment show there is potential for disturbing any dolphins in the area.

To summarise, the environmental constraints do not appear overly onerous and neither do they warrant favour of a particular location for the proposed footbridge.

1.4.2 Contamination

The Ground Investigation Report as found in appendix B contains a preliminary evaluation of potential chemical and gaseous contamination of the site with a corresponding risk assessment in relation to contamination. The results of this risk assessment conclude that the existing site possess a negligible to low risk to all identified receptors.

1.5 Land and Property

Moray Council are currently investigating land ownership within the immediate area of the proposed crossing locations. They are also trying to determine the ownership of the existing bridge. No pertinent issues are envisaged. Full details of the findings will follow.

2 Options

The following section presents options and supporting information for the provision of a pedestrian crossing from the mainland of Lossiemouth over the tidal River Lossie and onto East Beach.

A total of five options are documented in section 2.1, this includes the standard 'do nothing' and 'do minimum' scenarios. The other three options provide alternate locations for a replacement bridge.

Section 2.3 is allocated to the investigation into bridging materials and finishes with a focus on durability. This has been separated from the preceding section to highlight the importance of selecting suitable materials, it also allows the opportunity to present sub-alternatives for each location.

Section 2.4 provides capital and whole life costing for all option derivatives (location + material/finish) to assist the reader in understanding the monetary pros and cons for each.

The ensuing subsections provide further collective information relating to each option, including design, risks, and operation.

The options are compared and concluded in section 3.

2.1 General Option Descriptions

2.1.1 Option 1 – Do-nothing

Under the do-nothing scenario the existing bridge would be left as is, closed to access and allowed to deteriorate at an ongoing rate. The public would continue to have no direct link to East Beach, potentially impacting the local economy and wellness of the community through loss of a vital outdoor asset.

In the short term it is envisaged that the superstructure will progressively collapse, causing disruption of flow and potential contamination (risk of lead-based paint on steelwork) to the water below.

The safety risk will also continue to evolve, and it is likely further measures will be required to restrict access on and below the structure to avoid any potential harm to the public. Deteriorating, seemingly abandoned assets can also attract unwanted attention and become a magnet for antisocial behaviour.

Without a usable footbridge it is possible that the reduction in human footfall will allow for improvement of the natural habitat, and in turn increasing the diversity of species frequenting East Beach. Given time this positive could become a major constraint to any future crossing.

All the above points should be considered concurrent with the issue of unknown ownership and the subsequent liability should problems arise going forward.

Table 4 – Option 1 Considerations

Positives	Negatives
Zero capital cost to Moray Council	The deteriorating structure presents a safety risk and will become a visual eyesore
Less human disturbance on East Beach resulting in a potential ecological benefit	Impact on local economy through loss of major attraction
	Impact on wellness of local community through loss of access to a valued outdoor asset
	Disturbance of river flow should the structure collapse
	Unknown ownership

2.1.2 Option 2 – Do-minimum

Considering the points raised in the do-nothing option, the do-minimum scenario would need to address the issues that the existing bridge presents.

Unfortunately, the option of refurbishing the existing superstructure is clearly not feasible. The majority of steel members appear to have significant section loss with several areas where sections are missing in their entirety.

The existing wooden piled piers appear to be in good condition for their age and the option for their use to support a new superstructure could be considered. A key consideration for the reuse of the existing piles is that the proposed replacement superstructure should not impose loadings that the substructure and its foundations were not originally designed for. To achieve this, the replacement superstructure would be limited to the footprint and self-weight of the existing structure as not to impart any additional or destabilising loads. The existing bridge is approximately 1.2 metres wide between parapets and 120 metres long.

The 100-year plus age of the substructure does raise some concern as it is likely the remaining working life is shorter than would be desired. Taking this into account it would be prudent to design the superstructure with consideration to the reconstruction of the substructure at a later date. This would require the temporary removal of the superstructure, demolition of the existing substructure and subsequent reconstruction to allow replacement of the bridge.

Table 5 – Option 2 Considerations

Positives	Negatives
Crossing to East Beach reinstated	Remaining life of substructure unknown
lower capital cost in relation to complete replacement	Short term solution, theoretical whole life cost will be high
Heritage retained	The bridge would continue to be narrow, constrained by the existing substructure
	Ownership of the existing bridge would need to be transferred to Moray Council, potential to be a protracted process

Bridge Replacement Options

Options 3 to 5 below give differing positions for replacement structures, documenting how each one will be achieved. Options 3 and 4 have been taken forward from the pretender proposals issued by Moray Council. Option 5 has been considered as an alternative. The following points are applicable to all the options and have been included in this prefacing section to avoid repeat text.

- All superstructures would be set a suitable distance above High Astronomical Tide (HAT) level in their entirety to ensure they are not regularly submerged.
- The span(s) over the main river channel will be positioned clear above the flood level with the approach spans set at a maximum gradient of 1 in 20 to facilitate ease of access for all.
- Where necessary to lift the superstructure out of HAT level, an approach structure with compliant gradient will be incorporated on the land side.
- Where future flood defences are considered it is proposed that flood gates are provided at the bridge access as opposed to setting the approach height above the level of flood. This negates the need for lengthy ramps to navigate over the defence infrastructure.
- At the beach approach a concrete abutment and ramp is proposed, set well into the ground with an allowance for erosion and shifting of the sands. The front face of the buried ramp will be formed in steps as to allow continued access should the local area erode considerably. The structure would be protected from scour by rock armour with the addition of native planting if feasible. It is proposed to investigate the use of a sand-coloured pigment within the surface of that the ramp to allow it to blend in with the surroundings.
- Where a structural steel superstructure is preferred, an FRP deck board system will be proposed to allow for free draining and increased durability overall.
- Where FRP or Aluminium superstructures are preferred they will incorporate decking systems manufactured in a similar material.
- Overall clear width on the bridge deck will be 3.5m.
- Minimum parapet height will be 1.4m.

2.1.3 Option 3 – New Bridge Local to the Existing

See Drawings BB2020-GA-001, BB2020-RV-001 & BB2020-TR-001 in Appendix A for the proposed General Arrangement, rendered conceptual views and public network connectivity proposal.

The position for a bridge at this location is constrained by existing structure. The optimal position to land on the beach is between the two established dunes where the existing structure lies. Some minor adjustment to the western dune may be required to facilitate the abutment and ramp construction, and to also prevent it from being encompassed in sand. A number of positions have been investigated on church street and it is proposed to land the structure local to the Spynie Canal bridge (grid ref. NJ 23721 70424) to take advantage of the current public paved area and shorter distance to the East Beach carpark, this is approximately 30m to the northwest of the existing bridge. Between these points the proposed bridge would approximately be made up of 5 separate 29m spans equating to a total length of 145m.

Considering the length of the individual spans it would be wise to adopt half through truss forms similar to that of the existing bridge, owing to their inherent structural efficiency. Above 20 metres in span a simple underslung steel beam arrangement starts to become uneconomical and presents issues with clearance given the increasing depth of beams required to support the loading. A half through truss allows the user to traverse in between the main structural elements as opposed to above, this results in a shallow overall deck depth meaning less elevation is required to clear obstacles. Using a truss form would provide a replacement bridge that is sympathetic to the existing structure but with the betterment that current bridge standards bring.

Hydrology in this area is favourable which is clear to see given how long the existing structure has stood (+100 years). The proposed structure would have a vastly reduced number of supports in the water so an improvement over existing.

As this position is local to the existing there should be no greater impact on the locality through traffic or pedestrian movements than there would have been pre-closure of the existing bridge. It is noted that the existing footpath in this location is not particularly wide at approximately 1.4m to 1.6m in width, so a reduced distance from the car park and other amenities is favourable. For reference, the Transport Scotland document Roads for All – Good Practice Guide for Roads stipulates '*The minimum width of a footway is to be 2000 millimetres in normal circumstances, since this width allows two wheelchair users to pass'.*

This location presents difficulties with construction as access is served from one direction only and the limited space for a works area would likely result in issues for residents east of the Spynie Canal Bridge. Sea defences are also likely to be compromised during the works hence temporary measures would be required.

Figure 3 – Option 3 – View from Church Street

Table 6 – Option 3 Considerations

Positives	Negatives
The provision of a new bridge structure with a 120-year design life.	Longest overall span of the 3 potential replacement bridge locations, hence greatest capital and whole life costs.
There is likely to be no impact to the existing traffic and pedestrian movements as the bridge remains in a similar locality to the existing.	The existing footway to the bridge from the East Beach carpark is narrow.
Comparable overall appearance to the existing structure.	Constrained works area off church street, disturbance to local residents is likely to be unavoidable during construction.
The existing bridge has survived over 100 years in this location, likely owing to the shelter from the dunes and favourable hydrology.	Sea defences will be compromised during the works hence temporary measures will be required.
	The location appears disconnected from local amenities.

2.1.4 Option 4 – New Bridge at the Esplanade

See Drawings BB2020-GA-002, BB2020-RV-002 & BB2020-TR-002 in Appendix A for the proposed General Arrangement, rendered conceptual views and public network connectivity proposal.

The historic projection from the sea wall at the Esplanade (grid ref. NJ 23725 70637) provides a theoretical ideal location to cross from the mainland to East Beach as the river channel is at its narrowest point. Positioning the bridge more local to the amenities of Clifton Road can present opportunities to both business and users, enabling people more ready access to shops and café's when visiting the beach. The location also offers greater scope for incorporating the bridge into a wider public realm improvement scheme, but this and its potential benefits are something that would have to be explored separately.

The bridge would project from an increased level at the Esplanade over to the beach in an envisaged 4 spans totalling an approximate 75m length. The approach spans would rise at 1 in 20 to meet an arched span over the main river channel, clearing the required flood soffit height as required.

At this location it is felt that a steel beam/plate girder type bridge would suit best for a number of complimentary reasons. Firstly, the distance to the proposed supports allows for an economic solution to this style of bridge, particularly if designed as continuous across the supports. The underslung superstructure allows for a clean looking deck on which an aesthetic parapet can be incorporated. As an addition and safety betterment to the Esplanade area, matching parapets could be placed on the edge of the sea wall to tie in with the bridge. To expand upon the parapets design, it is proposed to adopt a backward raking post (to prevent climbing) and horizontal tension wire system to allow flood water to flow through at peak flood events. Should a storm event damage the tensioned wires within the parapet, these can be easily replaced at reasonable cost in comparison to more rigid parapet systems. For clarity, a truss form has not been considered at this locality as a beam style bridge is more favourable for several reasons as discussed above.

Hydrology in this area is less favourable than in the existing position. Flood levels are very marginally reduced but peak water velocities are over twice as high due to the constriction of the channel. It is envisaged that the proposed bridge form will help alleviate these issues by better allowing water to flow through the structure at high flood because of its relatively small cross-sectional area. Sediment movement is predicted to be more active in this location, but this can be accounted for through considered foundation design.

There are concerns that moving the crossing to this location would focus a large amount of activity into one area of Lossiemouth, creating traffic and pedestrian safety issues. Moray Council traffic engineering team have been contacted for advice on how best to facilitate the bridge at this position and their recommendations have been included in drawing BB2020-TR-002.

Figure 4 – Option 4 – View from The Esplanade

Table 7 – Option 4 Considerations

Positives	Negatives
The provision of a new bridge structure with a 120-year design life.	The location is more exposed to the sea, and the river channel is constricted hence less favourable hydrology.
Shortest overall span of the 3 potential replacement bridge locations, hence lowest capital and whole life costs.	Potential for increased traffic and pedestrian safety issues as Lossiemouth's attractions will be focused more to one area.
Potential economic and social benefit as located closer to amenities. Better integration into the wider public realm.	Greater distance from East Beach carpark for pedestrians to walk compared to existing.
The shorter individual spans allow the use of an underslung structure providing a more open and pleasurable bridge crossing.	The seawall in this area is noted to be in poor condition.

2.1.5 Option 5 – New Bridge at Seatown Road

See Drawings BB2020-GA-003, BB2020-RV-003 & BB2020-TR-003 in Appendix A for the proposed General Arrangement, rendered conceptual views and public network connectivity proposal.

As an alternative to the bridge locations suggested at tender stage, a position between the two was investigated in an effort to balance the pros and cons of each. Positioning the bridge at the Esplanade has its benefits but there are clearly some public concerns that have already been covered in option 4. The proposed bridge local to the existing is long and set some distance away from the main amenities but again there are also positives to its location.

The proposed alignment from this location starts 25m to the northeast of the public conveniences on Seatown Road (grid ref. NJ 23669 70566) just above the sea wall and continues to the beach over an approximate total distance of 100m, made up of 3 separate spans. This location is 90m southwest of the Esplanade option and 140m to the north of the existing option. The position balances access to the frontage of Clifton Road without directly causing further traffic issues. It is a short distance to the public conveniences and the existing Lossiemouth East Beach carpark, the latter being a key concern raised in the public survey. The area in which the bridge starts is a sizable public space which could be altered locally to improve tie-in with the public footpath and road networks.

Given the length of the individual spans it would be prudent to adopt truss forms to keep the option within a sensible budget. Although this location is some distance away from the existing bridge, its alignment is of similar vein and could potentially offer a sympathetic replacement for the locally admired bridge. The reduced overall span may also make more costly durable material options more economically viable in comparison to the existing alignment. A beam bridge similar to that proposed at the Esplanade could be proposed but this would require additional supports within the channel, increasing cost as a result.

The hydrology assessments and FRA do not focus on this area as it was not originally intended to investigate a bridge in this location, so flow velocities and sediment activity can only be predicted. Given that the channel is wider at this point and there is slightly more protection from the effects of the sea, it would be sensible to assume more favourable hydrological conditions in relation to the Esplanade option.

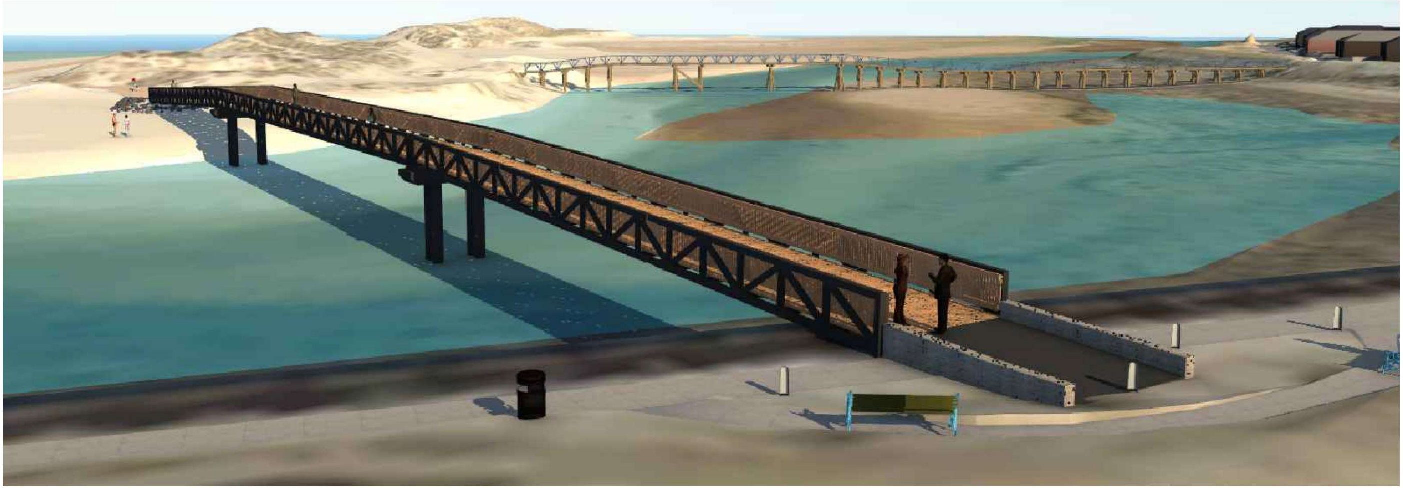


Figure 5 – Option 5 – View from Seatown Road

Table 8 – Option 5 Considerations

Positives	Negatives
The provision of a new bridge structure with a 120-year design life.	A bridge has not been sited in this location before so may present planning issues.
A middle ground of the 3 replacement options in many respects.	Not the most cost-effective option.
Lands in an open existing area adjacent to public conveniences.	

2.2 Durability/Design Life

The primary structure for options 3 to 5 and the superstructure only for option 2 would be design working life category 5 (typically > 120 years) in accordance with table 7.1of CD 350.

The following replaceable/maintainable parts will be design working life category 2 (up to 50 years):

- Bearings
- Parapets
- Decking system
- Protective coatings

The remaining working life for the existing footbridge sub-structure as utilised in option 2 cannot be quantified at this stage. As a high-level assumption, 10 years remaining service has been considered.

2.2.1 Superstructure Materials

The following gives a non-exhaustive list of pro's and con's for typical bridging materials which would be applicable to options 2 to 5:

- Weathering Steel (Corten)
    - Forms a protective rust 'patina', that inhibits corrosion and hence does not require additional protective coatings. 120-year design life achievable without major maintenance.
    - Similar properties to ordinary structural steel.
    - Off-site construction.
    - Requires careful detaining to prevent areas of accelerated corrosion and unwanted staining.
    - **Not suitable where in contact with chlorides e.g., salt spray and seawater contact.**
    - Patina can be affected by human contact.
    - Removal of graffiti very difficult.
    - Availability of Hot Rolled Sections limited within the UK.
    - Easily recyclable.

- Structural Steel
    - Commonly used for footbridges within the UK.
    - Requires a maintainable protective coating to prevent corrosion. Several systems available with a typical life of up to 25 years to re-coat.
    - 120-year design life achievable if protective coating is maintained.
    - Strong, ductile, and durable.
    - High quality off-site construction.
    - Considered detailing required to prevent water ponding.
    - Cost effective.
    - Easily recyclable.

- Aluminium
    - Corrosion resistant. Does not require a protective coating but does form an undesirable patina over time. 120-year design life achievable without major maintenance.
    - Coating required for decorative purposes.
    - Lightweight.
    - Lower strength properties in comparison to structural steel.
    - Careful detailing of connections and fixings to avoid galvanic corrosion.
    - Non typical highway bridge construction material in the UK.
    - High initial cost.
    - Off-site construction.
    - Easily recyclable.

- Fibre Reinforced Plastic (FRP)
    - Durable, does not corrode as per traditional structural steel.
    - Assumed to achieve a 120-year design life but there is limited historical performance data.
    - High strength to weight ratio.
    - Requires a maintainable coating to protect it from UV degradation, weathering, and water ingress.
    - Low shear strength.
    - Requires careful detailing of connections.
    - High initial cost.
    - Off-site construction.
    - Pultruded and moulded options, the latter being custom at a time and cost increase.
    - Difficult to recycle.

- Timber (Hardwood)
    - **Low maintenance if specified suitably but required design life is unachievable.**
    - Organic appearance.
    - Sustainable if sourced correctly (genuine FSC certification).
    - Requires careful detailing of connections.
    - Off-site construction.
    - Non typical highway bridge construction material in the UK.
    - Easily recyclable.

- Reinforced Concrete
    - Durable when detailed and specified correctly.
    - 120-year design life achievable but questionable in marine environment.
    - Use in composite construction e.g., steel beams and concrete deck.
    - Flexibility of form.
    - Heavy in comparison to other materials. More substantial superstructure.
    - In-situ construction phase can be lengthy.
    - High volume of wet works over water not ideal e.g., environmental hazard.
    - Recyclable.

- Stainless Steel
  - Proven durability (when specified to suit the environment).
  - Very high cost.
  - Non typical highway bridge construction material in the UK.
  - Typically used for aesthetic purpose and in areas of high wear e.g., handrails.
  - Recyclable.

Based upon the preceding points there are three clear materials which should be considered for construction at this location, Structural Steel, Aluminium and FRP.

Structural Steel is very typical in footbridge construction and with considered detailing and surface protection can deliver both an aesthetically desirable and durable structure. Its long-term durability is questionable in a marine environment, but its comparable low capital cost allows for more balanced view towards the whole life cost. Additionally, steel offers more aesthetic options in comparison to FRP and Aluminium which within budget constraints are likely to be based on pultruded and extruded modular forms.

Aluminium is commonly used in marine environments owning to its corrosion resistance and can be typically seen used in gangway construction at ports and marinas. It is not a commonly found material in UK bridging so it can be difficult to source. Typical, aluminium bridge construction follows the truss form using extruded sections that are bolted together at node points. Aluminium has lower strength properties in comparison to steel hence a similar structure will need to be larger to support the same load. Notwithstanding this the aluminium bridge would still be lighter of the two. Construction in aluminium does require a much higher capital cost compared to traditional materials but whole life costing will be vastly reduced.

Fibre Reinforced Plastics are becoming more common in UK bridging particularly in the rail industry. Their long-term performance is still questionable due to lack of historic data in the field. Its many advantages (e.g. non-corrosive, high strength to weight, non-conductive) can strike the balance of this uncertainty. FRP bridges are typically constructed in modular form using standard pultruded sections. For footbridges, this usually consists of hollow sections joined together at node points with reinforcing stainless-steel plate connections to form a truss. This type of structure can look bulky to compensate for its relatively low stiffness, the truss is also tall in comparison to those of other materials. Wet lay custom moulded decks are a possibility but would come at considerable cost with long lead-in times for a one-off application such as this.

The remainder of materials have been dismissed for several reasons:

- Weathering steel is simply not suited to coastal environments.
- Concrete does not typically lend itself well to large scale construction over water due to the environmental risk and construction time. It is also an inherently heavy material for a footbridge, and the embedded nature of the required steel reinforcement can be problematic should chlorides be able to penetrate.
- The design life of hardwood is very questionable particularly in a damp climate.
- Stainless steel is vastly expensive.

These dismissals are not total as it is likely that discrete elements will use the materials where suited. Tropical hardwood is a good decking material, stainless steel is well suited to decorative items and concrete will be used for the substructures.

2.2.2 Protective Coatings

Two of the three materials chosen to take forward from the previous section require some form of protective coating to ensure a serviceable working life of 120 years. Raw steel in its very nature will corrode if left unprotected, and in a coastal environment that process will be drastically accelerated. FRP does not corrode but is susceptible to degradation via Ultraviolet Light exposure from the sun, weathering and water absorption hence requires a suitable paint or gel coating. Aluminium is the only material of the three which strictly does not require a protective coating, it is typically painted for aesthetic reasons as bare aluminium oxidises over time leaving a surface patina. This patina does not affect performance but can look undesirable, particularly if organisms such as Lichen develop on the surface.

The following documents two typical surface treatments that could utilised in this location, the first is limited to steel protection and the latter applicable to all:

Hot Dip Galvanising for Structural Steel

Applicable only to open section steel (closed hollow sections are not typically suitable as venting holes are required), Hot Dip Galvanising (HDG) provides a zinc barrier between the coated steel surfaces and their environment. The process provides protection through a continuous, tough metallurgically bonded coating that has the ability to self-heal. The zinc coating will corrode in preference to steel, sacrificing itself and resealing the exposed area if not too significant in size.

Galvanizers Association (GA), the representational body for the hot dip galvanizing industry in the UK and the Republic of Ireland have been consulted to understand the feasibility of a HDG coating in this specific location. They have conducted wide scale atmospheric corrosion rate testing to produce the Zinc Corrosion Map and for Lossiemouth this map indicates a background atmospheric corrosion rate 1-micron per year. Further interrogation of the data base of results by a technical representative of GA indicates a background atmospheric corrosion rate of 0.4-microns per year for a sample located at Lossiemouth. In addition to this it has been advised that an additional 1.5-micron loss per year be allowed for considering the exposure to seaborne chlorides. Based upon available data a value of 2.5-micron per year might be taken as an indication of the expected corrosion rate.

In order to maximise the level of corrosion protection provided the following specification for a thicker galvanized coating would be proposed which assumes all steelwork is more than 6 mm thick.

Grit blasting to Sa2½ with G24 chilled angular iron grit prior to batch hot dip galvanizing to BS EN ISO 1461 : 2009 to achieve a nominal coating thickness of 140-micron.

Assuming a total annual corrosion rate of 2.5-microns per year a 140-micron coating would give and expected coating life of 56 years.

Galvanized steel can also be painted for additional corrosion protection or for aesthetic reasons if the dull grey appearance is not desired. While painting will increase the overall level of corrosion protection it is likely that there will be a reduced time to first maintenance due to the shorter working life of most paint systems. It must also be noted that failure to maintain the paint system could allow saline seawater to sit and propagate beneath compromised areas causing a localised increase in the corrosion rate.

There are limits to the type and size of the fabrication that can be physically galvanised hence this can be a deciding factor to its feasibility.

Paint systems

Typically, a steel footbridge would be protected with a Type II (for Inland Difficult Access, **Marine Ready** or Difficult Access) paint system in accordance with Series 1900 of the Specification for Highways Works. This system is used on approximately 90% of all steel pedestrian structures in the UK regardless of location owing to the difficultly in repainting an operational asset in a typical trafficked area.

A Type II paint system has an approximate design life of up to 25 years and after that period it is predicted that the bridge will require a full repaint. As a result, in the whole 120 year predicted life of the structure it can be reasonable to expect to repaint the bridge up to a minimum of 4 times. This can be a costly process, mainly because of the temporary works involved.

As an alternative to the standard approved polyurethane paint system (Type II) there is a new product to the UK market that has potential for a vastly increased serviceable life. Fluoropolymer paint has started to appear on some national infrastructure projects with manufacturers predicting serviceable lifespans in the region of 60 years. Previously the system has been used under a departure from standard but recently it has been approved by the Highways Authority Product Approval Scheme (HAPAS). To gain HAPAS certification a system must be expected to perform satisfactorily for a period in excess of 15 years before its first major maintenance. The current standard regime of testing for certification does not go beyond this, hence the acceptance of its predicted life would need to be agreed with the adopting body. Initial discussions with manufacturers and painting contractors suggest a 100% increase in cost over the equivalent traditional type II system.

If a 60 year plus serviceable life can be agreed on a Fluoropolymer paint system, then the predicted whole life cost of a structural steel asset would reduce considerably.

Surface colour and combinations are limitless within reason. This gives the opportunity to create a cost-effective statement if desired.

The majority of the above also applies to decorative aluminium finishes, basically any coating applied to it will require forward maintenance hence will need inclusion into the whole life costing analysis.

The FRP pultruded sections that are considered are coated in a Fluoropolymer paint system as noted above. The manufacturer of these sections offers a warranty based upon a minimum coating life of 25 years. As also mentioned above, it is anticipated that coating life will surpass this but remains a maintainable element for consideration.

2.2.3 Substructure

All substructures for options 3 to 5 would be designed in accordance with the relevant standards with the aim of providing minimal to no maintenance. Concrete will be specified in accordance with BS 8500-1 utilising the appropriate exposure conditions and reinforcement cover to achieve a 120-year design life. Where required, exposed steel to piles will provide sufficient sacrificial thickness to allow for corrosion loss without effecting structural performance over the working life.

2.3 Capital and whole life costing

High level capital cost estimates have been derived utilising previous experience of bridging projects and with the assistance of relevant specialist sub-contractors.

Each option has been costed utilising the appropriate materials for each. Pricing each material allows comparison of capital cost against future maintenance cost. This is particularly pertinent in justifying the use of high capital cost low maintenance materials such as aluminium. Option 2 has been limited to the use of a steel truss to keep within the spirit of a do minimum scenario, namely low cost.

Table 9 - Superstructure Costs

Option	Material and Form	Cost £
1	Not applicable	0
2	Steel Truss	400,000
3	Steel Truss	650,000
3	Aluminium (Raw) Truss	1,050,000
3	Aluminium (Painted) Truss	1,255,000
3	FRP Truss	1,075,000
4	Steel Beam/Plate girder	450,000
5	Steel Truss	500,000
5	Aluminium (Raw) Truss	800,000
5	Aluminium (Painted) Truss	900,000
5	FRP Truss	800,000

Note, prices are for supply only. Paint allowance for steel options is a standard type II system.

Table 10 - Substructure, installation, and all other associated costs

Option	Cost £
1	0
2	500,000
3	1,500,000
4	900,000
5	1,200,000

Note, assumes the same costings for each superstructure material. Option 2 excludes substructure as the existing is utilised.

Whole life costing for a 120-year period has been estimated utilising the DMRB document CD 355 'Application of whole-life costs for design and maintenance of highway structures' and the CIPFA Structures Asset Management Planning Toolkit. Net Present Values are presented in table 6, these are the value of costs incurred at future dates when discounted to the present value year. Discount factors taken from the 'Green Book' are based on a discount rate of 3.5% for years 1-30, 3.0% for years 31-75 and 2.5% for years 76-120.

The following assumptions have been made in calculating the Net Present Value of the anticipated maintenance activities over the 120-year life of each structure:

- It is assumed that the existing substructure for option 2 has a remaining working life of 10 years and will be replaced in its entirety after this period. This cost is added to the maintenance value.
- Reapplication of finish to the painted steel structures is assumed to be required every 20 years.
- Reapplication of finish to the painted FRP and Aluminium structures is assumed to be required every 30 years.
- Reapplication of the resin bonded nonslip deck surface on the Aluminium structures is assumed be required every 10 years.
- Replacement of the FRP deck boards on the Steel and FRP structures is assumed to be required every 30 years.
- A percentage uplift of 20% is applied to all activities to cover Works Contract Preliminaries and Design and Works Supervision Costs.
- There are no provisions for traffic management.
- The bridge is assumed to be in a severe environment hence a reduced cycle time to activity has been adopted.
- An estimate of cost for General and Principal Inspections is included.

Table 11 - Whole life cost of complete structure

Option	Material and Form	Maintenance Net Present Value £	Net Present Value Total (inc. Capital) £
1	Not Applicable	0	0
2	Steel Truss	1,800,000	2,700,000
3	Steel Truss	550,000	2,700,000
3	Aluminium (Raw) Truss	190,000	2,740,000
3	Aluminium (Painted) Truss	390,000	3,145,000
3	FRP Truss	385,000	2,960,000
4	Steel Beam/Plate girder	345,000	1,695,000
5	Steel Truss	400,000	2,100,000
5	Aluminium (Raw) Truss	125,000	2,125,000
5	Aluminium (Painted) Truss	290,000	2,390,000
5	FRP Truss	290,000	2,290,000

2.4 Health and safety, and potential risks and constraints to the project

The following are unusual hazards and risks that have been identified following a preliminary design risk review:

- **Effects of the sea – Options 2 to 5**
  Changing tides, storm surges and flood should be considered through the life of the structure. A competent specialist marine contractor should be consulted at construction stage with measures put in place to safeguard construction workers and the public throughout the project.
- **Jumping from the bridge for leisure and self-harm purposes – All options**
  It is understood that people frequently jumped from the existing bridge into the water below for pleasure. The location of the bridge and the ability to climb over should be considered in the design to dissuade the activity. The existing bridge is difficult to access following the installation of barriers, but a risk of unwanted entry and jumping is still present.
- **Alcohol induced incident – Options 4 & 5**
  There is a possible increase in risk of incident particularly at the Esplanade as the bridge would be directly opposite establishments selling alcohol.
- **Unexploded Ordnance – All options**
  See section 2.8.2
- **Condition of the existing sea walls – All options**
  See section 2.8.5

2.5 Loading and Usage

It is proposed that a complete replacement footbridge (options 3 to 5) be designed for unsegregated combined use by pedestrians and cyclists in accordance with the DMRB document CD 353, providing a 3.5m wide clear footway and 1.4m high parapets. Although the route is not particularly suited to cycling, the width prescribed will offer ample space for a multitude of users to cross without conflict. The wide consistent width will also allow users to seek refuge at any point along the bridge without impeding those around them.

The proposed bridge will not be designed for equestrian usage as it is felt the governing requirements will far out way the benefits of inclusion. For instance, the two main documents for parapets, BS 7818 ‘Specification for pedestrian restraint systems in metal’ and CD 377 ‘Requirements for road restraint systems’ call for a minimum of height of 1.8m for equestrian usage. Unfortunately, high containment parapets are difficult to accommodate visually and can severely impact the ability of other bridge users to experience the landscape. High sides to a structure can also give the effect of funnelling and enclosure, something that is particularly undesirable to all users on longer crossings. The exclusion is no change to the present arrangement as the existing bridge is not suitable for equine use.

The bridge will be designed for pedestrian Loads in accordance Section 5 of BSEN1991-2 ‘Actions on structures - Traffic loads on bridges’ and its accompanying UK National Annex. In addition, these codes define a concentrated load on the bridge deck in Cl. 5.3.2.2. Our understand is that this load relates to quad bikes and equine traffic, which we propose the bridge is not subjected to as it can restrict the type of deck construction. Adequate signage and physical barriers in the form of bollards would be provided to prevent access from these users. As such this load will be omitted along with the Service Vehicle loading (Cl 5.3.2.3).

2.6 Proposed Design Method

To ensure robustness the complete scheme will be designed as a Roads project with reference to the Design Manual for Roads and Bridges (DMRB) and its associate standards and guidance.

The superstructure regardless of form shall be analysed using a linear elastic 3D space frame with a commercial computer package and by simple hand calculations.

The truss options will be modelled as simply supported and treated as pin jointed structures, but with moment connections (and rotational stiffness) for the U-Frame restraints to the top chord. The deck would be considered to act independently of the structure with plan bracing incorporated to provide the lateral restraint to hydrodynamic, wind and other transverse loadings.

The beam bridge option from the Esplanade will be modelled as a continuous structure comprising a minimum of two main beams, positioned beneath the deck and attracting live load based on linear distribution. The beams will be designed to act structurally independent in terms of loading, but for strength purposes they will be treated as braced at centres to correspond with the position of the lateral bracing.

The analysis model will be augmented to provide eigenvalues for the whole structure to evaluate the principal modes of vibration with the aim of providing a suitably comfortable structure for the user. CD 353 of the DMRB notes 'Footbridges with vertical modes of vibration less than 5 Hz and/or lateral modes of vibration less than 2.5 Hz can be particularly susceptible (to vibrations), and the resulting motions can cause discomfort to bridge users'. If these minimum vibration values are unachievable, dynamic analysis will be carried out to determine the sensitivity of the structure to excitation under pedestrian loading with appropriate response limits set.

The substructure and foundations for options 3 to 5 will be analysed by simple hand calculations. Piles and pile groups will be analysed by means of an industry standard pile analysis program.

The existing substructure for option 2 would be qualitatively assessed.

Scour and flooding effects will be assessed and designed for in accordance with the DMRB document CD 356. For wave effects reference will be made to BS 6349-1-2.

2.7 Departures from Standard

It is not envisaged that significant departures will be necessary for options 3 to 5. Some minor deviations are likely, but these will be fully justified. For example, the omission of the service vehicle loading in BSEN1991-2 and the use of horizontal infill in the parapet as opposed to vertical as defined in BS 7818.

Option 2 would require an agreement for a reduced footway width given that CD 353 of the DMRB prescribes a minimum clear width of 2.0 metres for a pedestrian footbridge.

2.8 Construction Issues

2.8.1 Lossiemouth Canal Bridge

Lossiemouth Canal Bridge provides the sole road access to the existing footbridge and landing site for option 3. It is Category B listed as set out by law in the Planning Listed Buildings and Conservation Areas (Scotland) Act 1997, hence construction movements should be considered. The structure appears to be in good condition and has been assessed to 40/44 tonne vehicle loading. The following information has been provided by Moray Council.

Lossiemouth Canal Bridge (U172/10) was built in approximately 1810 and consists of a single span masonry arch bridge, with a culverted section to the south side which is in the form of 4 culvert spans, with flap valves (to stop the tide backing up the canal). The bridge was Category B Listed on 24th March 1988.

Most recent Inspection was on 24th June 2019 and gave the bridge an average condition score of 93.27, with the critical elements being scored 100 (100 is perfect condition, no defects). The elements scores as having defects were the carriageway surfacing and the waterproofing system. No load-carrying elements showed significant defects.

The recorded span of the bridge is 9.2m and the recorded width is 8.68m, which is the total width of the bridge including the parapets. The available width between the parapets will be less than this.

The most recent load capacity assessment was on 22nd March 2002, and indicated that the bridge has ample strength for full HA loading (40/44T) or for up to 30 units of HB loading (abnormal loads etc.)

2.8.2 Unexploded Ordnance (UXO) Risk

As part of the Ground Investigation works a preliminary UXO risk review identified that the surrounding area of Lossiemouth suffered enemy bombing raids during WWII, with one raid impacting RAF Lossiemouth (located approximately 1.7km to the south-west). The report discussed a credible possibility that items of UXO may have found their way onto the site (being washed up in storm events) and remained there buried to the present day. To reduce the risk of unexpectedly encountering UXO during the GI the services of a specialist Explosive Ordinance Disposal Engineer were enlisted. No abnormalities were encountered during the works, but this is something that should be considered during the construction phase. This risk would apply to options 3 to 5 and additionally option 2 when substructure replacement is required.

2.8.3 The existing bridge

It is understood that the existing bridge would not be removed as part of a total bridge replacement scheme as it is not owned Moray Council, unless it is required on safety grounds. If the existing location (option 3) is chosen, this will present some issues for the construction of the abutment and lifting in of the spans at the beach approach. If possible, it would be beneficial to remove the existing structure (even if just a section at the beach) prior to construction of the proposed.

2.8.4 Proposed flood defence works

A feasibility Study into the provision of a Flood Protection Scheme at Lossiemouth Seatown is included in the Local Flood Risk Management Plan for the Findhorn, Nairn and Speyside Local Plan District. Any interaction this scheme may have with the replacement bridge will be considered as part of the detailed design process. This does not appear to affect the Esplanade location (option 4).

2.8.5 Condition of the existing sea wall

There are concerns that the existing sea walls are in poor condition, particularly at the Esplanade. In terms of temporary works, any construction close to the sea wall will require assessment and appropriate action to ensure the continued stability. Any abutment works will either need to be set back to avoid surcharge or more proactive measures taken such as local improvement, reconstruction and/or incorporation into the proposed abutment.

2.8.6 Traffic Management

In all locations traffic management will be difficult to implement given the limited diversion routes. Clifton Road (option 4) is a main route through Lossiemouth, and Church Street (options 2 & 3) is the only access to the south section of Seatown and the caravan park. Seatown road (option 5) would present less issues and could potentially be managed with a partial closure. All proposed traffic management would need to be agreed with Moray Council.

2.9 Operation and maintenance

A proposed replacement bridge would be designed to ensure there are no unusual operation and maintenance procedures.

2.9.1 General Inspection

General inspections can be carried out under normal operation of the proposed footbridge. The abutments can be inspected from ground level, preferably at low tide. The deck soffit steelwork and outer surfaces of the structure can be viewed from ground level using binoculars if required. The deck surfacing, expansion joints, and parapets can also be inspected from deck level.

2.9.2 Principal Inspection

Principal inspections can be carried out under normal operation of the proposed footbridge with local demarcation and a banksman where required. The abutments can be inspected from ground level, preferably at low tide. The deck soffit steelwork and outer surfaces of the structure can be reached for a touching distance inspection either via a pontoon and scaffold tower or by a specialist rope access team. Substructures within the river channel would be inspected by a specialist water access/diving team. All operations will require careful planning with a good understanding of the tidal movements given the unavoidable risk of working over/in water.

3 Conclusion

The following conclusions are based upon the information obtained and presented within this report. Each option has been appraised in an un-biased manner and a single option has been put forward for recommendation.

The criteria used in selecting an option focuses primarily on whole life cost, providing that the economically favourable solution delivers the desired outcome. As defined in clause 1.3 of DMRB document CD 355 'The lowest whole life cost option shall become the recommended solution in an options report, except where other factors override that selection.'

Options

Option 1 in the very nature of a do-nothing scenario, presents no cost, but it also offers little in forward benefit. The rationale for this report was to investigate a proposed replacement crossing to East Beach, but this option does not fulfil that need. There is some potential ecological benefit to restricting human presence at East Beach, but there is a firm argument for the long-standing usage of the area for recreational purposes.

Option 2 is a compromised short-term solution with a high degree of imbedded risk, this is due to the proposed re-use of the existing timber substructure. The capital cost is likely to be lower than all the other bridge crossing options but the whole life cost will be un-favourable due to the impending replacement of the substructure. In summary this option gives some benefit as it would reinstate a crossing to the beach, but Murray Council are unlikely to accept the inherent risks and hence are unlikely to back or adopt this option.

Option 3 the proposal local to the existing bridge presents the **greatest of all whole life costs**, this is because it has the largest overall span (**145 metres**) of all the proposed options. It appears that the existing bridge was positioned at this location out of necessity rather than it being a favoured location. It would have been more costly to construct than the original 1913 bridge and the same has been concluded for the proposed replacement structure. In its favour, the location offers good protection from the elements and the hydrodynamic actions are less prevalent than they are at the other proposed locations. The distance from the Esplanade allows separation of users in Lossiemouth but equally detaches beach goers from the amenities of Clifton Road. The clear draw of this option is that it maintains the status quo of the existing arrangement and additionally is sympathetic to the current visual landscape.

Option 4 presents the shortest span (**75 metres**) of all the locations, hence by default a shorter bridge to construct and maintain, resulting in the **lowest whole life cost**. The span arrangement permits for a less obtrusive superstructure to be adopted whilst still being economically favourable, this will allow the bridge to better tie in with the locality and provide the user a more pleasant crossing experience. The main perceived issue that this location presents, which cannot be designed out within the immediate proposed structure, is the potential for traffic increase and pedestrian conflict on Clifton Road. If this were deemed an issue, a small amount of targeted investment could be utilised to improve local user interaction as shown on drawing BB2020-TR-002 in appendix A. It is felt this would negate any apparent concern and potentially provide betterment to the immediate area. The hydrodynamics are least favourable at this location but not so much so to cause an obvious issue.

Option 5 was studied as a more economical alternative to option 3. At **100 metres** in total span, it is 45 metres shorter than option 3 hence provides a valuable cost saving. It also appears to have an improved access point from the land side, and better integrates existing facilities without compromising some of the perceived benefits that option 3 brings. The location is suitably distanced from the Esplanade to avoid conflicts yet remains close to the existing East Beach Car Park, again balancing the benefits of the other options.

Materials

The discussion on bridging materials has been made separately to the options as per section 2.

Utilising steel in a costal location presents higher maintenance costs than the equivalent FRP and Aluminium structures but the capital cost is vastly lower, hence a balance can be struck. A particular downfall of FRP is that it requires a protective coating which is typically warranted for 30 years. It is assumed that the coating will exceed this, but it is difficult to prove as there are limited historical examples to draw information from. Aluminium does not require a protective coating, but a paint system is typically applied for aesthetic purpose and this becomes a maintenance liability. A raw finish aluminium bridge gives the lowest maintenance cost as in theory only the deck anti-slip requires replacement, but unfortunately the capital cost is high.

With regards to surface finish, galvanising as a choice would be restricted to option 4 as this is the only structural form offered that would be suitable if detailed appropriately. The steel trusses presented in options 2, 3 and 5 do not lend themselves to the galvanising process as they would be formed with closed hollow sections. Galvanising can provide an enduring finish, but at the end of the coatings working life the structure must either be painted or taken off site to be cleaned and re-dipped. Additionally, an exposed galvanised finish is unlikely to provide the desired aesthetics in this location. A painted finish could be applied, but to maintain appearance it would require recoating at regular intervals.

A traditional type II painted coating is not the most durable option, but capital cost is inherently low. Fluoropolymer paint should be considered with the aim to reduce maintenance and resulting overall whole life cost. The manufacturers estimated life span of 60 years would need to be accepted by the overseeing organisation to warrant the initial added cost of the coating. An estimated saving based upon option 4 has been shown in the following table.

Table 12 - Option 4 estimated costs with superstructure paint comparison

Paint System	Total Capital Cost £	Maintenance Net Present Value £	Net Present Value Total (inc. Capital) £
Standard Type II	**1,350,000**	**345,000**	**1,695,000**
Fluoropolymer	**1,375,000**	**165,000**	**1,540,000**

As can be seen in table 12 above, an approximate 2% uplift in capital cost has the potential to save over 50% on the maintenance net present value. This assumes that a type II paint system will require 5 reapplications in the 120-year life of the bridge, against the single recoat for Fluoropolymer based on accepting a 60-year design life.

Studies and Consultation

With regards the consultations and studies within section 1 of the report, there are no particular items that dictate where a proposed bridge should be sighted.

The **Geology** appears comparable throughout the area and no pertinent issues are expected, hence there is no geological preference to a particular location.

The **hydrological** studies offer favour to option 3, this is based upon the immediate area having the least onerous effects on a bridge. Options 4 and 5 can be economically designed to withstand the increased local effects, hence this should not be an overriding factor when selecting a bridge location.

From an **Environmental** perspective any proposed bridge is unlikely to cause untoward effect or change to the current regime. Construction techniques will be carefully considered to mitigate any direct impact.

Land ownership has not yet been clarified, but it is understood issues are unlikely.

The **current bridge ownership** is still unclear, and efforts are underway to understand this better. All 3 replacement options have been derived with this ownership uncertainty in mind.

The **consultations** with the various authoritative bodies have been constructive and a number of their representatives appear keen to see the scheme progress. There appears to be no obvious blocks and the process for permissions is now understood.

The **Public survey** has offered a valuable contribution. The clear outcome from the combined survey is for a bridge local to the existing and the reasoning for this has been made clear in the accompanying comments. These comments have been considered in each option with the aim of addressing any genuine concerns.

3.1 Recommendation

Contemplating all the options it is recommended that **option 4**, a new footbridge from the Esplanade is taken forward. This solution presents itself as the most cost-effective compliant bridge crossing in both capital and whole life terms. Comparing equivalent steel painted superstructures this option is approximately £800,000 cheaper than option 3 in capital cost, raising to £1,000,000 difference in whole life cost. The monetary benefit over option 5 is reduced at £350,000 capital and £400,000 whole life but still a notable difference.

Regards corrosion protection it is envisaged that a standard type II paint system would require to be repainted at 20-year intervals, costing Moray Council significant sums at each interval. For this to be viable it is likely that the council would require the promise of future funding or a commuted sum to cover the impending costs. Neither of which are likely to be agreed by Scottish Government. Alternatively, a Fluoropolymer system is predicted to have a serviceable life of up to 60 years and therefor would only require repainting once during the 120-year working life of the superstructure. Moray Council are more likely to accept this maintenance liability and therefore it is proposed that a Fluoropolymer paint system is adopted.

For optimum durability and a theoretical do-nothing maintenance approach a Fluoropolymer system with a suitable grey finish and undercoats could be applied over a 140-micron galvanised coating. In theory, as the paint degrades up to its 60 years predicted life, the galvanising would still be present, giving a hypothetical additional 50 years plus of protection. By using a grey paint, this would avoid a patchy appearance as the paint system gives way to the galvanising underneath. However, a dull grey paint finish and future possibility of a degraded appearance is not particularly desirable at this location. As such, although this is an option to reconsider at the detail design stage, it is not the preferred option at present. There are some embedded issues with the Esplanade location as already noted, but it is felt these can be addressed with considered integration into the local network. This will increase expense marginally but not so much as to outweigh the capital and whole life cost benefits.

Positioning the bridge at the Esplanade has the potential to alleviate some safety concerns, particularly the existing issue of people jumping off the current bridge. Having the bridge in a more populated open area will inherently discourage antisocial behaviour, this can also be true of vandalism.

Table 13 - Option 4 Preliminary costing

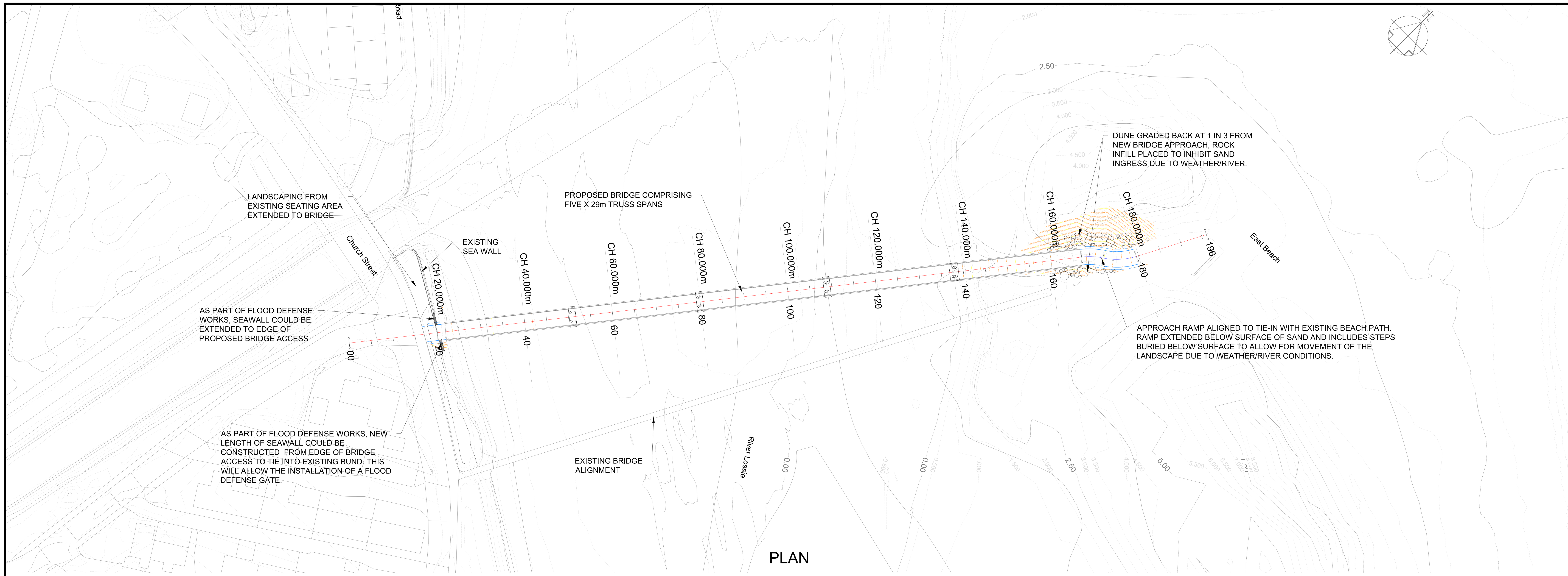
Total Capital Cost £	Maintenance Net Present Value £	Net Present Value Total (inc. Capital) £
1,375,000	**165,000**	**1,540,000**

Assumes Fluouroploymer paint system

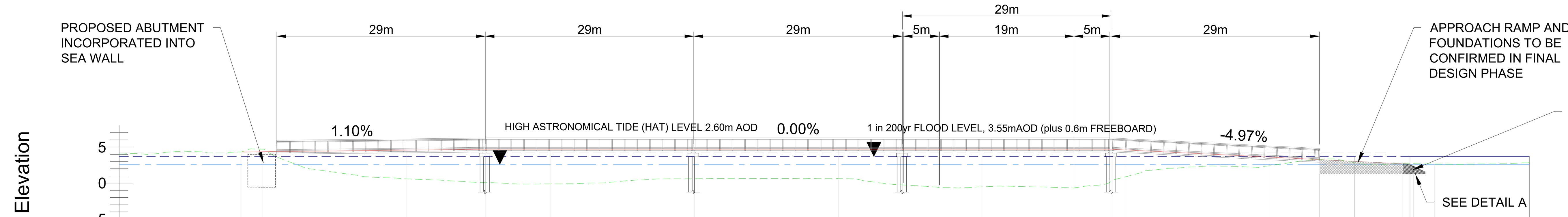
Appendix A - Drawings

NOTES

1. All dimensions in millimeters. All levels in meters.
2. This drawing to be read in conjunction with other scheme drawings if applicable
3. This is a CAD produced drawing and should not be amended by hand
4. Do not scale from this drawing, work to stated dimension only. If in doubt ASK.



PLAN



Chainage	Existing Levels	Proposed Levels
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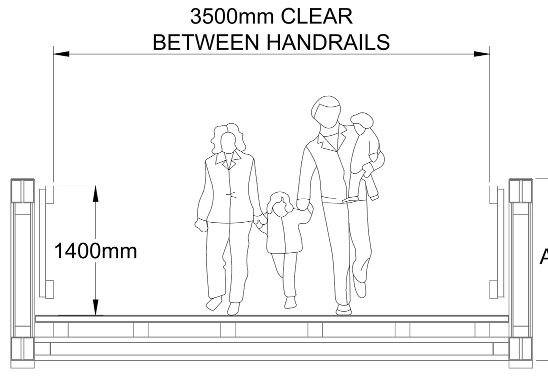
05.000	4.071	
10.000	4.383	
15.000	4.193	
20.000	4.712	4.361
25.000	2.452	4.416
30.000	1.502	4.471
35.000	0.833	4.526
40.000	0.596	4.580
45.000	0.388	4.635
50.000	0.088	4.690
55.000	-0.096	4.700
60.000	-0.109	4.700
65.000	-0.014	4.700
70.000	0.270	4.700
75.000	0.571	4.700
80.000	0.616	4.700
85.000	0.659	4.700
90.000	0.644	4.700
95.000	0.661	4.700
100.000	0.635	4.700
105.000	0.147	4.700
110.000	-0.311	4.700
115.000	-0.625	4.700
120.000	-0.513	4.700
125.000	-0.465	4.700
130.000	-0.599	4.700
135.000	-0.361	4.700
140.000	0.885	4.596
145.000	1.943	4.348
150.000	2.285	4.099
155.000	2.328	3.850
160.000	2.421	3.601
165.000	3.160	3.353
170.000	3.180	3.104
175.000	2.561	2.855
180.000	2.698	2.674
185.000	2.630	
190.000	2.665	
195.000	2.910	
196.097	2.804	

Horizontal Geometry: L =166.974; R: 15.000 L: 4.864; R: 15.000 L: 7.655; L =16.604

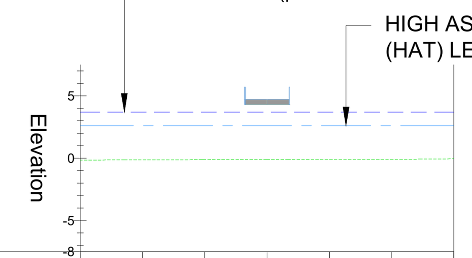
Vertical Geometry: G =1:91.255 L =33.839; G =Horizontal L =87.000; G =-1:20.101 L =40.500; G =-1:138.664 L =4.473

LONGSECTION
ALIGNMENT - BB2020 - CHURCH STREET TO EAST BEACH
SCALE: H 1:500,V 1:500. DATUM: -5.000



TYPICAL SECTION THROUGH BRIDGE

SCALE N.T.S.



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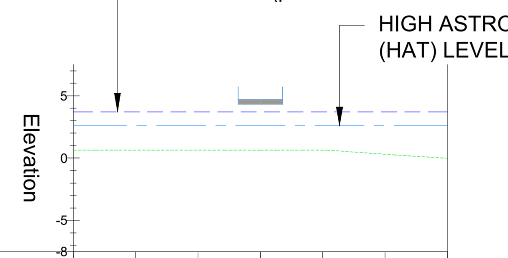
Existing Level	-0.150	-0.134	-0.119	-0.109	-0.097	-0.085	-0.054
Proposed Level				4.700 4.700 4.700			

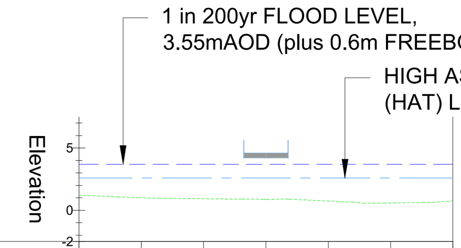
Chainage 60.000 (15)



Offset	-15.00	-10.00	-5.00	0.00	5.00	10.00	15.00
Existing Level	0.627	0.633	0.635	0.635	0.633	0.309	-0.016
Proposed Level				4.700 4.700 4.700			

Chainage 100.000 (17)

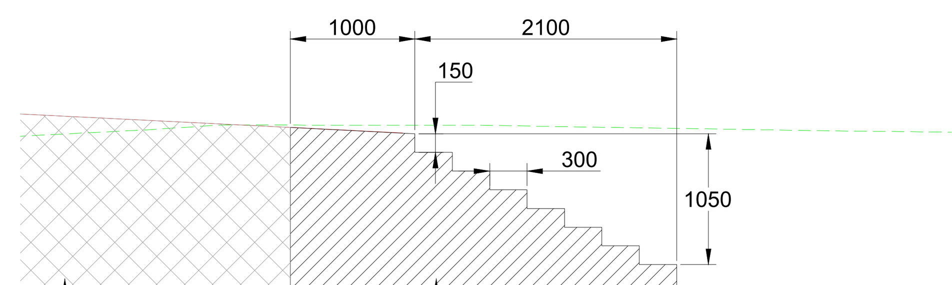
Chainage 160.000 (20)



Offset	-15.00	-10.00	-5.00	0.00	5.00	10.00	15.00
Existing Level	1.213	1.004	0.931	0.885	0.746	0.587	0.762
Proposed Level				4.596 4.596 4.596			

Chainage 140.000 (19)

TYPICAL CROSS SECTIONS



DETAIL A
END OF APPROACH RAMP DETAIL

SCALE 1:50

Rev	Description	Chkd	By	Date

Beaver Bridges Ltd
5 Knights Court,
Archers Way,
Battlefield Enterprise Park,
Shrewsbury SY1 3GA
Tel: 01743 811 811

Client
MORAY COUNCIL

Project Name
LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

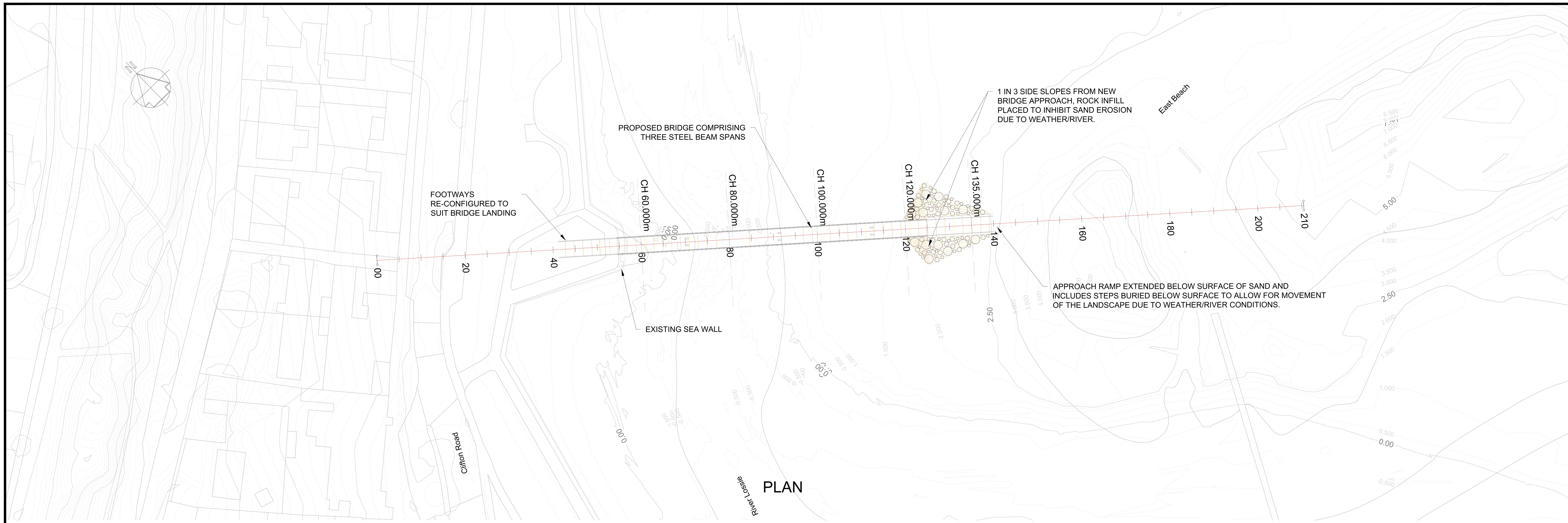
Drawing Title
OPTION 3 : EXISTING LOCATION CHURCH STREET TO EAST BEACH ADJACENT TO EXISTING BRIDGE

Start Date	Drawn	Designed	Checked	Scale
08/12/2020	BS	xx	LJ	1:500

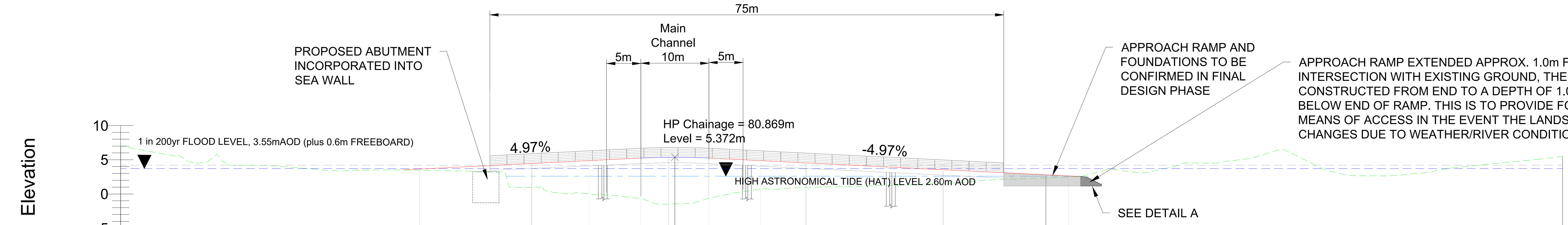
Drawing Status: PRELIMINARY
Page Size: A1 L
Drawing No: BB2020-GA-001
Rev: 0

NOTES

1. All dimensions in millimeters. All levels in meters.
2. This drawing to be read in conjunction with other scheme drawings if applicable
3. This is a CAD produced drawing and should not be amended by hand
4. Do not scale from this drawing, work to stated dimension only. If in doubt ASK.



PLAN



Chainage	Existing Levels	Proposed Levels
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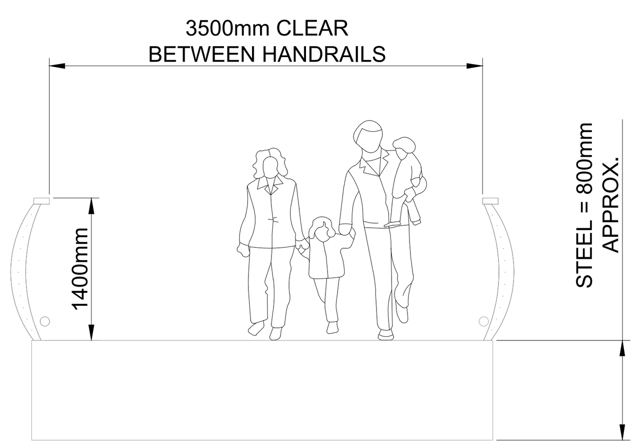
05.000	6.080 4.727	
10.000		
15.000	4.665 4.189	
20.000		
25.000	3.911 3.446	
30.000		
35.000	3.469 3.523	
40.000		
45.000	3.444 3.355	3.711 3.960
50.000		
55.000	3.121 0.940	4.209 4.457
60.000		
65.000	0.035 -0.113	4.706 4.955
70.000		
75.000	-0.568 -1.479	5.204 5.368
80.000		
85.000	-0.898 0.211	5.286 5.041
90.000		
95.000	0.687 0.948	4.792 4.544
100.000		
105.000	1.059 1.214	4.295 4.046
110.000		
115.000	1.352 1.558	3.797 3.549
120.000		
125.000	1.884 2.164	3.300 3.051
130.000		
135.000	2.343 2.548	2.802 2.554
140.000		
145.000	3.575 3.210	
150.000		
155.000	4.509 4.523	
160.000		
165.000	5.227 6.363	
170.000		
175.000	3.872 2.675	
180.000		
185.000	2.673 3.085	
190.000		
195.000	3.879 4.398	
200.000		
205.000	4.884 5.435 5.403	
210.000 / 210.409		

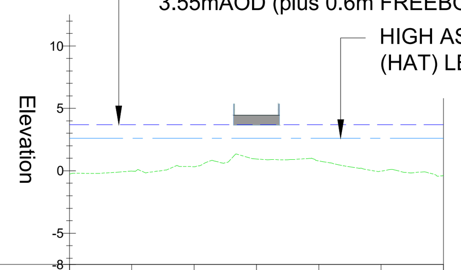
Horizontal Geometry: L =210.409

Vertical Geometry: G =1:20.101 L =34.672 | R = 100.000 K = 1.000 L = 9.950 | G =-1:20.101 L =54.193

LONGSECTION
ALIGNMENT - BB2020 - ESPLANADE TO EAST BEACH
SCALE: H 1:500,V 1:500. DATUM: -5.000



TYPICAL SECTION THROUGH BRIDGE
SCALE N.T.S.



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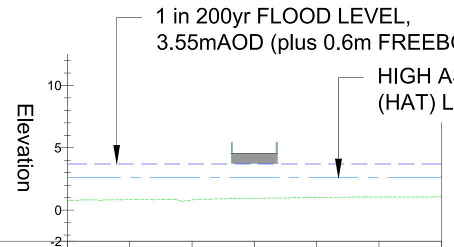
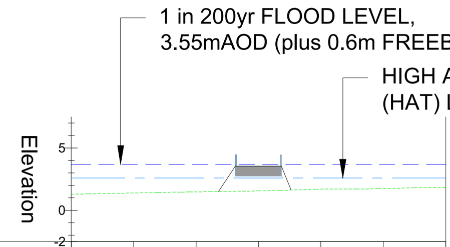
Chainage 60.000 (1)



Offset	-15.00	-10.00	-5.00	0.00	5.00	10.00	15.00
Existing Level	0.792	0.834	0.812	0.948	1.021	1.054	1.070
Proposed Level				4.544 4.544 4.544			

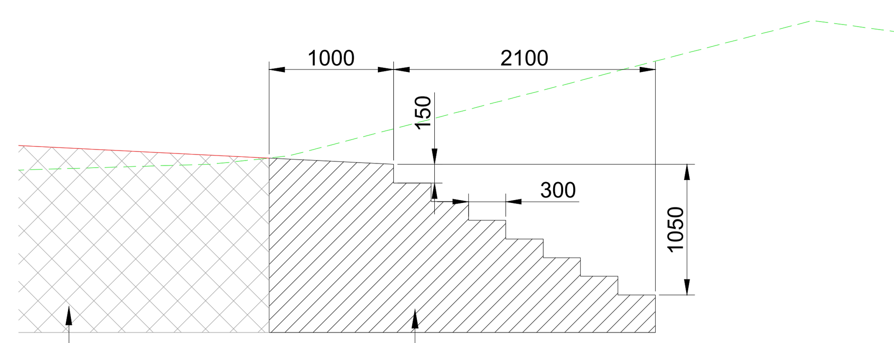
Chainage 100.000 (3)



Offset	-15.00	-10.00	-5.00	0.00	5.00	10.00	15.00
Existing Level	1.292	1.392	1.480	1.558	1.701	1.739	1.843
Proposed Level				1.505 3.549 3.549 3.549 1.622			

Chainage 120.000 (4)

TYPICAL CROSS SECTIONS



DETAIL A
END OF APPROACH RAMP DETAIL
SCALE 1:50

Rev	Description	Chkd	By	Date

Beaver Bridges Ltd
5 Knights Court,
Archers Way,
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Tel: 01743 811 811

BEAVER BRIDGES

Client
MORAY COUNCIL

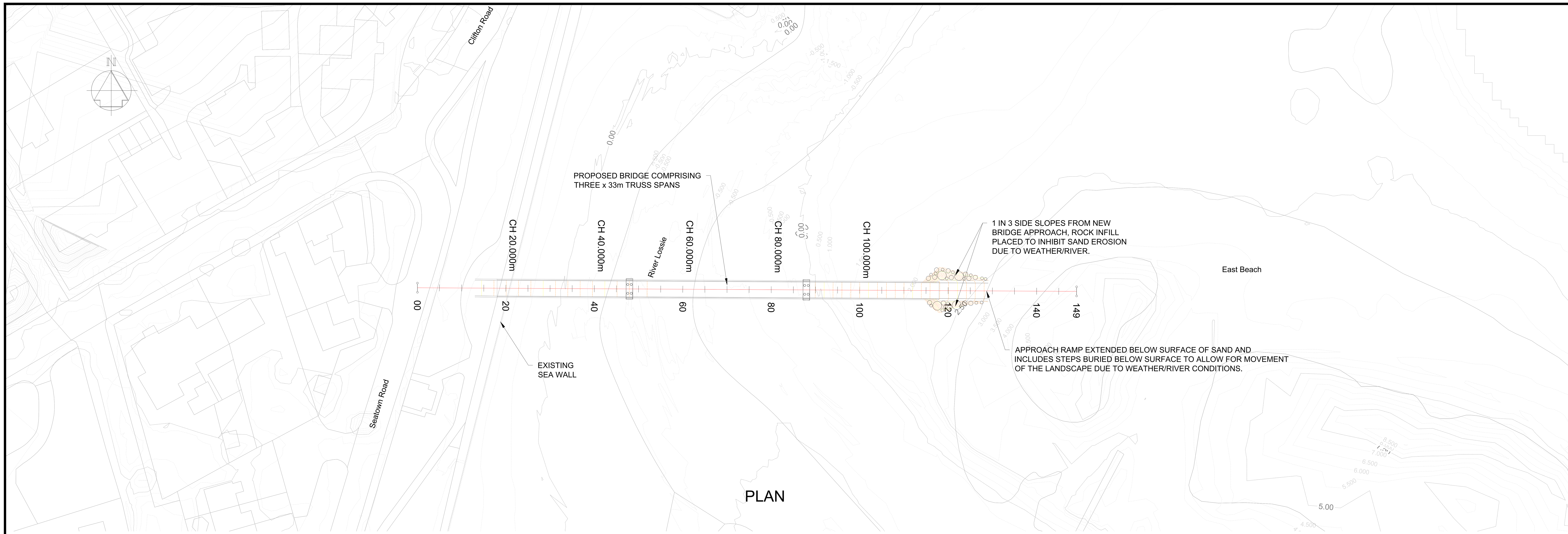
Project Name
LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

Drawing Title
OPTION 4 : ESPLANADE
ESPLANADE TO EAST BEACH

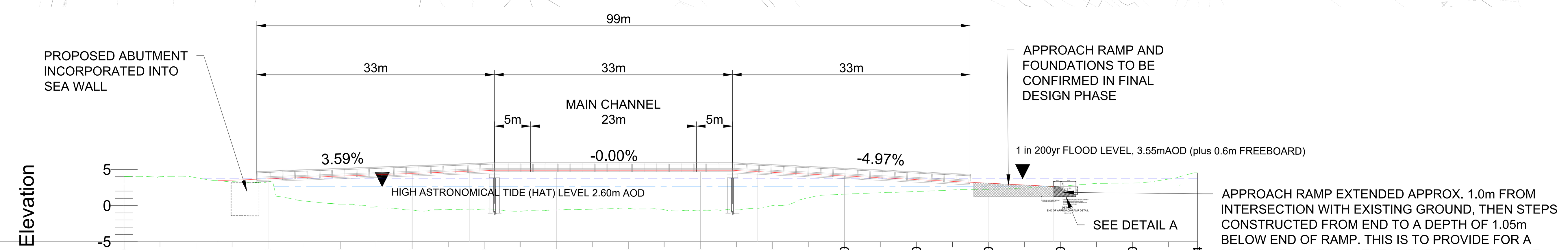
Start Date	Drawn	Designed	Checked	Scale
08/12/2020	BS	xx	LJ	1:500

Drawing Status: PRELIMINARY | Page Size: A1 L

Drawing No: BB2020-GA-002 | Rev: 0



PLAN



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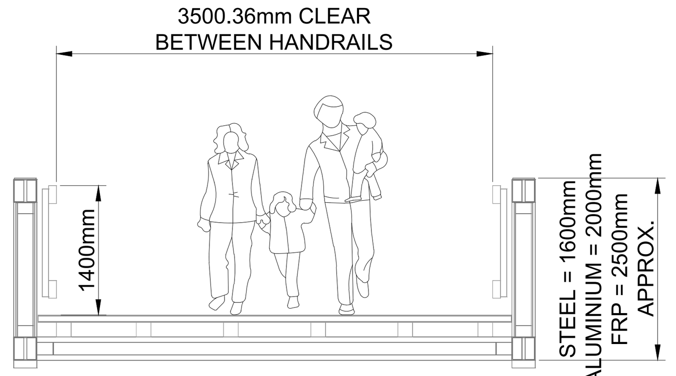
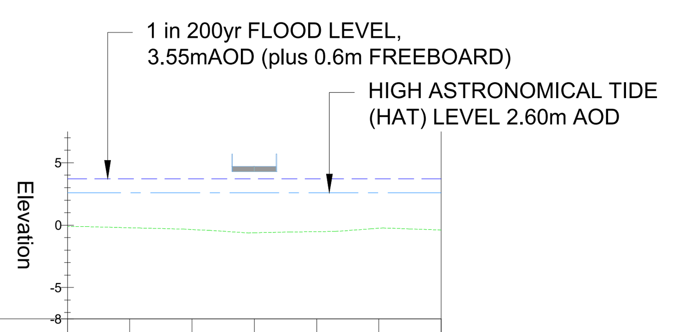
Existing Levels	4.028	4.011, 3.853	3.311, 3.289	0.635, 0.194	-0.167, -0.611	-0.533, -0.491	-0.792, -0.609	-0.499, -0.382	-0.573, -0.704	-0.597, 0.000	1.071, 1.580	1.785, 1.953	2.169, 2.246	2.440, 2.707	3.072, 3.124	3.671, 4.539
Proposed Levels			3.517, 3.697	3.876, 4.056	4.235, 4.415	4.594, 4.700	4.700, 4.700	4.700, 4.700	4.700, 4.700	4.700, 4.598	4.349, 4.100	3.851, 3.603	3.354, 3.105	2.856		
Horizontal Geometry	L =149.034															
Vertical Geometry			G =1:27.857 L =34.920					G =-Horizontal L =40.000				G =-1:20.101 L =41.101				

LONGSECTION
ALIGNMENT - B2020 CLIFTON ROAD TO EAST BEACH OPTION
SCALE: H 1:500,V 1:500. DATUM: -5.000



TYPICAL SECTION THROUGH BRIDGE

SCALE N.T.S.



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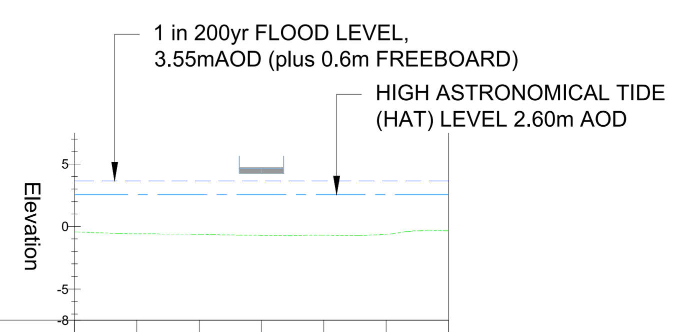
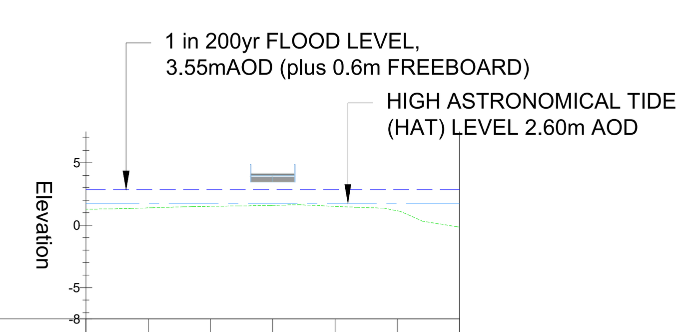
Proposed Level				4.415 4.415 4.415			

Chainage 40.000 (23)



Offset	-15.00	-10.00	-5.00	0.00	5.00	10.00	15.00
Existing Level	-0.438	-0.580	-0.621	-0.704	-0.698	-0.618	-0.318
Proposed Level				4.700 4.700 4.700			

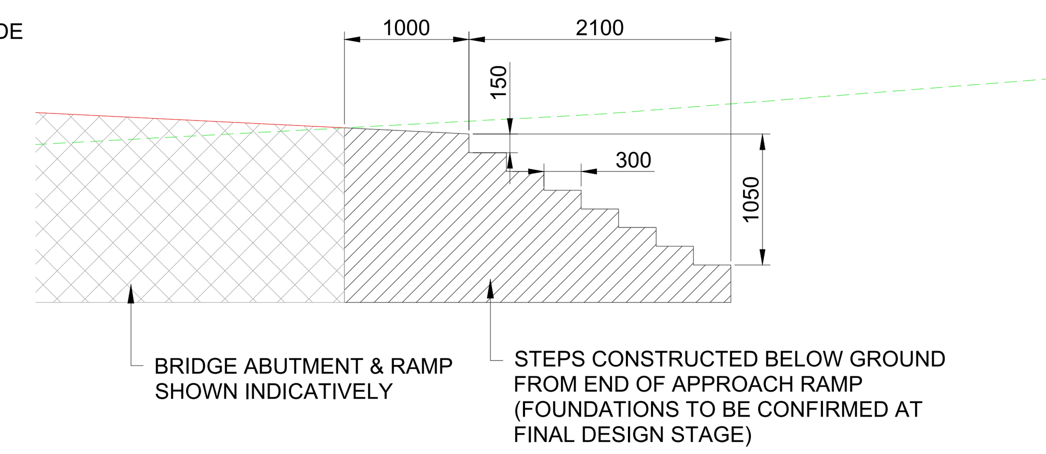
Chainage 80.000 (25)



Offset	-15.00	-10.00	-5.00	0.00	5.00	10.00	15.00
Existing Level	1.286	1.391	1.515	1.580	1.511	1.158	-0.155
Proposed Level				4.100 4.100 4.100			

Chainage 100.000 (26)

TYPICAL CROSS SECTIONS



DETAIL A
END OF APPROACH RAMP DETAIL

SCALE 1:50

NOTES

1. All dimensions in millimeters. All levels in meters.
2. This drawing to be read in conjunction with other scheme drawings if applicable
3. This is a CAD produced drawing and should not be amended by hand
4. Do not scale from this drawing, work to stated dimension only. If in doubt ASK.

Rev	Description	Chkd	By	Date

Beaver Bridges Ltd
5 Knights Court,
Archers Way,
Battlefield Enterprise Park,
Shrewsbury SY1 3GA
Tel: 01743 811 811

Client
MORAY COUNCIL

Project Name
LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

Drawing Title
OPTION 5 : COMPROMISE SEATOWN ROAD TO EAST BEACH

Start Date	Drawn	Designed	Checked	Scale
09/12/2020	BS	xx	LJ	1:500

Drawing Status	Page Size
PRELIMINARY	A1 L

Drawing No	Rev
BB2020-GA-003	0

VIEW 1: FROM THE EAST

VIEW 2: FROM THE NORTH

VIEW 3: FROM CHURCH STREET BRIDGE

VIEW 4: FROM CHURCH STREET BRIDGE AT HIGH ASTRONOMICAL TIDE

VIEW POINT LOCATIONS

VIEW 5: FROM EAST BEACH

Rev	Description	Chkd	By	Date
A	EXISTING BRIDGE ADDED TO VIEWS	LJ	BS	27/01/21

Beaver Bridges Ltd
5 Knights Court,
Archers Way,
Battlefield Enterprise Park,
Shrewsbury SY1 3GA
Tel: 01743 811 811

BEAVER BRIDGES

Client

MORAY COUNCIL

Project Name

LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

Drawing Title

OPTION 3 : EXISTING LOCATION
CHURCH STREET TO EAST BEACH
SCHEMATIC VIEWS

Start Date	Drawn	Designed	Checked	Scale
08/12/2020	BS	xx	LJ	N.T.S

Drawing Status: PRELIMINARY

Page Size: A2 L

Drawing No: BB2020-RV-001

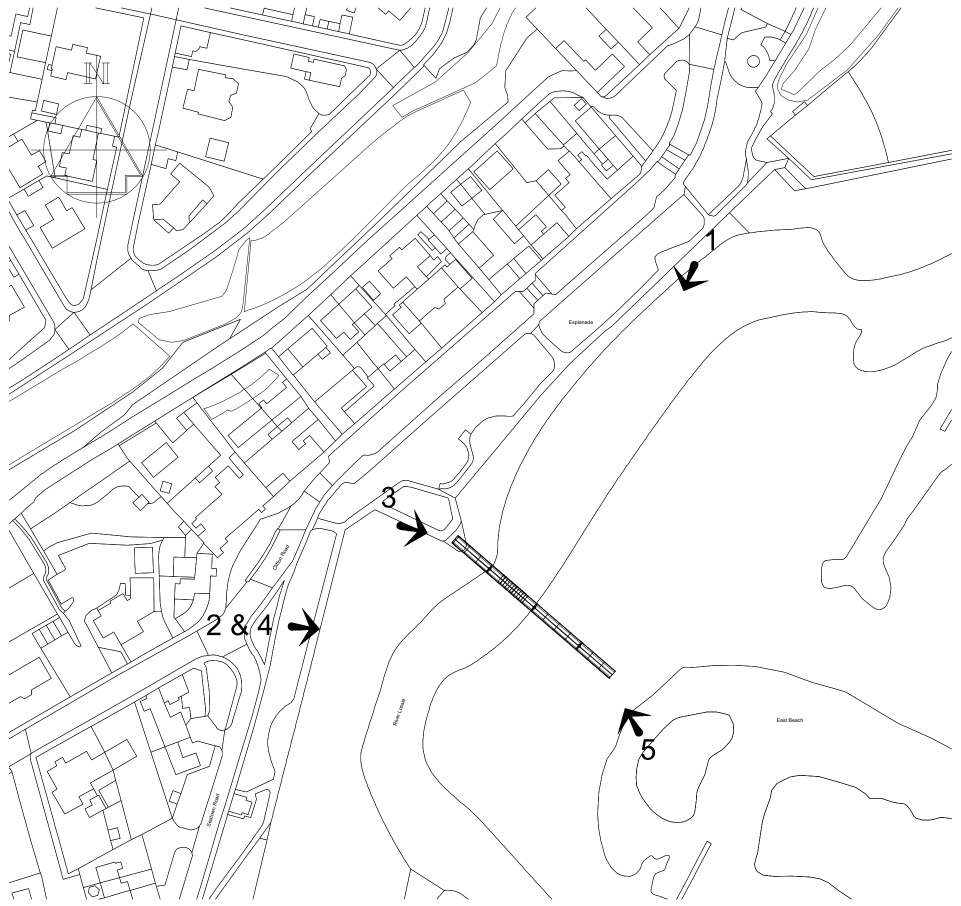
Rev: A

VIEW 1: FROM THE NORTH-EAST

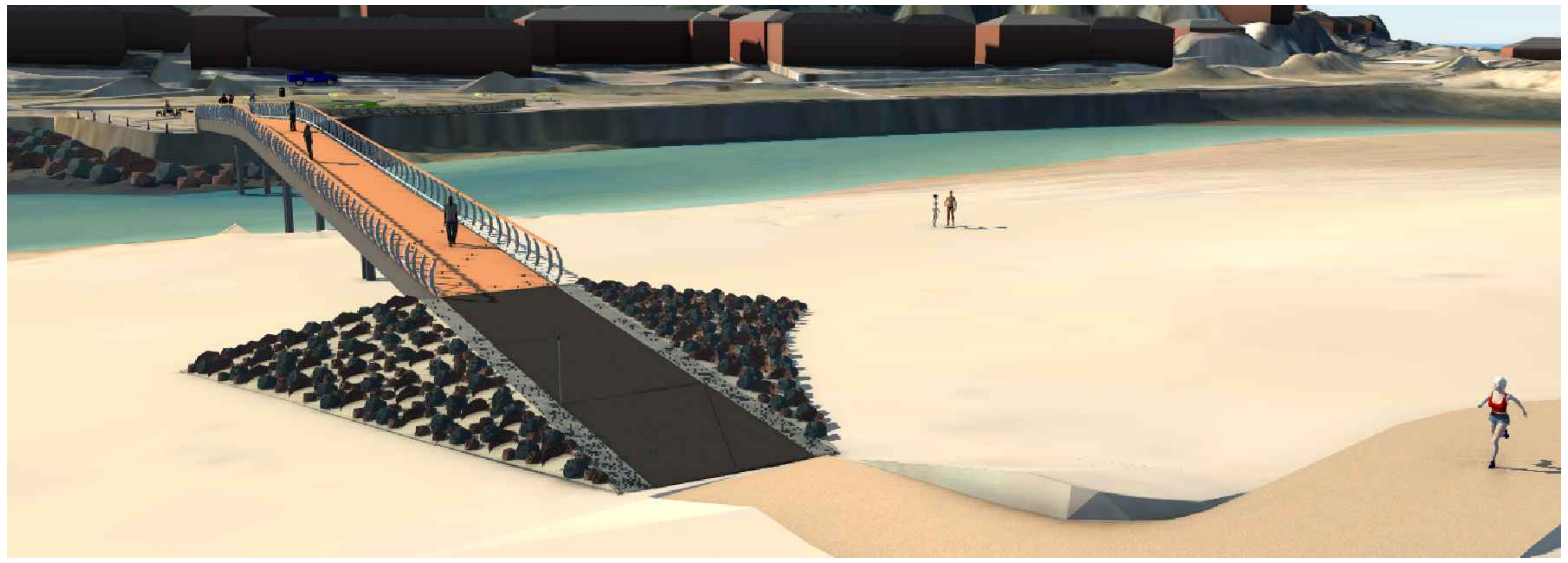
VIEW 2: FROM THE WEST

VIEW 3: FROM THE ESPLANADE

VIEW 4: FROM THE WEST AT HIGH ASTRONOMICAL TIDE



VIEW POINT LOCATIONS



VIEW 5: FROM EAST BEACH

Rev	Description	Chkd	By	Date
A	EXISTING BRIDGE ADDED TO VIEWS	LJ	BS	27/01/21

Beaver Bridges Ltd
5 Knights Court,
Archers Way,
Battlefield Enterprise Park,
Shrewsbury SY1 3GA
Tel: 01743 811 811

BEAVER BRIDGES

Client

MORAY COUNCIL

Project Name

LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

Drawing Title

OPTION 4 : ESPLANADE
ESPLANADE TO EAST BEACH
SCHEMATIC VIEWS

Start Date	Drawn	Designed	Checked	Scale
08/12/2020	BS	xx	LJ	N.T.S

Drawing Status: PRELIMINARY

Page Size: A2 L

Drawing No: BB2020-RV-002

Rev: A

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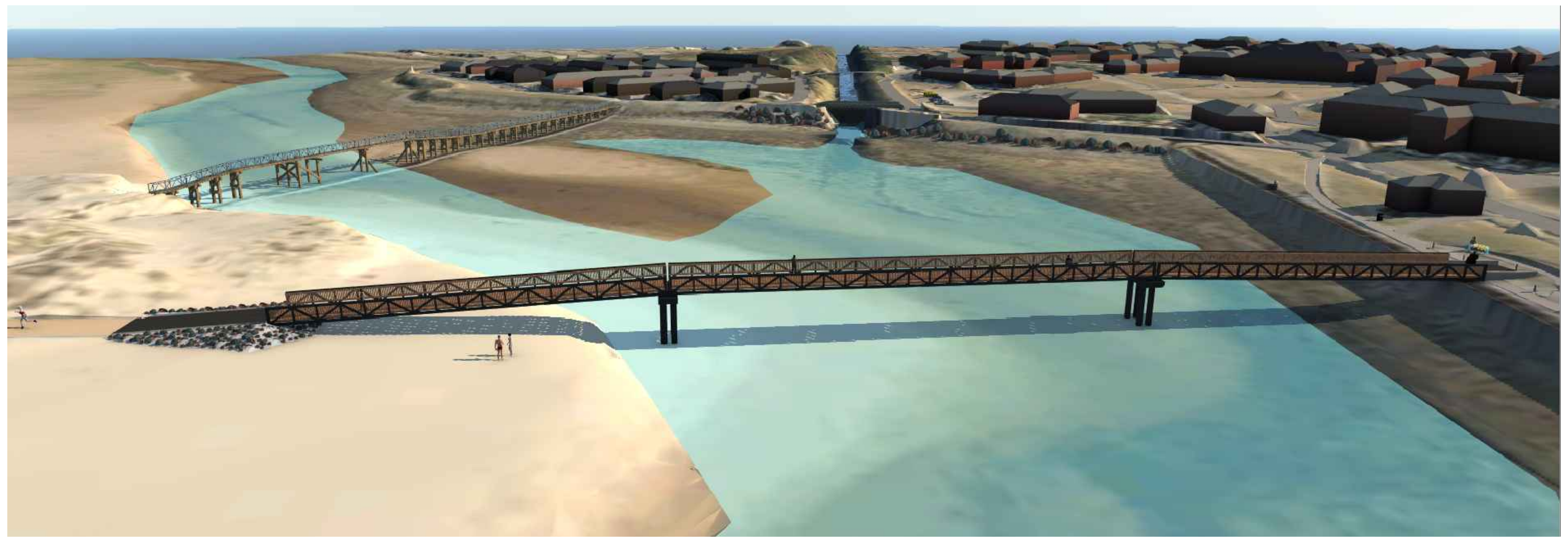
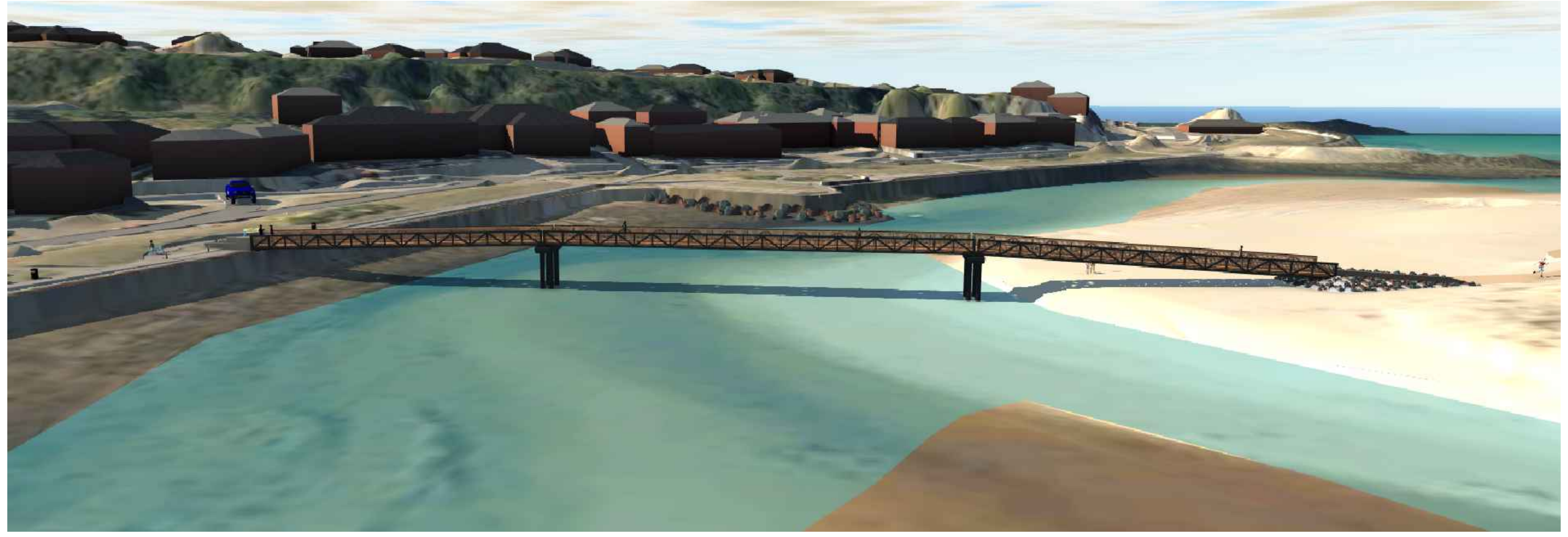
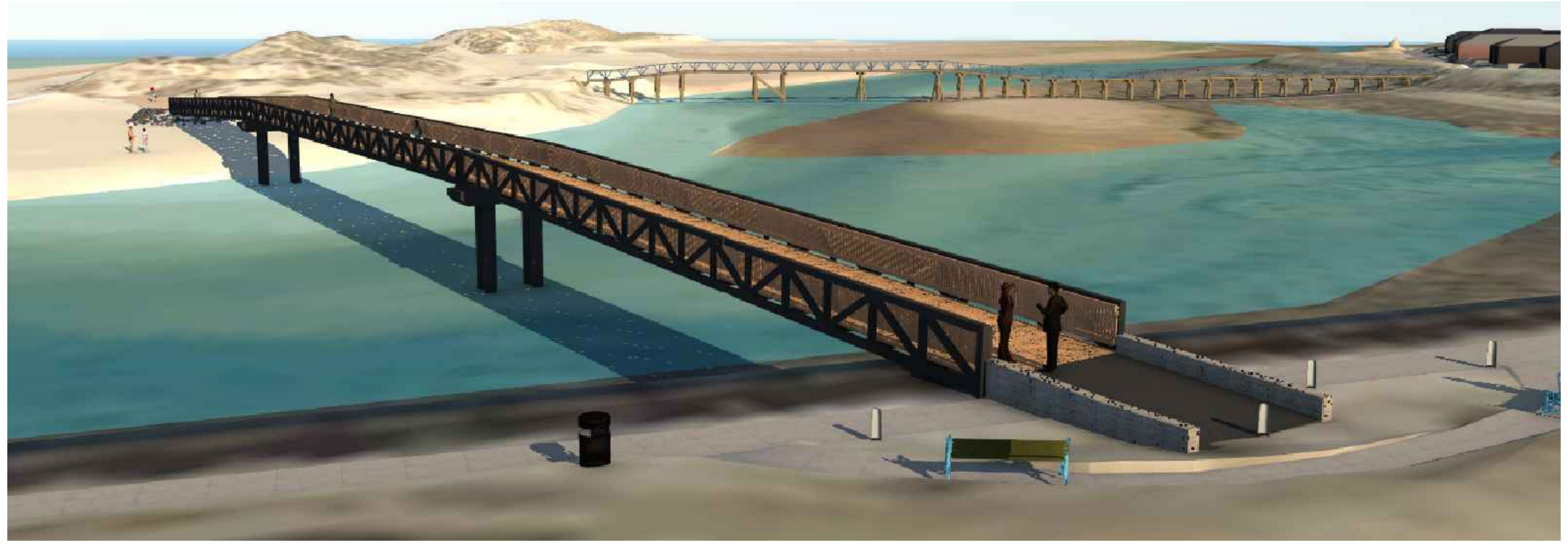


VIEW 1: FROM THE NORTH



VIEW 2: FROM THE SOUTH



VIEW 3: FROM SEATOWN ROAD

VIEW 4: FROM THE SOUTH AT HIGH ASTRONOMICAL TIDE

VIEW POINT LOCATIONS

VIEW 5: FROM EAST BEACH

Rev	Description	Chkd	By	Date
A	EXISTING BRIDGE ADDED TO VIEWS	LJ	BS	27/01/21

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MORAY COUNCIL

Project Name

LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

Drawing Title

OPTION 5 : COMPROMISE
SEATOWN ROAD TO EAST BEACH
SCHEMATIC VIEWS

Start Date	Drawn	Designed	Checked	Scale
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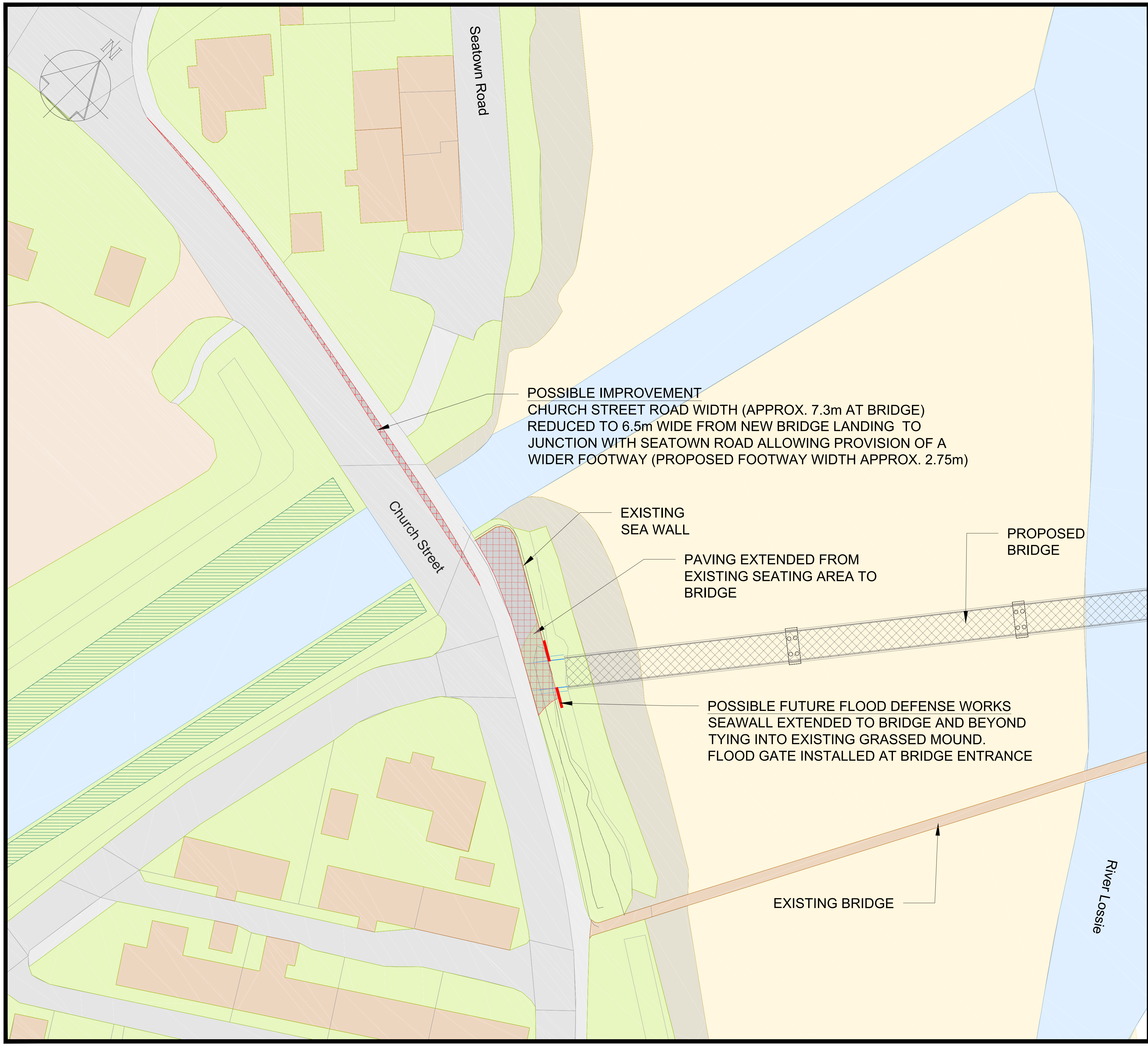
Drawing Status: PRELIMINARY

Page Size: A2 L

Drawing No: BB2020-RV-003

Rev: A



KEY:

- PROPOSED BRIDGE
- PROPOSED WORKS TO IMPROVE PEDESTRIAN MOVEMENT
- ROADS
- FOOTWAYS
- CAR PARK
- BUILDINGS / STRUCTURES
- GRASS / LANDSCAPING / UNDERGROWTH
- WATER / BEACH
- ROCKS

Rev	Description	Chkd	By	Date

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Client

MORAY COUNCIL

Project Name

LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

Drawing Title

OPTION 3 : EXISTING LOCATION PUBLIC NETWORK CONNECTIVITY

Start Date	Drawn	Designed	Checked	Scale
26/01/2021	BS	xx	LJ	1:500

Drawing Status: PRELIMINARY

Page Size: A3 L

Drawing No: BB2020-TR-001

Rev: 0

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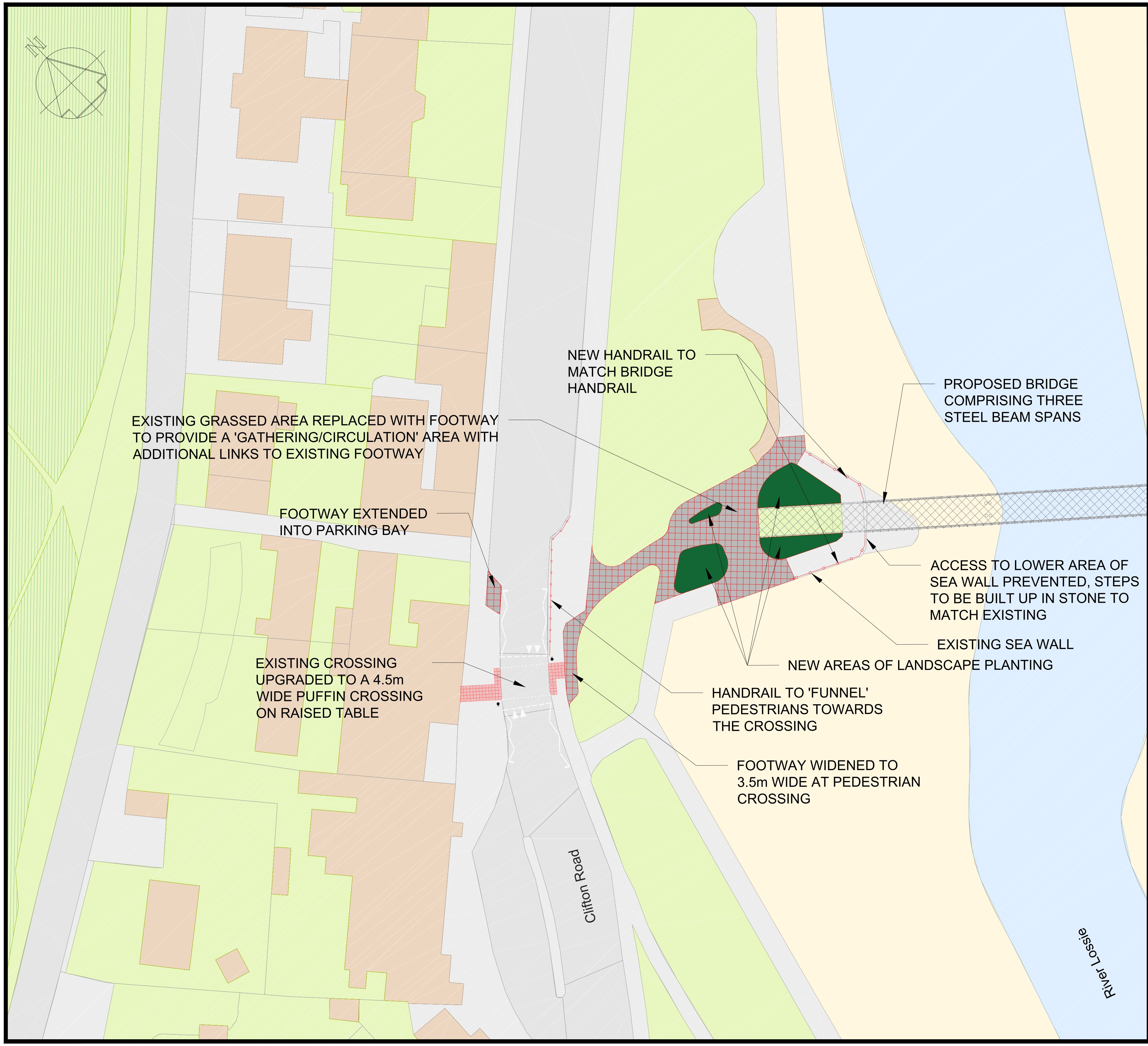

KEY:

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- PROPOSED WORKS TO IMPROVE PEDESTRIAN MOVEMENT
- PROPOSED PLANTING
- ROADS
- FOOTWAYS
- CAR PARK
- BUILDINGS / STRUCTURES
- GRASS / LANDSCAPING / UNDERGROWTH
- WATER / BEACH
- ROCKS

Rev	Description	Chkd	By	Date

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BEAVER BRIDGES

Client

MORAY COUNCIL

Project Name

LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

Drawing Title

OPTION 4 : ESPLANADE PUBLIC NETWORK CONNECTIVITY

Start Date	Drawn	Designed	Checked	Scale
26/01/2021	BS	xx	LJ	1:500

Drawing Status	Page Size
PRELIMINARY	A3 L

Drawing No	Rev
BB2020-TR-002	0

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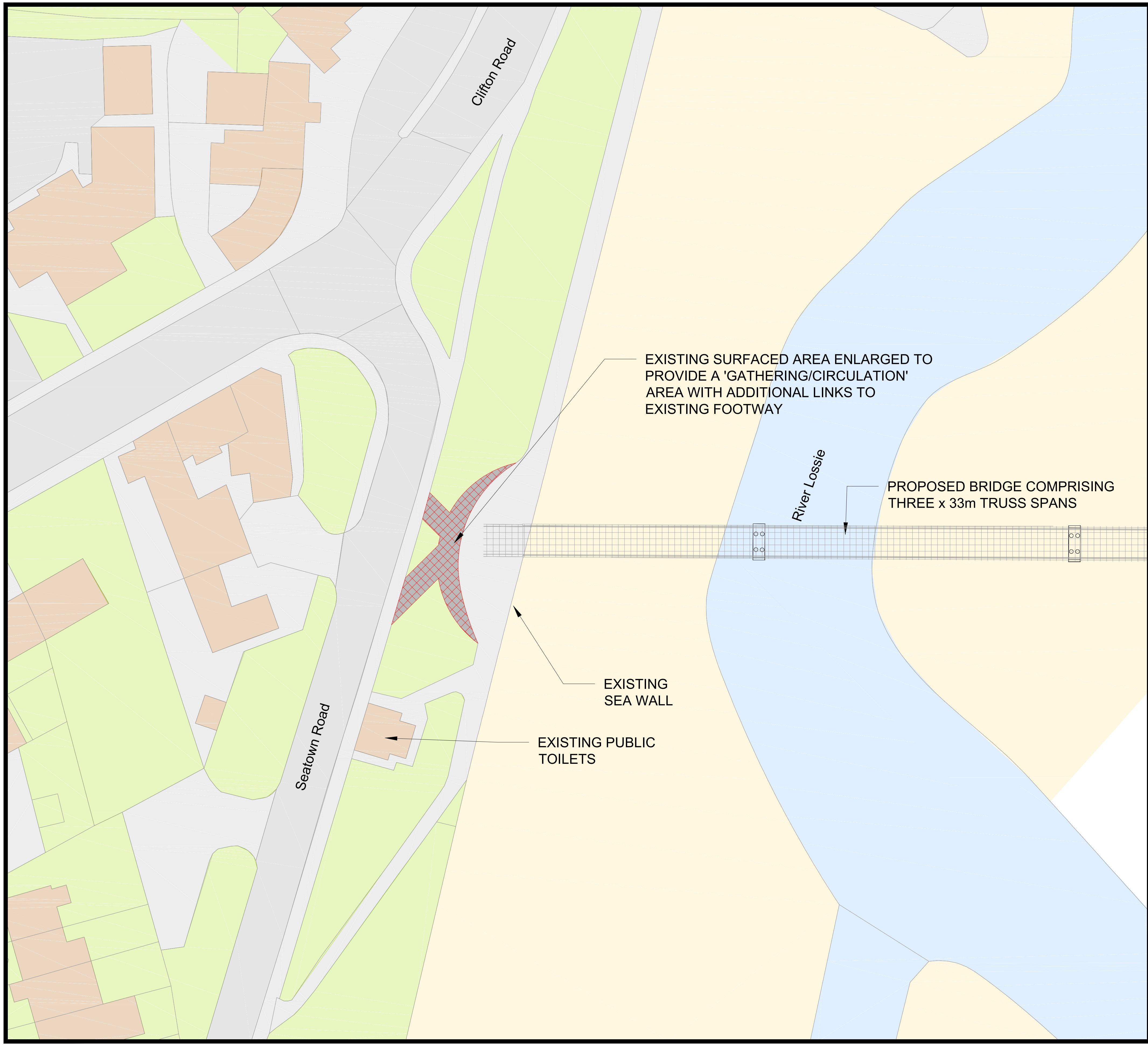

KEY:

- PROPOSED BRIDGE
- PROPOSED WORKS TO IMPROVE PEDESTRIAN MOVEMENT
- ROADS
- FOOTWAYS
- CAR PARK
- BUILDINGS / STRUCTURES
- GRASS / LANDSCAPING / UNDERGROWTH
- WATER / BEACH
- ROCKS

Rev	Description	Chkd	By	Date

Beaver Bridges Ltd
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BEAVER BRIDGES

Client

MORAY COUNCIL

Project Name

LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

Drawing Title

OPTION 5 : COMPROMISE PUBLIC NETWORK CONNECTIVITY

Start Date	Drawn	Designed	Checked	Scale
27/01/2021	BS	xx	LJ	1:500

Drawing Status	Page Size
PRELIMINARY	A3 L

Drawing No	Rev
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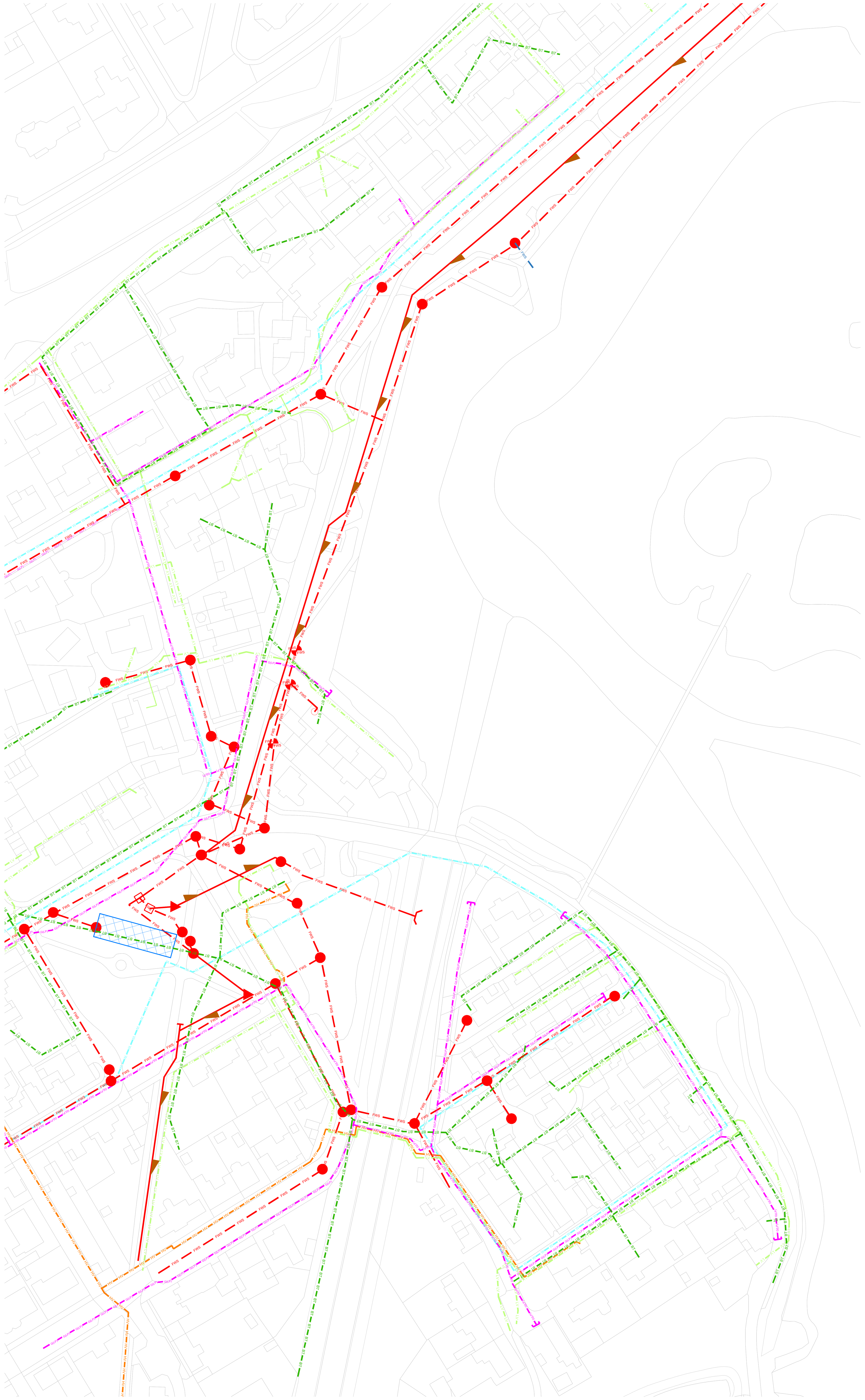

NOTES

1. All dimensions in millimeters. All levels in meters.
2. This drawing to be read in conjunction with other scheme drawings if applicable
3. This is a CAD produced drawing and should not be amended by hand
4. Do not scale from this drawing, work to stated dimension only. If in doubt ASK.

Key:

- Foul Sewer
- Combined Sewer
- Foul detention tank
- Water supply
- Low voltage electric
- High voltage electric
- Low pressure gas
- Telecoms

Rev	Description	Chkd	By	Date

Beaver Bridges Ltd
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Archers Way,
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Tel: 01743 811 811

BEAVER BRIDGES

Client
MORAY COUNCIL

Project Name
LOSSIEMOUTH FOOTBRIDGE REPLACEMENT

Drawing Title
EXISTING UTILITIES INFORMATION

Start Date	Drawn	Designed	Checked	Scale
28/11/2020	BS	xx	LJ	1:500

Drawing Status	Page Size
INFORMATION	A1 L

Drawing No	Rev
BB2020-UT-001	00

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Appendix B – Ground Investigation Report

soiltechnics
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Proposed redevelopment
East Beach Footbridge
Lossiemouth

Ground Investigation Report

Unit 9, Clarence Avenue, Westpoint Enterprise Park, Trafford Park, Manchester, M17 1QS
t: 0161 9470270 e: mail@soiltechnics.net w: www.soiltechnics.net

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Proposed footbridge redevelopment at East Beach Lossiemouth Scotland IV30 8NQ

GROUND INVESTIGATION REPORT

Soiltechnics Ltd. Unit 9, Clarence Avenue, Westpoint Enterprise Park, Trafford Park, Manchester, M17 1QS
Tel: (0161) 9470270 E-mail: mail@soiltechnics.net

Report originators

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Reviewed by	Sam Dean B.Sc. (Hons)., CEnv., MIEnvSc., FGS	sam.dean@soiltechnics.net Director

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Aerial photograph of site

Site boundary outlined in **MAGENTA**

Bookmarking

As a PDF version this document is bookmarked. If you click on the bookmark icon on a PDF viewer then the main contents listing is shown and by clicking on the bookmark you can navigate through the report.

Report status and format

Report section	Principal coverage	Report status	
		Revision	Comments
1	Executive summary		
2	Introduction		
3	Desk study information and site observations		
4	Chemical contamination		
5	Fieldwork		
6	Laboratory testing		
7	Ground conditions encountered		
8	Geotechnical Appraisal		
9	Further investigations		

List of drawings

Drawing	Principal coverage	Status	
		Revision	Comments
01	Site location plan		
02	Plan showing existing site features, location of exploratory points and proposed footbridge location		

List of appendices

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1 Executive summary

General

We recommend the following executive summary is not read in isolation to the main report which follows.

Site description, history and development proposals

The site is a proposed footbridge with two potential crossings being considered, allowing access to East Beach, located to the east of Lossiemouth. In general, the site comprises three areas: East Beach, the River Lossie, and mainland areas off Church Street and Clifton Road.

The site has generally remained the same with historic maps indicating no significant change since the 1870s. The River Lossie flows north-west then north towards the Old Harbour with East Beach to the east and Lossiemouth to the west. The current footbridge existed from as early as 1959.

We understand the scheme will comprise a replacement footbridge to allow access to East Beach from either the west (via Clifton Road), or from the south at the location of the current footbridge (via Church Street). We understand this existing footbridge crossing the River Lossie is structurally unsafe and has therefore been closed for use.

Ground conditions encountered

On the land side, the general geological sequence comprised Made Ground soils from surface to a depth of 0.8 to 0.9m comprising reworked sands over Storm Beach Deposits. Groundwater was encountered at 3.0m depth and is expected to be tidal.

On East Beach, the geological sequence comprised Marine Beach Deposits from surface. Groundwater was encountered at 1.3m and 3.0m and tidally influenced.

Suspected Burghead Sandstone Formation was encountered in BH01 at 6.50m depth, comprising a grey sandstone.

Foundation solution

In our opinion, the naturally deposited Marine Beach Deposits and Storm Beach Deposits could support the proposed development on pad type foundations. However, due to the nature of the site and difficulty working in the tidal channel and increased potential for scour, a piled solution has also been considered.

Chemical and gaseous contamination

As no source of significant chemical contamination has been identified on site, we are of the opinion that the site represents a low risk of causing harm to the health of identified current and proposed users of the site, and to construction operatives.

Due to the nature of the development comprising of a footbridge, with no enclosed spaces anticipated, the risk of any gaseous contamination affecting human receptors is considered negligible.

Unexploded Ordnance

A detailed UXO desk study identified Lossiemouth to have experienced enemy bombing raids during WWII suggesting the site is within a medium level risk zone. The report states there is a credible possibility that items of UXO may have found their way onto the site and could remain buried to the present day.

2 Introduction

2.1 Objectives

2.1.1 This report describes a ground investigation carried out for the proposed construction of a replacement footbridge at East Beach, Lossiemouth.

2.1.2 The objective of the ground investigation was to establish ground conditions at the site, sufficient to identify possible foundation solutions for the development and provide parameters necessary for the design and construction of foundations.

2.1.3 The investigation also included a preliminary evaluation of potential chemical and gaseous contamination of the site leading to the production of a risk assessment in relation to contamination.

2.2 Status of this report

2.2.1 This report is final based on our current instructions.

2.3 Client instructions and confidentiality

2.3.1 The investigation was carried out in October 2020 and reported in November 2020 acting on instructions received from Beaver Bridges Ltd.

2.3.2 This report has been prepared for the sole benefit of our above named instructing client, but this report, and its contents, remains the property of Soiltechnics Limited until payment in full of our invoices in connection with production of this report.

2.3.3 Our original investigation proposals were outlined in our letter to Beaver Bridges Ltd dated October 2020. The investigation generally followed our original investigation proposals. The investigation process was also determined to maintain as far as possible the original investigation budget costs.

2.4 Site location and scheme proposals

2.4.1 The National Grid reference for the site is 323760, 870540. A plan showing the location of the site is presented on Drawing 01.

2.4.2 At present, an existing footbridge allows access to East Beach from Church Street, from the south. We understand this existing footbridge crossing the River Lossie is structurally unsafe and has therefore been closed for use.

2.4.3 We understand the scheme will comprise the development of a footbridge to allow access to East Beach. Two potential route crossings are being considered; one option comprises a replacement crossing in the same location as the current condemned bridge, with the alternative route suggestion providing access from the west, via Clifton Road.

2.4.4 The two proposed bridge routes are indicated approximately on Drawings 01 and 02.

2.5 Report format and investigation standards

2.5.1 Sections 2, 3, 5, 6 and 7 of this report describe the factual aspects of the investigation with Section 4 providing a risk assessment of chemical contamination and Section 8 presenting an engineering assessment of the investigatory data. Section 9 outlines any further works.

2.5.2 Geotechnical aspects

2.5.2.1 Geotechnical investigations were carried out generally, and where practical following the recommendations of BS EN 1997:2 2007 '*Eurocode 7 – Geotechnical Design – Part 2: Ground Investigation and Testing*'. From a geotechnical viewpoint this is deemed to be a Ground Investigation Report (GIR) as set out in BS EN 1997:2. This report does not constitute a Geotechnical Design Report as defined in section 2.8 of BS EN 1997-1:2004+A1:2013 *'Eurocode 7 – Geotechnical Design – Part 1: General Rules'* and in particular will exclude assessment of lifetime actions to buildings from geotechnical influences.

2.5.3 Geo-environmental aspects

2.5.3.1 The investigation process also followed the principles of BS 10175:2011+A2:2017 *'Investigation of potentially Contaminated Sites – Code of Practice'*. The following elements, defined in BS 10175, have been completed and incorporated in this report.

a) Phase I — Preliminary investigation (desk study and site reconnaissance)

2.5.3.2 This investigation has been carried out and reported based on our understanding of best practice. Improved practices, technology, new information and changes in legislation may necessitate an alteration to the report in whole or part after publication. Hence, should the development commence after expiry of one year from the publication date of this report then we would recommend the report be referred back to Soiltechnics for reassessment. Equally, if the nature of the development changes, Soiltechnics should be advised and a reassessment carried out if considered appropriate.

2.6 Report distribution

2.6.1 This report has been prepared to assist in the design and planning process of the development and normally will require distribution to the following parties, subject to Soiltechnics liabilities defined below, although this list may not be exhaustive:

Table summarising parties likely to require information contained in this report

Party	Reason
Client	For information / reference and cost planning
Developer / Contractor / project manager	To ensure procedures are implemented, programmed and costed
Planning department	Potentially to discharge planning conditions
Environment Agency	If controlled waters are affected and obtain approvals to any remediation strategies
Independent inspectors such as Building Control	To ensure procedures are implemented and compliance with building regulations
Project design team	To progress the design
Principal Designer (PD)	To advise in construction risk identification and management under the Construction (design and management) regulations

Table 2.6

2.7 Soiltechnics liability

2.7.1 Soiltechnics disclaims any responsibility to our Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence in accordance with the terms of our contract, taking account of the manpower, resources, investigations and testing devoted to it by agreement with our Client. This report is confidential to our Client and Soiltechnics accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk.

3 Desk study information and site observations

3.1 General

3.1.1 We have carried out a desk study which was limited to a review of readily available information including:

a) Review of published Ordnance Survey maps dating back to 1871 at various published scales

b) Inspection of geological maps produced by the British Geological Survey together with relevant geological memoirs

c) Consultation with Statutory Undertakers

d) Site reconnaissance

e) Other relevant published documents

3.1.2 We have obtained old Ordnance Survey maps using the Envirocheck database system. In addition to retrieval of historical and current Ordnance Survey data, Envirocheck provide information compiled from outside agencies.

3.1.3 The study did not extend to the research of meteorological information, ecological or archaeological considerations, or consultation with any interested parties.

3.1.4 A copy of records produced by Envirocheck is presented in Appendix H. Envirocheck produce a wealth of factual database information. Although we can provide a discussion on each of the database topics, this would produce a very lengthy document, but some of these discussions would not be relevant to the aims of this report. As a consequence, we have extracted some of the relevant topics and discussed them in this section of the report.

3.2 Description of the site

3.2.1 The site comprises two potential crossing routes for a proposed footbridge allowing access from Lossiemouth to the East Beach land-spit, which is separated from the mainland by the River Lossie.

3.2.2 The River Lossie flows to the northwest before meandering northwards towards the North Sea. At high tide the river is approximately 110m wide beneath the existing footbridge, and 60m wide where it begins to flow north.

3.2.3 East Beach is a predominantly sandy stretch of coastline, forming a gently sloping beach, with sand dunes and sporadic vegetation running along the approximate centre of the land-spit.

3.2.4 One potential bridge route comprises a replacement of the existing footbridge, which is an approximately 120m long steel and timber structure allowing access from the south off Church Street. The alternative route would provide access from the old harbour wall, off Clifton Street, to the west of East Beach.

3.2.5 Along the landside of the River Lossie, the banks comprise of a stone-built sea wall with the land approximately 2m higher than the high tide level. The proposed abutment areas comprise of relatively flat grassed landscaped areas.

3.2.6 A plan showing observed site features and location of exploratory points together with scheme proposals is presented on Drawing 02. Photographs of the site are presented in Appendix E.

3.3 Injurious and invasive weeds and asbestos

3.3.1 Injurious and invasive weeds

3.3.1.1 Our investigations exclude surveys to identify the presence of injurious and invasive weeds. We did not observe any obvious evidence the above species, however, a specialist would need to confirm this.

3.3.2 Asbestos

3.3.2.1 Our investigations exclude surveys to identify the presence or indeed absence of asbestos on site. It should be noted however, that where intrusive investigations were undertaken, we did not observe any obvious evidence of potential asbestos containing materials.

3.4 History of the site

3.4.1 An attempt to trace the history of the site has been carried out by reviewing copies of old Ordnance Survey maps provided by Envirocheck. The recent history of the site based on published Ordnance Survey maps is summarised below.

3.4.2 The East Beach, River Lossie and immediate land-side coastline has generally remained the same with no significant changes noted since the 1870s. The River Lossie flows north-west then north towards the Old Harbour with East Beach to the east and Lossiemouth to the west. The current footbridge existed from as early as 1959.

3.4.3 From the 1870s, residential properties are predominantly located to the south of the site, with mixed residential, commercial and light industrial land uses present to the north and west. Lossiemouth Railway Station existed to the north with a railway line running south along the now named Clifton Road immediately west of the site. A series of quarries are also recorded at this time c.80m west of the site.

3.4.4 An Old Pier is indicated protruding from the East Beach's northern tip, which is later developed into a breakwater in subsequent mapping records.

3.4.4 By the late 1960s, the quarries, railway line and station are no longer recorded.

3.5 Geology and geohydrology of the area

3.5.1 Geology of the area

3.5.1.1 Envirocheck reproduce geological map extracts taken from the British Geological Survey (BGS) digital geological map of Great Britain at 1:50,000 scale (ref Appendix H).

3.5.1.2 Surface geology at the East Beach comprises recent Marine Beach Deposits (sand), with the sand dunes comprising of Blown Sand.

3.5.1.3 Land-side, the surface geology is recorded to comprise post-glacial Storm Beach Deposits. It is also noted that the former coastline ran further east and south of the site, and it is therefore anticipated this is underlain by older strata of Marine Beach Deposits, potentially containing marine and estuarine alluvium.

3.5.1.3 A summary of the recorded geological information for the site is presented in the following table:

<table>
<tr><th colspan="6">Summary of Geology and likely aquifer containing strata</th></tr>
<tr><th>Strata</th><th>Bedrock or superficial</th><th>Approximate thickness</th><th>Typical soil type</th><th>Likely permeability</th><th>Aquifer designation</th></tr>
<tr><td>Blown Sand</td><td rowspan="3">Superficial</td><td rowspan="4">Unknown</td><td>Sands</td><td>Permeable</td><td>-</td></tr>
<tr><td>Storm Beach Deposits</td><td>Gravels</td><td>Permeable</td><td>Secondary A</td></tr>
<tr><td>Marine Beach Deposits</td><td>Predominantly sands with some gravels and silts</td><td>Permeable</td><td>Secondary A</td></tr>
<tr><td>Burghead Sandstone Formation</td><td rowspan="2">Bedrock</td><td rowspan="2">Sandstone</td><td>Permeable</td><td>Principal Aquifer</td></tr>
<tr><td>Kingsteps Sandstone Formation</td><td>Up to 73m</td><td>Permeable</td><td>Principal Aquifer</td></tr>
<tr><td colspan="6">Table 3.5.1</td></tr>
</table>

3.5.2 Water abstractions

3.5.2.1 There are no active groundwater or surface water abstraction points located within 2000m of the site.

3.5.2.2 The site is not located within a zone protecting a potable water supply abstracting from a Principal Aquifer (i.e. a Source Protection Zone).

3.5.3 Coal mining and brine extraction

3.5.3.1 The site is not recorded to be within an area affected by past or present coal mining, or minerals worked in association with coal or brine extraction (within the Cheshire Brine Compensation District).

3.5.4 Shallow mining and natural subsidence hazards

3.5.4.1 The British Geological Survey present hazard ratings for shallow mining and natural subsidence hazards. The site has the following ratings:

Table summarising mining and subsidence hazards

Hazard	Rating
Mining hazard in non-coal mining areas	Rare
Potential for collapsible ground stability hazard	No hazard
Potential for compressible ground stability hazard	No hazard
Potential for ground dissolution stability hazard	No hazard
Potential for landslide ground stability hazard	Very low
Potential for running sand ground stability hazard	Moderate
Potential for shrinking or swelling clay ground stability hazard	No hazard

Table 3.5.4

3.5.4.2 The moderate rating for running sands is associated with the unconsolidated sand deposits on East Beach and the high groundwater levels.

3.6 Landfill and infilled ground

3.6.1 There are no registered landfill sites within 1000m of the site. Inspection of old Ordnance Survey maps indicates Lossie Quarry c.80m west of the subject site and we are aware from our site reconnaissance visit that the quarry face is still exposed with the local area now comprising of roads and residential properties.

3.6.2 In addition, records also indicate two areas of potentially infilled land within 250m of the site; 92m and 204m to the north west. Both areas are described as unknown filled ground and presently comprise residential properties and public open space.

3.7 Flood risk

3.7.1 The site is located within a tidal flood plain. The site is in an area which has a high likelihood of coastal and river flooding, and is also recorded to be in an area which has the potential for groundwater flooding to occur at surface.

3.7.2 It should be noted that this information does not constitute a site-specific Flood Risk Assessment (FRA), and a full FRA may be required for the development to support a planning application or satisfy planning conditions.

3.8 Environmental sensitivity

3.8.1 The site is not reported to be within or close to an area of designated sensitive land use, such as a Ramsar Site or Special Area of Conservation.

3.8.2 The site is located in a Nitrate Vulnerable Zone associated to polluted waters.

3.9 Recent industrial activity

3.9.1 There are no recorded pollution incidents or discharge consents within 200m of the site.

3.9.2 There are no pertinent Contemporary Trade Directory entries on site. There are a small number of records held within 250m, which include an active engineers, dry cleaners and garage services. None of these lie within 50m of the site.

3.9.3 There are no Integrated Pollution Control (IPC), Integrated Pollution Prevention and Control (IPPC), or Hazardous Substances records held within 200m of the site

3.10 Enquiries with statutory undertakers

3.10.1 We have obtained a Linesearch report and contacted the following Statutory Undertakers (SUs) to obtain copies of their records in order to avoid damaging their apparatus during our fieldwork activities: -

a) BT Openreach Ltd
b) Scottish Water
c) Scotia Gas Networks plc
d) Scottish & Southern Electricity Networks
e) Indigo Pipelines Ltd

3.10.2 Copies of responses received prior to publication of this report are presented in Appendix G.

3.10.3 Normally Statutory Undertakers drawings record the approximate location of their services. We recommend further on site investigations be undertaken to confirm the position of the apparatus and thus establish the effect on the proposed development and the necessity or otherwise for the permanent or temporary diversion of the service to allow the construction of the development to safely and successfully proceed.

3.10.4 It should be noted that statutory undertakers' records normally exclude private services.

3.11 Unexploded Ordnance (UXO) Risk

3.11.1 As part of our fieldwork activities we obtained a preliminary UXO risk review, from MACC International. The report confirmed that the surrounding area of Lossiemouth did suffer enemy bombing raids during WWII, with one raid impacting RAF Lossiemouth (located approximately 1.7km to the south-west).

3.11.2 The report discussed a credible possibility that items of UXO may have found their way onto the site (being washed up in storm events), and remained there buried to the present day. A copy of the report produced by MACC is presented in Appendix I.

3.11.3 Owing to the potential risk of encountering UXO on site a specialist EOD engineer attended site during fieldwork activities. The EOD Engineer provided a UXO briefing to all site workers and conducted frequent scanning using a magnetometer to identify potential UXO objects in advance of and during our drilling operations. No abnormalities were encountered during the works.

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4 Chemical contamination

4.1 Objectives and procedures

4.1.1 This report section discusses investigations carried out with respect to chemical contamination issues relating to the site. The investigation process followed the principles of BS 10175:2011+A2:2017 *'Investigation of potentially contaminated sites – Code of Practice'* and was limited to a desk study (preliminary investigation).

4.1.2 This section of the report produces an *'Initial Conceptual Site Model'* (iCSM) based on desk study information obtained to date. The conceptual model is constructed by identification of *contaminants* and establishment of feasible *pathways* and *receptors.* The conceptual model allows a *risk assessment* to be derived. Depending upon the outcome of the risk assessment it may be necessary to carry out remediation and/or further investigations with a view to eliminating, reducing or refining the risk of harm being caused to identified receptors. If appropriate, our report will provide recommendations in this respect.

4.1.3 In determining our iCSM, We have adopted, in general, the procedures described in CIRIA C552 *'Contaminated land risk assessment - a guide to good practice'*

4.1.4 Definition of terms used in the preceding paragraph and subsequent parts of this section of the report are presented in Appendix B.

4.2 Development characterisation and identified receptors

4.2.1 Site characterisation

4.2.1.1 The nature of the site has a significant influence the likely exposure pathways between potentially contaminated soils and potential receptors. The following table summarises elements which characterise the site based on desk study information.

Summary of site characteristics		
Element	**Source / criteria**	**Characteristic**
Current land use	Observations	Existing footbridge over River Lossie. Currently condemned and inaccessible to the public. East Beach is a public sandy beach.
Future land use	Advice	Footbridge over River Lossie to access East Beach.
Site history	Desk study	Similar to the present day with current footbridge existing from as early as 1959.
Geology	Desk study	**Beach side:** Blown Sands and Marine Beach Deposits, underlain by Kingsteps Sandstone Formation. **Land side:** Storm Beach Deposits underlain by Marine Beach deposits and sandstone bedrock.
Groundwater	Aquifer potential	Secondary A in Marine Beach Deposits and Storm Beach Deposits. Principal Aquifer in Burghead Sandstone Formation and Kingsteps Sandstone Formation.
	Abstractions	None within 500m of site.
	Source protection zone	Site not within a Source protection zone
Surface waters	Location	River Lossie flows north westerly beneath the proposed footbridge and north into the North Sea.
	Abstractions	None within 500m of site.

Table 4.2.1

4.2.2 Identified receptors

4.2.2.1 The principal receptors subject to harm caused by any contamination of the proposed development site are as follows.

Principle Receptor	Detail
Humans	Users of the current site
	End user of the developed site
	Construction operatives and other site investigators
Vegetation	Plants and trees, both before and after development
Controlled waters	Surface waters (Rivers, streams, ponds and above ground reservoirs)
	Ground waters (used for abstraction or feeding rivers / streams etc)
Building materials	Materials in contact with the ground

Table 4.2.2

4.2.2.2 This section of the report assesses those receptors tabulated above.

4.2.3 Human receptors

4.2.3.1 Currently, the bridge is not accessible to the general public, and would only be accessible to construction operatives following appropriate CDM and H&S protocols. We therefore do not consider humans a viable receptor to the current site.

4.2.3.2 Following completion of the development the critical site user (receptor) is considered to be a child under the age of 6 years. Our assessment also considers the risk to construction operatives as adult receptors during the construction phase.

4.2.4 Vegetation receptors

4.2.4.1 Soil contaminants can have an adverse effect on plants if they are present at sufficient concentrations. The effects of phytotoxic contaminations include growth inhibition, interference with natural processes within the plant and nutrient deficiencies.

4.2.4.2 No significant vegetation is present on, or adjacent to the site, and we understand that no planting is proposed as part of the bridge redevelopment, therefore vegetation is discounted as a potential receptor and from further consideration within this report.

4.2.5 Water receptors

4.2.5.1 The site lies in an area designated as a Secondary A Aquifer, associated with the Marine Beach Deposits and Storm Beach Deposits. The underlying sandstone bedrocks are classified as Principal Aquifers.

4.2.5.2 The River Lossie runs directly beneath the proposed bridge development, ultimately discharging into the North Sea some 250m north of the site.

4.2.5.3 In consideration of the permeable geology and proximity to surface water features (the river and sea), any contaminants entering the groundwater locally is highly likely to quickly migrate into the nearby surface waters. Therefore, the surface waters are considered to be the primary surface water receptor, with the groundwater being a transient receptor only.

4.2.6 Building materials

4.2.6.1 Building materials in contact with the ground such as concrete foundations and water supply pipes, are receptive to damage caused by aggressive ground conditions. Generally risks and preventative measures are impossible to establish at the desk study stage and investigations are required to manage any identified risks. At this stage this receptor group is not considered further.

4.2.7 Summary of identified receptors

4.2.7.1 Based on the above assessments, the following table summarises identified and critical receptors.

Table summarising identified (viable) receptors				
Principle Receptor	**Detail**	**Viable and critical receptors**		
		Viability		**Critical receptor**
Humans	Users of the current site	No	Site inaccessible to public	-
	End user of the developed site	Yes	Site accessible to public including children	Child
	Construction operatives and other site investigators	Yes		Adult
Vegetation	Current site	No	None on site	Vegetation
	Developed site		None anticipated	Vegetation
Controlled waters	Surface waters: River Lossie and the North Sea)	Yes	Close proximity to sea	Surface waters
	Ground waters: Transient only, quickly discharging into surface waters	Yes	Site over Secondary A and Principal Aquifers	Groundwater
Building materials	Materials in contact with the ground	Yes	Not considered further	Building materials
Table 4.2.7				

4.3 Identification of pathways

4.3.1 Pathways to human receptors

4.3.1.1 Guidance published by the Environment Agency in Science Report SC050021/SR3 *'Updated technical background to the CLEA model'* provides a detailed assessment of pathways and assessment and human exposure rates to source contaminants. In summary, there are three principal pathway groups for a human receptor:

Table summarising likely pathways	
Principal pathways	**Detail**
Ingestion through the mouth	Ingestion of air-borne dusts
	Ingestion of soil
	Ingestion of soil attached to vegetables
	Ingestion of home-grown vegetables
Inhalation through the nose and mouth.	Inhalation of air-borne dusts
	Inhalation of vapours
Absorption through the skin.	Dermal contact with dust
	Dermal contact with soil
Table 4.3.1	

4.3.1.2 The proposed development comprises a new footbridge with associated hardstanding. The presence of hardstanding will severely restrict pathways to the potentially contaminated soils to human receptors, and the absence of any indoor spaces limits the potential for the inhalation of vapours (due to fresh air dilution).

4.3.2 Pathways to controlled waters

4.3.2.1 A number of pathways exist for transport of soil contamination to controlled waters. A summary of these pathways are:

- Percolation of water through contaminated soils.
- Near-surface water run-off through contaminated soils.
- Saturation of contaminated soils by flood waters.

4.3.2.2 Based on our current understanding of development proposals, the bridge and associated abutments areas will comprise of hardstanding materials. Pathways for percolation and near surface run off through near surface soils would, therefore, be limited post-development; however the presence of foundations may present preferential pathways for the vertical migration of contaminants.

4.3.3.3 The site is within the tidal floodplain for the River Lossie and the North Sea, and there is considered to be a high likelihood of coastal and surface water flooding. Therefore, saturation of contaminated soils by flood and tidal waters is considered to be a viable pathway post-development.

4.3.4 Summary of identified likely pathways

4.3.4.1 Based on the above assessments, the following table summarises likely pathways of potential chemical contaminants at the site to identified receptors.

Table of likely pathways

Receptor group	Critical receptor	Pathway
Proposed site users	Child	Inhalation, ingestion and dermal contact with soils and dusts (limited)
		Inhalation of vapour (limited)
Construction operatives	Adult	Inhalation, ingestion and dermal contact with soils and dusts
		Inhalation of vapour
Groundwaters and surface waters	Secondary A and Principal Aquifers, River Lossie, North Sea	Vertical migration of contaminants down foundation edges. Percolation (limited); Saturation from tidal and flood waters.

Table 4.3.4

4.4 Assessment of sources of chemical contamination

4.4.1 Introduction

4.4.1.1 Initially, potential sources of contamination are assessed using the following elements of the investigation process.

1. History of the site
2. Desk study information
3. Site reconnaissance
4. Geology

These elements will dictate a relevant soil/water testing regime to quantify possible risks of any identified contaminative sources which may harm identified receptors.

4.4.2 Source assessment – History of the site

4.4.2.1 Based on published historical maps, there is limited evidence to indicate the site or its immediate surroundings have been subject to activities likely to result in a significant source of chemical contamination.

4.4.3 Source assessment – Desk study information

4.4.3.1 Envirocheck presents a detailed database of environmental information in relation to the site including;

- Pollution incidents
- Landfill sites
- Trading activities

4.4.3.2 Based on the Envirocheck data (refer Appendix H) the site has no recorded history of any pollution events, land uses, or trading activities in close proximity to the site which is likely to result in a significant source of contamination.

4.4.4 Source assessment – Site reconnaissance

4.4.4.1 A full description of the site and observed adjacent land uses is provided in Section 3 of this report. A plan summarising observations made on site during our site reconnaissance visit is presented on Drawing 02.

4.4.4.2 We did not observe any obvious evidence of any current or recent activities on site or adjacent sites likely to result in a potential source of chemical contamination.

4.4.5 Source assessment – Geology

4.4.5.1 The recorded superficial deposits do not typically exhibit any abnormal concentrations of naturally occurring chemical contaminants.

4.4.6 Source assessment – Summary

4.4.6.1 With consideration to a range of available data sources, no viable contaminant sources have been identified on site or within influencing distance of the site.

4.5 Initial Conceptual Model

4.5.1 As no significant contaminant sources have been identified, no viable pollutant linkages can be established. Therefore, the risk to identified receptors is considered to be low.

4.5.2 Due to the absence of pollutant linkages, a tabulated or diagrammatic iCSM is not considered appropriate.

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4.6 Risk assessment summary and recommendations

4.6.1 Based on our assessments described above, we can provide the following summary and recommendations for each identified receptor.

4.6.2 Current and end site users

4.6.2.1 As no source of significant chemical contamination has been identified on site, we are of the opinion that the site represents a low risk of causing harm to the health of identified current and proposed users of the site.

4.6.3 Construction operatives and other site investigators

4.6.3.1 The risk of damage to health of construction operatives and other site investigators is, in our opinion, low. As a precautionary approach, however, we recommend adequate hygiene and safety precautions are adopted on site, in line with good working practices on brownfield sites. Guidance on safe working practices can be obtained from the following documents

- The Health and Safety Executive Publication *"Protection of Workers and the General Public during the Development of Contaminated Land"* (HMSO) and
- *"A Guide to Safer Working on Contaminated Sites"* (CIRIA Report 132).

4.6.4 Controlled waters

4.6.4.1 As no source of significant chemical contamination has been identified on/adjacent to the site, we are of the opinion that the site represents a low risk of causing harm to water receptors.

4.7 Gaseous contamination

4.7.1 Due to the nature of the development comprising of a footbridge, with no enclosed spaces anticipated, the risk of any gaseous contamination affecting human receptors is considered to be negligible.

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5 Fieldwork

5.1 General

5.1.1 Fieldwork was carried out from 19th to 23rd October 2020 and comprised the following activities:-

- Excavation of 5 (five) exploratory boreholes using cable and tool percussion drilling techniques
- Cone Penetration Testing (CPT) in 34 (thirty-four) locations

5.1.2 A plan of the site showing observed/existing site features and position of proposed footbridge and exploratory points is presented on Drawing 02. The position of exploratory points shown on these plans is approximate only.

5.1.3 The extent of fieldwork activities and position of exploratory points were defined by both the Client and Soiltechnics.

5.1.4 Exploratory points were positioned to avoid known locations of underground services, to avoid possible location of proposed foundations but were also positioned to provide a reasonable coverage of the site. Prior to commencement of exploratory excavations an electronic cable locating tool was used to scan the area of the excavation. If we received a response to this equipment, then the excavation would be relocated

5.1.5 All soils exposed in excavations were described in accordance with BS EN ISO 14688 *'Identification and Classification of soil'* and BS EN ISO 14689 *'Identification and classification of rock'.*

5.2 Site restrictions

5.2.1 Access to East Beach for pedestrians and road vehicles was unachievable due to the channel of the River Lossie separating the beach from mainland; unless a lengthy journey was undertaken allowing access from the east.

5.2.2 A cable percussive rig mounted on to a tracked all-terrain vehicle (ATV) was used to ford across the River Lossie, which was only possible during low tide events. Pedestrian access was made possible by the use of a small boat, provided by the client.

5.2.3 Boreholes undertaken on East Beach were restricted to areas which were relatively flat and this was assessed by Soiltechnics and sub-contractors.

5.2.4 Boreholes were also restricted to being located beyond the high tide level.

5.2.5 BH02 was terminated at 2m depth due to flooding by swells of the incoming tide. The borehole was reattempted as BH02A and located further to the east.

5.3 Light cable and tool percussion boring

5.3.1 Boreholes BH01 to BH04, (including BH02A) were excavated using light cable percussion boring techniques as described in EN ISO 22475-1:2006 forming 150mm diameter holes. Temporary casing was advanced within the borehole excavation to maintain the stability of the hole. When groundwater was encountered the excavation was temporarily halted to allow for groundwater observations to be made. Following groundwater observations the casing was advanced within the hole and the location/locations of the water strikes recorded. The casing was subsequently advanced to maintain the stability of the borehole and seal off the water to prevent further ingress. Additional records were taken when (and if) the casing produced a seal against water ingress and at the commencement and completion of a days drilling operations. When obstructions were encountered a chisel was employed to break through the obstruction. Time taken to progress the excavation using the chisel is recorded on the borehole logs.

5.3.2 1.2m deep service inspection pits were excavated prior to the drilling of BH01 and BH03.

5.3.3 On completion of the boreholes, they were backfilled with arisings and compacted using drilling tools.

5.3.4 Bulk soil samples for identification or subsequent 'classification' laboratory testing were taken from borehole cutting equipment. The samples were placed in a plastic bag and subsequently sealed and labelled. Soil samples were obtained where possible to meet category B quality classes 3 to 5 as described in BS EN 1997-2:2007 (table 3.1).

5.3.5 Standard Penetration Testing (SPT) was carried out at regular frequencies in the borehole. The test was carried out in accordance with BS EN ISO 22476-3:2005. Key details of the test, as required by BS EN ISO 22476-3 are recorded in Appendix D. The drive rods were type AW. Samples taken from the open sampler (SPT) were placed in a plastic bag, sealed and labelled. In coarse granular soils, a solid 60^{o} cone may have been used to replace the SPT cutting shoe. This test is reported as SPT(C). Summary of standard penetration testing is recorded on borehole logs.

5.3.6 A graphical summary of standard penetration test results is presented in Appendix C.

5.3.7 The borehole excavations were formed by drillers who are NVQ Level 2 qualified in Land Drilling under the Construction Awards Alliance CAA with samples relogged by an experienced Geotechnical Engineer.

5.3.8 Records of boreholes formed by light cable and tool percussion drilling techniques are presented in Appendix D.

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5.4 Static cone penetration testing

5.4.1 The static cone penetration test involves hydraulically pushing a 15cm^2 cone into the ground at a standard rate of 2cm/sec and measuring its penetration resistance. The cone is equipped with a 'friction sleeve', which measures the shear stress applied by the soil as the sleeve passes through it. The ratio between cone resistance (expressed in units of stress) and the side shear is termed 'friction ratio' and is used to estimate the type of soil through which the cone is being driven. The equipment is housed in a tracked vehicle, which is used for the hydraulic equipment to the jack against.

5.4.2 The static cone penetrating testing was carried out following BS EN ISO 22476-1:2012 *Geotechnical investigation and testing. Field testing. Electrical cone and piezocone penetration test'.* Static cone penetration testing was carried out by Insitu Site Investigations Ltd in a total of 34 locations to depths ranging between 1.74m and 6.67m.

5.4.3 A copy of their report and interpretation of soils types penetrated by the cone is provided in their report presented in Appendix J.

5.5 Sampling strategy

5.5.1 Geotechnical

5.5.1.1 In general we adopted a judgemental sampling strategy in relation to geotechnical aspects of the investigation. The location and frequency of sampling was carried out in consideration of the following:

i) Topography
ii) Geology (including Made Ground)
iii) Nature of development proposals

5.5.2 Sample retention

5.5.2.1 Samples are stored for a period of one month following issue of this report, unless otherwise requested.

6 Laboratory testing

6.1	Classification testing

6.1 Classification

6.1.1 Laboratory testing was carried out on samples retrieved from site. The method of testing is recorded on the laboratory test certificate. The following table summarises the classification testing scheduled;

Table summarising classification testing

Exploratory point	Depth (m)	Soil type	Testing scheduled (determination of)
BH01	2.0	Granular	Particle size distribution (coarse sieve)
BH01	4.0		
BH01	5.0		
BH02	1.2		
BH02A	3.2		
BH02A	4.2		
BH03	3.0		
BH03	5.0		
BH03	8.0		
BH04	1.2		
BH04	2.2		
BH04	3.8		

Table 6.1.1

6.1.2 Laboratory test certificates are presented in Appendix F.

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7 Ground conditions encountered

7.1 Soils

7.1.1 The exploratory excavations encountered the following geological profile, in order of superposition:

- Made Ground (Land side only)
- Marine Beach Deposits (Beach side only)
- Storm Beach Deposits (Land side only)
- Burghead Sandstone Formation (Land side only)

7.1.2 Made Ground

7.1.2.1 Made Ground soils were encountered in the two land side boreholes (BH01 and BH03) to depths of 0.8m and 0.9m, typically comprising a veneer of Topsoil (0.1m to 0.2m thick) over brown and greyish brown slightly gravelly/gravelly fine to medium sand with medium cobble content. Gravel comprised of sub angular to rounded fine to coarse mixed lithologies predominantly sandstone and quartzite and cobbles comprised of angular to sub angular sandstone.

7.1.3 Marine Beach Deposits

7.1.3.1 Marine Beach Deposits were encountered in BH02, BH02A, and BH04 to termination depths of approximately 5.10m.

7.1.3.2 Typically, these deposits comprised of a medium dense light brown fine to medium sand to 4m bgl, where it became slightly gravelly with occasional cobbles of sandstone.

7.1.3.3 CPT in-situ testing carried out along the proposed routes and abutment locations generally confirm the geology encountered within the boreholes. The testing shows a general increase of density with depth, and also indicates that localised silt bands are present within the unit. The results are included within Appendix J.

7.1.4 Storm Beach Deposits

7.1.4.1 Storm Beach Deposits were encountered in BH01 (to 6.50m depth) and BH03 (to 9.65m depth) directly underlying the Made Ground soils. This deposit comprised of light brown to brown slightly gravelly slightly silty fine to coarse sand with gravels consisting of sub angular to rounded fine to coarse mixed lithologies predominantly sandstone and quartzite. From 3.9m to 5.0m in BH01 this was encountered as a sand and gravel and as a slightly sandy gravel from 7.0m to termination depth of 9.65m in BH03.

7.1.5 Burghead Sandstone Formation

7.1.5.1 Suspected bedrock was only encountered in BH01 at 6.50m comprising of a light grey sandstone, recovered as a gravel after a prolonged effort of chiselling.

7.1.6 Summary

7.1.6.1 The following table summarises the geology encountered;

Table summarising soil types

Strata	Depth to top (m)	Depth to bottom (m)	Thickness (m)	Summary description
Made Ground Topsoil	0.0	0.1 – 0.2 (0.15)	0.1 – 0.2 (0.15)	Grass onto dark brown slightly gravelly sand with some rootlets
Made Ground – Reworked Sand	0.1 – 0.2 (0.15)	0.8 – 0.9 (0.85)	0.7	Brown and greyish brown slightly gravelly/gravelly fine to medium sand with medium cobble content
Marine Beach Deposits (shallow)	0.0	3.8 – 4.1 (3.95)	3.8 – 4.1 (3.95)	Light brown fine to medium sand.
Marine Beach Deposits (deep)	3.8 – 4.1 (3.95)	5.05 – 5.17 (5.11)	1.07 – 1.25 (1.16)	Greyish brown slightly gravelly/gravelly slightly silty fine to medium sand
Storm Beach Deposits	0.8 – 0.9 (0.85)	6.5 -9.65 (8.1)	5.7 – 8.75 (7.2)	Light brown to brown slightly gravelly slightly silty fine to coarse sand
Burghead Sandstone Formation	6.5	-	-	Light grey sandstone

Table 7.1.6.1

Figures in brackets are average values

7.1.6.2 With the exception of Made Ground, the investigation generally confirmed published geological records.

7.1.7 River Channel

7.1.7.1 The CPT testing encountered Marine Beach Deposits within the river channel, with the overall depths in relative parity with the holes undertaken on East Beach. Within the northern route crossing, the depth of the superficial deposits were proven to a depth of approximately 1.8m, where they met refusal on competent ground. Within the southern crossing, refusal was generally met at a depth of around 3m bgl.

7.2 Geotechnical parameters

7.2.1 The following table summarises test data in all of the natural geological strata encountered.

Table summarising soil testing and derived geotechnical parameters

Geotechnical parameter	Geological unit	Method	Value range (kN/m³)	Characteristic value (kN/m³)	Comments	Notes
Weight density (above water table)	Marine Beach Deposits (shallow)	Soil descriptions	15.5 - 18	16	Derived from BS 8004 figure 1. Lowest value to be used in structural design for a medium dense sand.	1, 2
	Marine Beach Deposits (deep)		17 – 19	17	Derived from BS 8004 figure 1. Lowest value to be used in structural design for a dense sand.	1, 2
	Storm Beach Deposits		15.5 - 19	17		1, 2
Weight density (below water table)	Marine Beach Deposits (shallow)	Soil descriptions	18 – 20.5	18	Derived from BS 8004 figure 2. Lowest value to be used in structural design for a medium dense sand.	1, 2
	Marine Beach Deposits (deep)		19.5 – 21.5	19.5	Derived from BS 8004 figure 2. Lowest value to be used in structural design for a dense sand.	1, 2
	Storm Beach Deposits		18 – 21.5	19.5		1, 2
SPT 'N' Value	Marine Beach Deposits (shallow)	Insitu testing	4 - 38	15	Average value used	1, 2
	Marine Beach Deposits (deep)		52 - refusal	50	Typical value for refusal used	1, 2
	Storm Beach Deposits		4 - 44	35	Average value used	1, 2
Angle of shearing resistance, ϕ_{pk} (°)	Marine Beach Deposits (shallow)	Soil description and laboratory testing	30 – 35	31	Derived using BS8004:2015 Equation 5 and literature	1, 2
	Marine Beach Deposits (deep)		36 – 40	36		1, 2
	Storm Beach Deposits		35 – 40	37		1, 2

Table 7.2.1

1. Insitu test data presented in Appendix C
2. CPT test data, presented in Appendix J.

7.2.2 The following table summarises test data in Made Ground.

Table summarising soil testing and derived geotechnical parameters

Geotechnical parameter	Geological unit	Method	Value range (kN/m³)	Characteristic value (kN/m³)	Comments	Notes
Weight density (above water table)	Reworked sands	Soil descriptions	16 - 20	16	Derived from BS 8004 figure 1. Lowest value to be used in structural design.	

Table 7.2.2

7.3 Groundwater

7.3.1 Groundwater inflows were observed in all of the exploratory excavations. A summary of our observations is tabulated below:

Table summarising groundwater observations

Exploratory point	Date of observation	Depth (m) below ground levels	Observations
BH01	19/10/20	3.0	Rising to 2.8m after 20 minutes
BH02	19/10/20	1.3	Rising associated with tide
BH02A	20/10/20	1.3	Rising associated with tide
BH03	21/10/20	3.0	Rising to 2.8m after 20 minutes
BH04	21/10/20	3.0	Rising associated with tide, 2m at end of shift and at 3.10m at beginning of shift on 22/10/20.

Table 7.3.1

7.3.2 It should be noted that due to the close proximity of the coast, the site is located within a tidal flood plain and water levels will vary depending generally on recent weather conditions and tide levels. Only long-term monitoring of levels in standpipes will provide a measure of seasonal variations in groundwater levels.

7.4 Evidence of contamination

7.4.1 During excavation of our exploratory points, no evidence of contamination was noted.

7.5 Obstructions and instability

7.5.1 The following table summarises obstructions encountered during our exploratory excavations;

Table summarising obstructions and instability observations

Exploratory point	Depth of obstruction (m)	Description of obstruction and/or instability
BH01	0.1 – 0.8	Frequent sandstone cobbles encountered in Made Ground
BH01	3.7 – 3.9	Sandstone cobble encountered
BH03	0.2 – 0.9	Frequent sandstone cobbles encountered in Made Ground
BH03	2.5 – 2.9	Sandstone boulder encountered

Table 7.5.1

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8 Geotechnical Appraisal

8.1 General description of the development

8.1.1 The following assessments are made on the investigatory data presented in the preceding sections of this report and are made with reference to specific nature of the development. Should scheme proposals change then it may be necessary to review the investigation and report.

8.1.2 The project will comprise the construction of a footbridge to allow access between East Beach and Lossiemouth. The proposed footbridge will replace an existing footbridge which has structural defects and is deemed unsafe.

8.2 Building regulations and this report section

8.2.1 Building Regulations

8.2.1.1 Current Approved Document A of the building Regulations references Eurocodes and their UK National Annexes as practical guidance in meeting part A requirements. Approved document A advises there may be alternative ways of achieving compliance with requirements where it can be demonstrated that the use of withdrawn standards no longer maintained by the British Standards Institution continues to meet Part A requirements.

8.2.2 This report section

8.2.2.1 This chapter of the report provides both a foundation strategy for the proposed development and geotechnical design parameters to comply with Eurocode 7 (BSEN1997-1:2004 *'Geotechnical Design – part 1 General Rules'* and the corresponding UK National Annex).

8.2.3 Geotechnical terms

8.2.3.1 Definitions of geotechnical terms used in the following paragraphs are provided in Appendix A.

8.2.4 **This report**

8.2.4.1 This report is a ground investigation report (GIR) and does not constitute a Geotechnical Design Report as defined in section 2.8 of BS EN 1997-1:2004 *'Eurocode 7 – Geotechnical Design – Part 1: General Rules'* and in particular will exclude assessment of lifetime actions to buildings from geotechnical influences.

8.3 The geological model

8.3.1 **Landside**

8.3.1.1 Made Ground was encountered in both land side boreholes (BH01 and BH03) to depths 0.8m and 0.9m. Made Ground is underlain by Storm Beach Deposits, typically described as medium dense and dense silty Sand and Gravel to 6.50m and 9.65m depths in BH01 and BH03 respectively. It is conjectured that bedrock was encountered in BH01 at 6.50m BGL.

8.3.2 **Beach Side**

8.3.2.1 Marine Beach Deposits, typically described as medium dense fine to medium sand, becoming slightly gravelly from c. 4m depth, were encountered to the termination depths of the boreholes at circa 5.10m BGL. It should be noted that the boreholes were terminated due to competency of the ground, i.e. unable to progress the hole further.

8.3.3 **Groundwater**

8.3.3.1 Groundwater is interpreted to be in hydraulic connectivity with river and sea levels, and heavily influenced by the tide. Accordingly, groundwater is anticipated to be at shallow depth on the beach side. Due to the elevated location around BH01, groundwater is anticipated to be relatively deep at this location.

8.4 Footbridge foundation solution

8.4.1 In our opinion, the naturally deposited Marine Beach Deposits and Storm Beach Deposits could support the proposed development on pad type foundations. However, forming excavations on the beach to facilitate construction of the pads would be difficult due to the presence of shallow groundwater. Additionally, scour protection measures would need to be considered as part of the detailed design. For these reasons, a piled solution may be more practical and beneficial in the long term.

8.5 Pad type foundations

8.5.1 The natural soils encountered at the site were generally granular in composition and encountered in a medium dense to dense state. Accordingly, natural soils would be suitable founding strata for proposed foundations. The soils are granular, hence not shrinkable and thus are not anticipated to be impacted by any future tree planting. It is recommended foundations extend a minimum of 1.2m below existing or proposed ground levels on both the beach and land. This depth has been considered which allows foundations to penetrate Made Ground soils on land and to depths where soils are of medium dense state on East Beach.

8.5.2 Geotechnical category

8.5.2.1 In our opinion the project will comprise conventional types of structure and foundations with no exceptional risk, or difficult ground or loading conditions thus meeting the requirements of geotechnical category 2.

8.5.3 Assumptions

8.5.3.1 Eurocode 7 list assumptions made in the provision of the standard (in section 1.3). Comments against some assumptions are provided below.

Assumption	Comment
Data for the design are collected, recorded and interpreted by appropriately qualified personnel	This report follows an in-house procedure of review and checking, ultimately approved by a Director of the company who by virtue of experience in geotechnical engineering and qualification is deemed appropriately qualified
Adequate continuity and communication exist between the personnel involved in data collection, design and construction	This can be challenging in situations in which structural and geotechnical design is carried out by different individuals and indeed different organisations. Invariably the ground investigation is carried out at an early stage of a development and prior to actions on buildings being established let alone their magnitude. It is important that we the geotechnical consultant form part of the design team with continuous review of geotechnical design data in the context of the structural design process.

Table 8.5.3

8.5.4 Ultimate limit state assessment

8.5.4.1 Ultimate limit state analyses (bearing capacity) have been undertaken in accordance with the approach outlined in Annex D of Eurocode 7 to derive the following design bearing resistances. In light of the tidal conditions at the site we have assumed that groundwater could rise to ground level.

8.5.4.2 The following table provides derived ultimate limit state bearing resistances.

Table of bearing resistance (pad foundations)			
Ultimate limit state derived using Design approach 1			
Strata	Foundation plan size (m x m)	Combination 1 kN/m²	Combination 2 kN/m²
Marine Beach Deposits	3.5 x 3.5	R_{d1} = 595	R_{d2} =285
	4 x 4	R_{d1} =630	R_{d2} =300
	4.5 x 4.5	R_{d1} =670	R_{d2} =315
Storm Beach Deposits	3.5 x 3.5	R_{d1} =1430	R_{d2} =600
	4 x 4	R_{d1} =1530	R_{d2} =640
	4.5 x 4.5	R_{d1} =1630	R_{d2} =680

Table 8.5.4

8.5.4.4 It is vitally important to note that partial factors given in table A3 of the code must be applied to actions (V_{uls}) imposed on the ground at foundation formation level (including self-weight of the foundation) to satisfy the requirement of: -

$$\mathbf{V_{uls} \leq R_d}$$

8.5.5 Serviceability limit state (SLS) assessment

8.5.5.1 Serviceability limit state has been assessed by undertaking settlement analyses in accordance with the approach outlined in Annex F of Eurocode 7 and adopting the following variables.

Table of geotechnical parameters to estimate settlement			
Symbol	Parameter	Range of values	Comment
N_{ave}	Average Standard Penetration Test N Value in soils below foundation	4 -38 (15)	Average value adopted for Marine Beach Deposits
		35	Lower bound adopted for Storm Beach Deposits

Table 8.5.5.1

8.5.5.2 The following table presents bearing resistances and associated estimates of settlement. It should be noted that the adopted methodology incorporates a creep factor which we have applied assuming a 50-year lifespan.

Table of bearing resistance (pad foundations)			
Strata	Foundation plan size (m x m)	Bearing resistance kN/m²	Settlement limit (initial and consolidation) mm
Marine Beach Deposits	3.5 x 3.5	R_{sls} = 120	25
	4 x 4	R_{sls} =110	25
	4.5 x 4.5	R_{sls} = 100	25
Storm Beach Deposits	3.5 x 3.5	R_{sls} = 225	25
	4 x 4	R_{sls} = 205	25
	4.5 x 4.5	R_{sls} = 190	25

Table 8.5.5.2

8.5.5.3 Differential settlement is totally dependent upon the variation of loads (actions) imposed on the ground and consistency of the foundation supporting ground. Assuming foundation loads are reasonably uniform, we consider differential settlement is unlikely to exceed 60% of the estimated total settlement. It is likely settlement will be substantially achieved within say 5 years of construction. If stresses applied at foundation formation levels vary significantly then this will increase levels of differential settlement produced by variation in ground conditions alone.

8.6 Piled foundations

8.6.1 Due to the nature of the site, difficulties in working in a tidal channel and increased potential for scour, a piled solution may be considered more suitable.

8.6.2 A preliminary assessment of single pile capacity has been undertaken to assist the foundation designer in establishing a foundation layout who will also retain design responsibility. The assessment has been undertaken in accordance with BS EN1997-1:2004 + A1:2013 and BS 8004:2015. It is recommended that the design and installation of the piles are determined by a specialist piling contractor who has experience in pile installation in these or similar ground conditions.

8.6.3 It is assumed that the piles will be installed using displacement piling techniques i.e. driven piles.

8.6.4 The calculations have been undertaken with the aid of PILE, a specialist geotechnical software programme developed by OASYS. The analyses have been undertaken without explicit verification of serviceability limit state. Accordingly, set R4 partial factors have been adopted for Combination 2. However, as a general guide, the settlement of a single pile at working loads (factor of safety > 2) is typically of the order of 1% of the pile diameter.

8.6.5 A model factor of 1.4 has been adopted in the analyses. The value may be reduced to 1.2 If the resistance is verified by a maintained load test taken to the required, unfactored ultimate resistance.

8.6.6 Shaft resistance within the Made Ground is assumed to be zero. It is further assumed that the Made Ground will not cause downdrag on the pile.

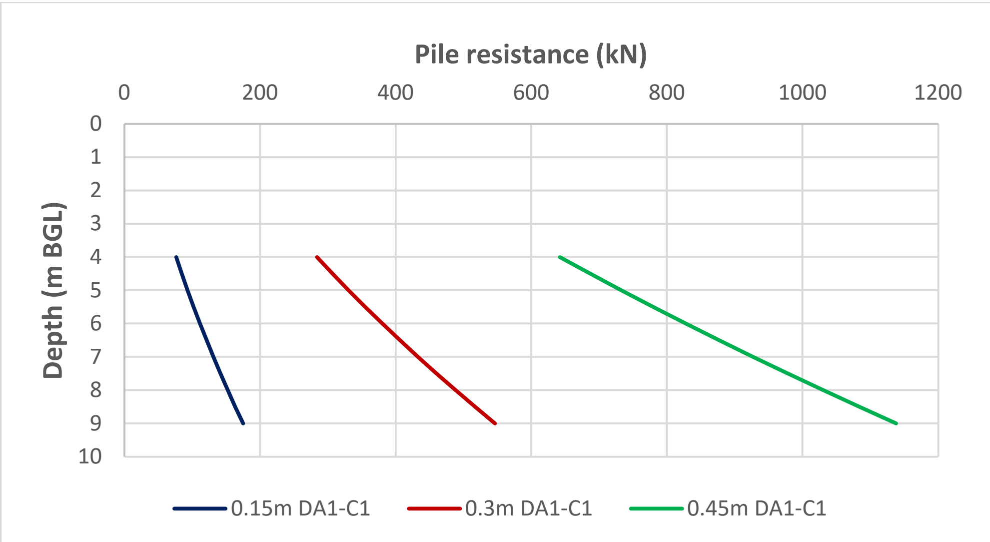
8.6.7 Unit base and shaft resistance within the granular strata have been derived using an effective stress approach, adopting the variables detailed below. When deriving unit base resistance, a bearing pressure coefficient has been adopted based on the relationship suggested by Berezantsev (1961).

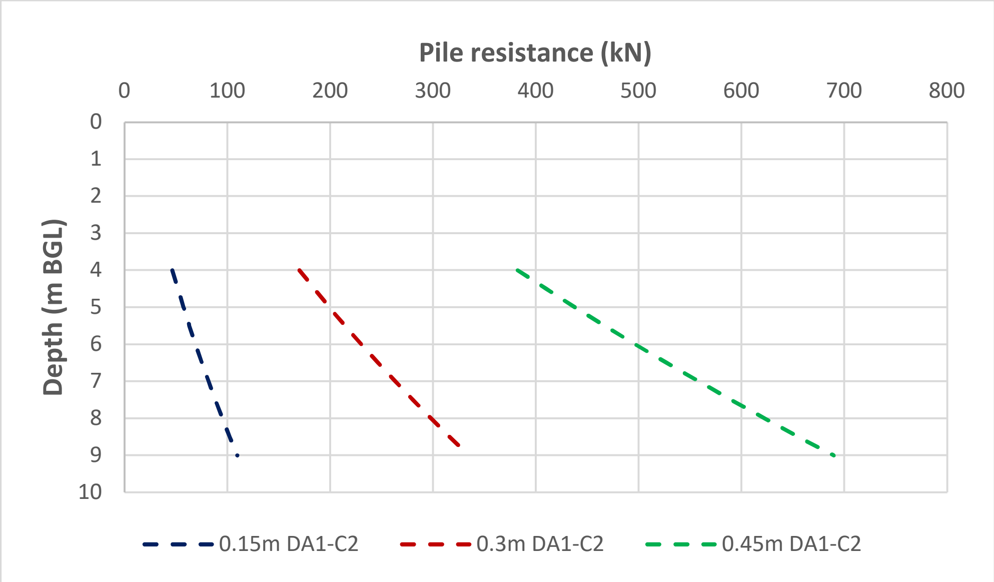
Table of pile parameters			
Strata	**Foundation plan size (m x m)**	**Value**	**Derivation**
Marine Beach Deposits (upper 4m)	Earth pressure coefficient, K_s	1	BS 8004:2015 – Table 8
	Angle of interface friction, δ (°)	21	BS 8004:2015 – Eqn 36
Storm Beach Deposits	Earth pressure coefficient, K_s	1	BS 8004:2015 – Table 8
	Angle of interface friction, δ (°)	25	BS 8004:2015 – Eqn 36
Marine Beach Deposits (>4m)	Earth pressure coefficient, K_s	1	BS 8004:2015 – Table 8
	Angle of interface friction, δ (°)	24	BS 8004:2015 – Eqn 36
Table 8.6.7			

8.6.8 It is assumed that piles on the beach will be primarily end bearing and founded within the Marine Beach Deposits at a depth of circa 5m. This depth coincides with the termination of the borehole due to competency of the ground. Accordingly, the following preliminary pile resistances have been derived for a 5m long pile installed on the beach side of the site: -

Table of pile resistances for a 5m long pile on the beach side		
Pile diameter (m)	**Resistance (kN)**	
	Combination 1	**Combination 2**
0.15	38	23
0.30	139	83
0.45	313	187
Table 8.6.8		

8.6.9 For the land side of the site, the variation of a single pile resistance in relation to pile toe depth is presented below for three different pile diameters. It should be noted that the analysis is based on the ground conditions encountered in BH03 and therefore assumes that bedrock is not present at 6.50m as conjectured in BH01. Whilst this is a conservative assumption for deriving pile capacities, such conditions would not be compatible with pile driving to lower depths. Accordingly, should these conditions be encountered then piles would need to be terminated early and cut off.





8.6.10 It should be noted that the resistance of a single pile is reduced in the vicinity of other piles. Accordingly, detailed design of the piled foundation arrangement should take into account spacing between piles and pile group effects.

8.7 Concrete classification

8.7.1 Due to the site being located in a marine environment where cyclic wetting and drying will occur, an exposure class of XS3 will apply accordance with BS EN 206.

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9 Further investigations

9.1 At this stage we do not consider further investigations to be necessary.

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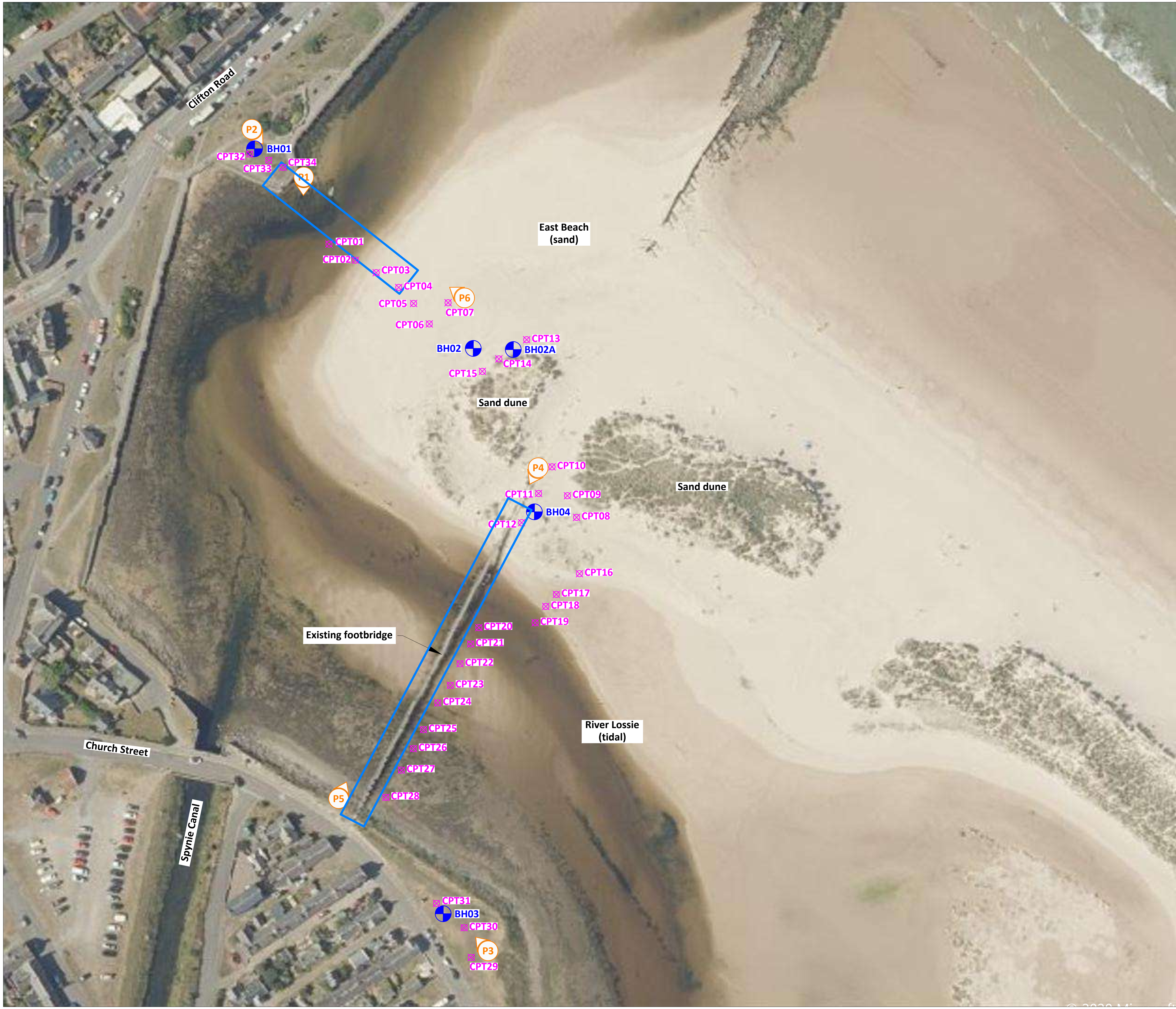
Title	Scale	Drawing number
Site location plan	Not to scale	01



Key

BH	Cable percussive borehole location
CPT	Cone Penetration Test (CPT) location
	Proposed footbridge route
P1	Location and orientation of site photographs (See Appendix E)

Notes:

Locations are approximate

REV	DESCRIPTION	PRODUCED BY	CHECKED BY	REVIEWED BY	DATE
A	First issue	KD	FQ	MOH	30.11.2020

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PROJECT
Lossiemouth East Beach Footbridge

TITLE
Plan showing existing site features, location of exploratory points and proposed footbridge location

PROJECT NO.	SCALE AT A3	DRAWING NO.
STS5161M	1:1250	02

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Definition of geotechnical terms used in this report - foundations

Strip foundations.
A foundation providing a continuous longitudinal ground bearing.

Trench fill concrete foundation*.*
A trench filled with mass concrete providing continuous longitudinal ground bearing.

Pad foundation.
An isolated foundation to spread a concentrated load.

Raft foundation.
A foundation continuous in two directions, usually covering an area equal to or greater than the base area of the structure.

Substructure*.*
That part of any structure (including building, road, runway or earthwork) which is below natural or artificial ground level. In a bridge this includes piers and abutments (and wing walls), whether below ground level or not, which support the superstructure.

Piled foundations and end bearing piles. A pile driven or formed in the ground for transmitting the weight of a structure to the soil by the resistance developed at the pile point or base and the friction along its surface. If the pile supports the load mainly by the resistance developed at its point or base, it is referred to as an end-bearing pile; if mainly by friction along its surface, as a friction pile.

Bored cast in place pile.
A pile formed with or without a casing by excavating or boring a hole in the ground and subsequently filling it with plain or reinforced concrete.

Driven pile.
A pile driven into the ground by the blows of a hammer or a vibrator.

Precast pile.
A reinforced or pre-stressed concrete pile cast before driving.

Driven cast in place pile.
A pile installed by driving a permanent or temporary casing, and filling the hole so formed with plan or reinforced concrete.

Displacement piles.
Piled formed by displacement of the soil or ground through which they are driven.

Skin friction.
The frictional resistance of the surrounding soil on the surface of cofferdam or caisson walls, and pile shafts.

Downdrag or negative skin friction. A downwards frictional force applied to the shaft of a pile caused by the consolidation of compressible strata, e.g. under recently placed fill. Downdrag has the effect of adding load to the pile and reducing the factor of safety.

Definition of geotechnical terms used in this report – bearing values

To Eurocode 7

Formal definitions of Eurocode terms are provided in BS EN 1990:2002 '*Eurocode – Basis of Structural Design*'. The following are considered informal definitions relating to the context of the geotechnical design report.

Bearing resistance
Calculated ability of a foundation to resist applied actions considered for ultimate and serviceability limit states.

Ultimate limit state (ULS) considerations
Partial factors applied to soil parameters, and actions (applied loads) in bearing resistance calculations to avoid risk of failure of the foundation in bearing.

Serviceability limit state (SLS) considerations
Calculations to determine bearing resistance of a foundation which will generate acceptable levels of settlement under applied actions

Characteristic geotechnical parameters
These are based on results and derived values from laboratory field tests, complemented by well-established experience.

Pre-Eurocode 7 methods.

Ultimate bearing capacity.
The value of the gross loading intensity for a particular foundation at which the resistance of the soil to displacement of the foundation is fully mobilised.

Presumed bearing value.
The net loading intensity considered appropriate to the particular type of ground for preliminary design purposes. The particular value is based on calculation from shear strength tests or other field tests incorporating a factor of safety against shear failure.

Allowable bearing pressure.
The maximum allowable net loading intensity at the base of the foundation, taking into account the ultimate bearing capacity, the amount and kind of settlement expected and our estimate of ability of the structure to accommodate this settlement.

Factor of safety.
The ratio of the ultimate bearing capacity to the intensity of the applied bearing pressure or the ratio of the ultimate load to the applied load.

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Definition of geotechnical terms used in this report – road pavements

The following definitions are based on Transport and Road Research Laboratory (TRRL) Report LR1132.

Equilibrium CBR values.
A prediction of the CBR value, which will be attained at formation level under the completed pavement.

***Thin pavement*.**
A thin pavement (which includes both bound and unbound pavement construction materials) is 300mm thick (very lightly trafficked road) and a thick pavement is 1200mm thick (typical of motorway construction).

Definition of geo-environmental terms used in this report

Conceptual model
Textual and/or schematic hypothesis of the nature and sources of contamination, potential migration pathways (including description of the ground and groundwater) and potential receptors, developed on the basis of the information obtained from the investigatory process.

Contamination
Presence of a substance which is in, on or under land, and which has the potential to cause harm or to cause pollution of controlled water.

Controlled water
Inland freshwater (any lake, pond or watercourse above the freshwater limit), water contained in underground strata and any coastal water between the limit of highest tide or the freshwater line to the three mile limit of territorial waters.

Harm
Adverse effect on the health of living organisms, or other interference with ecological systems of which they form part, and, in the case of humans, including property.

Pathway
Mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor.

Receptor
Persons, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by the contaminant(s).

Risk
Probability of the occurrence of, and magnitude of the consequences of, an unwanted adverse effect on a receptor.

Risk assessment
Process of establishing, to the extent possible, the existence, nature and significance of risk.

Definition of environmental risk/hazard terms used in this report

Based on CIRIA report C552 '*Contaminated land risk assessment – A guide to good practice*'.

Potential hazard severity definition

Category	Definition
Severe	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures
Mild	Pollution of non-sensitive waters, minor damage to buildings or structures
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species

Probability of risk definition

Category	Definition
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

Level of risk for potential hazard definition

Probability of risk	Potential severity			
	Severe	Medium	Mild	Minor
High likelihood	Very high	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low likelihood	Moderate	Low/Moderate	Low	Very low
Unlikely	Low/Moderate	Low	Very low	Very low

See below for definitions of 'very high' to 'very low'

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Definition of environmental risk/hazard terms used in this report

Based on CIRIA report C552 '*Contaminated land risk assessment – A guide to good practice'.*

Risk classifications and likely action required:

Very high risk
High probability that severe harm could arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised is likely to result in substantial liability. Urgent investigation and remediation are likely to be required.

High risk
Harm is likely to arise to a designated receptor from an identified hazard. This risk, if realised, is likely to result in substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.

Moderate risk
It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.

Low risk
It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that this harm, if realised, would at worst normally be mild.

Very low risk
It is a low possibility that harm could arise to a designated receptor. On the event of such harm being realised it is not likely to be severe.

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List of documents used in assessment of chemical contamination

No.	Title	Publication reference / publisher
1	Human health toxicological assessment of contaminants in soil	EA Science Report – SC050021/SR2
2	Updated technical background to the CLEA model	EA Science Report – SC050021/SR3
3	CLEA Software (Version 1.03 beta) Handbook	EA Science Report - SC050021/SR4
4	Guidance on comparing Soil Contamination Data with a Critical Concentration	CIEH
5	The LQM/CIEH S4ULs for Human Health Risk Assessment (2015)	LQM/CIEH
6	Assessment of Risks to Human Health from Land Contamination: An overview of the development of soil guideline values and related research	R&D Publication, Contaminated Land Report CLR 7
7	Contaminants of Soil: Collation of Toxicological Data and Intake Values for Humans	R&D Publication, Contaminated Land Report CLR 9
8	The Contaminated Land Exposure Assessment Model (CLEA): Technical Basis and Algorithms	R&D Publication, Contaminated Land Report CLR 10
9	Model Procedures for the Management of Land Contamination	R&D Publication, Contaminated Land Report CLR 11
10	Contaminants in Soil: Collection of Toxicological Data and Intake Values for Human Values	R&D Publications, Tox. 6
11	Soil Guideline Values for Contamination (2002)	R&D Publications, SGV 10
12	Soil Guideline Values (2009)	EA Science Reports – SC050021
13	Atkins ATRISK^{SOIL} (2011)	http://www.atrisksoil.co.uk
14	Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination (September 2014)	CL:AIRE

CIEH	Chartered institute of Environmental Health
LQM	Land Quality Management
EA	Environment Agency
CL:AIRE	Contaminated Land: Applications in Real Environments

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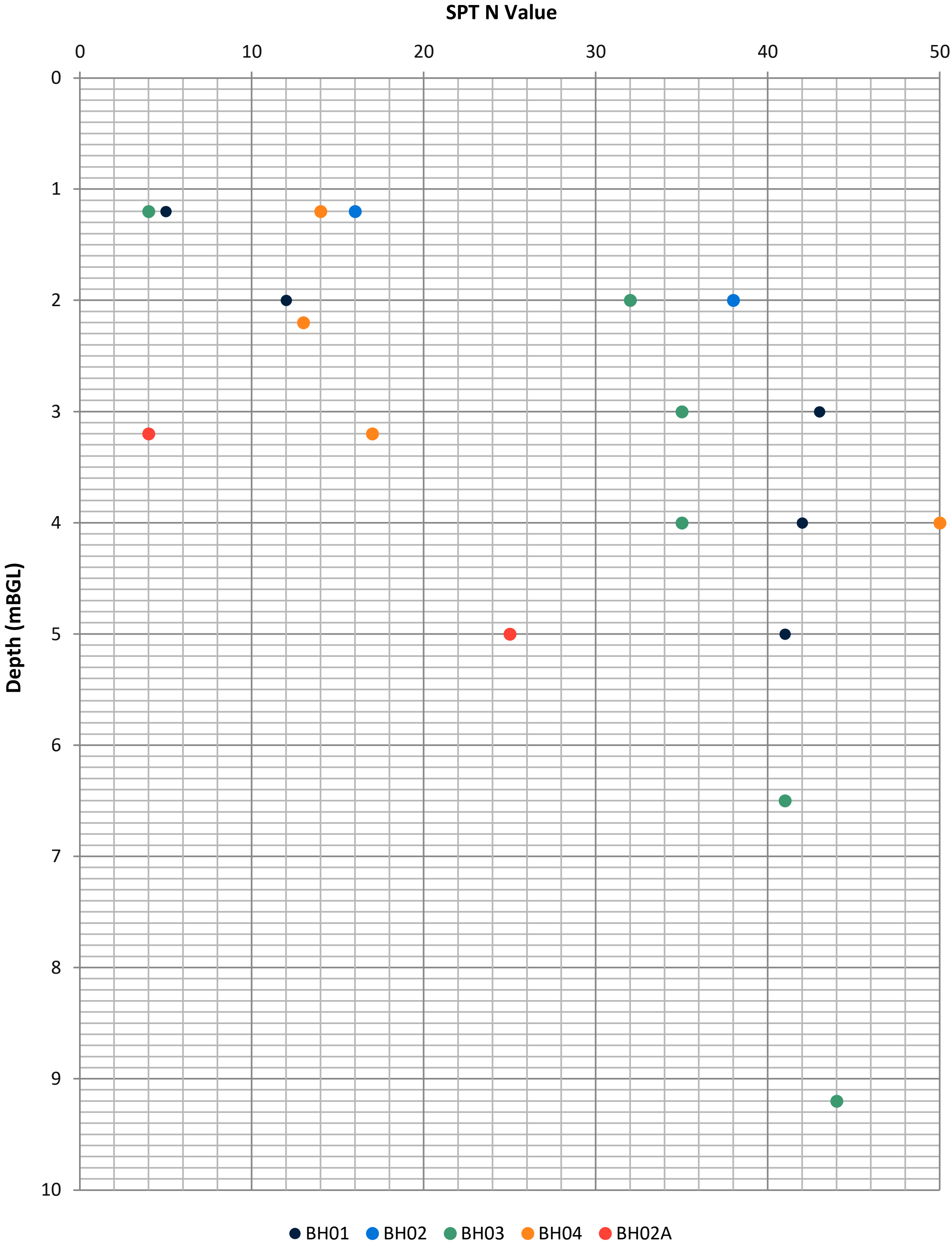
Testing suite summary

Table summarising testing suites		
Suite	**Parameters**	**Medium**
Suite 1	Arsenic, beryllium, boron, cadmium, chromium (total and VI), copper, lead, mercury, nickel, selenium, vanadium zinc, cyanide (free, total and complex), organic matter content, PAH (16 speciated), pH, phenol (total), TOC	Soil
Suite 2	Arsenic, boron (water soluble), beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, cyanide (free, total and complex, PAH (16 speciated), pH, phenol (total), sulfate (water soluble), sulfide, nitrate	Leachate
Suite 3	Arsenic, boron (water soluble), beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, cyanide (free, total and complex, PAH (16 speciated), pH, phenol (total), sulfate (water soluble), sulfide, nitrate	Water
Suite 4	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, MTBE, PAH (16 speciated), organic matter	Soil
Suite 5	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, MTBE, PAH (16 speciated)	Leachate
Suite 6	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, MTBE, PAH (16 speciated)	Water
Suite 7	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, TOC, organic matter	Soil
Suite 8	Sulphur (total), sulphate (water and acid soluble), pH	Soil
Suite 9	Sulphate, ammoniacal nitrogen, dissolved magnesium, pH	Water
Suite 10	VOC, SVOC, TOC, organic matter	Soil
Suite 11	VOC, SVOC	Leachate
Suite 12	VOC, SVOC	Water
Suite 13	Organotins dibutyltin/ tributyl-tin/tetrabutyltin/triphenyl-tin, tetraethyl-lead/tetramethyl-lead	Soil
Suite 14	Organotin	Leachate
Suite 15	Organotin	Water
Suite 16	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, VOC, SVOC	Soil, water, leachate
Suite 17	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, SVOC, VOC, arsenic, boron (water soluble), beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, cyanide (free, total and complex, pH, phenol (total), sulfate (water soluble), sulfide, nitrate	Soil, water, leachate
Concrete BRE suite	pH, sulphate (water and acid soluble), magnesium (water soluble), ammonia (water soluble), chloride, nitrate	Soil

Plot summarising Standard Penetration Test (SPT) results versus depth filtered by location



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Plot summarising Standard Penetration Test (SPT) results versus depth filtered by geology

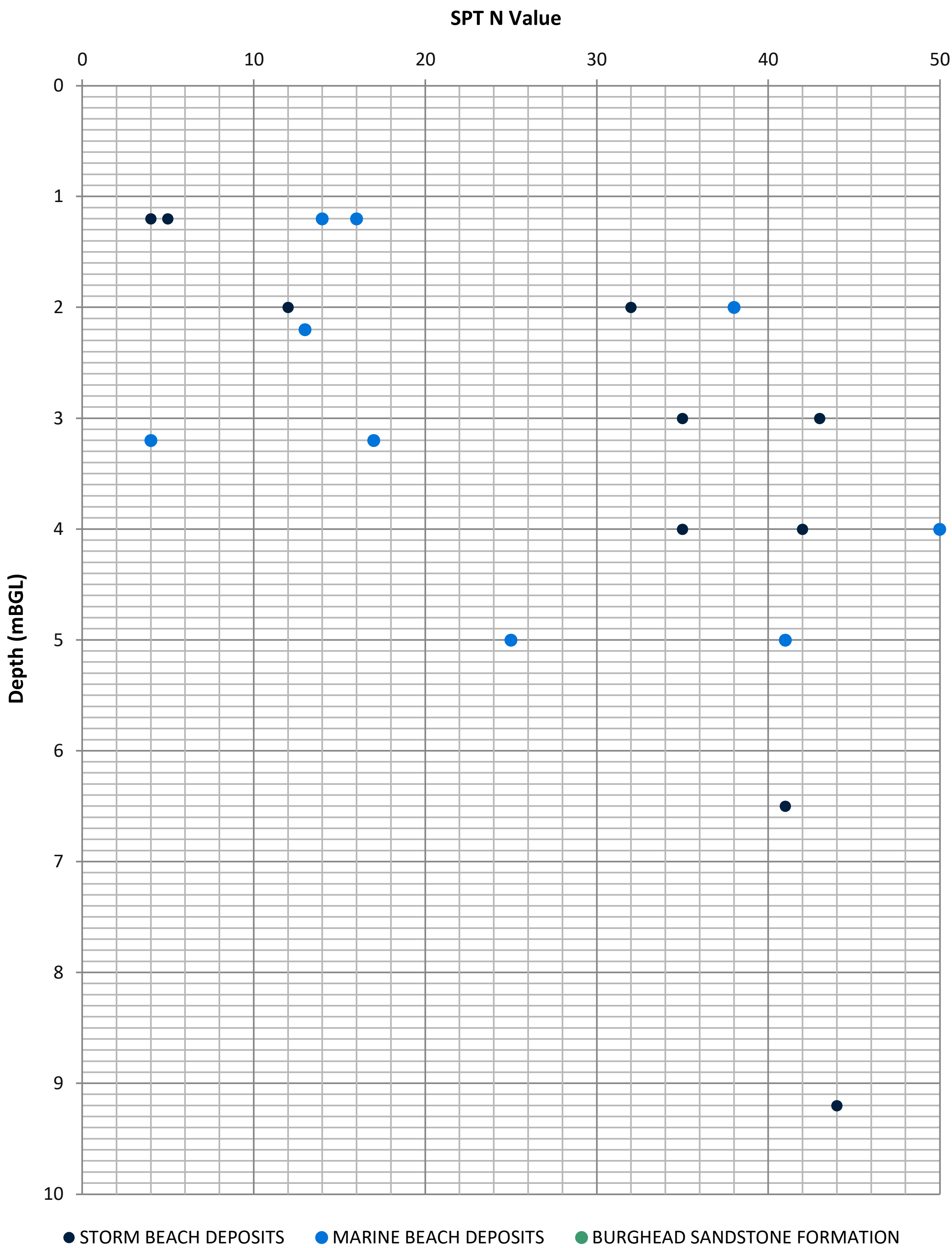

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Table summarising Standard Penetration Test (SPT) results

Location	Start Depth (m)					Penetration (mm)	
		Seating 1-2	Main 1-4	Total Seating	Total Main	Total Seating	Total Main
BH01	1.20	1/2	1/1/1/2	3	5	150	300
BH01	2.00	2/3	3/2/4/3	5	12	150	300
BH01	3.00	6/8	12/10/10/11	14	43	150	300
BH01	4.00	9/9	12/10/10/10	18	42	150	300
BH01	5.00	9/7	7/11/11/12	16	41	150	300
BH01	6.50	25/25		50	0	40	
BH01	6.70	50		50	0	0	
BH02	1.20	2/3	2/4/6/4	5	16	150	300
BH02	2.00	4/6	5/9/12/12	10	38	150	300
BH02A	3.20	0/0	1/1/1/1	0	4	150	300
BH02A	4.20	11/13	10/10/17/15	24	52	150	300
BH02A	5.00	12/15	25	27	25	150	20
BH03	1.20	1/1	1/1/1/1	2	4	150	300
BH03	2.00	3/9	9/7/7/9	12	32	150	300
BH03	3.00	10/10	7/10/9/9	20	35	150	300
BH03	4.00	8/8	7/10/9/9	16	35	150	300
BH03	5.00	7/8	8/50/8/8	15	74	150	150
BH03	6.50	8/8	8/9/12/12	16	41	150	300
BH03	8.00	10/14	17/50	24	67	150	105
BH03	9.20	3/10	10/9/11/14	13	44	150	300
BH04	1.20	1/2	2/4/4/4	3	14	150	300
BH04	2.20	1/2	1/3/4/5	3	13	150	300
BH04	3.20	1/2	2/2/5/8	3	17	150	300
BH04	4.00	5/15	25/25	20	50	150	95
BH04	5.05	25		25	0	0	

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DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND	WATER STRIKES	SPT TYPE / DEPTH (m)	SPT RESULT	CASING DEPTH (m)	WATER LEVEL (m)	OTHER IN SITU TYPE / DEPTH (m)	OTHER IN SITU RESULT	SAMPLING FROM (m)	SAMPLING TO (m)	SAMPLING TYPE
Grass onto dark brown slightly gravelly fine to medium SAND with some rootlets. Gravels consists of fine to coarse angular to rounded mixed lithologies. (TOPSOIL - REWORKED TOPSOIL)	0.10												
Greyish brown slightly gravelly fine to medium SAND with medium cobble content. Gravel consists of fine to medium angular to rounded mixed lithologies. Cobbles are angular of sandstone. (MADE GROUND)	0.80				S 1.20 - 1.65	(3) 5	1.20				1.20 1.20		B D
Loose light brown slightly gravelly fine to medium SAND. Gravel consists of subangular to rounded mixed lithologies, predominantly sandstone. (STORM BEACH DEPOSITS)													
Medium dense brown silty very sandy fine to coarse subangular to rounded GRAVEL. Gravel consists of mixed lithologies predominantly sandstone and quartz. Sand is fine to coarse. (STORM BEACH DEPOSITS)	2.00				S 2.00 - 2.45	(5) 12	2.00				2.00 2.00		B D
...from 3.0m depth, becoming dense.					C 3.00 - 3.45	(14) 43	3.00	2.80			3.00		B
...at 3.7m depth, 200mm long dark grey sandstone cobble.													
Dense brown slightly silty very sandy fine to coarse subangular to rounded GRAVEL. Gravel consists of mixed lithologies predominantly sandstone and quartz. Sand is fine to coarse. (STORM BEACH DEPOSITS)	3.90				C 4.00 - 4.45	(18) 42	4.00	3.50			4.00		B
Dense greyish brown and light brown silty fine to coarse SAND. (MARINE BEACH DEPOSITS)	5.00				C 5.00 - 5.45	(16) 41	5.00	4.80			5.00		B
Light grey fine grained SANDSTONE. Recovered as angular gravel. (BURGHEAD SANDSTONE FORMATION)	6.50 6.70				S 6.50 - 6.54 S 6.70 - 6.70	(50/40mm) (50/0mm)	6.50 6.70	3.00 4.00			6.50		D

BOREHOLE TERMINATED AT 6.70m

Notes
Inspection pit excavated to 1.2m depth. Borehole terminated due to encountering bedrock.

Groundwater observations
Groundwater strike at 3m depth, filling borehole to 2.8m in 20 minutes.

Chiselling details

Depth (m)	Duration (hh:mm)
3.70 - 3.90	01:00
6.50 - 6.70	01:00

Drilling details

Diameter	Base depth (m)
150	6.70

Water added details

Depth (m)	Water Added (l)

Casing details

Diameter	Base depth (m)
150	6.70

Title
Borehole record

Date(s)
19/10/2020 - 20/10/2020

Method
Cable tool percussion

Logged by
FQ

Sheet number
Sheet 1 of 1

Level (m OD)
-

Compiled by
KD

Revision

Co-ordinates
-

Checked by
MOH

BH01

soiltechnics
environmental ▪ geotechnical ▪ building fabric

INSTALL	STRATA				WATER STRIKES	SPT TESTING				OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND		TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Medium dense light brown fine to medium SAND. (MARINE BEACH DEPOSITS)				▼	S 1.20 - 1.65	(5) 16					1.20 1.20		B D
	...from 2.0m depth, becoming dense.	2.65				S 2.00 - 2.45	(10) 38					2.20 2.20		B D
	BOREHOLE TERMINATED AT 2.65m													

Notes
Borehole terminated due to high tide reaching position.

Groundwater observations
Groundwater strike at 1.3m depth, filling borehole with rising tide.

Chiselling details		Drilling details	
Depth (m)	Duration (hh:mm)	Diameter	Base depth (m)

Water added details		Casing details	
Depth (m)	Water Added (l)	Diameter	Base depth (m)

Title Borehole record		**Date(s)** 19/10/2020
Method Cable tool percussion	**Logged by** FQ	**Sheet number** Sheet 1 of 1
Level (m OD) -	**Compiled by** KD	**Revision**
Co-ordinates -	**Checked by** MOH	**BH02**

soiltechnics
environmental ▪ geotechnical ▪ building fabric

INSTALL	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND	WATER STRIKES	SPT TESTING TYPE / DEPTH (m)	SPT RESULT	SPT CASING DEPTH (m)	SPT WATER LEVEL (m)	OTHER IN SITU TESTING TYPE / DEPTH (m)	OTHER IN SITU RESULT	SAMPLING FROM (m)	SAMPLING TO (m)	SAMPLING TYPE
	[Medium dense] light brown fine to medium SAND. (MARINE BEACH DEPOSITS)				▼									
												2.20		B
	...at 3,2m depth, SPT likely affected by piping / blowing sands.					S 3.20 - 3.65	(0) 4					3.20		B
												3.20		D
	Very dense greyish brown slightly gravelly fine to coarse SAND. Gravel consists of fine to coarse subrounded to rounded mixed lithologies. (MARINE BEACH DEPOSITS)	4.10				S 4.20 - 4.65	(24) 52					4.20		B
												4.20		D
						S 5.00 - 5.17	(27) 25/20mm					5.00		D
	BOREHOLE TERMINATED AT 5.17m	5.17												

Notes
Borehole terminated due to competency of soil.

Chiselling details		Drilling details	
Depth (m)	Duration (hh:mm)	Diameter	Base depth (m)
4.35 - 4.85	00:15		

Groundwater observations
Groundwater strike at 1.3m depth.

Water added details		Casing details	
Depth (m)	Water Added (l)	Diameter	Base depth (m)

Title Borehole record		**Date(s)** 20/10/2020
Method Cable tool percussion	**Logged by** FQ	**Sheet number** Sheet 1 of 1
Level (m OD) -	**Compiled by** KD	**Revision**
Co-ordinates -	**Checked by** MOH	**BH02A**

East Beach Footbridge, Lossiemouth
STS5161M

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environmental ▪ geotechnical ▪ building fabric

INSTALL	STRATA				WATER STRIKES	SPT TESTING				OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND		TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Grass onto dark brown slightly gravelly SAND. Gravel consists of fine to medium subangular to rounded mixed lithologies, predominantly sandstone. (TOPSOIL - REWORKED TOPSOIL)	0.20												
	Brown gravelly fine to medium SAND with medium cobble content of angular to subangular sandstone. Gravel consists of fine to coarse subangular to rounded mixed lithologies, predominantly sandstone. (MADE GROUND)	0.90												
	Dense light brown silty slightly gravelly fine to medium SAND. Gravel consists of is fine to coarse subangular to rounded mixed lithologies. (STORM BEACH DEPOSITS)	7.00				S 1.20 - 1.65	(2) 4	1.20				1.20 1.20		B D
	...from 0.9m to 1.8m depth, locally loose.					S 2.00 - 2.45	(12) 32	2.00				2.00 2.00		B D
	...at 2.5m depth, 400mm long sandstone boulder.					S 3.00 - 3.45	(20) 35	3.00	2.80			3.00 3.00		B D
						S 4.00 - 4.45	(16) 35	4.00	3.00			4.00 4.00		B D
	...at 5.0m depth, SPT likely affected by cobble / boulder obstruction.					S 5.00 - 5.30	(15) 74/150mm	5.00	3.00			5.00 5.00		B D
						S 6.50 - 6.95	(16) 41	6.50	4.00			6.50 6.50 7.00		B D B
	Dense brown and grey SAND and GRAVEL. Gravel consists of fine to coarse subangular to rounded mixed lithologies. Sand is fine to coarse. (STORM BEACH DEPOSITS)	9.65												
	...at 8.0m depth, SPT likely affected by cobble / boulder obstruction.					C 8.00 - 8.26	(24) 67/105mm	8.00	3.00			8.00		B
						C 9.20 - 9.65	(13) 44	9.20	6.00			9.20		B
	BOREHOLE TERMINATED AT 9.65m													

Notes

Running sands encountered resulting in redrilling of borehole from 3.0m to 6.0m and from 4.0m to 7.0m. Inspection pit excavated to 1.2m depth.

Groundwater observations

Groundwater strike at 3m depth, filling borehole to 2.8m in 20 minutes.

Chiselling details		Drilling details	
Depth (m)	Duration (hh:mm)	Diameter	Base depth (m)
2.50 - 2.90	01:00		

Water added details		Casing details	
Depth (m)	Water Added (l)	Diameter	Base depth (m)

Title Borehole record		**Date(s)** 20/10/2020 - 22/10/2020
Method Cable tool percussion	**Logged by** FQ	**Sheet number** Sheet 1 of 1
Level (m OD) -	**Compiled by** KD	**Revision**
Co-ordinates -	**Checked by** MOH	**BH03**

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INSTALL	STRATA				WATER STRIKES	SPT TESTING				OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND		TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Medium dense light brown fine to medium SAND. (MARINE BEACH DEPOSITS)				▼	S 1.20 - 1.65 S 2.20 - 2.65 S 3.20 - 3.65	(3) 14 (3) 13 (3) 17					0.00 1.20 1.20 2.20 2.20 3.20 3.20		B B D B D B D
	Very dense greyish brown slightly gravelly SAND with low cobble content of angular to subrounded sandstone. Gravel consists of fine to coarse subangular to rounded mixed lithologies predominantly sandstone and quartzite. (MARINE BEACH DEPOSITS)	3.80				S 4.00 - 4.24	(20) 50/95mm					3.80 4.00 4.00		B B D
	BOREHOLE TERMINATED AT 5.05m	5.05				C 5.05 - 5.05	(25/0mm)							

Notes
Borehole terminated due to competency of soil.

Chiselling details

Depth (m)	Duration (hh:mm)
4.15 - 4.55	00:20
5.00 - 5.05	01:00

Drilling details

Diameter	Base depth (m)
150	5.05

Groundwater observations
Groundwater strike at 3m depth.

Water added details

Depth (m)	Water Added (l)

Casing details

Diameter	Base depth (m)
150	3.20

Title Borehole record		**Date(s)** 21/10/2020 - 22/10/2020
Method Cable tool percussion	**Logged by** FQ	**Sheet number** Sheet 1 of 1
Level (m OD) -	**Compiled by** KD	**Revision**
Co-ordinates -	**Checked by** MOH	**BH04**

Key to legends

Composite materials, soils and lithology			
Topsoil	Made Ground	Boulders	Chalk
Clay	Coal	Cobbles	Concrete
Gravel	Limestone	Mudstone	Peat
Sand	Sandstone	Silt	Siltstone

Note: Composite soil types are signified by combined symbols.

Key to ‘test results’ and ’sampling’ columns

Test result	
Depth	Records depth that the test was carried out (i.e.: at 2.10m or between 2.10m and 2.55m)
Result	PP – Pocket penetrometer result reported as an equivalent undrained shear strength (kN/m²) by applying a factor of 50. SV – Hand held shear vane result reported as an undrained shear strength (kN/m²). Where multiple readings are taken at the same level the average value is shown on the log. * Signifies that instrument limit reached.
	SPT – Standard Penetration Test result (N value) (uncorrected)[1,2,3] SPT(c) – Standard Penetration Test result (solid cone) (N value) (uncorrected)[1,2,3]
	UT – Undisturbed sample 100mm diameter sampler with number of blows of driving equipment required to obtain sample

Sampling		
From (m) To (m)	Records depth of sampling	
Type	D	Disturbed sample
	B	Bulk disturbed sample
	ES	Environmental sample
	W	Water sample
	U	Undisturbed thick-walled sample 100mm diameter sampler
	UT	Undisturbed thin walled sample 100mm diameter sampler
	UTF	Failed undisturbed sample

Note 1: Seating blows recorded in brackets.

Note 2: Casing depth records depth of casing when SPT or SPT(c) was carried out.

Note 3: Water depth records depth of water when SPT or SPT(c) was carried out.

Water observations

Described at foot of log and shown in the ‘water strike’ column.

▼ Water level observed after specified delay in drilling

▽ Water strike

Installation details

Gravel filter	Bentonite
Slotted pipe	Unslotted pipe
Arisings	Grout
Extensometer magnet	Vibrating wire piezometer

Density

Density recorded in brackets determined by qualitative field assessment or inferred from density testing and soil descriptions from across the site (i.e.: [Medium dense]).

P1: Photograph looking south showing the existing footbridge over the River Lossie

P2: Area of BH01, looking south-east towards East Beach

P3: Area of BH03, looking north-west, Church Street on left leading to footbridge.

P4: Looking south along existing footbridge from East Beach.

P5: Looking north along exisitng footbridge towards East Beach with River Lossie at low tide.

P6: Looking west from East Beach towards Lossiemouth.

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	19/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669118	Depth Top [m]:	2.00
Hole No.:	BH01	Depth Base [m]:	Not Given
Sample Reference:	3	Sample Type:	B
Sample Description:	Dark brown slightly clayey very sandy GRAVEL		
Sample Preparation:	Sample was quartered, oven dried at 106.4 °C and broken down by hand.		

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	95		
37.5	80		
28	63		
20	56		
14	53		
10	50		
6.3	48		
5	46		
3.35	45		
2	44		
1.18	42		
0.6	41		
0.425	38		
0.3	33		
0.212	19		
0.15	13		
0.063	8		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	56.40
Sand	35.40
Fines <0.063mm	8.10

Grading Analysis		
D100	mm	63
D60	mm	24.6
D30	mm	0.279
D10	mm	0.0888
Uniformity Coefficient		280
Curvature Coefficient		0.036

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

Signed:

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Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

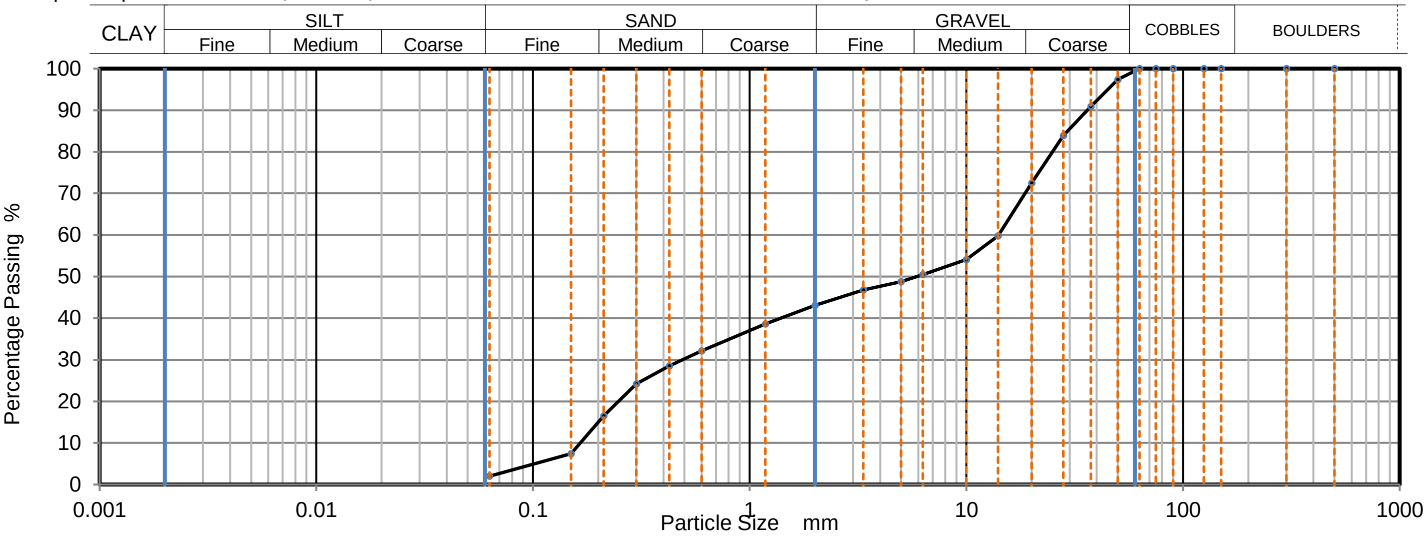
Environmental Science

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	19/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669119	Depth Top [m]:	4.00
Hole No.:	BH01	Depth Base [m]:	Not Given
Sample Reference:	6	Sample Type:	B
Sample Description:	Brown slightly clayey very sandy GRAVEL		
Sample Preparation:	Sample was quartered, oven dried at 108.9 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	97		
37.5	91		
28	84		
20	73		
14	60		
10	54		
6.3	51		
5	49		
3.35	47		
2	43		
1.18	39		
0.6	32		
0.425	29		
0.3	24		
0.212	17		
0.15	7		
0.063	3		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	56.90
Sand	40.30
Fines <0.063mm	2.80

Grading Analysis		
D100	mm	63
D60	mm	14.1
D30	mm	0.492
D10	mm	0.166
Uniformity Coefficient		85
Curvature Coefficient		0.1

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

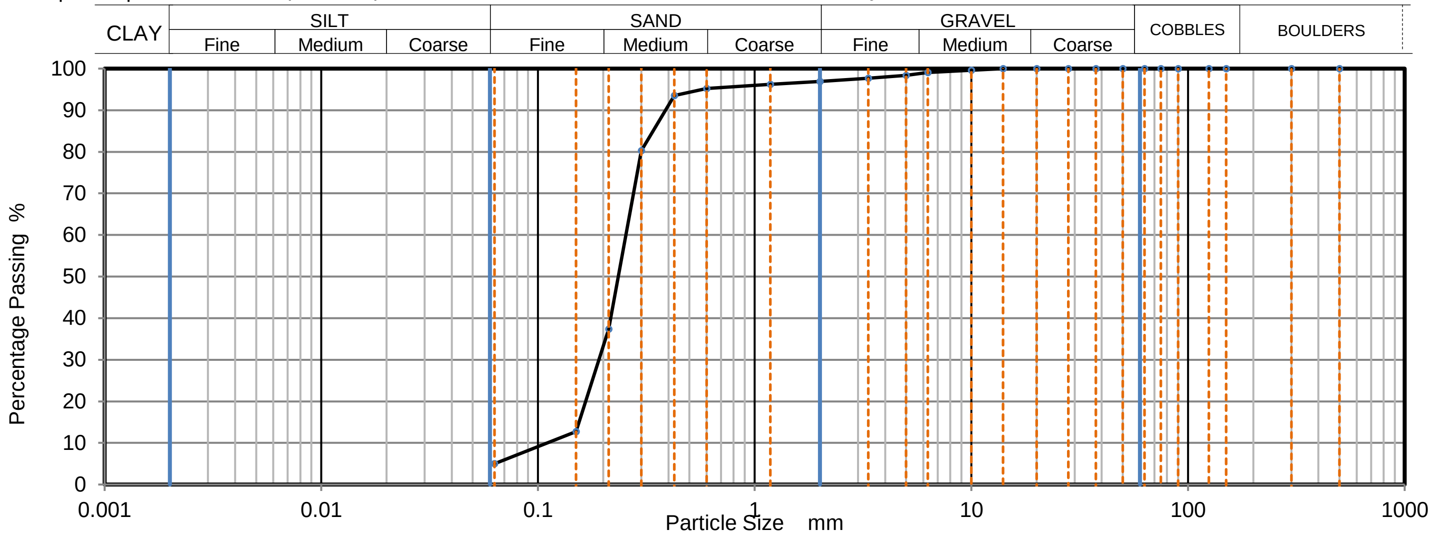
i2 Analytical Environmental Science

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	19/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669120	Depth Top [m]:	5.00
Hole No.:	BH01	Depth Base [m]:	Not Given
Sample Reference:	7	Sample Type:	B
Sample Description:	Brownish grey slightly gravelly slightly clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 107.1 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	98		
3.35	98		
2	97		
1.18	96		
0.6	95		
0.425	94		
0.3	80		
0.212	37		
0.15	13		
0.063	6		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	3.10
Sand	91.30
Fines <0.063mm	5.60

Grading Analysis		
D100	mm	14
D60	mm	0.254
D30	mm	0.191
D10	mm	0.108
Uniformity Coefficient		2.4
Curvature Coefficient		1.3

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed: Monika Janoszek

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

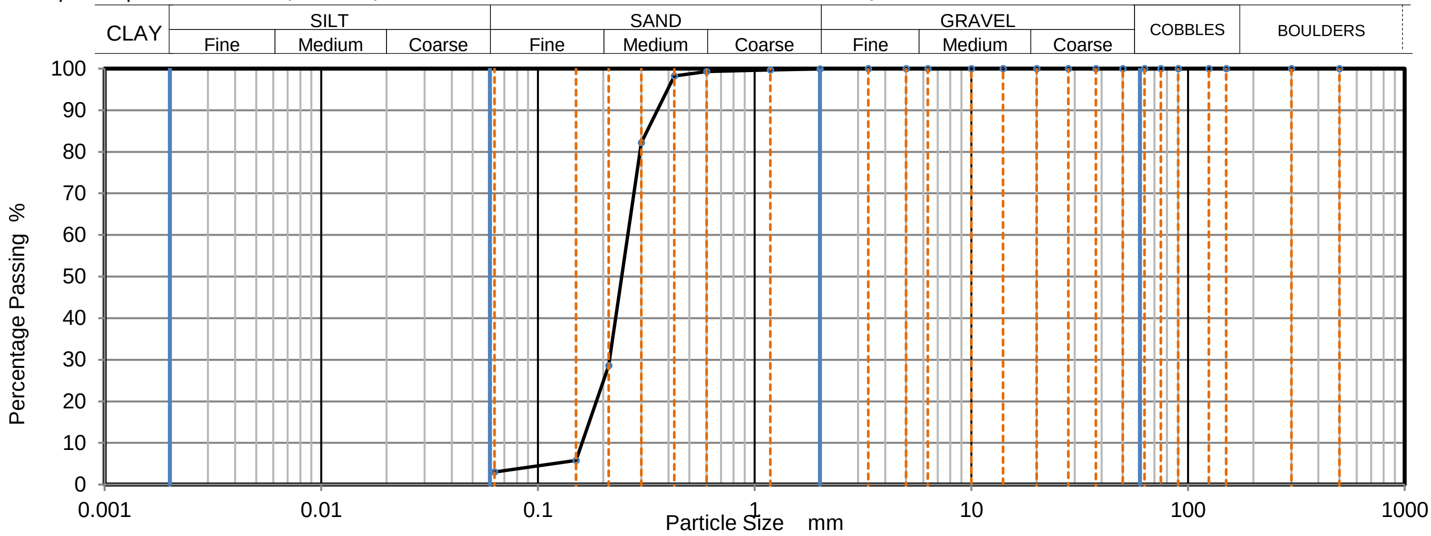
Analytical i2 Environmental Science

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	19/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669121	Depth Top [m]:	1.20
Hole No.:	BH02	Depth Base [m]:	Not Given
Sample Reference:	9	Sample Type:	B
Sample Description:	Brown slightly clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	98		
0.3	82		
0.212	29		
0.15	6		
0.063	3		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.10
Sand	96.60
Fines <0.063mm	3.20

Grading Analysis		
D100	mm	3.35
D60	mm	0.26
D30	mm	0.214
D10	mm	0.16
Uniformity Coefficient		1.6
Curvature Coefficient		1.1

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed: Monika Janoszek

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

4041

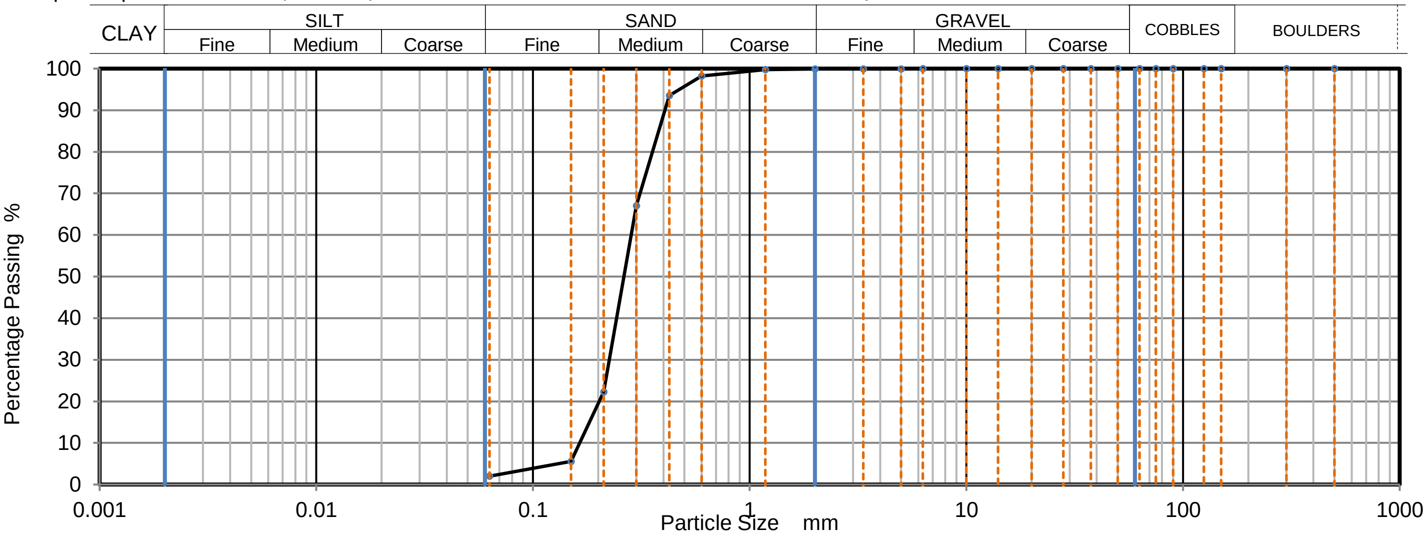
i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	20/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669122	Depth Top [m]:	3.20
Hole No.:	BH02A	Depth Base [m]:	Not Given
Sample Reference:	14	Sample Type:	B
Sample Description:	Brown slightly clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 107.1 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	98		
0.425	94		
0.3	67		
0.212	22		
0.15	6		
0.063	2		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.10
Sand	97.50
Fines <0.063mm	2.40

Grading Analysis		
D100	mm	6.3
D60	mm	0.284
D30	mm	0.225
D10	mm	0.164
Uniformity Coefficient		1.7
Curvature Coefficient		1.1

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Signed:

Monika Janoszek

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

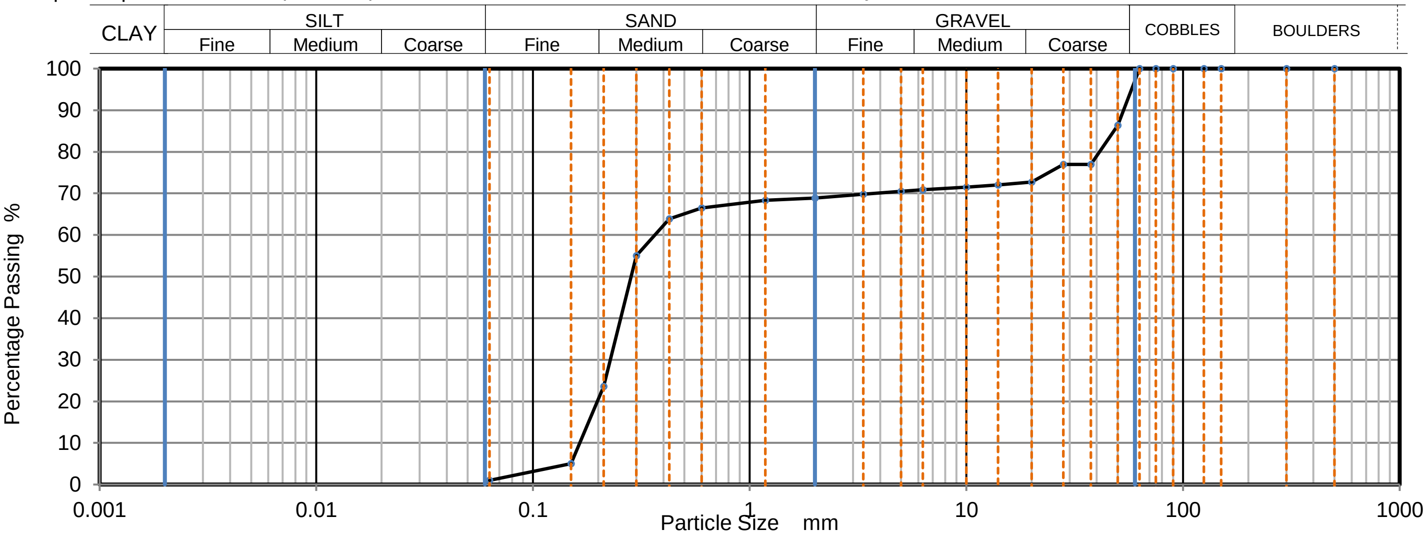
Environmental Science

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	20/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669123	Depth Top [m]:	4.20
Hole No.:	BH02A	Depth Base [m]:	Not Given
Sample Reference:	16	Sample Type:	B
Sample Description:	Brown gravelly SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.4 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	86		
37.5	77		
28	77		
20	73		
14	72		
10	72		
6.3	71		
5	71		
3.35	70		
2	69		
1.18	68		
0.6	67		
0.425	64		
0.3	55		
0.212	24		
0.15	5		
0.063	2		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	31.10
Sand	67.10
Fines <0.063mm	1.70

Grading Analysis		
D100	mm	63
D60	mm	0.365
D30	mm	0.228
D10	mm	0.165
Uniformity Coefficient		2.2
Curvature Coefficient		0.86

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

Signed: Monika Janoszek

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

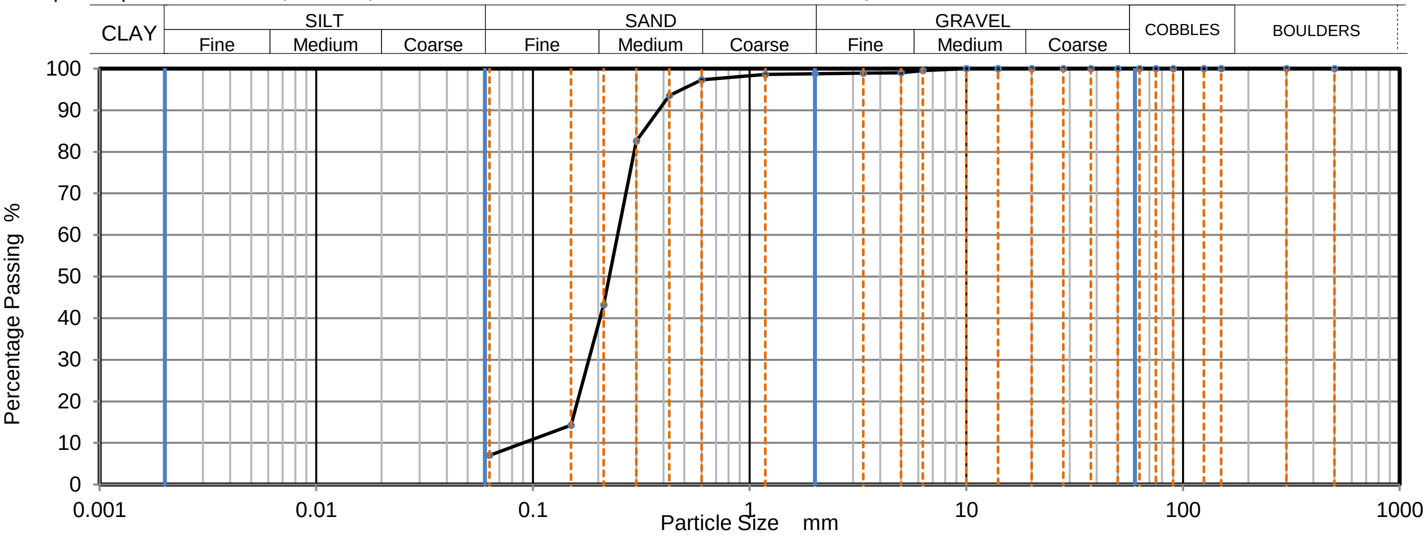
i2 Analytical Environmental Science

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	21/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669124	Depth Top [m]:	3.00
Hole No.:	BH03	Depth Base [m]:	Not Given
Sample Reference:	23	Sample Type:	B
Sample Description:	Brown slightly clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.4 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	99		
2	99		
1.18	99		
0.6	97		
0.425	94		
0.3	83		
0.212	43		
0.15	14		
0.063	8		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	1.20
Sand	91.20
Fines <0.063mm	7.60

Grading Analysis		
D100	mm	10
D60	mm	0.246
D30	mm	0.181
D10	mm	0.0863
Uniformity Coefficient		2.8
Curvature Coefficient		1.5

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Analytical i2 Environmental Science

Client:	Soiltechnics Limited
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY
Contact:	Alexa Band
Site Address:	East Beach Footbridge

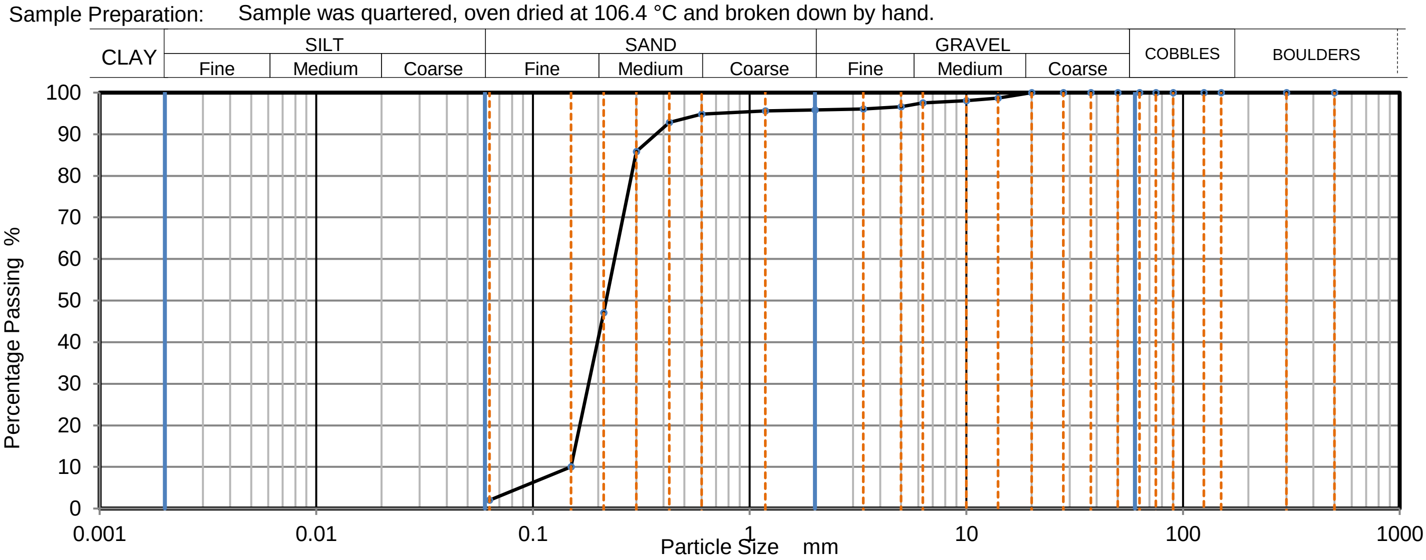
Client Reference:	STS5161
Job Number:	20-38678
Date Sampled:	21/10/2020
Date Received:	29/10/2020
Date Tested:	06/11/2020
Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669125
Hole No.:	BH03
Sample Reference:	27
Sample Description:	Brown slightly gravelly slightly clayey SAND
Sample Preparation:	Sample was quartered, oven dried at 106.4 °C and broken down by hand.

Depth Top [m]:	5.00
Depth Base [m]:	Not Given
Sample Type:	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	98		
6.3	98		
5	97		
3.35	96		
2	96		
1.18	96		
0.6	95		
0.425	93		
0.3	86		
0.212	47		
0.15	10		
0.063	2		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	4.20
Sand	93.40
Fines <0.063mm	2.40

Grading Analysis		
D100	mm	20
D60	mm	0.238
D30	mm	0.181
D10	mm	0.15
Uniformity Coefficient		1.6
Curvature Coefficient		0.92

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Monika Janoszek

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

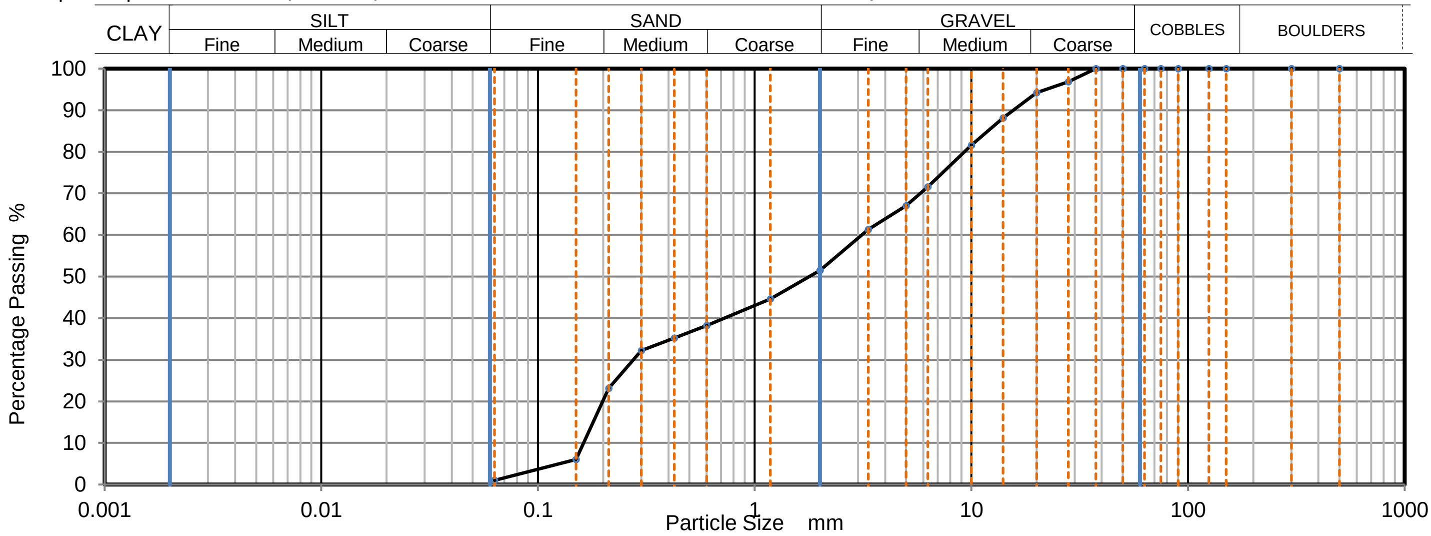
i2 Analytical Environmental Science

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	22/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669126	Depth Top [m]:	8.00
Hole No.:	BH03	Depth Base [m]:	Not Given
Sample Reference:	32	Sample Type:	B
Sample Description:	Brown very gravelly SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	97		
20	94		
14	88		
10	82		
6.3	72		
5	67		
3.35	61		
2	52		
1.18	45		
0.6	38		
0.425	35		
0.3	32		
0.212	23		
0.15	6		
0.063	1		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	48.50
Sand	50.30
Fines <0.063mm	1.30

Grading Analysis		
D100	mm	37.5
D60	mm	3.12
D30	mm	0.276
D10	mm	0.163
Uniformity Coefficient		19
Curvature Coefficient		0.15

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed: Monika Janoszek

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Soiltechnics Limited
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY
Contact:	Alexa Band
Site Address:	East Beach Footbridge

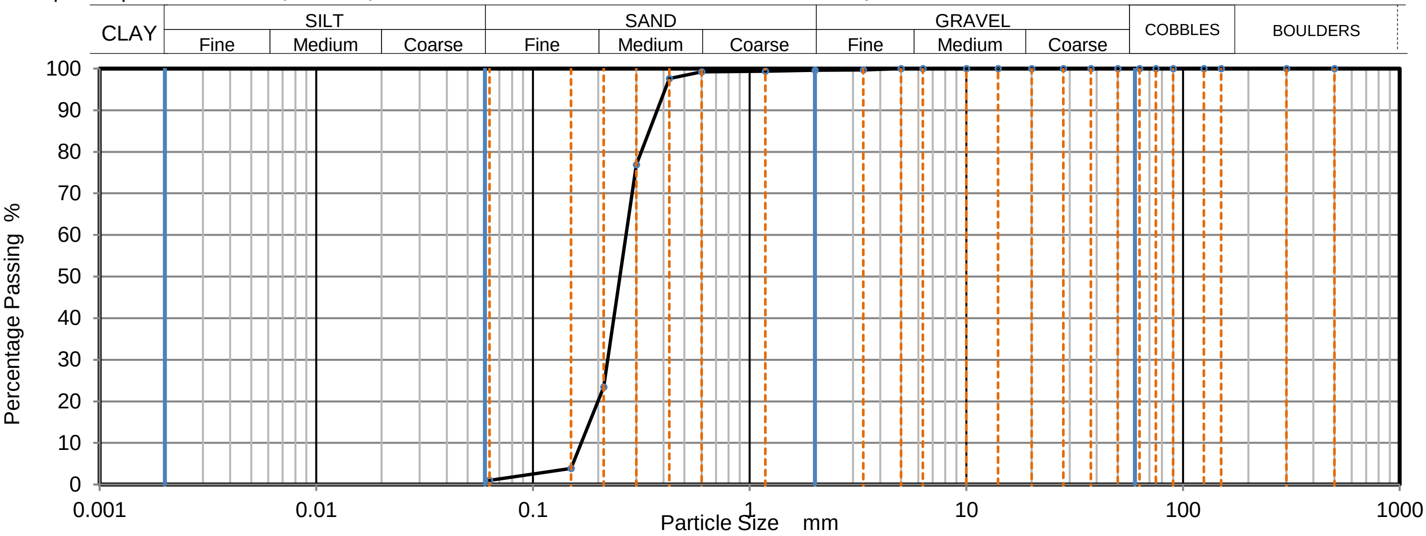
Client Reference:	STS5161
Job Number:	20-38678
Date Sampled:	21/10/2020
Date Received:	29/10/2020
Date Tested:	06/11/2020
Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669127
Hole No.:	BH04
Sample Reference:	35
Sample Description:	Brown SAND
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.

Depth Top [m]:	1.20
Depth Base [m]:	Not Given
Sample Type:	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	98		
0.3	77		
0.212	23		
0.15	4		
0.063	2		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.40
Sand	97.90
Fines <0.063mm	1.70

Grading Analysis		
D100	mm	5
D60	mm	0.269
D30	mm	0.221
D10	mm	0.167
Uniformity Coefficient		1.6
Curvature Coefficient		1.1

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed: Monika Janoszek

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

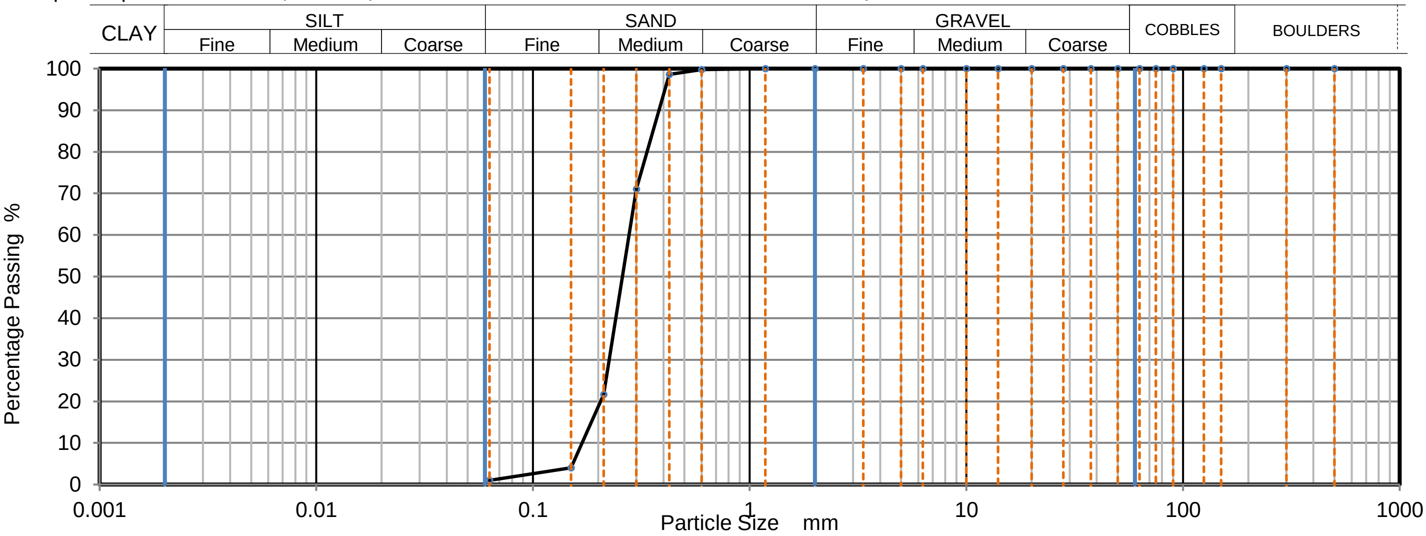
4041

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	21/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669128	Depth Top [m]:	2.20
Hole No.:	BH04	Depth Base [m]:	Not Given
Sample Reference:	37	Sample Type:	B
Sample Description:	Brown medium fine SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	71		
0.212	22		
0.15	4		
0.063	2		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.00
Sand	98.30
Fines <0.063mm	1.70

Grading Analysis		
D100	mm	2
D60	mm	0.278
D30	mm	0.225
D10	mm	0.169
Uniformity Coefficient		1.6
Curvature Coefficient		1.1

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

4041

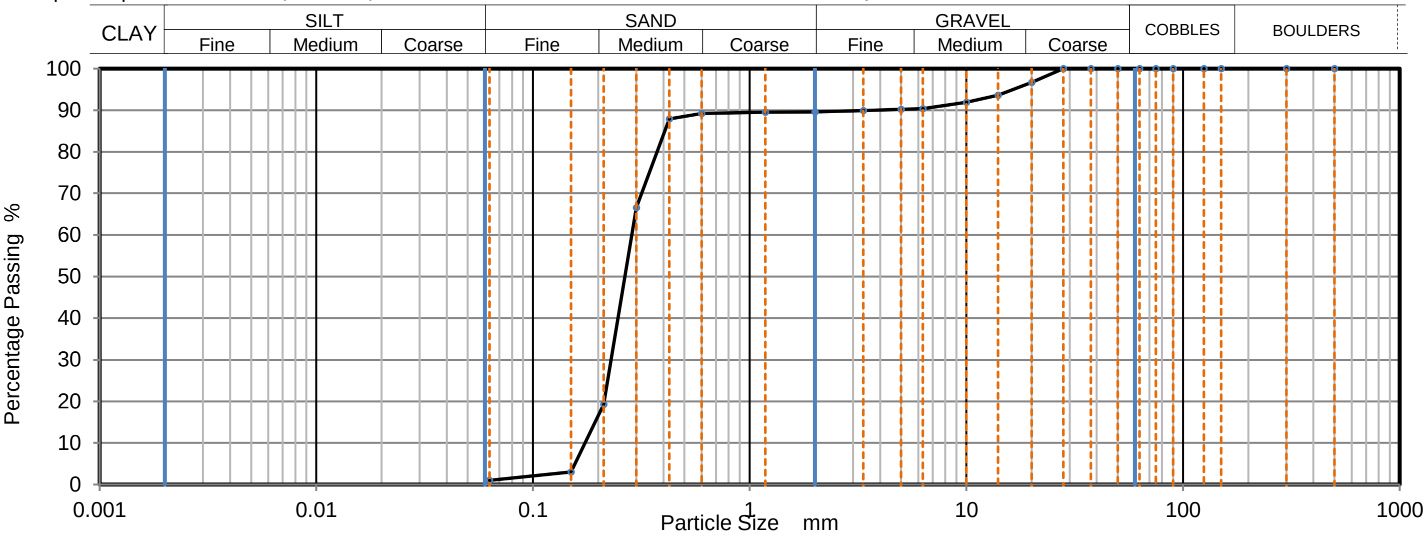
i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client:	Soiltechnics Limited	Client Reference:	STS5161
Client Address:	Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY	Job Number:	20-38678
		Date Sampled:	22/10/2020
		Date Received:	29/10/2020
Contact:	Alexa Band	Date Tested:	06/11/2020
Site Address:	East Beach Footbridge	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1669129	Depth Top [m]:	3.80
Hole No.:	BH04	Depth Base [m]:	Not Given
Sample Reference:	40	Sample Type:	B
Sample Description:	Brown gravelly SAND		
Sample Preparation:	Sample was quartered, oven dried at 106.4 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	97		
14	94		
10	92		
6.3	90		
5	90		
3.35	90		
2	90		
1.18	90		
0.6	89		
0.425	88		
0.3	67		
0.212	19		
0.15	3		
0.063	1		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	10.40
Sand	88.40
Fines <0.063mm	1.20

Grading Analysis		
D100	mm	28
D60	mm	0.286
D30	mm	0.229
D10	mm	0.174
Uniformity Coefficient		1.6
Curvature Coefficient		1.1

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Monika Janoszek
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/11/2020

GF 100.19

Enquiry Confirmation

LSBUD Ref: 20047775

Date of enquiry: 28/09/2020
Time of enquiry: 14:47

Enquirer

Name	Miss Alexa Band	Phone	01604 781877
Company	Soiltechnics	Mobile	Not Supplied
Address	Cedar Barn White Lodge Walgrave Northamptonshire NN6 9PY		
Email	Alexa.Band@soiltechnics.net		

Enquiry Details

Scheme/Reference	sts5161m		
Enquiry type	Initial Enquiry	Work category	Development Projects
Start date	29/09/2020	Work type	Commercial/industrial
End date	29/09/2020	Site size	139814 metres square
Searched location	XY= 323720, 870517	Work type buffer*	25 metres
Confirmed location	323778 870497		
Site Contact Name	Not Supplied	Site Phone No	Not Supplied
Description of Works			

* The WORK TYPE BUFFER is a distance added to your search area based on the Work type you have chosen.

Site Map

V3.3.6

Asset Owners

Terms and Conditions. Please note that this enquiry is subject always to our standard terms and conditions available at www.linesearchbeforeudig.co.uk ("Terms of Use") and the disclaimer at the end of this document. Please note that in the event of any conflict or ambiguity between the terms of this Enquiry Confirmation and the Terms of Use, the Terms of Use shall take precedence.

Notes. Please ensure your contact details are correct and up to date on the system in case the LSBUD Members need to contact you.

Validity and search criteria. The results of this enquiry are based on the confirmed information you entered and are valid only as at the date of the enquiry. It is your responsibility to ensure that the Enquiry Details are correct, and LinesearchbeforeUdig accepts no responsibility for any errors or omissions in the Enquiry Details or any consequences thereof. LSBUD Members update their asset information on a regular basis so you are advised to consider this when undertaking any works. It is your responsibility to choose the period of time after which you need to resubmit any enquiry but the maximum time (after which your enquiry will no longer be dealt with by the LSBUD Helpdesk and LSBUD Members) is 28 days. If any details of the enquiry change, particularly including, but not limited to, the location of the work, then a further enquiry must be made.

Asset Owners & Responses. Please note the enquiry results include the following:

1. "LSBUD Members" who are asset owners who have registered their assets on the LSBUD service.
2. "Non LSBUD Members" are asset owners who have not registered their assets on the LSBUD service but LSBUD is aware of their existence. Please note that there could be other asset owners within your search area.

Below are three lists of asset owners:

1. LSBUD Members who have assets registered within your search area. ("Affected")
   a. These LSBUD Members will either:
      i. Ask for further information ("Email Additional Info" noted in status). The additional information includes: Site contact name and number, Location plan, Detailed plan (minimum scale 1:2500), Cross sectional drawings (if available), Work Specification.

      ii. Respond directly to you ("Await Response"). In this response they may either send plans directly to you or ask for further information before being able to do so, particularly if any payments or authorisations are required.

2. LSBUD Members who do not have assets registered within your search area. ("Not Affected")

3. Non LSBUD Members who may have assets within your search area. Please note that this list is not exhaustive and all details are provided as a guide only. It is your responsibility to identify and consult with all asset owners before proceeding.

National Grid. Please note that the LSBUD service only contains information on National Grid's Gas above 7 bar asset, all National Grid Electricity Transmission assets and National Grid's Gas Distribution Limited above 2 bar asset.

For National Grid Gas Distribution Ltd below 2 bar asset information please go to www.beforeyoudig.nationalgrid.com

Linesearch before U dig

Enquiry Confirmation

LSBUD Ref: 20047775

Date of enquiry: 28/09/2020
Time of enquiry: 14:47

LSBUD Members who have assets registered on the LSBUD service within the vicinity of your search area.

List of affected LSBUD members			
Asset Owner	**Phone/Email**	**Emergency Only**	**Status**
Scottish and Southern Electricity Networks	08000483516	08000727282	Await response
SGN	08009121722	0800111999	Await response
SSE Utility Solutions Limited	03450707386	Gas 0800111999 Enterprise Water and Electric 0345 078 3268	Await response

LSBUD Members who do not have assets registered on the LSBUD service within the vicinity of your search area. Please be aware that LSBUD Members make regular changes to their assets and this list may vary for new enquiries in the same area.

List of not affected LSBUD members		
AWE Pipeline	Balfour Beatty Investments Limited	BOC Limited (A Member of the Linde Group)
BP Exploration Operating Company Limited	BPA	Carrington Gas Pipeline
CATS Pipeline c/o Wood Group PSN	Cemex	Centrica Storage Ltd
Chrysaor Production (UK) Limited	CLH Pipeline System Ltd	CNG Services Ltd
Concept Solutions People Ltd	ConocoPhillips (UK) Teesside Operator Ltd	Diamond Transmission Corporation
DIO (MOD Abandoned Pipelines)	DIO (MOD Live Pipelines)	Drax Group
E.ON UK CHP Limited	EirGrid	Electricity North West Limited
ENI & Himor c/o Penspen Ltd	EnQuest NNS Limited	EP Langage Limited
ESP Utilities Group	ESSAR	Esso Petroleum Company Limited
Fulcrum Pipelines Limited	Gamma	Gas Networks Ireland (UK)
Gateshead Energy Company	Gigaclear Ltd	Gtt
Heathrow Airport LTD	Humbly Grove Energy	IGas Energy
INEOS FPS Pipelines	INEOS Manufacturing (Scotland and TSEP)	INOVYN Enterprises Limited
Intergen (Coryton Energy or Spalding Energy)	Jurassic Fibre Ltd	Mainline Pipelines Limited
Manchester Jetline Limited	Manx Cable Company	Marchwood Power Ltd (Gas Pipeline)
Melbourn Solar Limited	Murphy Utility Assets	National Grid Gas (Above 7 bar), National Grid Gas Distribution Limited (Above 2 bar) and National Grid Electricity Transmission
Northumbrian Water Group	NPower CHP Pipelines	NYnet Ltd
Oikos Storage Limited	Ørsted	Perenco UK Limited (Purbeck Southampton Pipeline)
Petroineos	Phillips 66	Portsmouth Water
Premier Transmission Ltd (SNIP)	Redundant Pipelines - LPDA	RWE - Great Yarmouth Pipeline (Bacton to Great Yarmouth Power Station)
RWEnpower (Little Barford and South Haven)	SABIC UK Petrochemicals	Scottish Power Generation
Seabank Power Ltd	SES Water	Shell
Shell NOP	SSE (Peterhead Power Station)	SSE Enterprise Telecoms
SSE Generation Ltd	Tata Communications (c/o JSM Construction Ltd)	Total (Colnbrook & Colwick Pipelines)

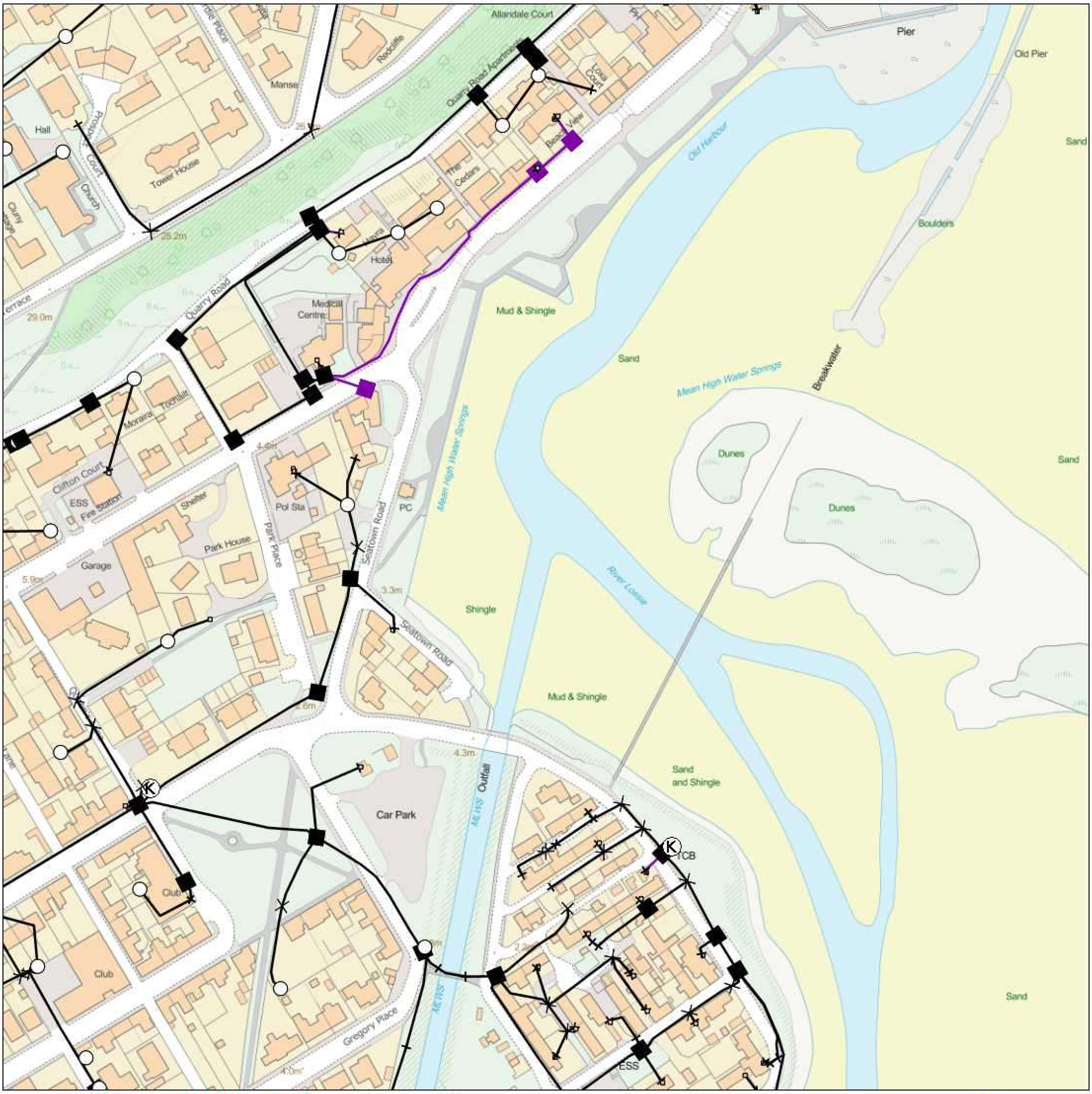
Total Finaline Pipelines	Transmission Capital	UK Power Networks
Uniper UK Ltd	University of Cambridge Granta Backbone Network	Vattenfall
Veolia ES SELCHP Limited	Veolia ES Sheffield Ltd	Wales and West Utilities
West of Duddon Sands Transmission Ltd	Western Power Distribution	Westminster City Council
Zayo Group UK Ltd c/o JSM Group Ltd		

The following Non-LSBUD Members may have assets in your search area. It is YOUR RESPONSIBILITY to contact them before proceeding. Please be aware this list is not exhaustive and it is your responsibility to identify and contact all asset owners within your search area.

Non-LSBUD members (Asset owners not registered on LSBUD)

Asset Owner	Preferred contact method	Phone	Status
BT	https://www.swns.bt.com/pls/mbe/welcome.home	08000232023	Not Notified
CenturyLink Communications UK Limited	plantenquiries@instalcom.co.uk	02087314613	Not Notified
CityFibre	asset.team@cityfibre.com	033 3150 7282	Not Notified
Colt	plantenquiries@catelecomuk.com	01227768427	Not Notified
Energetics Electricity	plantenquiries@lastmile-uk.com	01698404646	Not Notified
ENGIE	nrswa.uk@engie.com	01293 549944	Not Notified
GTC	https://pe.gtc-uk.co.uk/PlantEnqMembership	01359240363	Not Notified
KPN (c/-Instalcom)	kpn.plantenquiries@instalcom.co.uk	n/a	Not Notified
Mobile Broadband Network Limited	mbnlplantenquiries@turntown.com	01212 621 100	Not Notified
Moray Council	road.maint@moray.gov.uk		Not Notified
Scottish Water	searches@scottishwater.co.uk	01382563666	Not Notified
Utility assets Ltd	assetrecords@utilityassets.co.uk		Not Notified
Verizon Business	osp-team@uk.verizonbusiness.com	01293611736	Not Notified
Virgin Media	http://www.digdat.co.uk	08708883116	Not Notified
Vodafone	osm.enquiries@atkinsglobal.com	01454662881	Not Notified

Maps by email Plant Information Reply



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email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

Accidents happen

If you do damage any Openreach equipment please let us know by calling 0800 023 2023 (opt 1 + opt 1) and we can get it fixed ASAP

KEY TO BT SYMBOLS	Planned	Live
PCP		
Pole		
Box		
Manhole		
Cabinet		

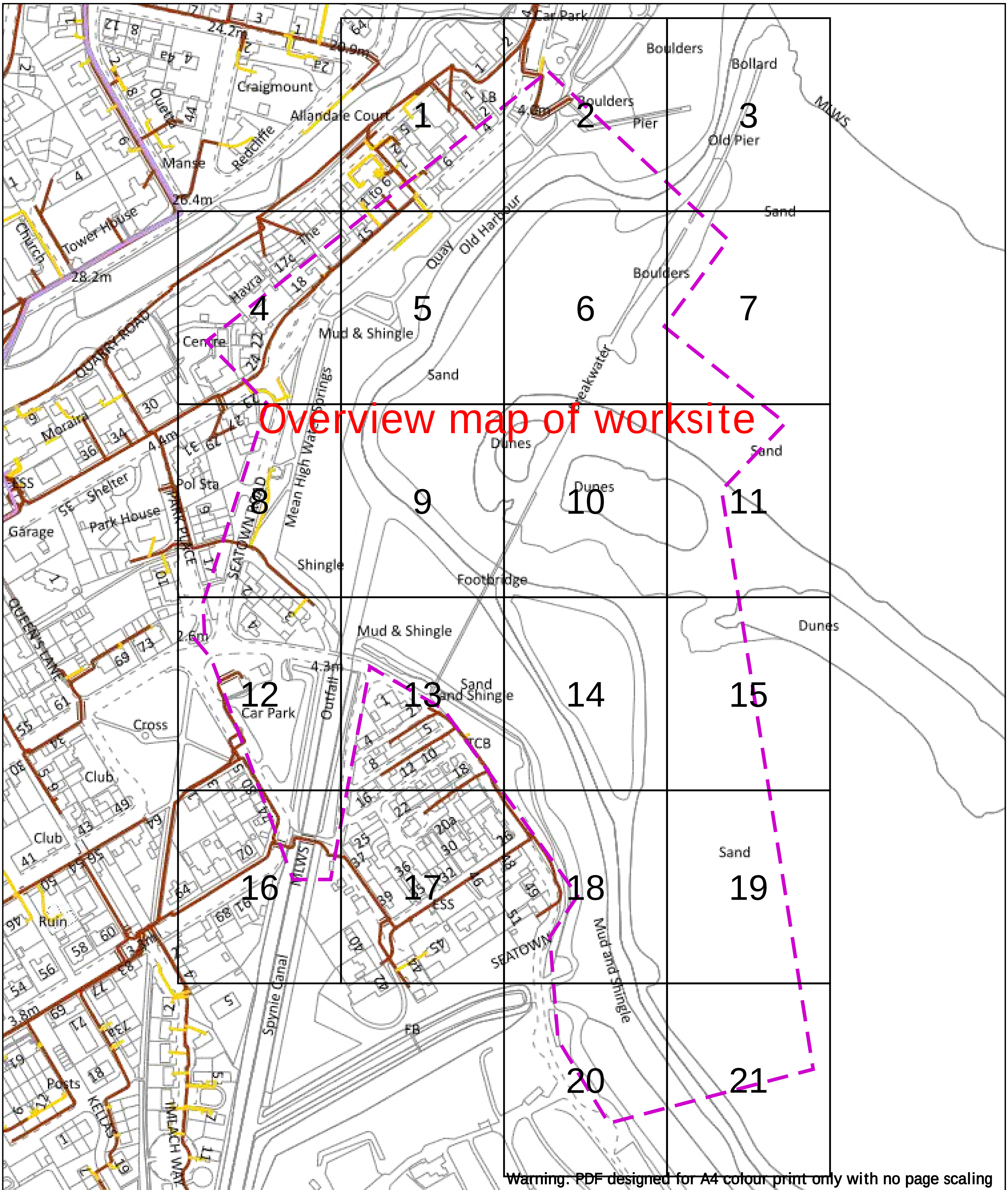
Change Of State	+	Hatchings	
Split Coupling	×	Built	
Duct Tee	▲	Planned	
Building		Inferred	
Kiosk	K	Duct	

Other proposed plant is shown using dashed lines.
BT Symbols not listed above may be disregarded.
Existing BT Plant may not be recorded.
Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

	Pending Add	In Place	Pending Remove	Not In Use
Power Cable				
Power Duct				N/A

BT Ref : QQY02455F
Map Reference : (centre) NJ2372070517
Easting/Northing : (centre) 323720,870517
Issued : 28/09/2020 14:45:47

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk



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Dig Sites Area: Line:

Date Requested: 28/09/2020
Job Reference: 20047775
Site Location: 323778 870497
Requested by: Miss Alexa Band

Your Scheme/Reference: sts5161m

Scale: 1:3075 (When plotted at A4)

Voltages (V)

LV (Low Voltage) and Services	Up to 1,000V
HV (High Voltage)	Over 1,000V to 11,000V
EHV (Extra High Voltage)	22,000V to 132,000V
Transmission	275,000V and 400,000V

NORMAL DEPTH TO THE TOP OF THE CABLE WHEN LAID

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Agricultural	1m	1m	1m	1.1m

Legend

Service Cable
LV Mains
2 – 3.3kV
6.6kV
11kV
22kV
33kV
66kV
132kV
275kV
400kV
Fibre Optic
Pilot Cable

Distribution Structures (Electric)

Pole, Existing Location
Pole Structure, Existing Location - Single
Pole Structure, Existing Location - H

Duct Route
Cross Section Route

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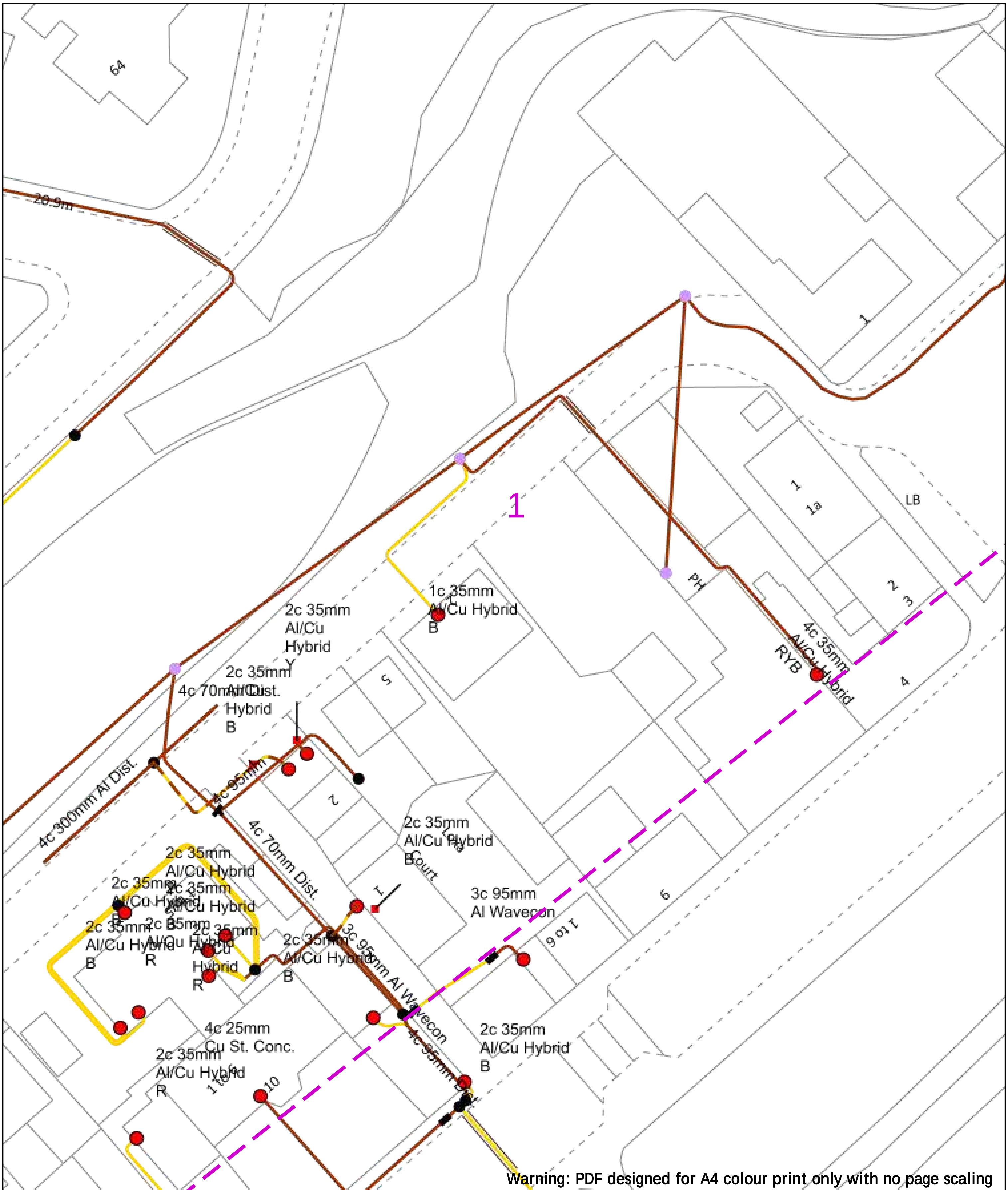

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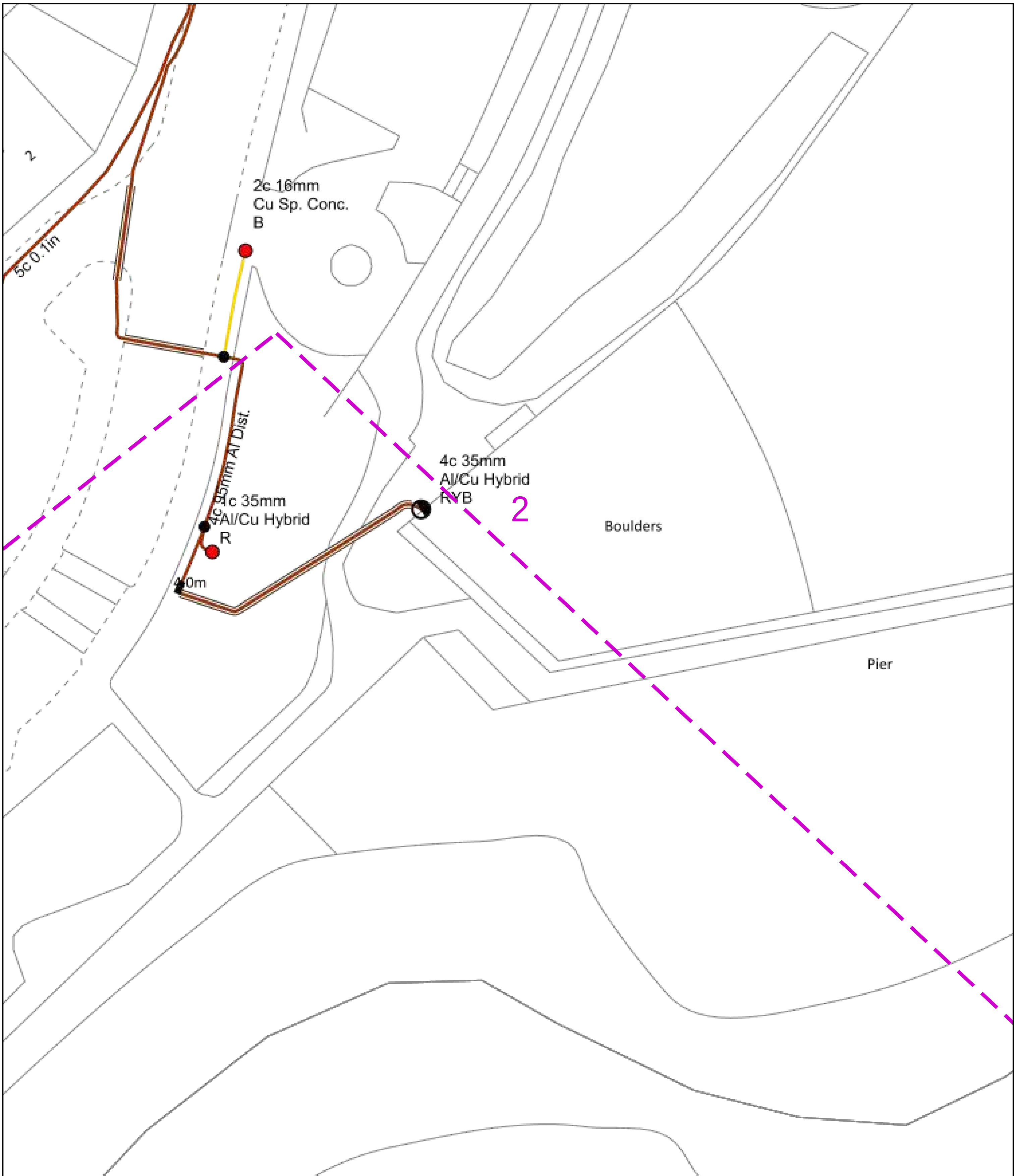

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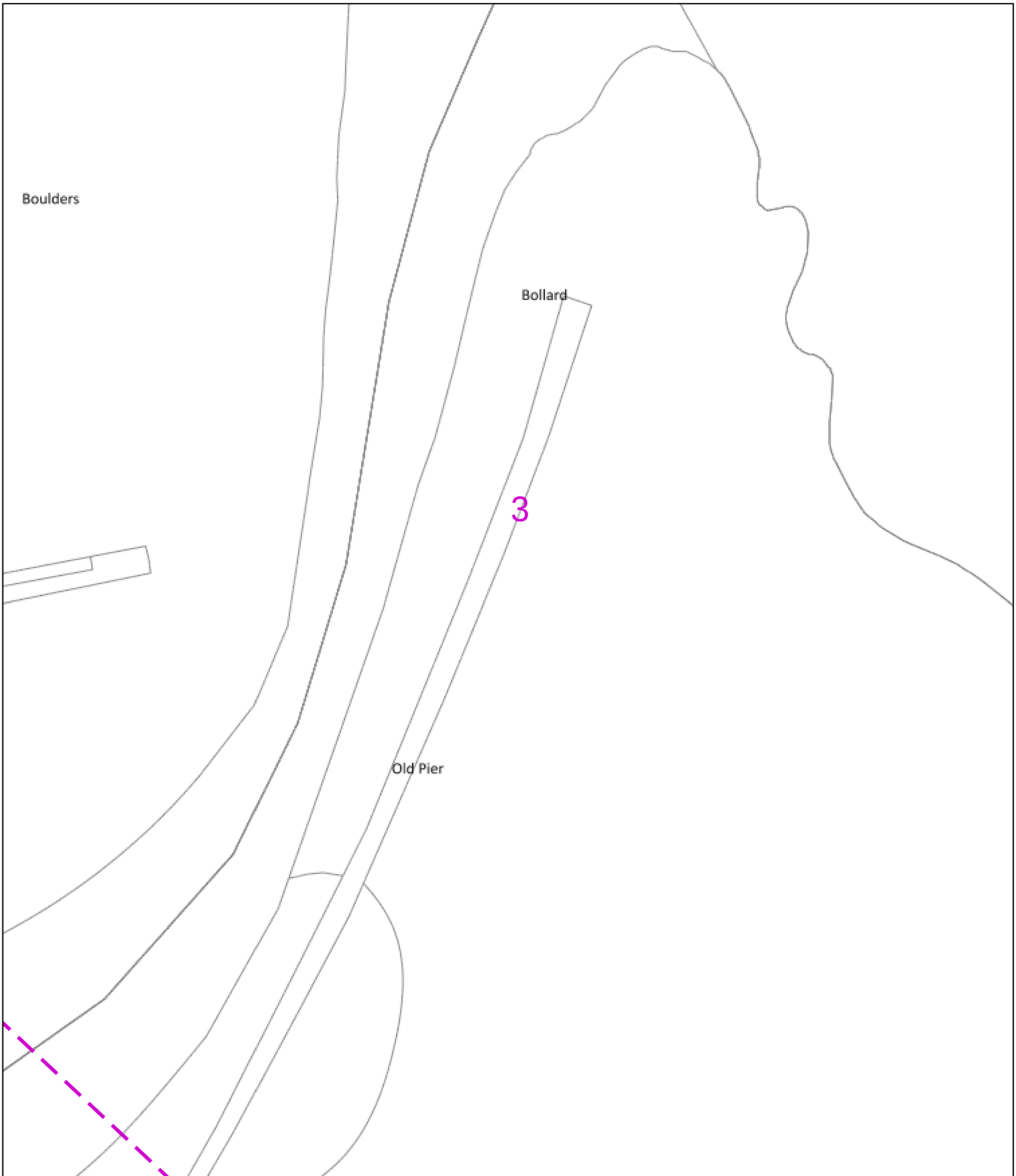

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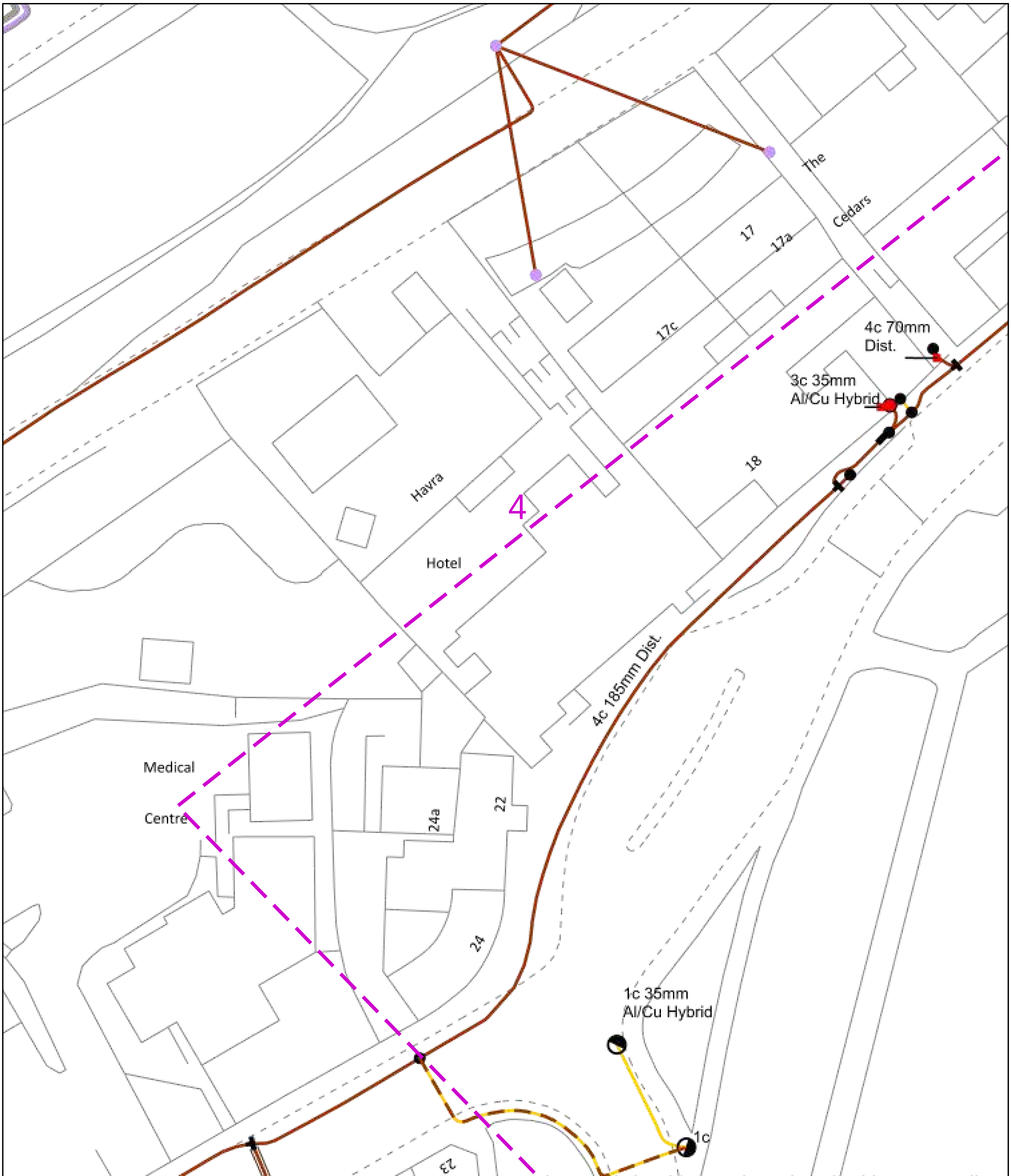

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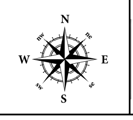

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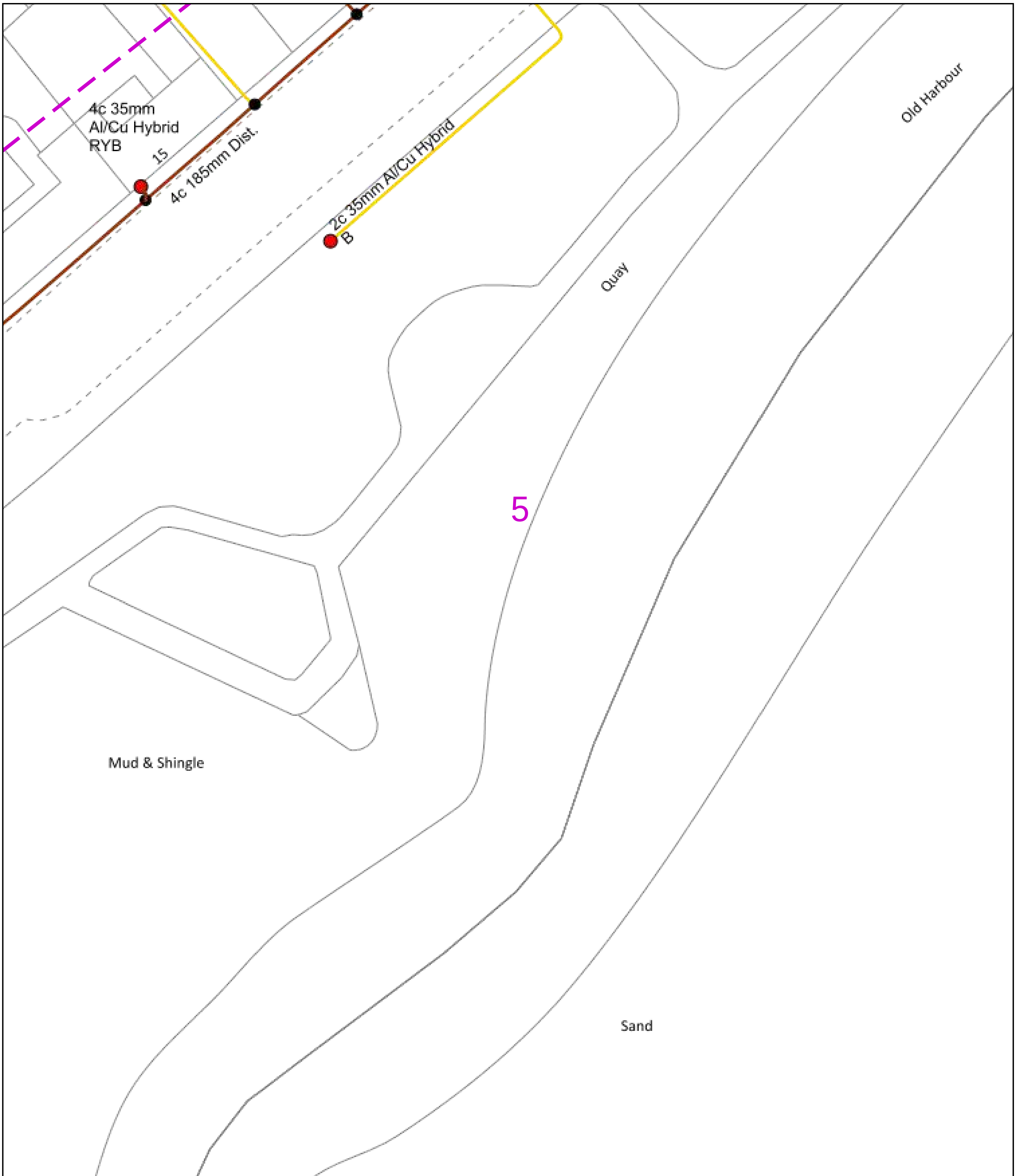

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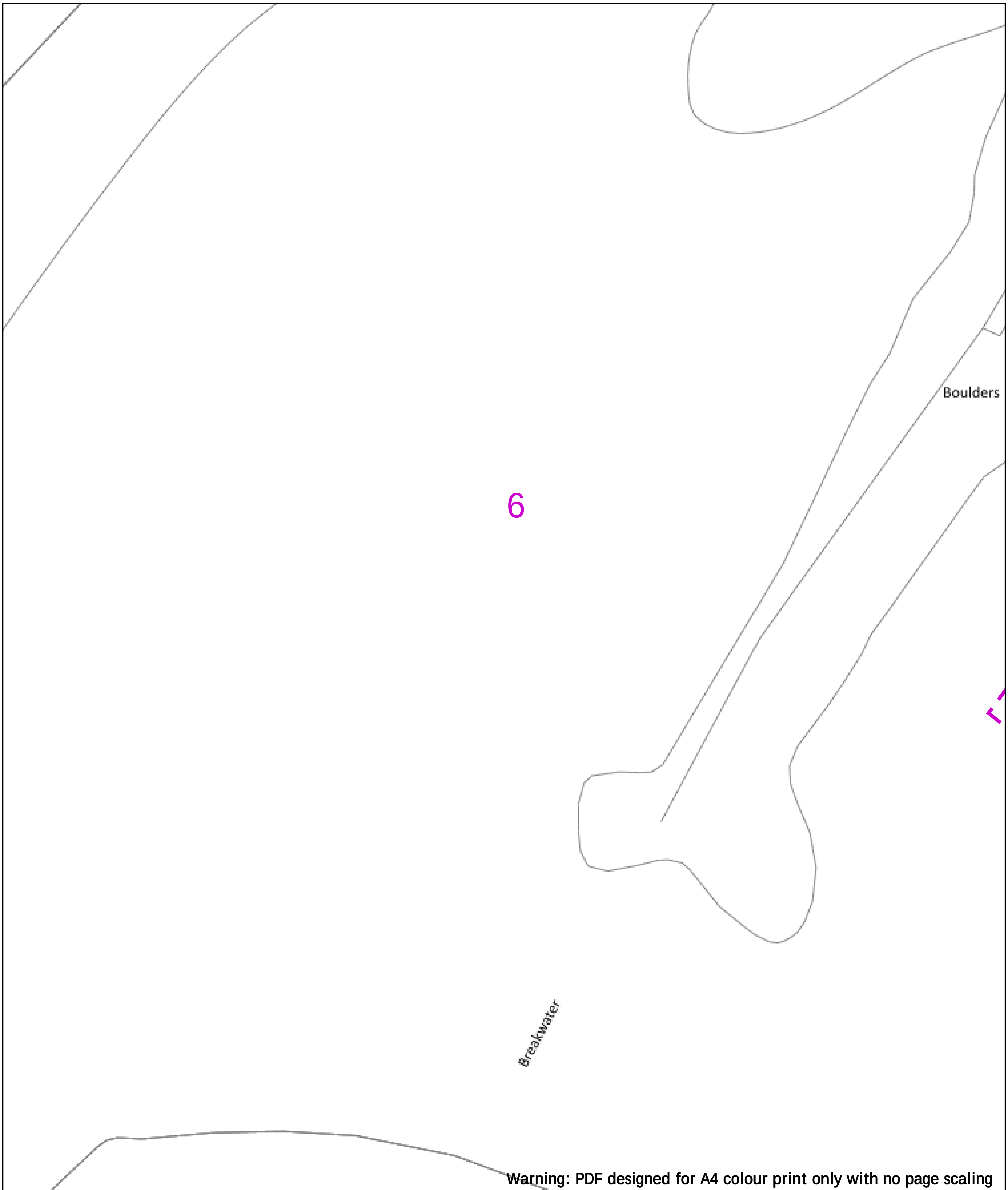

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Distribution Structures [Electric]

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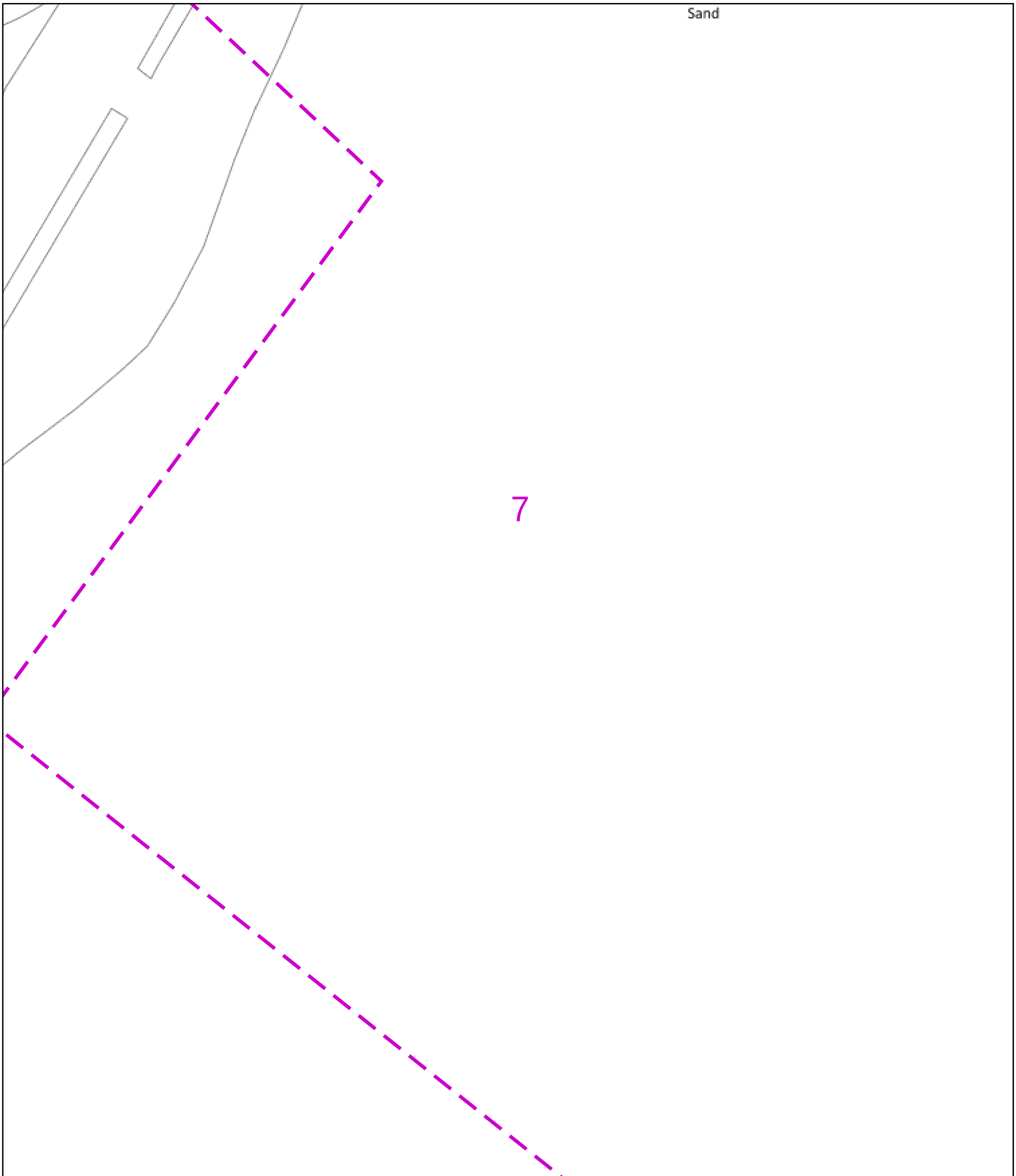

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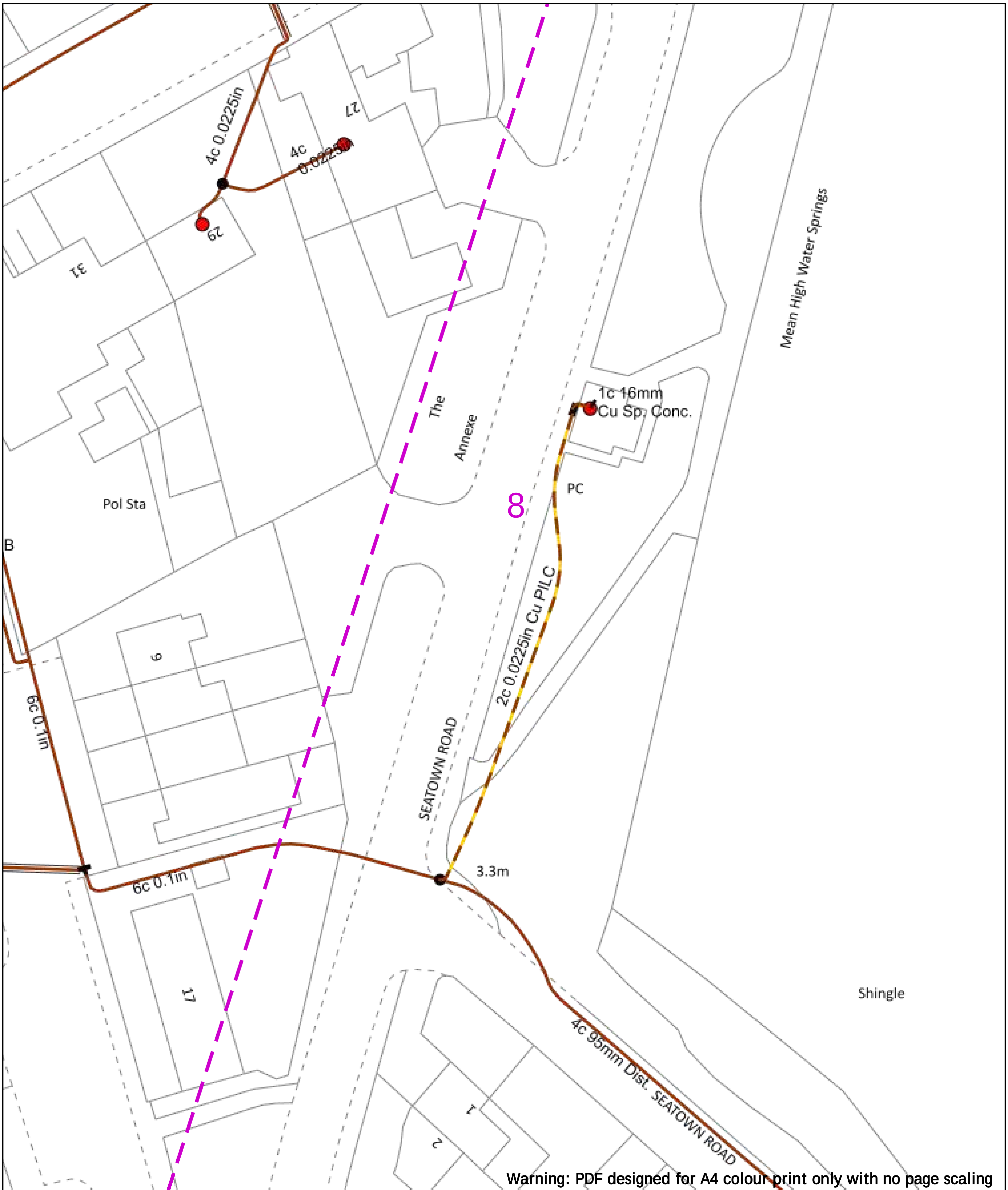

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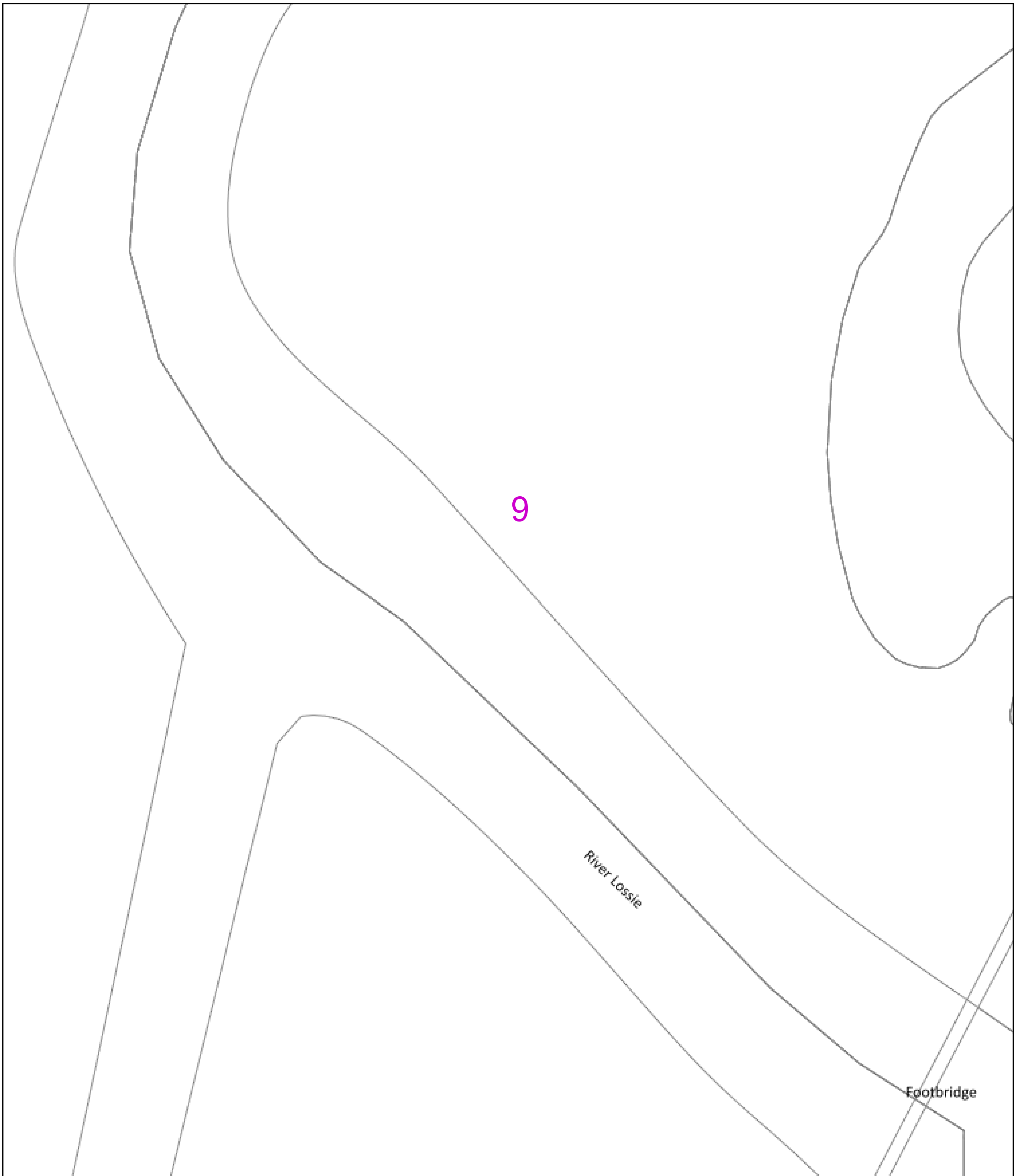

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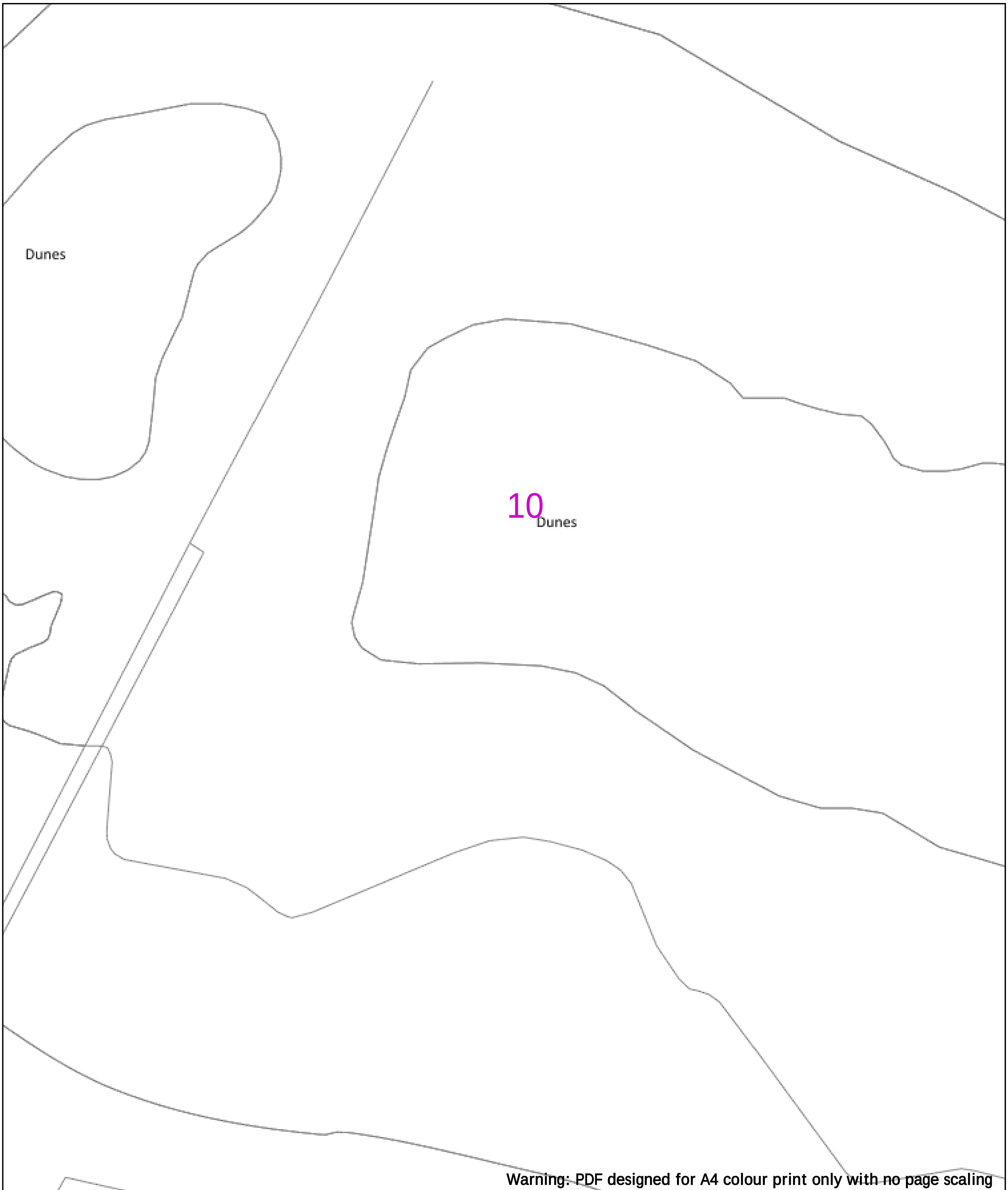

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Pole Structure, Existing Location - H
Duct Route
Cross Section Route

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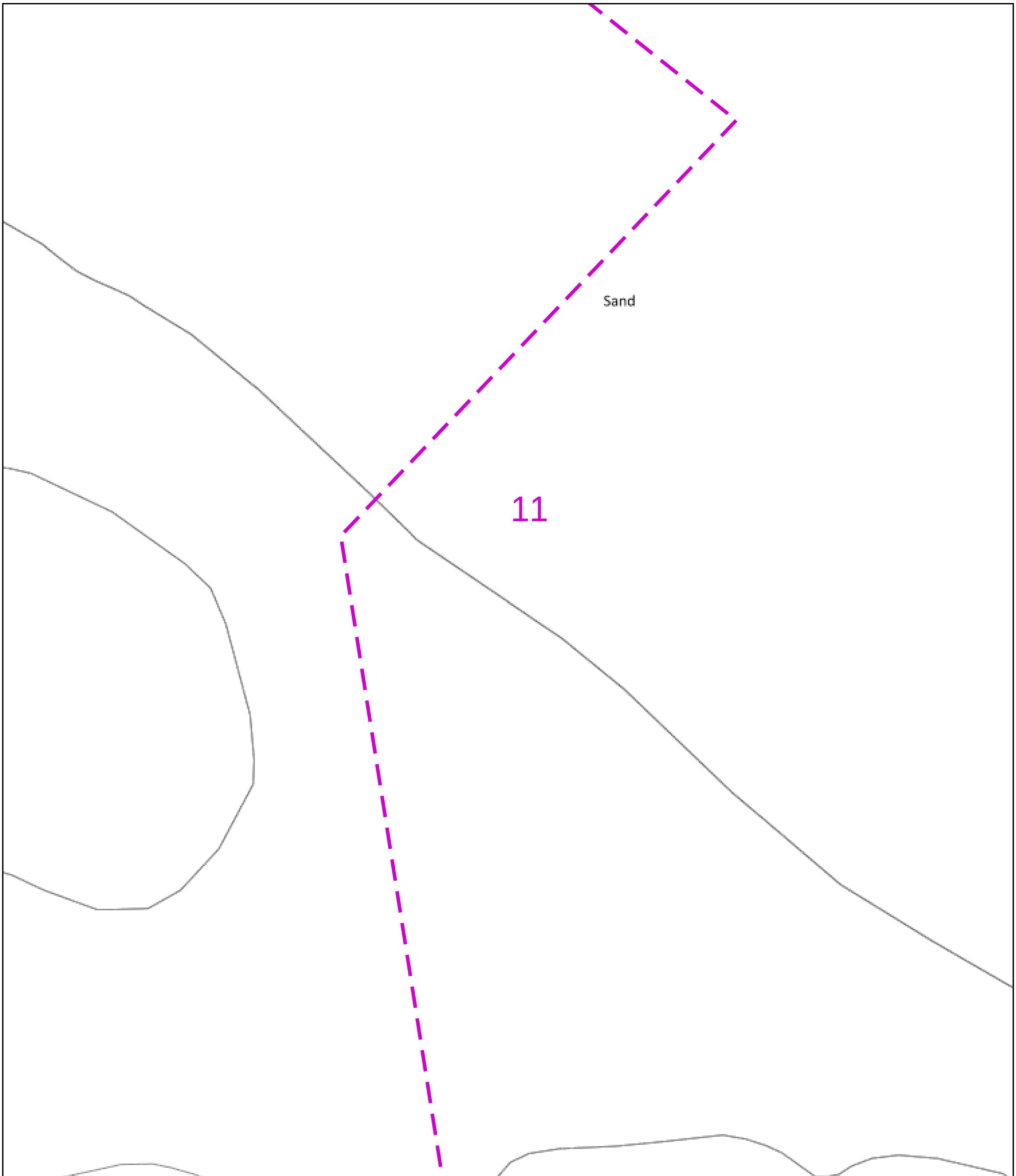

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0 20m Dig Sites Area: Line:

Date Requested: 28/09/2020
Job Reference: 20047775
Site Location: 323778 870497
Requested by: Miss Alexa Band

Your Scheme/Reference: sts5161m

Scale: 1:500 (When plotted at A4)

Voltages (V)

LV (Low Voltage) and Services	Up to 1,000V
HV (High Voltage)	Over 1,000V to 11,000V
EHV (Extra High Voltage)	22,000V to 132,000V
Transmission	275,000V and 400,000V

NORMAL DEPTH TO THE TOP OF THE CABLE WHEN LAID

	Services	LV	HV	EHV
Footpath/Unmade	0.45m	0.45m	0.6m	0.8m
Road Crossing	0.6m	0.6m	0.75m	0.9m
Agricultural	1m	1m	1m	1.1m

Legend

- Service Cable
- LV Mains
- 2 – 3.3kV
- 6.6kV
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- 66kV
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- 275kV
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- Fibre Optic
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Distribution Structures [Electric]

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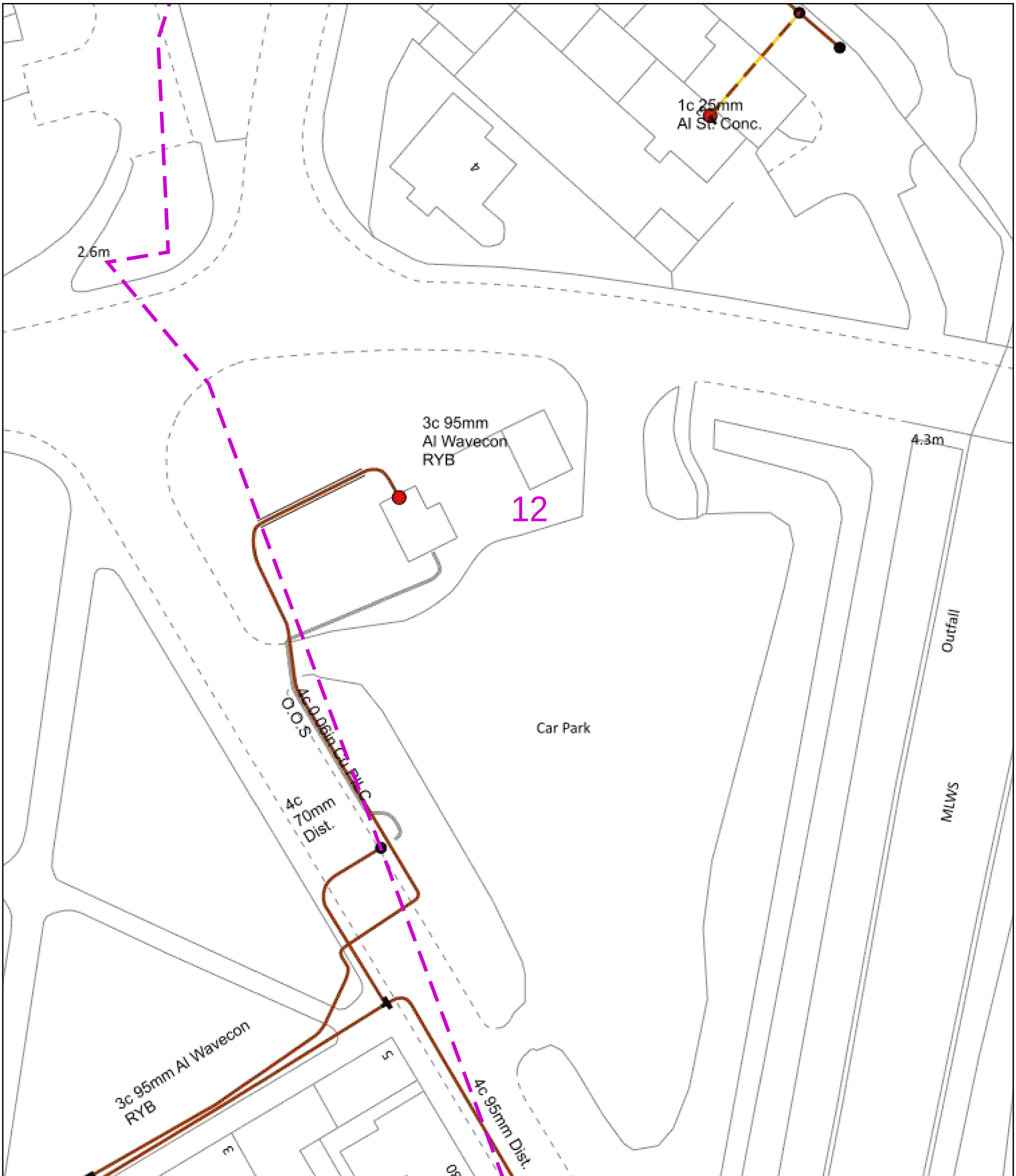

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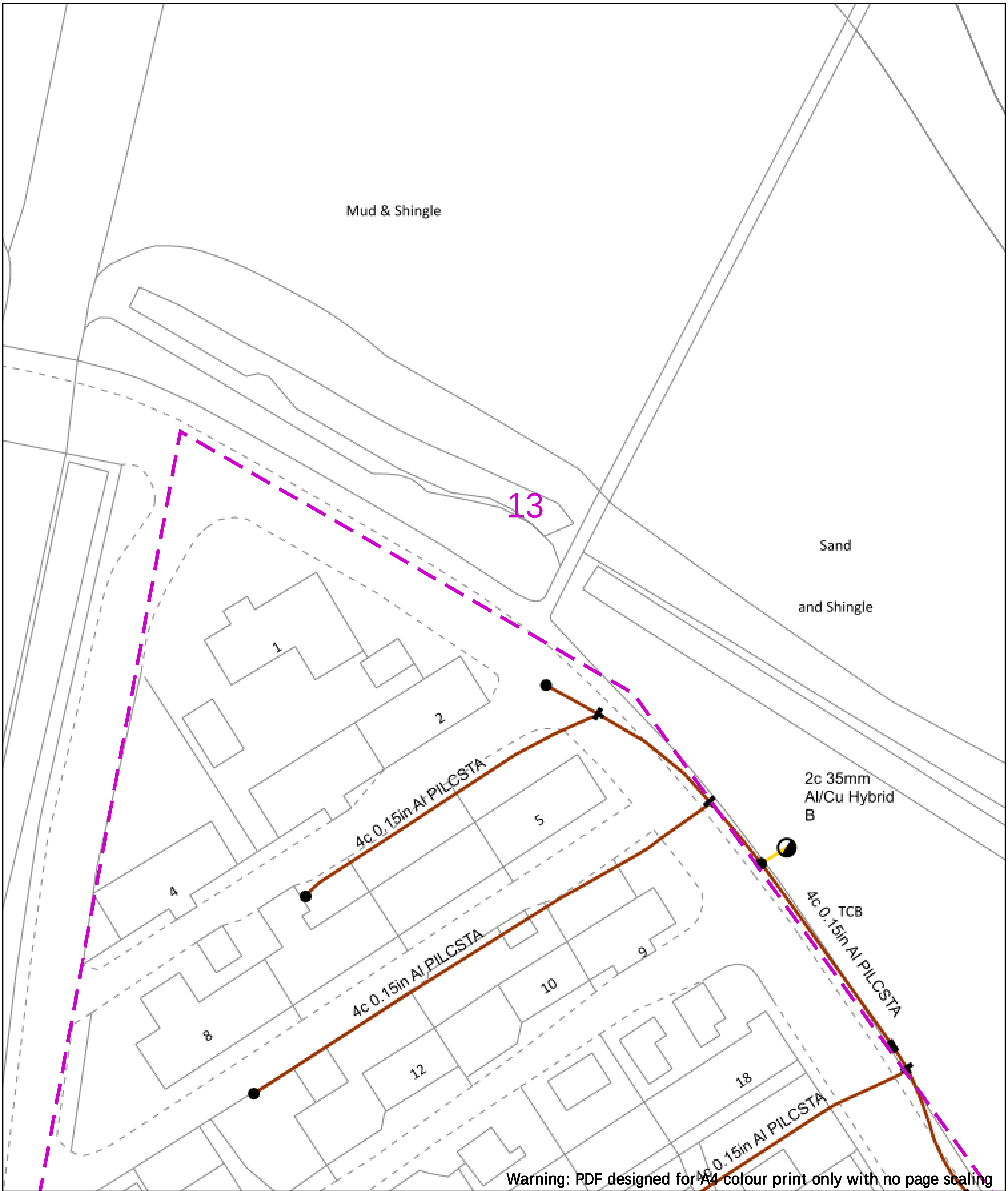

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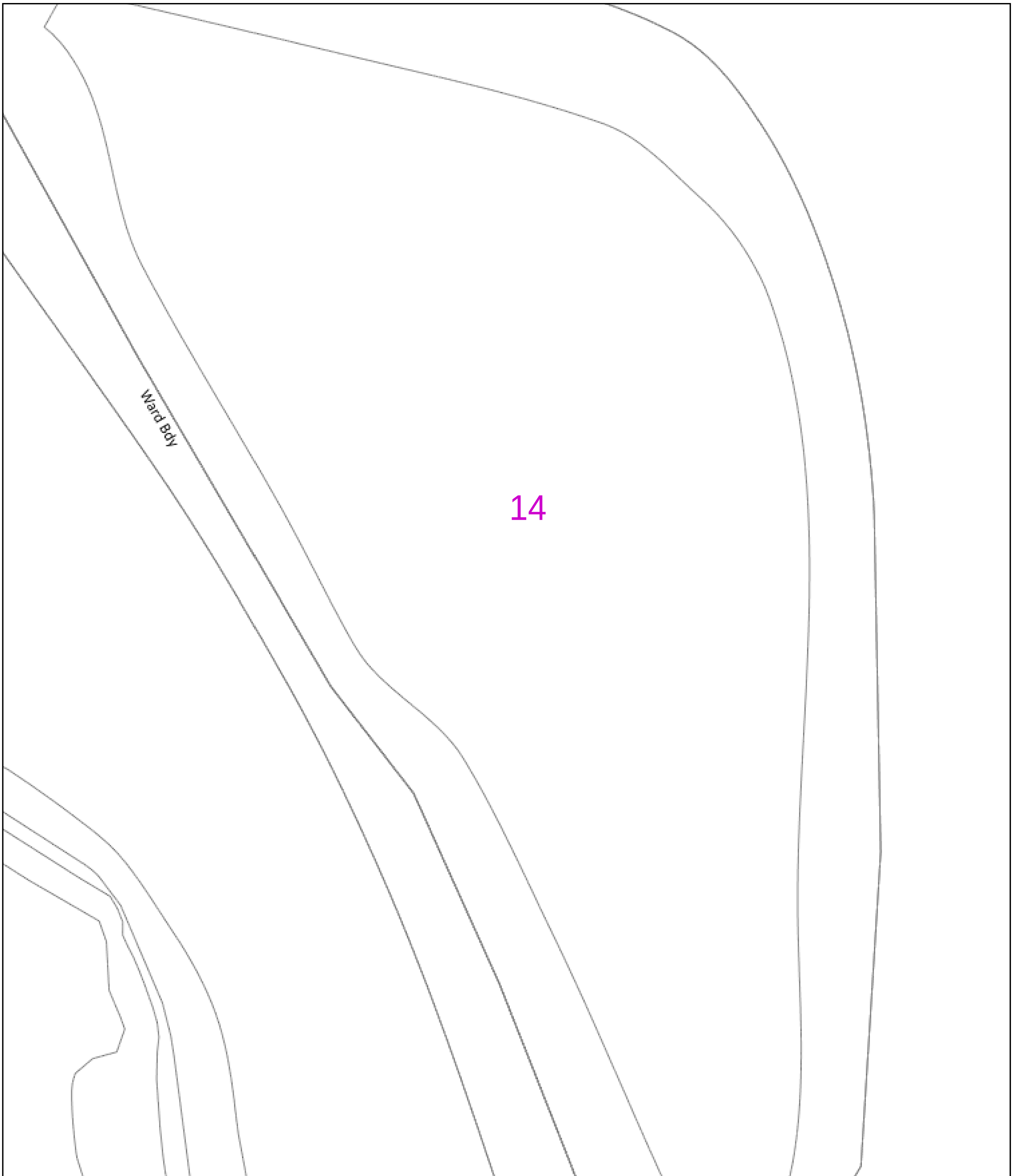

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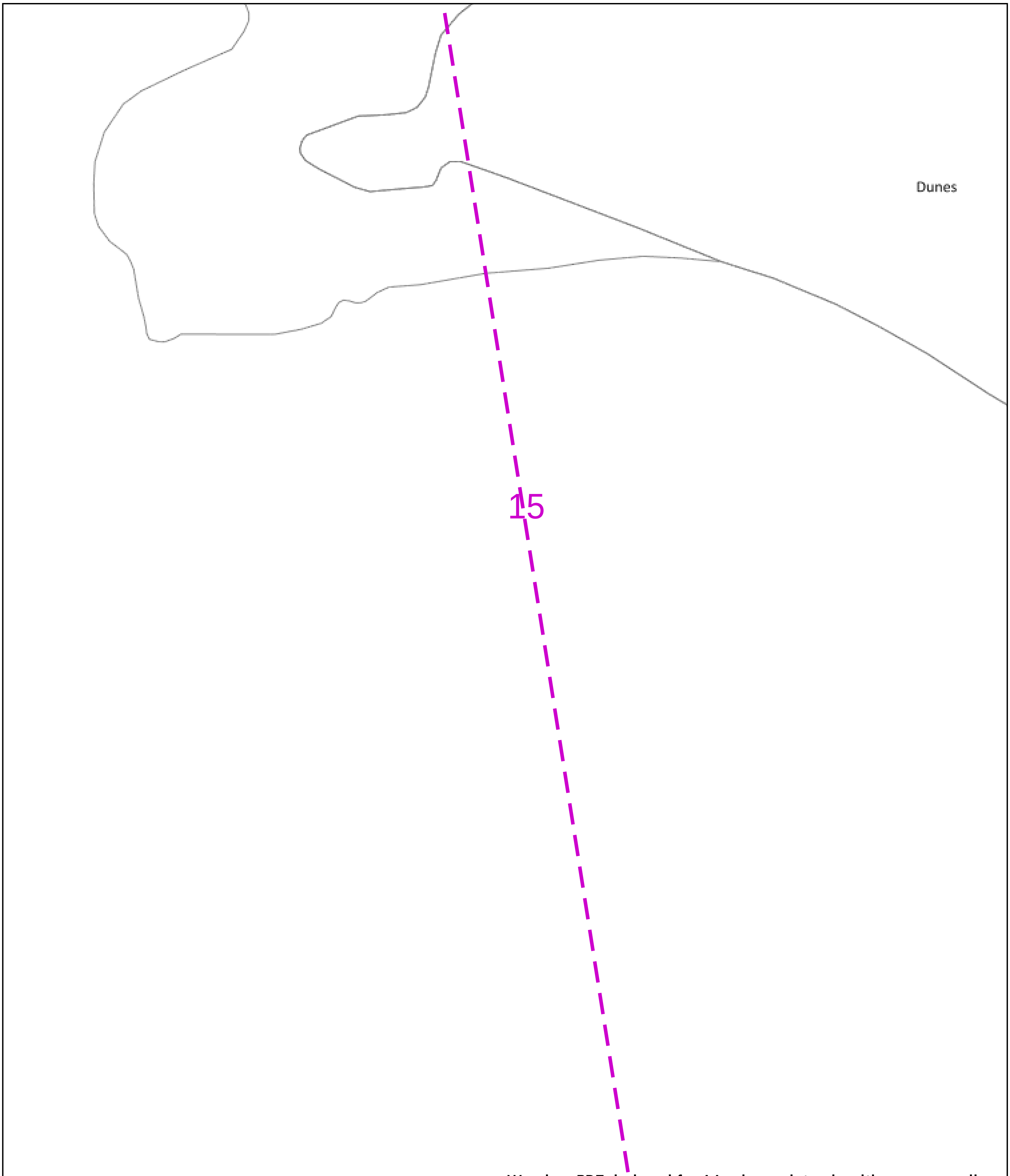

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Distribution Structures [Electric]

Pole, Existing Location
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Duct Route
Cross Section Route

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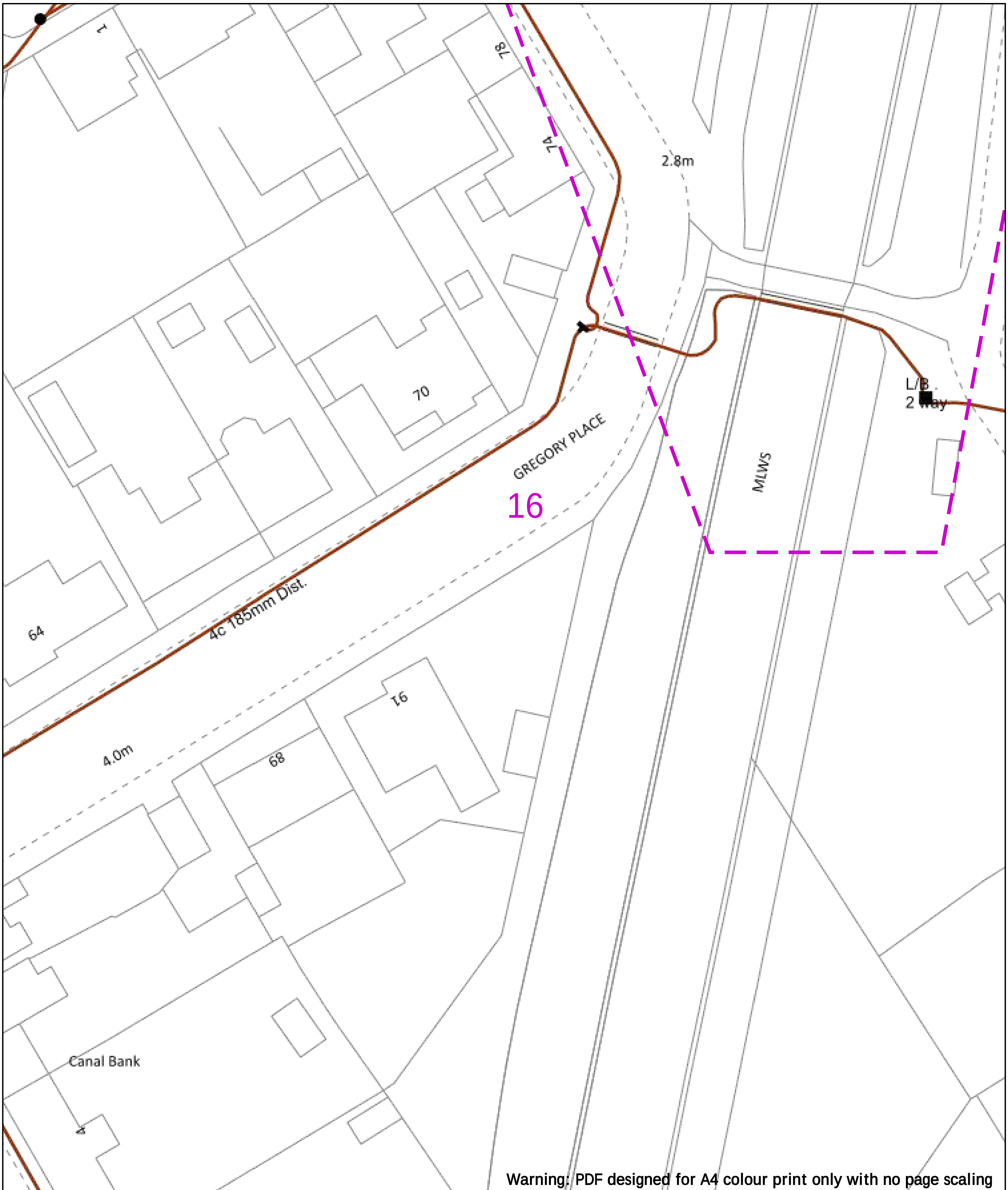

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Pole, Existing Location
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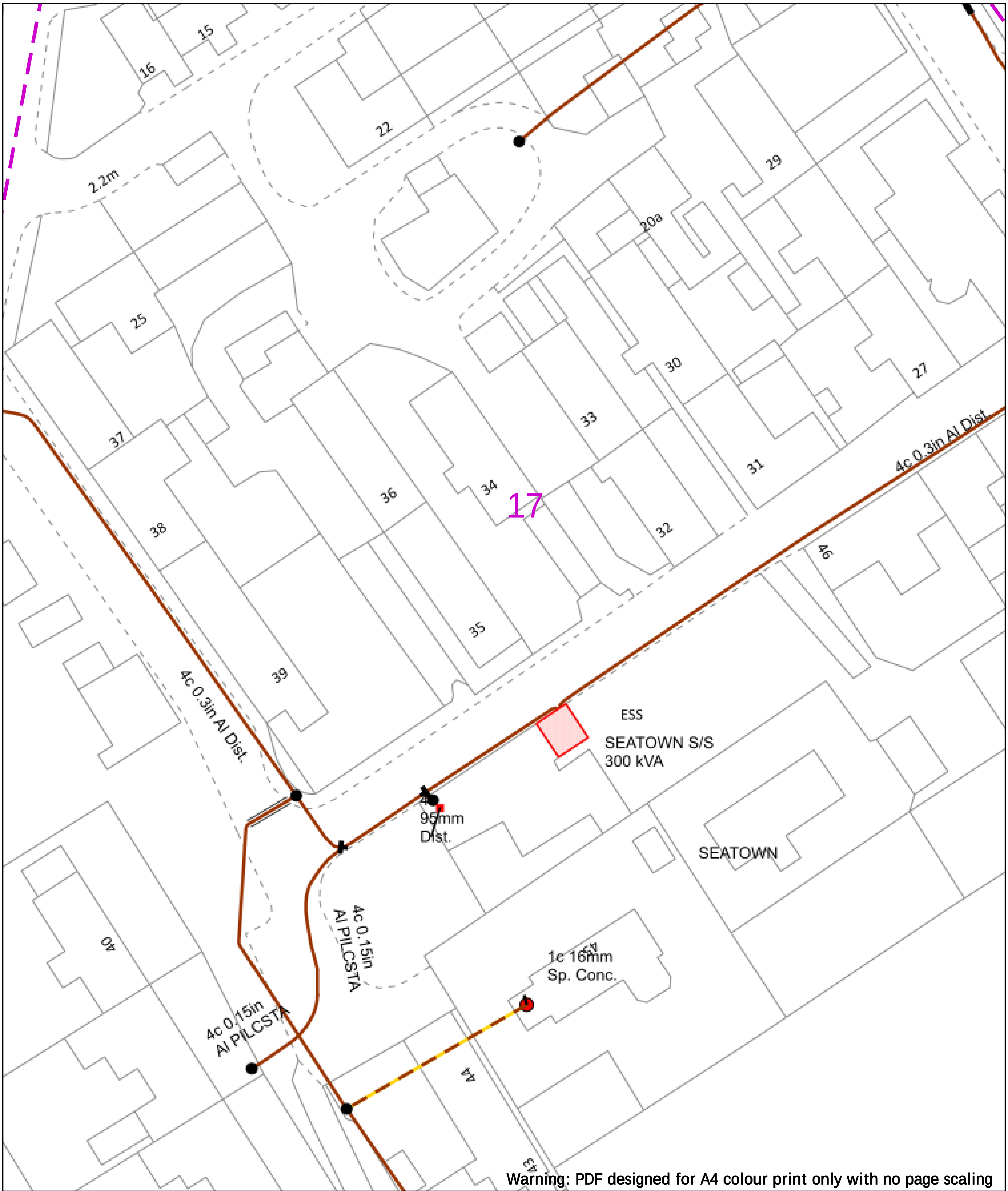

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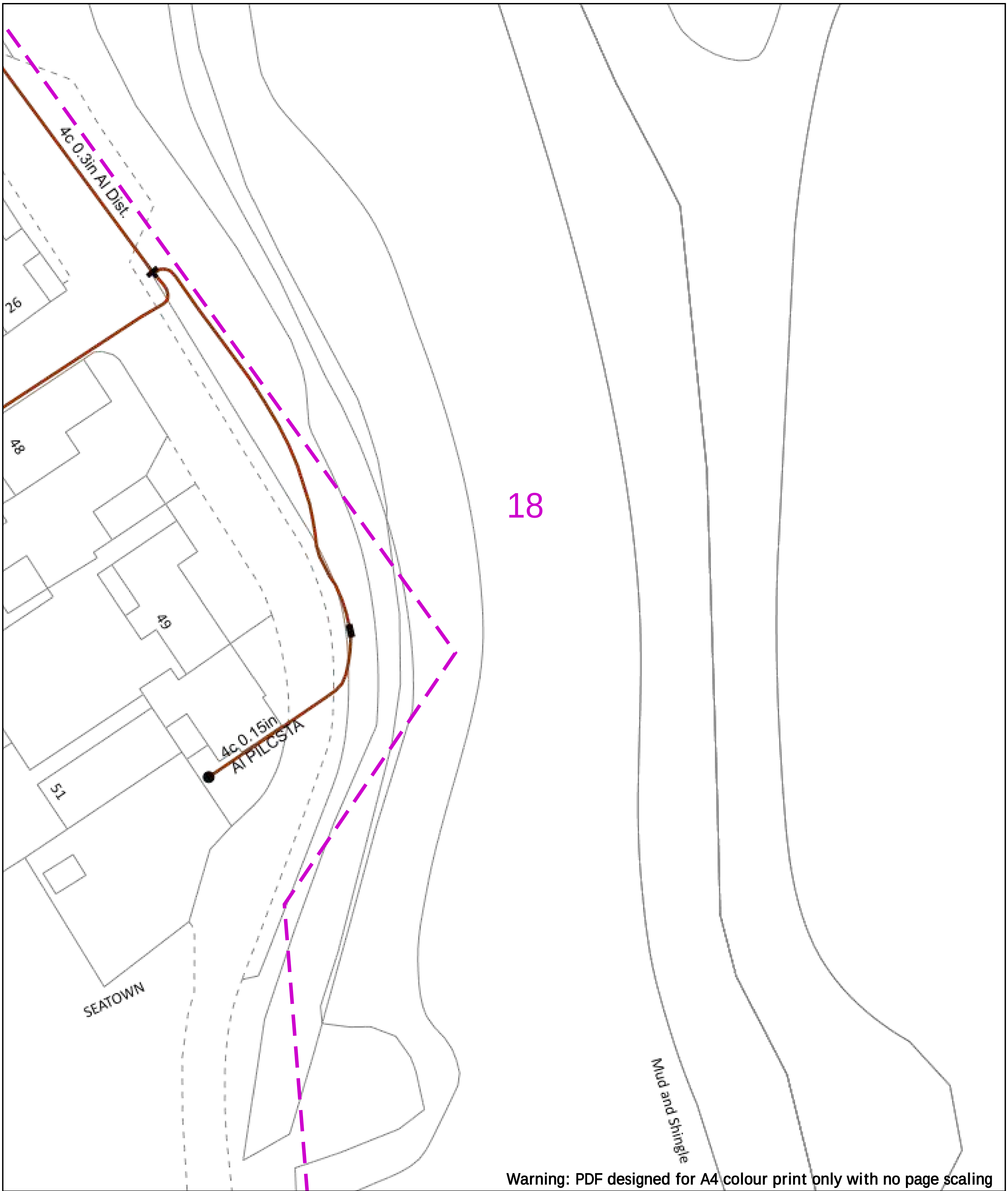

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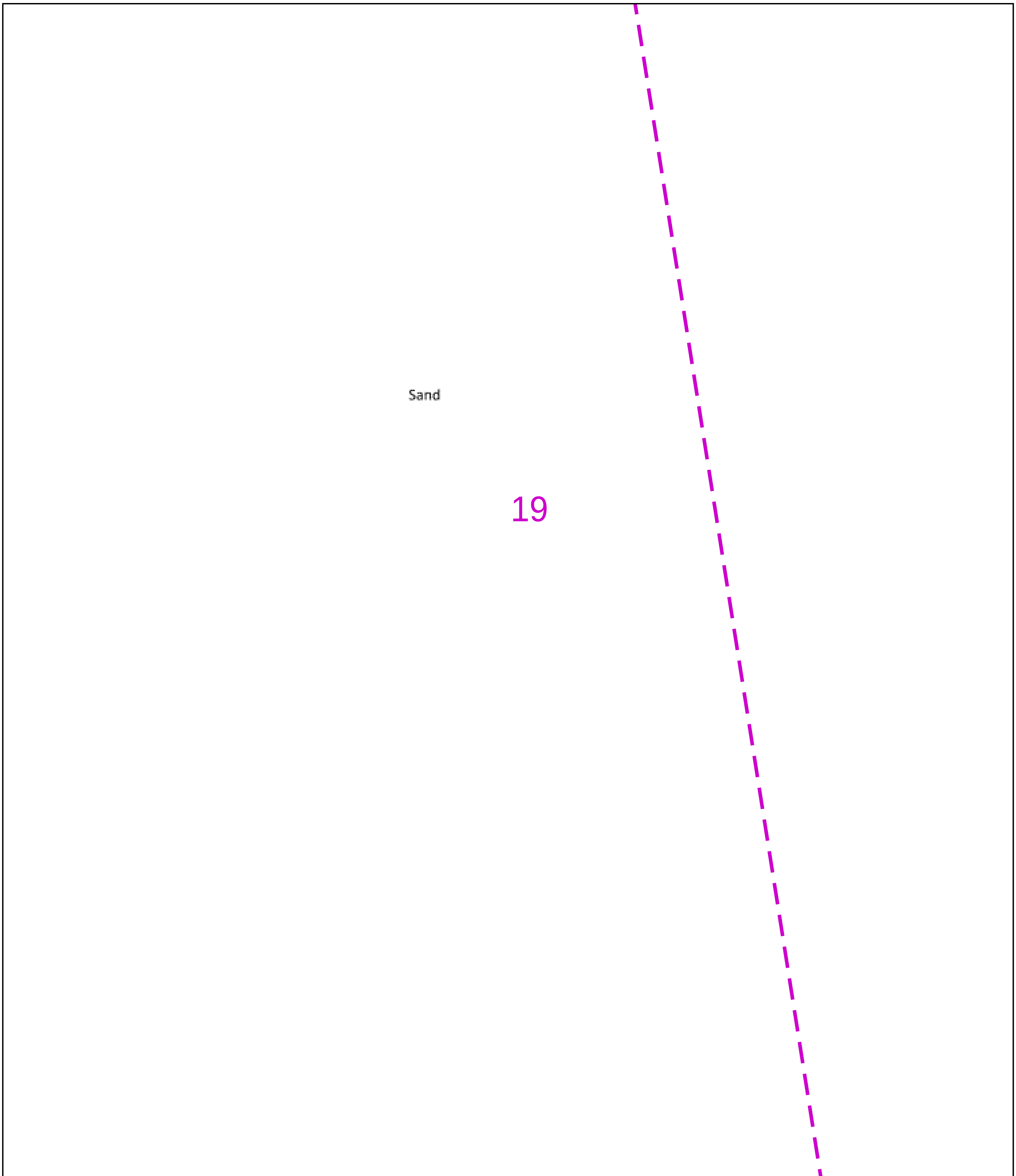

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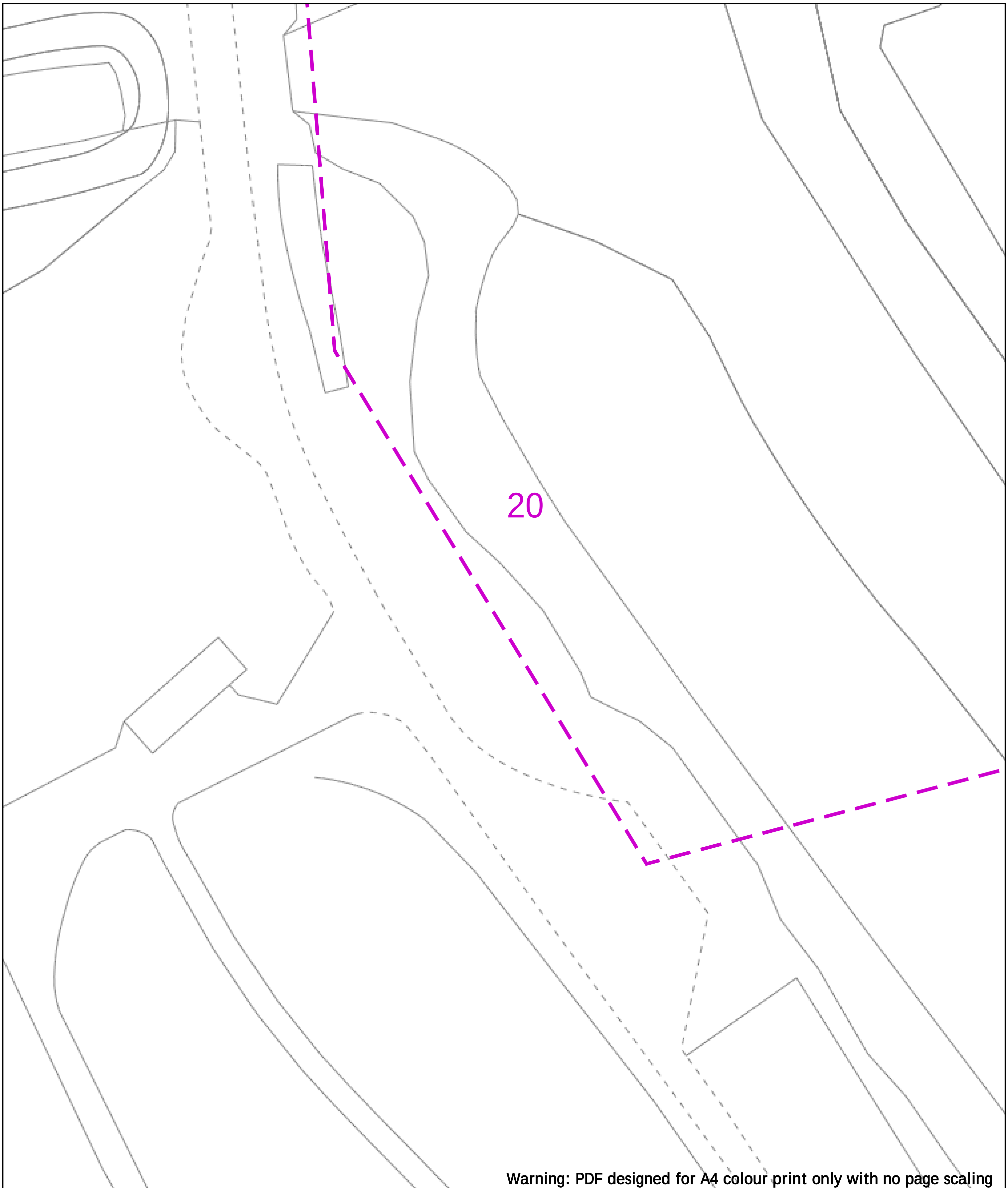

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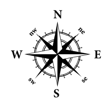

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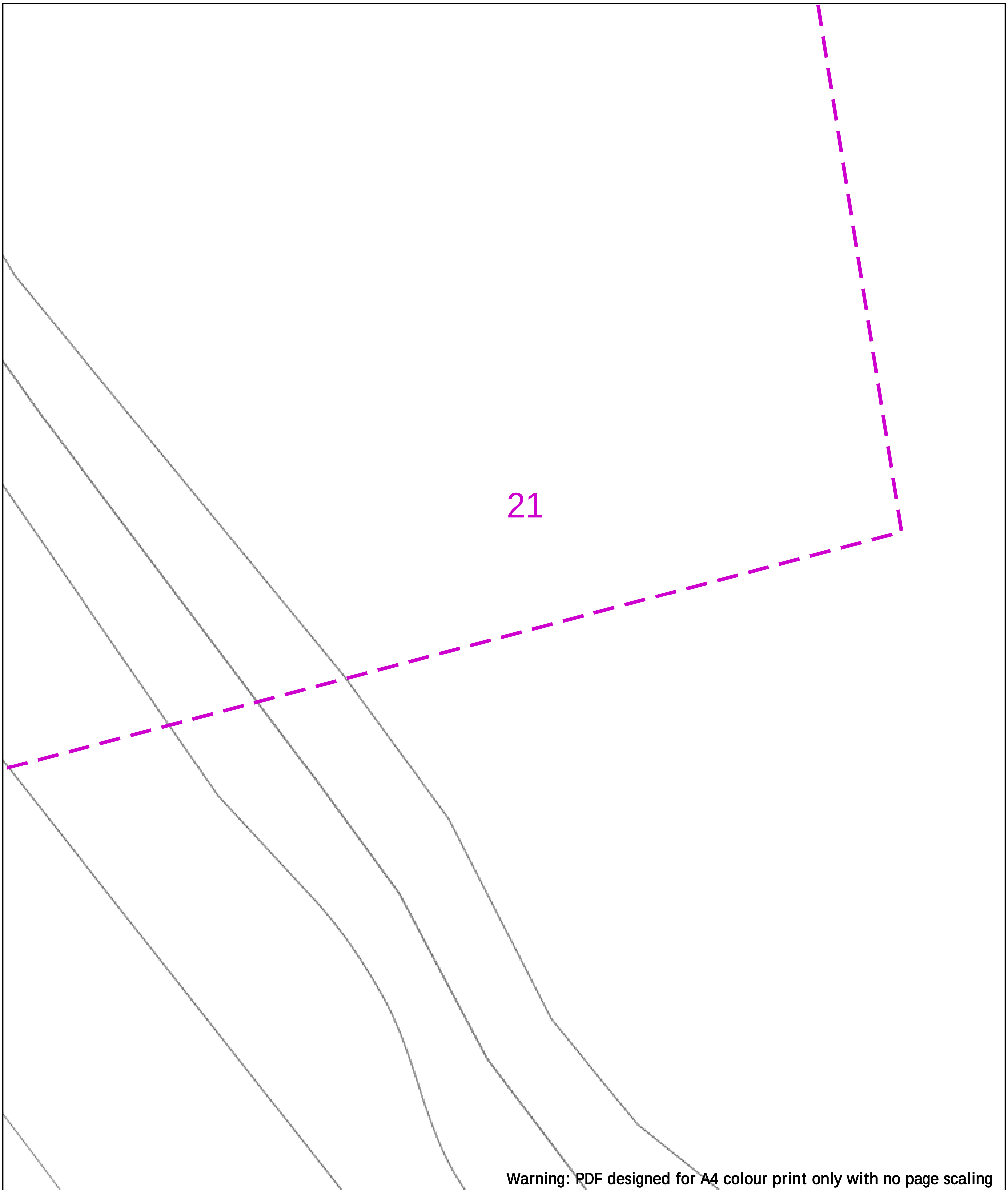

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Road Crossing	0.6m	0.6m	0.75m	0.9m
Agricultural	1m	1m	1m	1.1m

Legend

- Service Cable
- LV Mains
- 2 – 3.3kV
- 6.6kV
- 11kV
- 22kV
- 33kV
- 66kV
- 132kV
- 275kV
- 400kV
- Fibre Optic
- Pilot Cable

Distribution Structures [Electric]

- Pole, Existing Location
- Pole Structure, Existing Location - Single
- Pole Structure, Existing Location - H
- Duct Route
- Cross Section Route

WARNING

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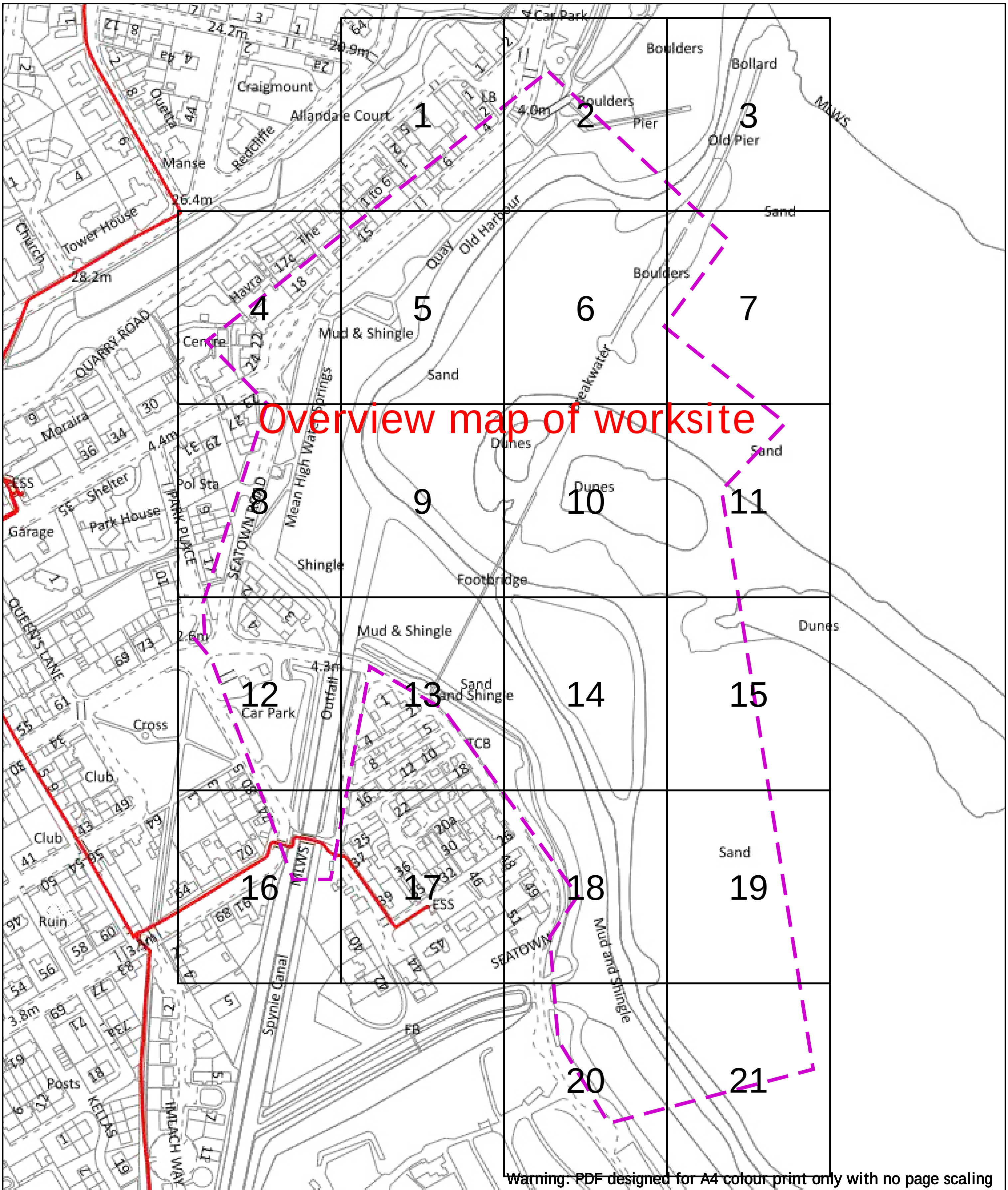

Dig Sites Area: Line:

Date Requested: 28/09/2020
Job Reference: 20047775
Site Location: 323778 870497
Requested by: Miss Alexa Band

Your Scheme/Reference: sts5161m

Scale: 1:3075 (When plotted at A4)

Voltages (V)

LV (Low Voltage) and Services	Up to 1,000V
HV (High Voltage)	Over 1,000V to 11,000V
EHV (Extra High Voltage)	22,000V to 132,000V
Transmission	275,000V and 400,000V

NORMAL DEPTH TO THE TOP OF THE CABLE WHEN LAID

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Legend

Service Cable
LV Mains
2 – 3.3kV
6.6kV
11kV
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Distribution Structures (Electric)

Pole, Existing Location
Pole Structure, Existing Location - Single
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Duct Route
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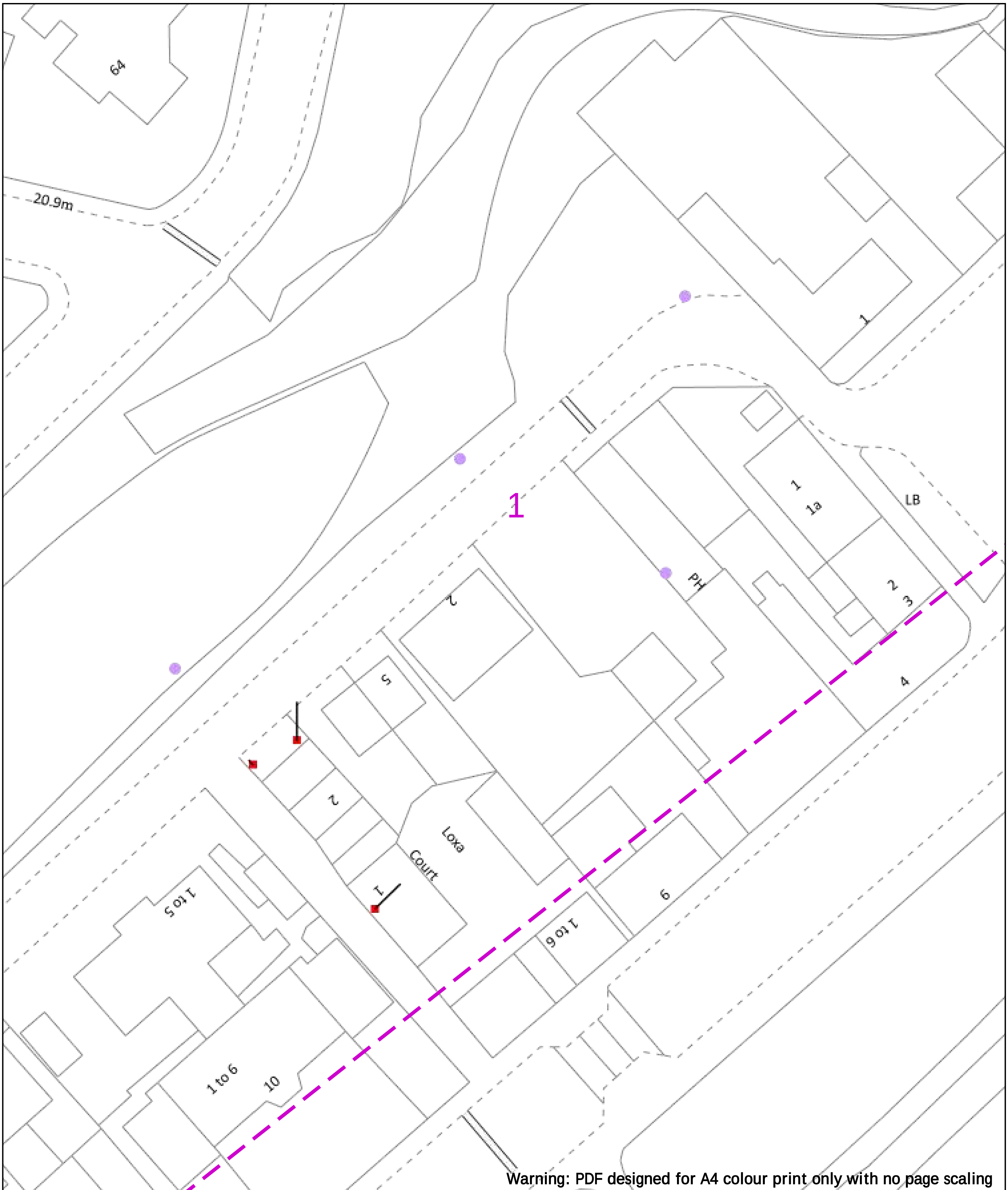

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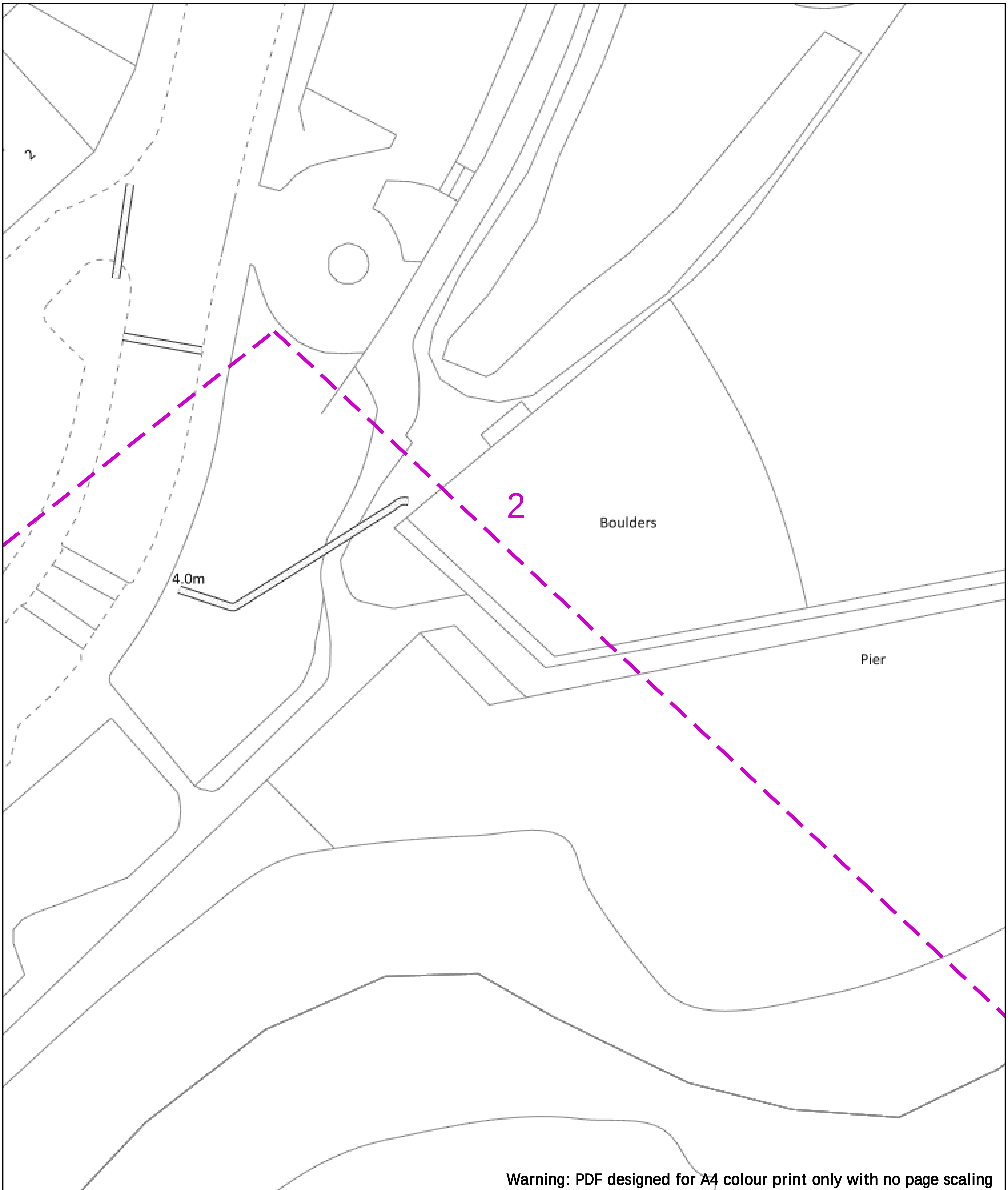

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Distribution Structures [Electric]

Pole, Existing Location
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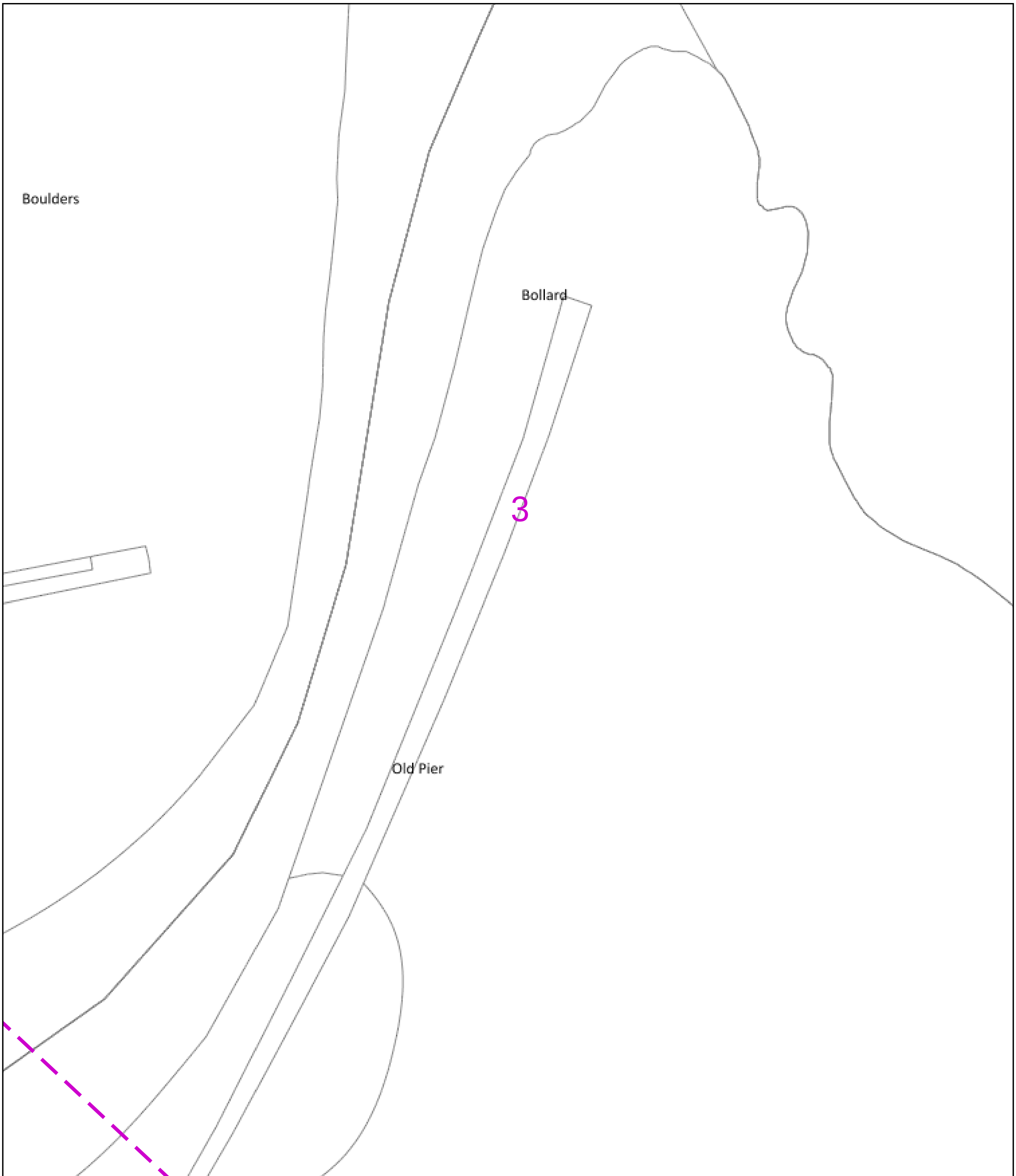

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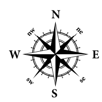

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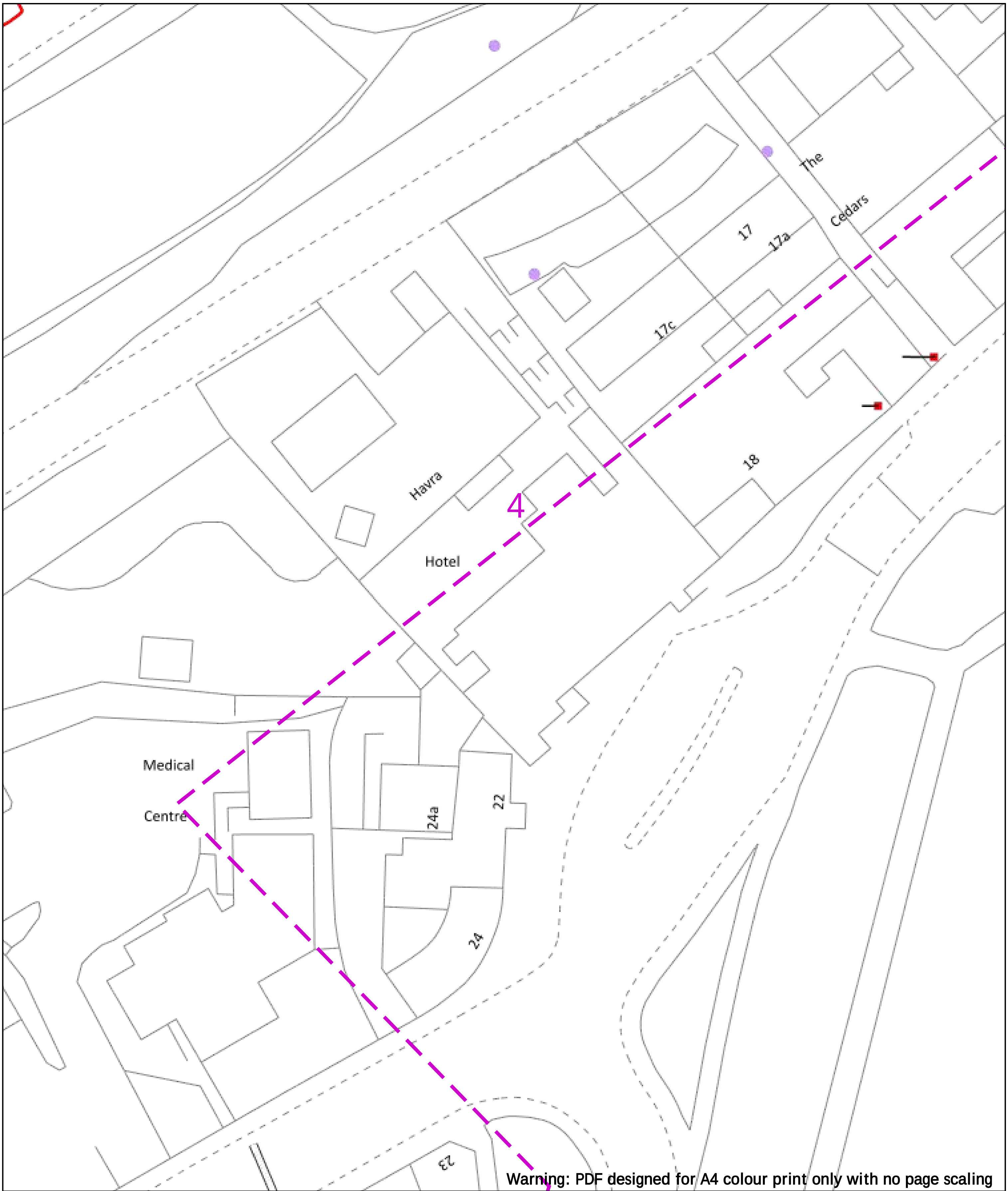

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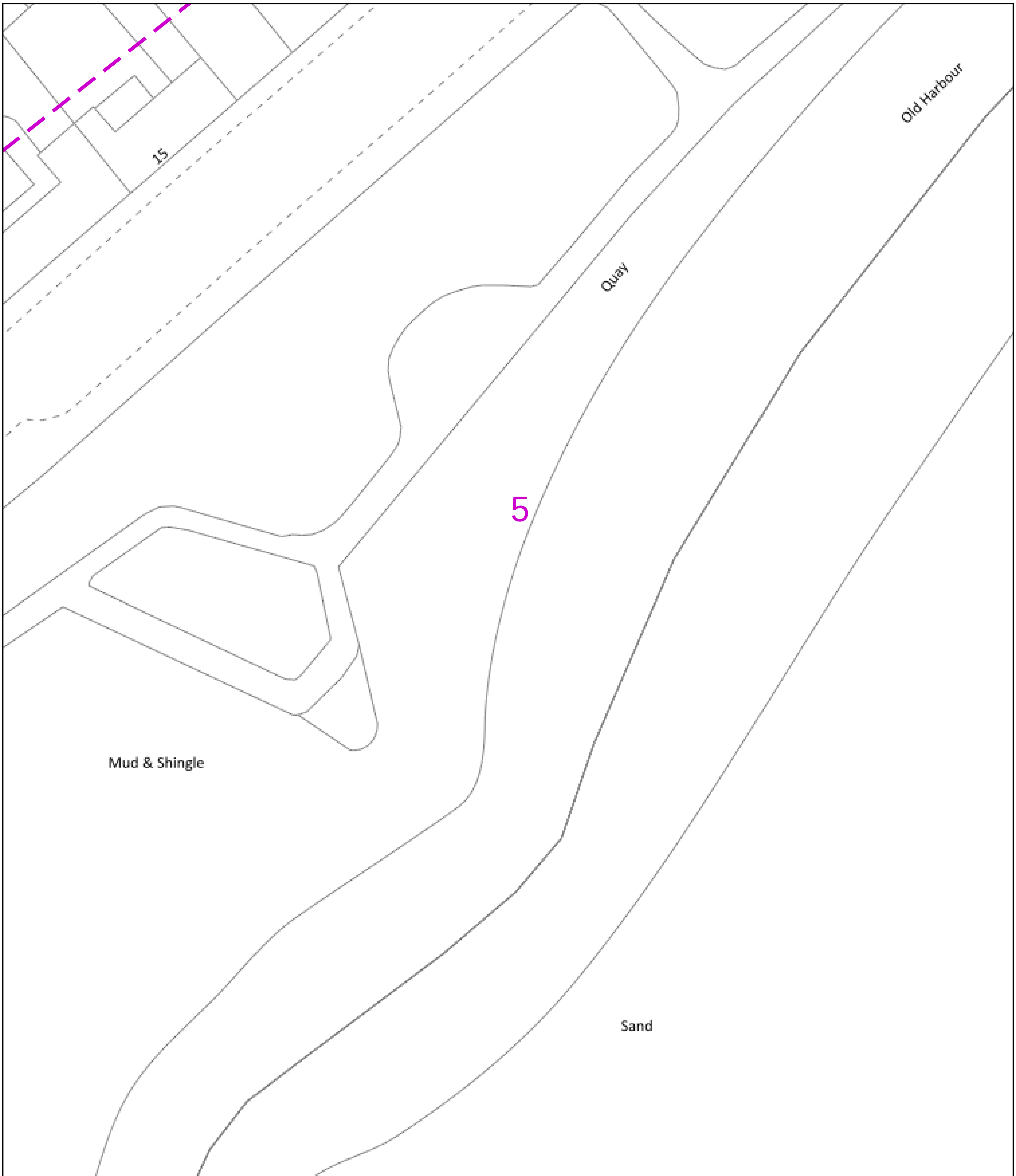

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Legend
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LV Mains
2 – 3.3kV
6.6kV
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Distribution Structures [Electric]
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Pole Structure, Existing Location - Single
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Duct Route
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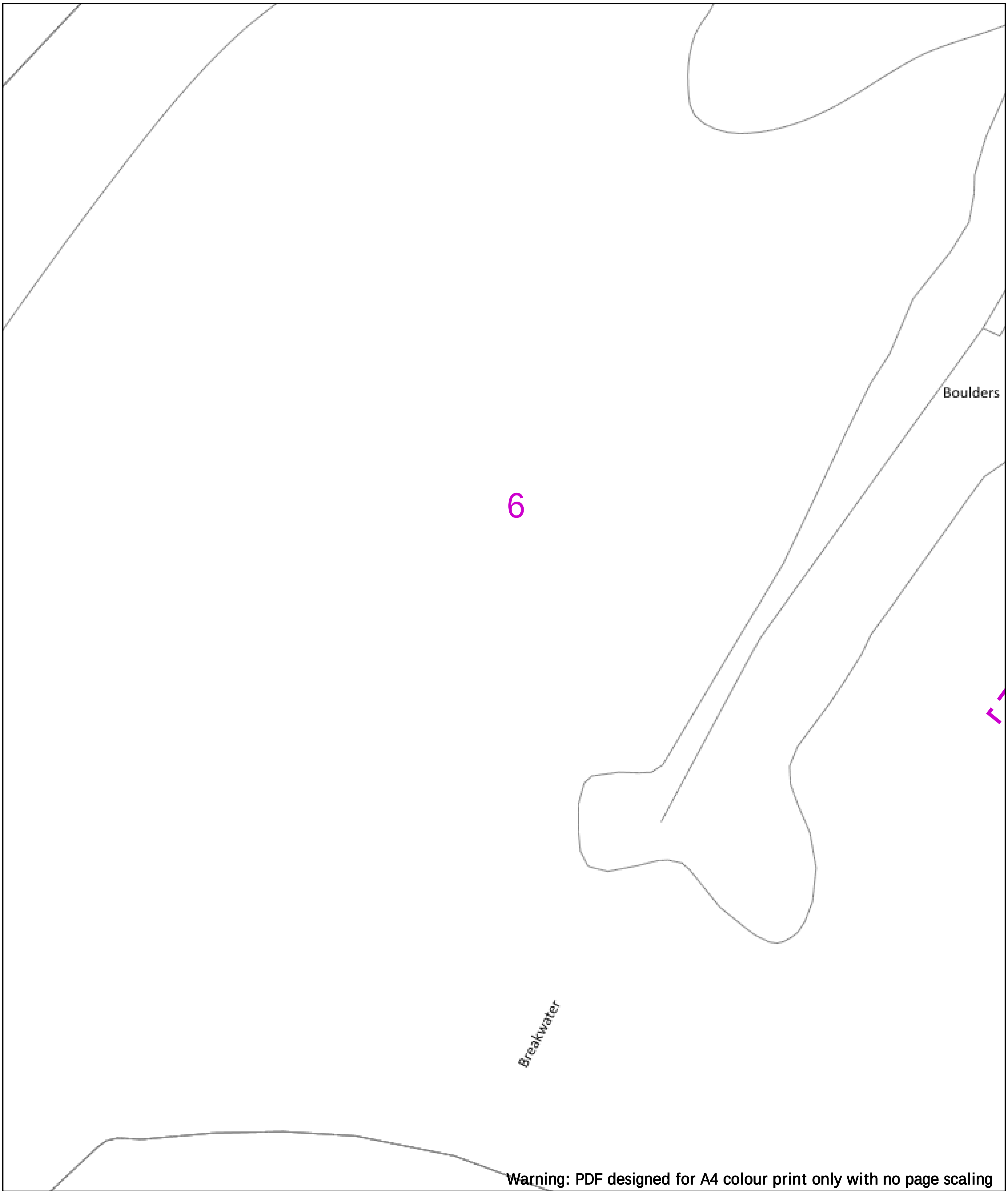

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6.6kV
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Distribution Structures [Electric]

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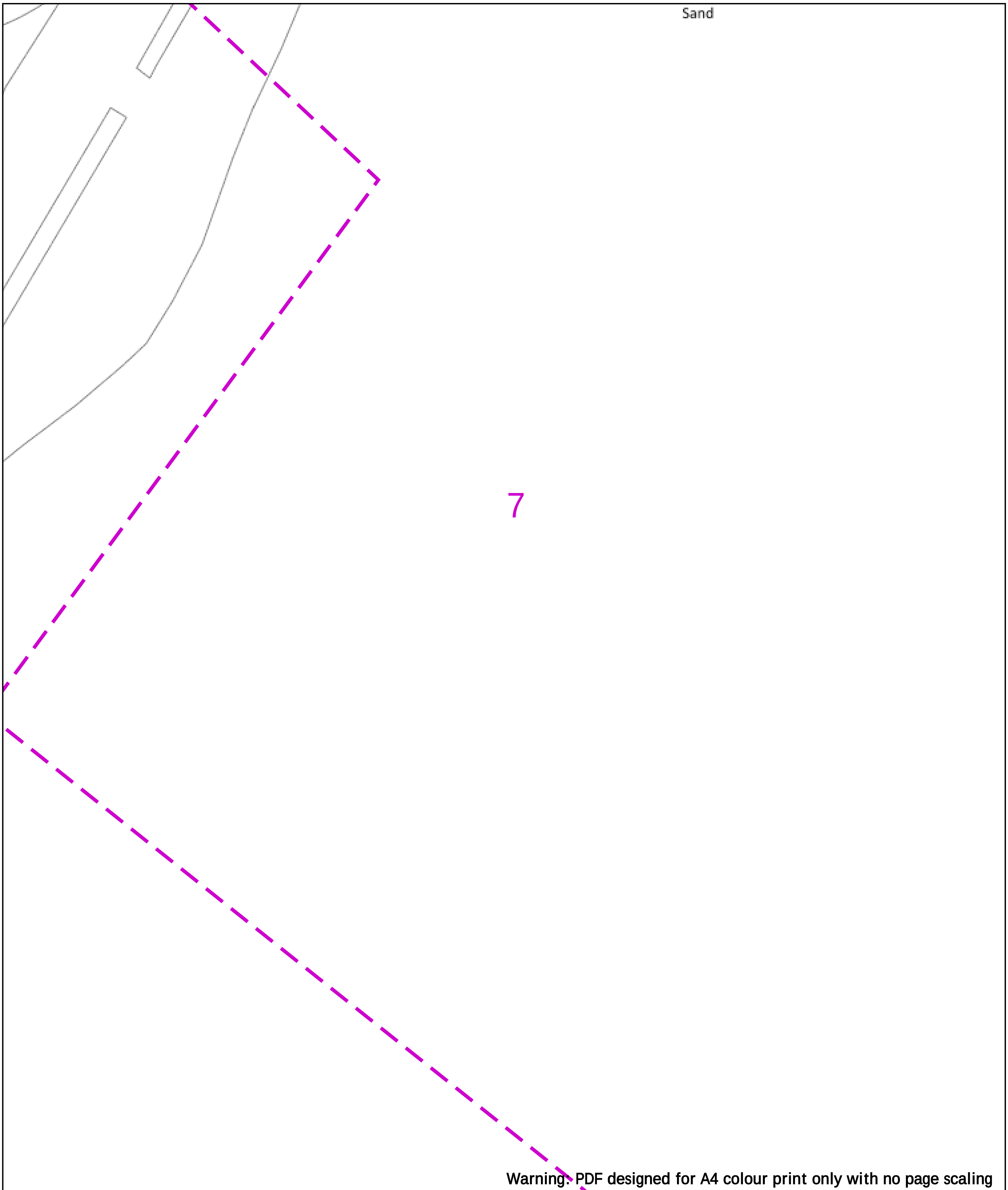

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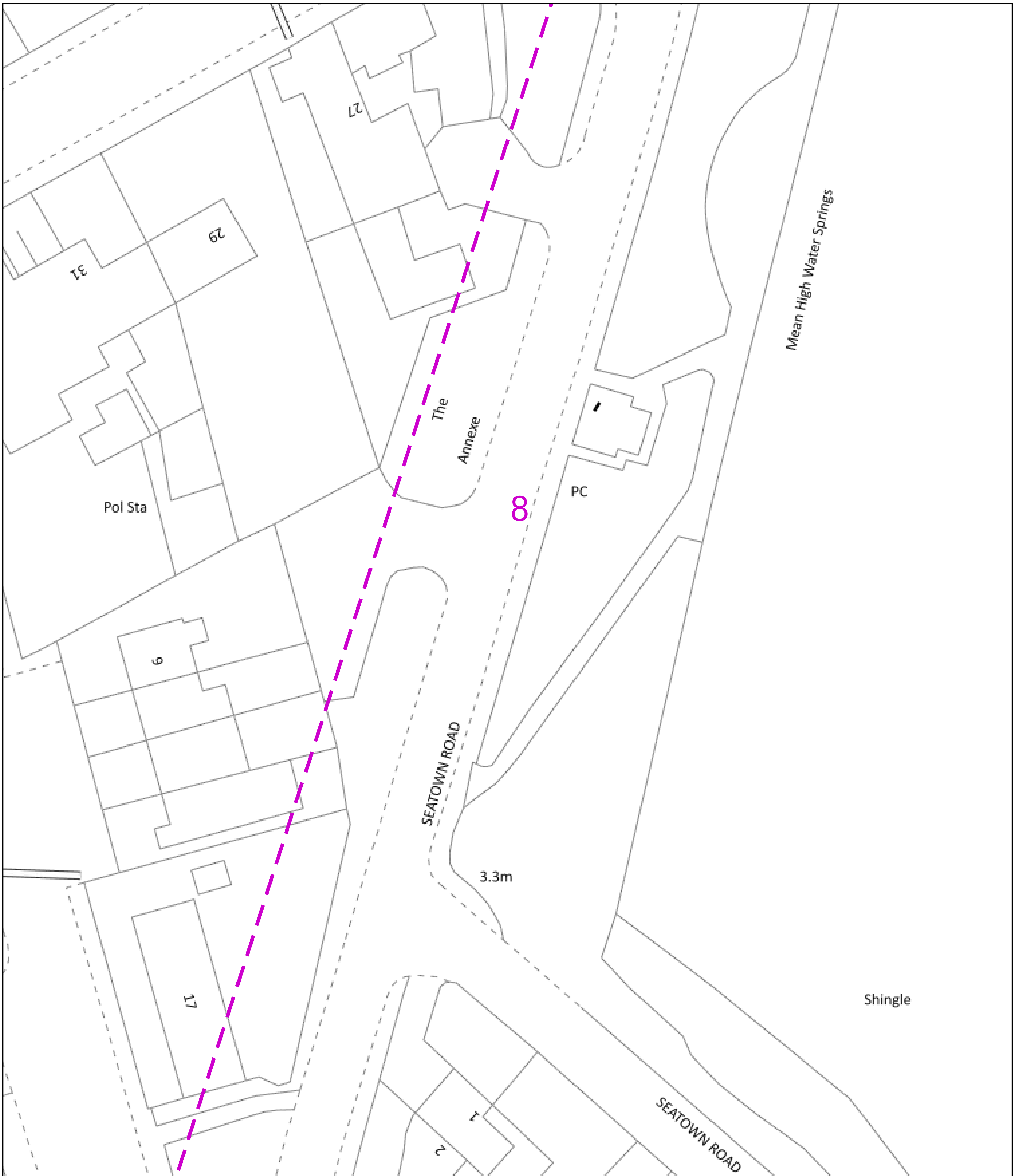

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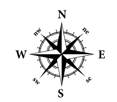

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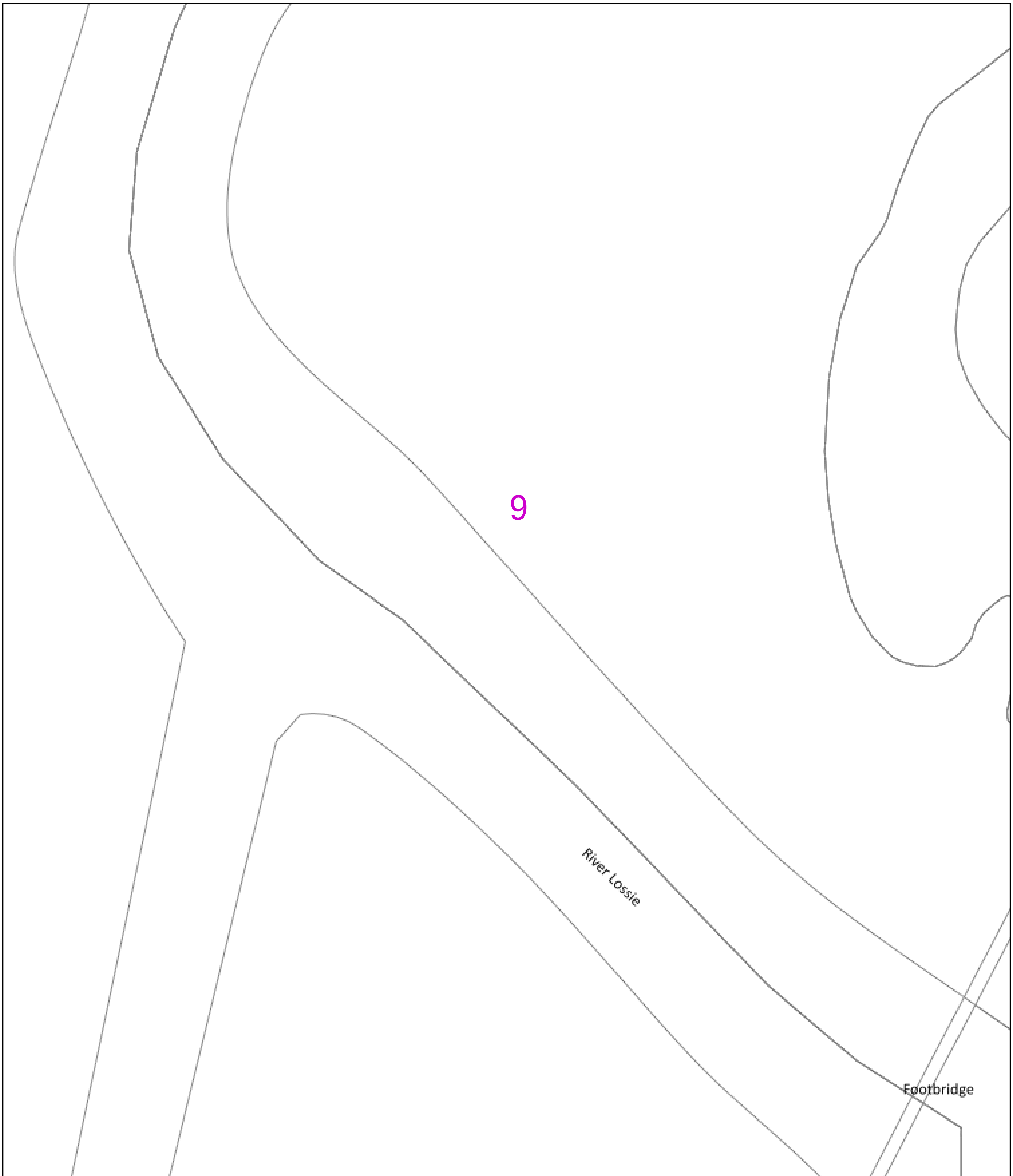

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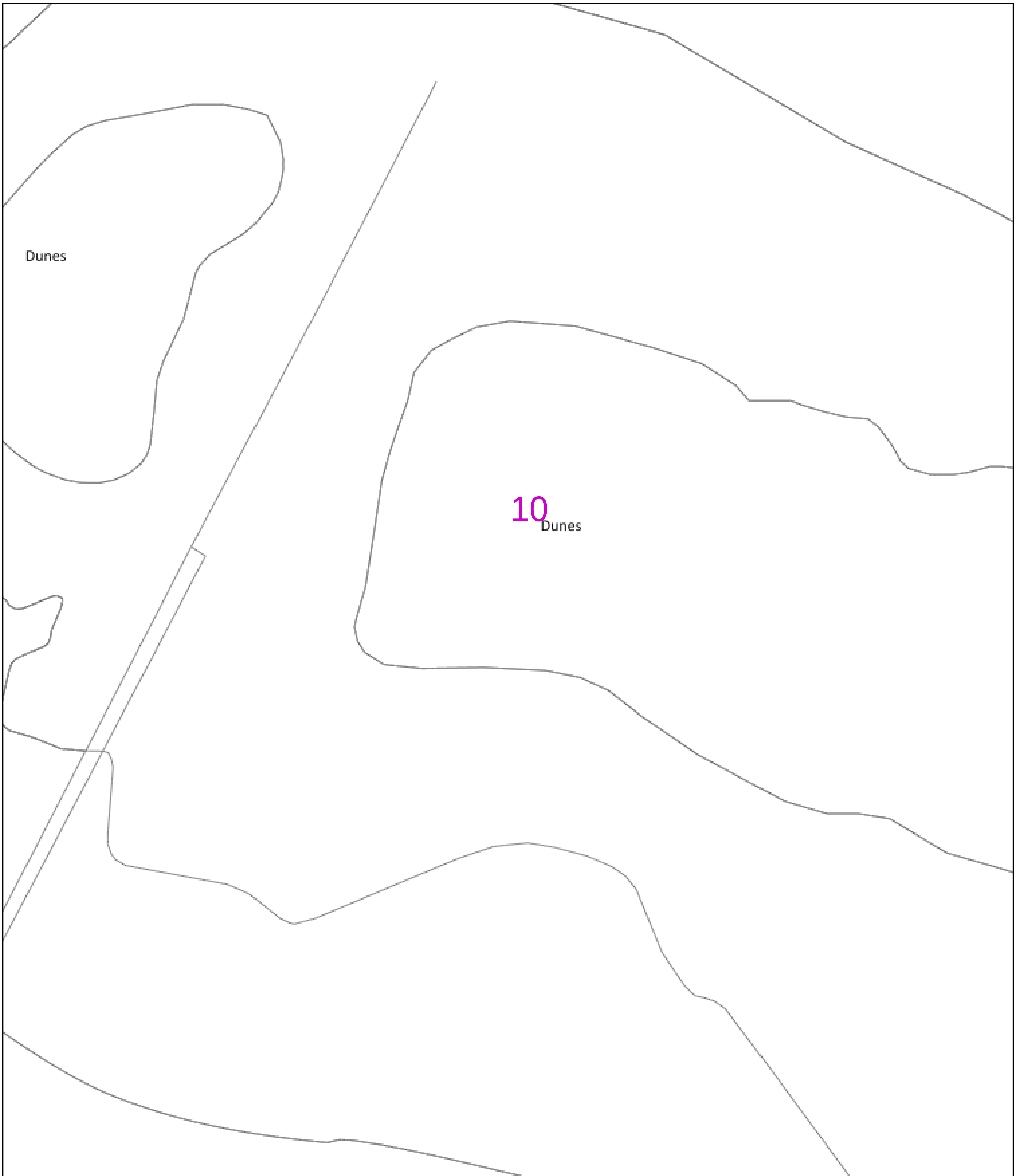

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0 20m Dig Sites Area: Line:

Date Requested: 28/09/2020
Job Reference: 20047775
Site Location: 323778 870497
Requested by: Miss Alexa Band

Your Scheme/Reference: sts5161m

Scale: 1:500 (When plotted at A4)

Voltages (V)

LV (Low Voltage) and Services	Up to 1,000V
HV (High Voltage)	Over 1,000V to 11,000V
EHV (Extra High Voltage)	22,000V to 132,000V
Transmission	275,000V and 400,000V

NORMAL DEPTH TO THE TOP OF THE CABLE WHEN LAID

	Services	LV	HV	EHV
Footpath/Unmade	0.45m	0.45m	0.6m	0.8m
Road Crossing	0.6m	0.6m	0.75m	0.9m
Agricultural	1m	1m	1m	1.1m

Legend

Service Cable
LV Mains
2 – 3.3kV
6.6kV
11kV
22kV
33kV
66kV
132kV
275kV
400kV
Fibre Optic
Pilot Cable

Distribution Structures [Electric]

Pole, Existing Location
Pole Structure, Existing Location - Single
Pole Structure, Existing Location - H

Duct Route
Cross Section Route

N
W E
S

Scottish & Southern Electricity Networks

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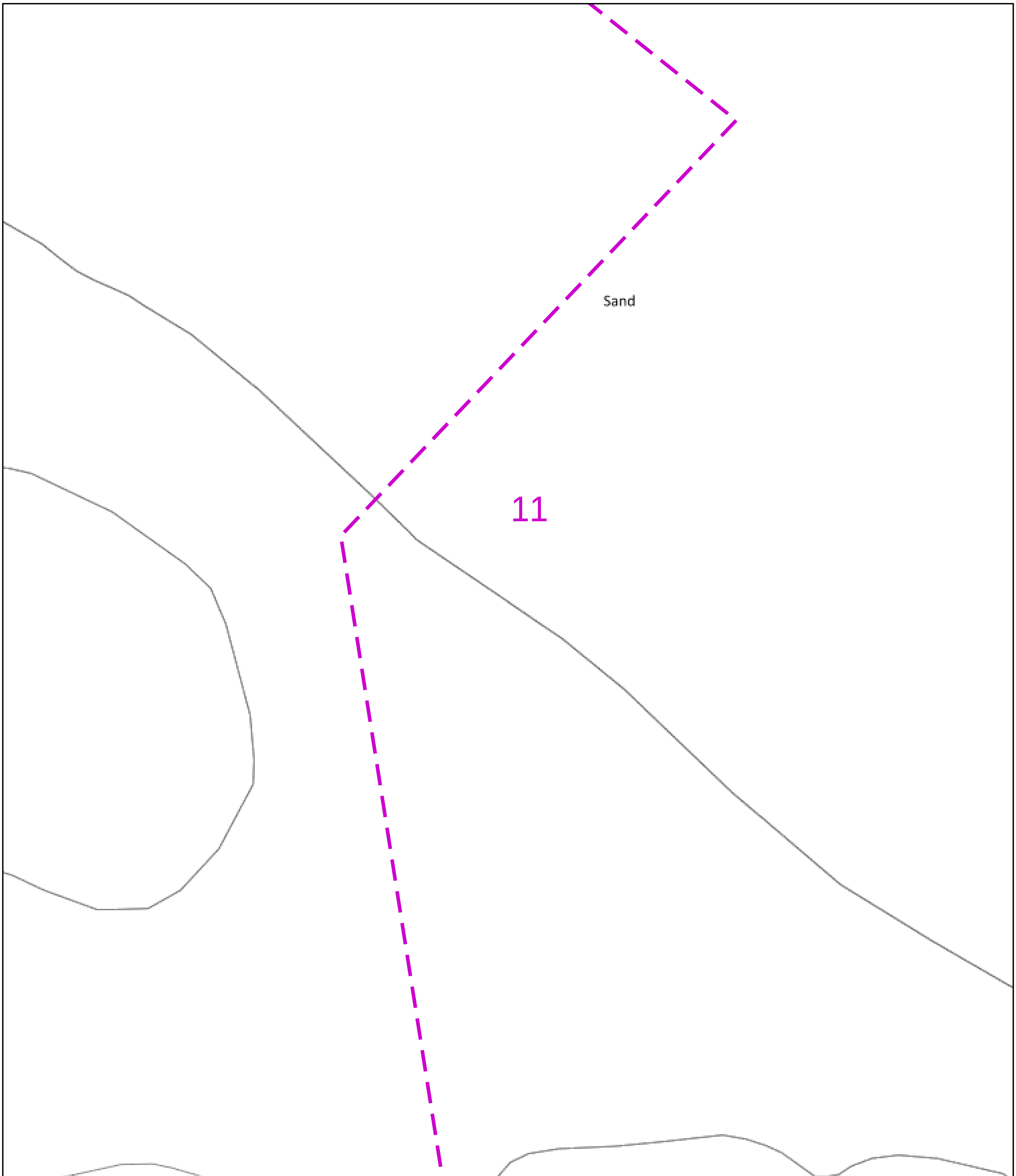

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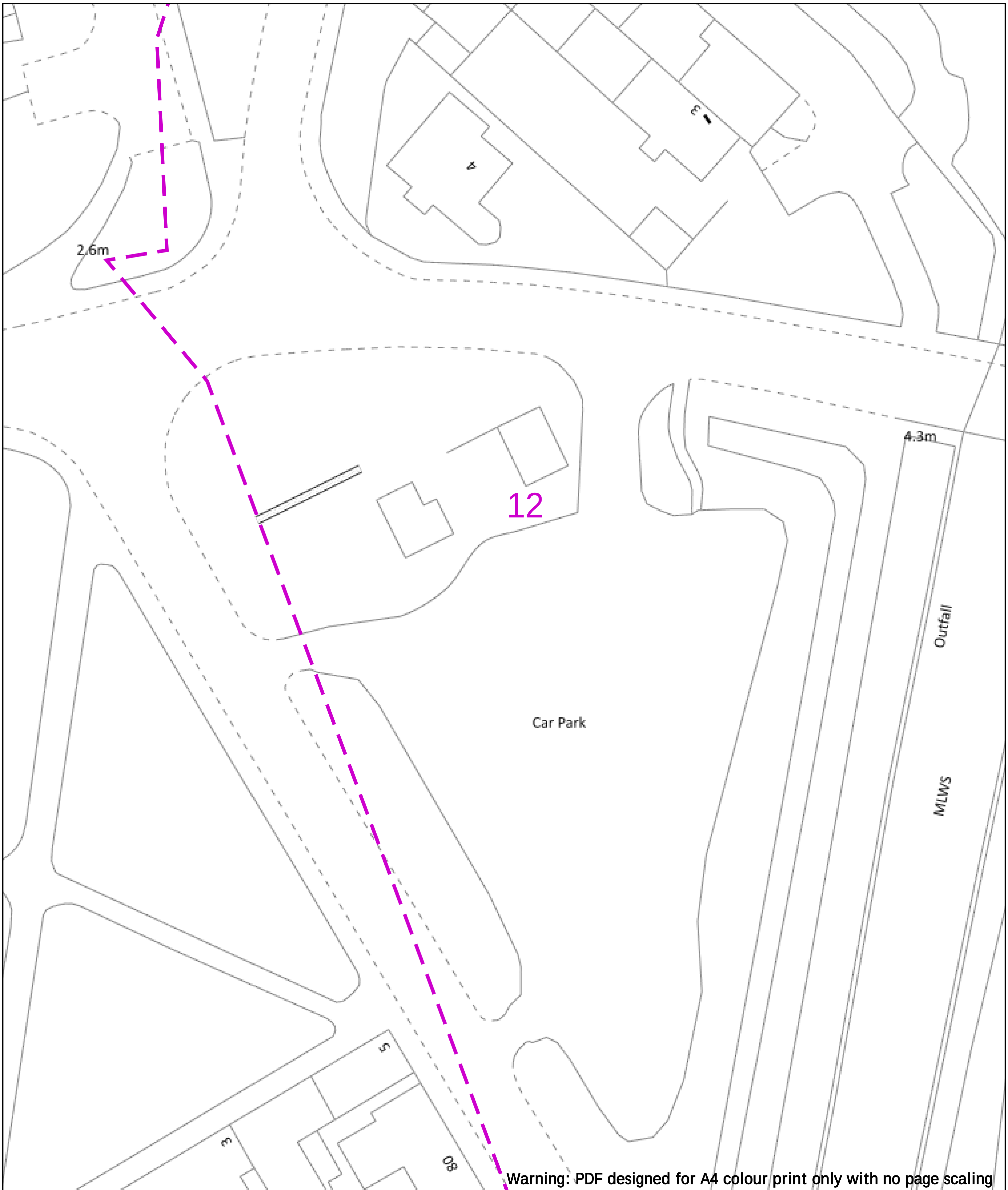

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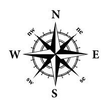

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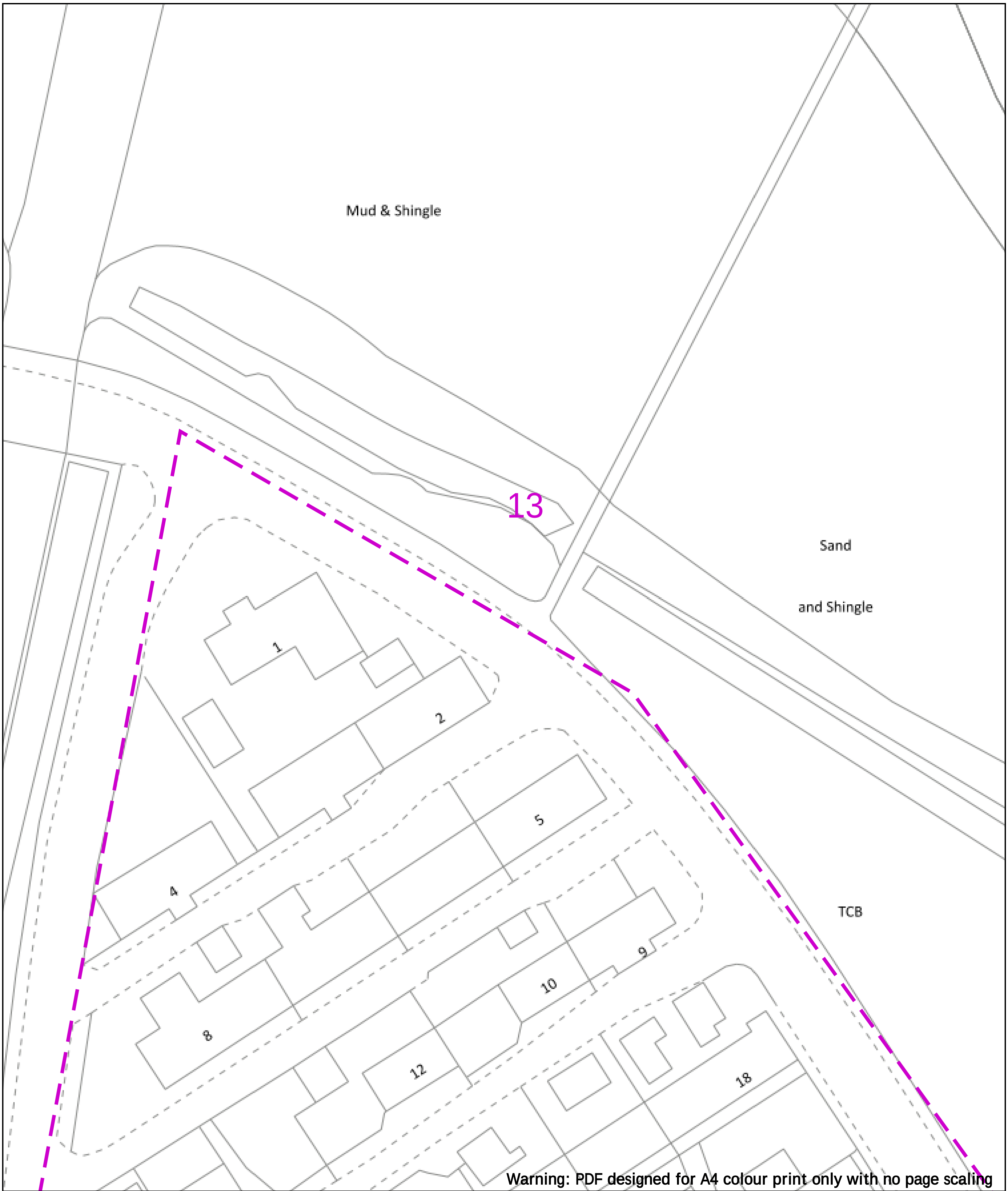

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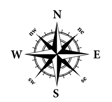

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Distribution Structures (Electric)

Pole, Existing Location
Pole Structure, Existing Location - Single
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Duct Route
Cross Section Route

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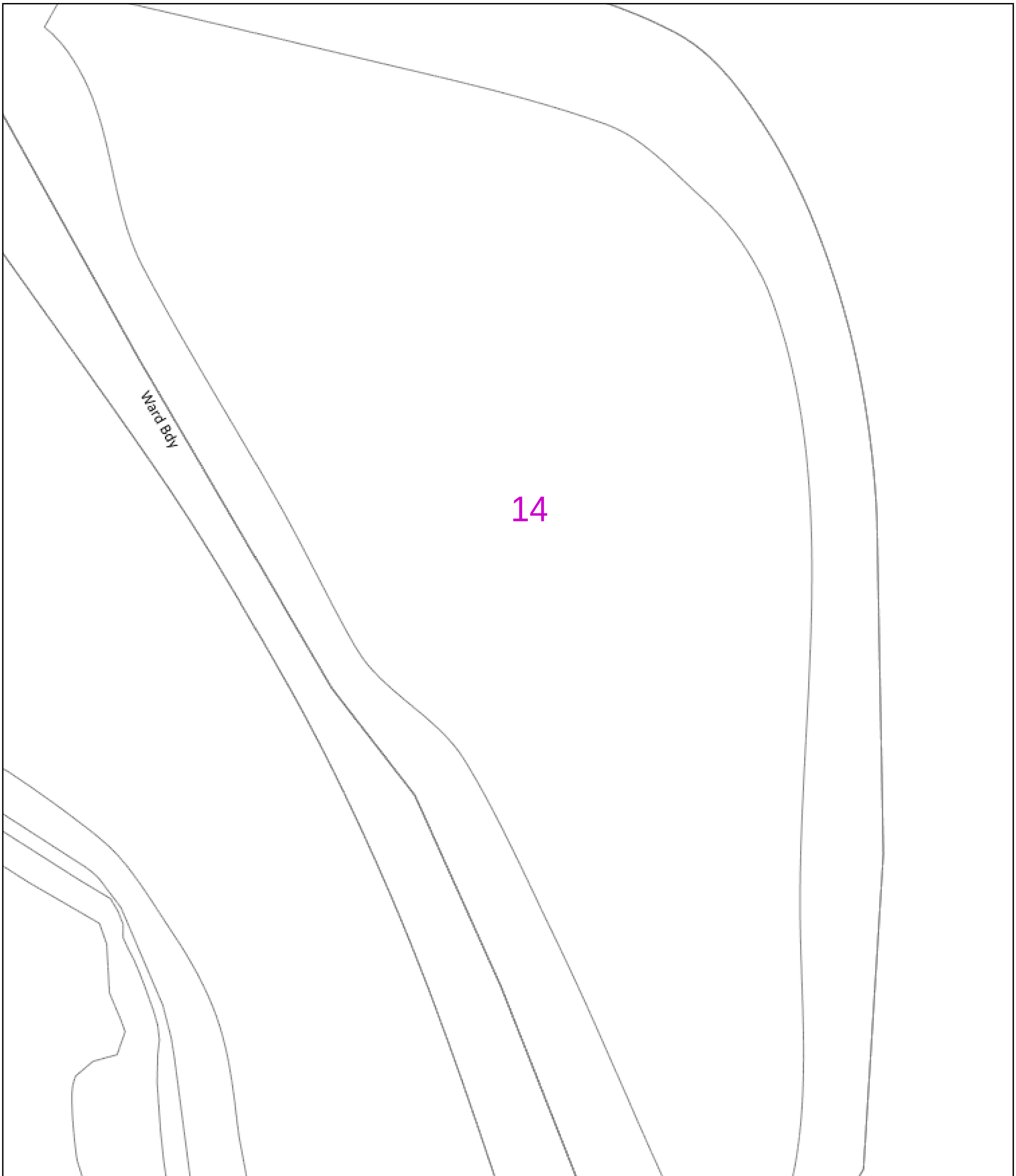

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Distribution Structures [Electric]

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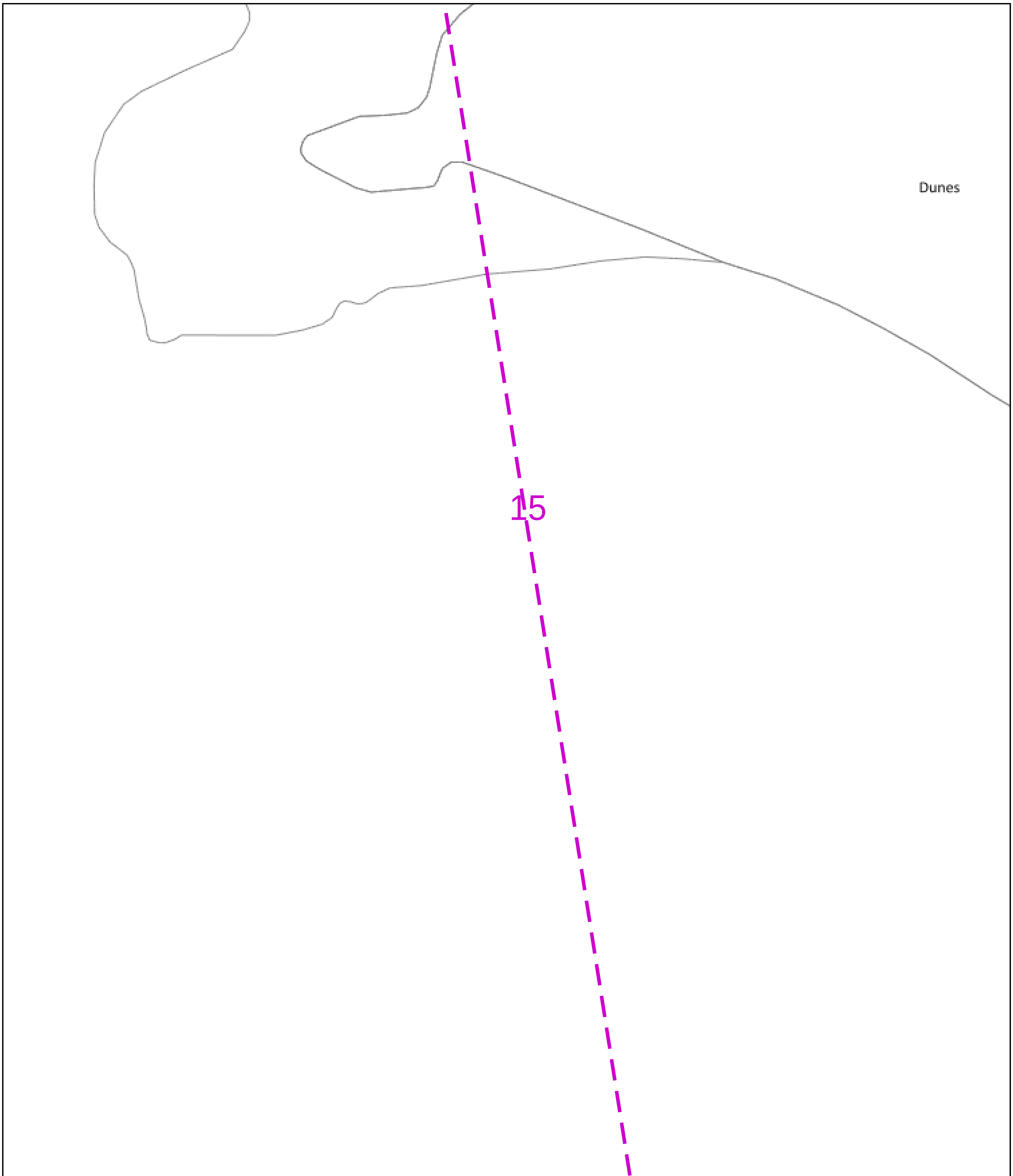

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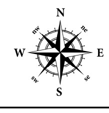

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Duct Route
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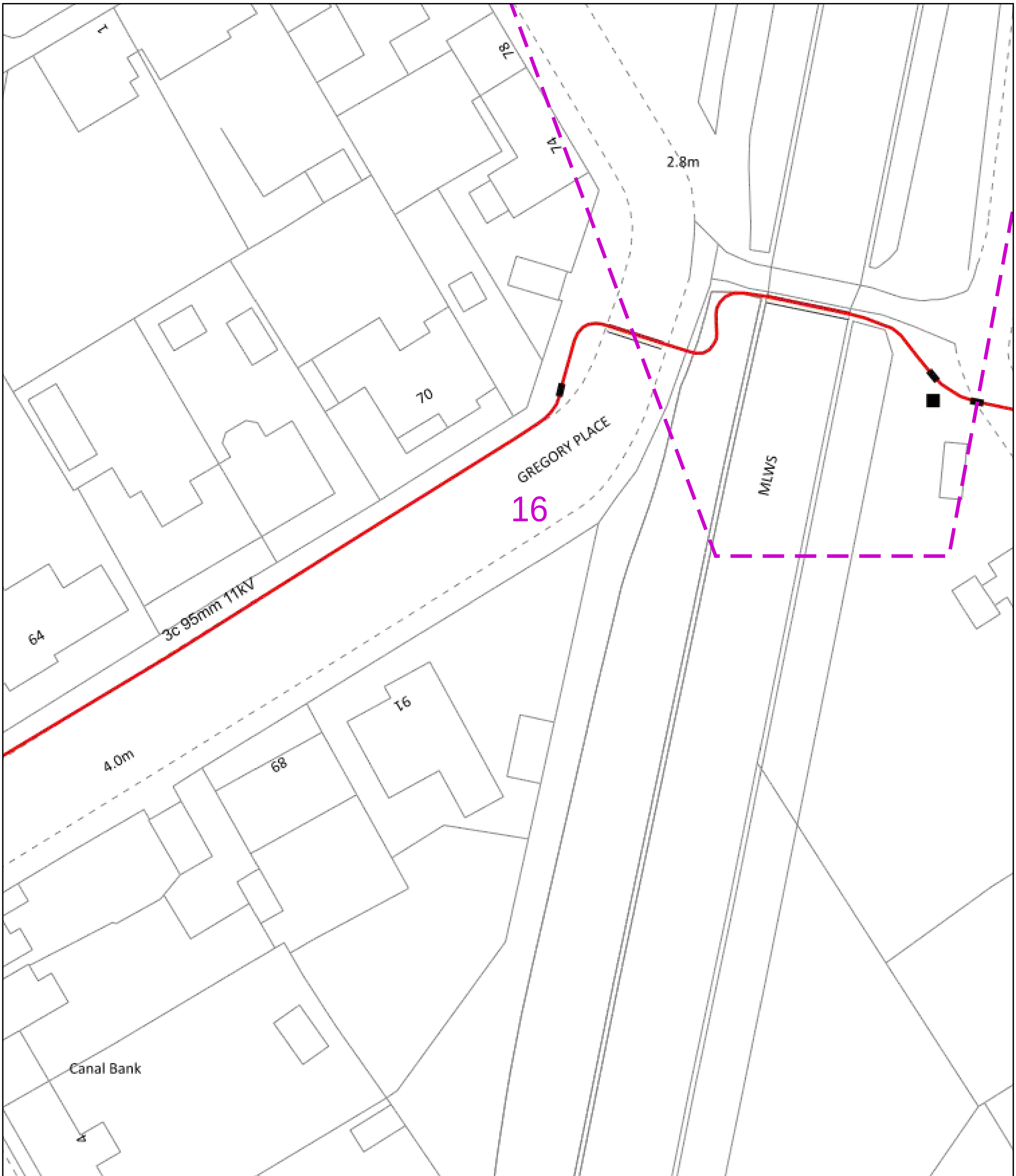

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Distribution Structures (Electric)

- Pole, Existing Location
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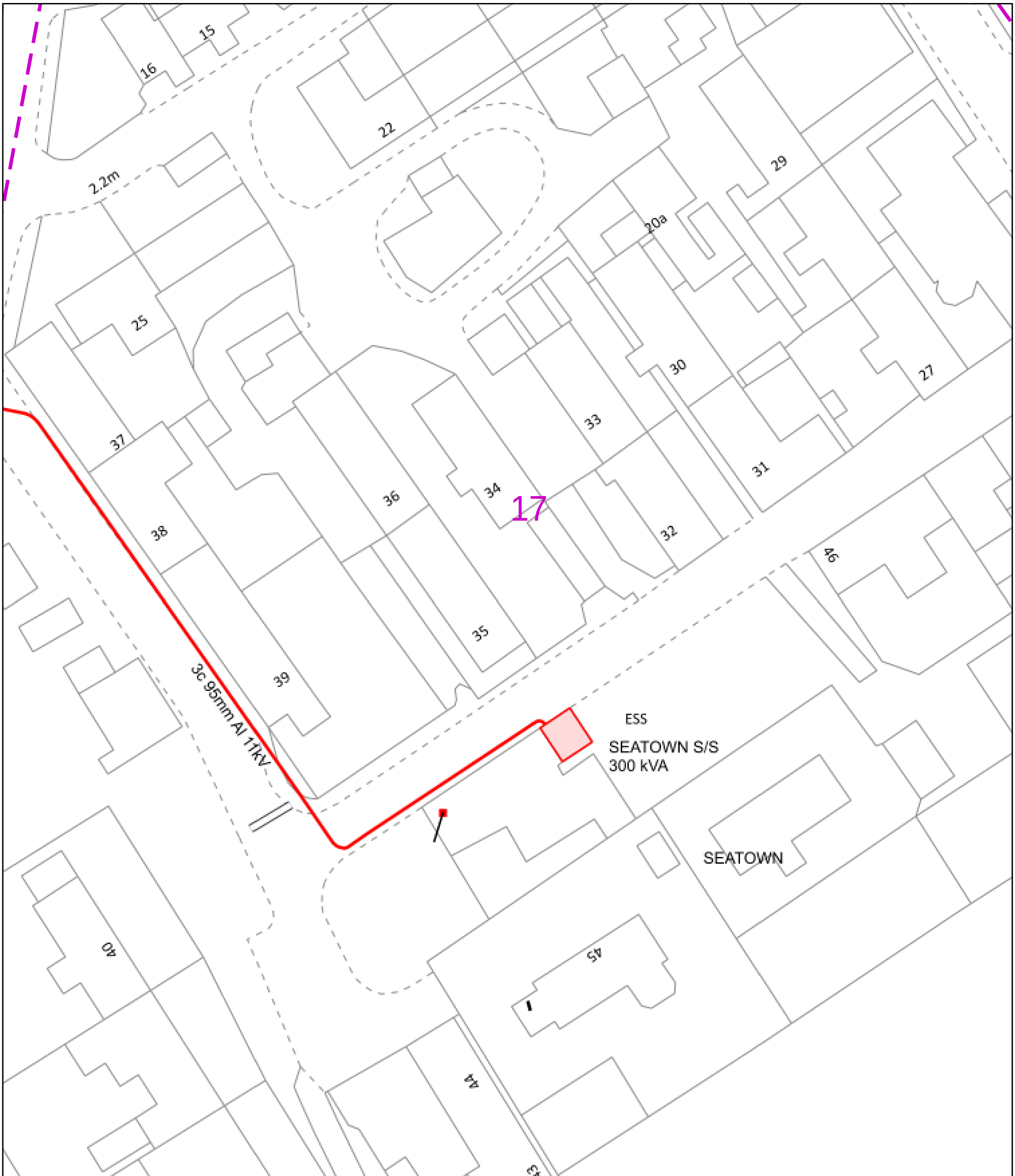

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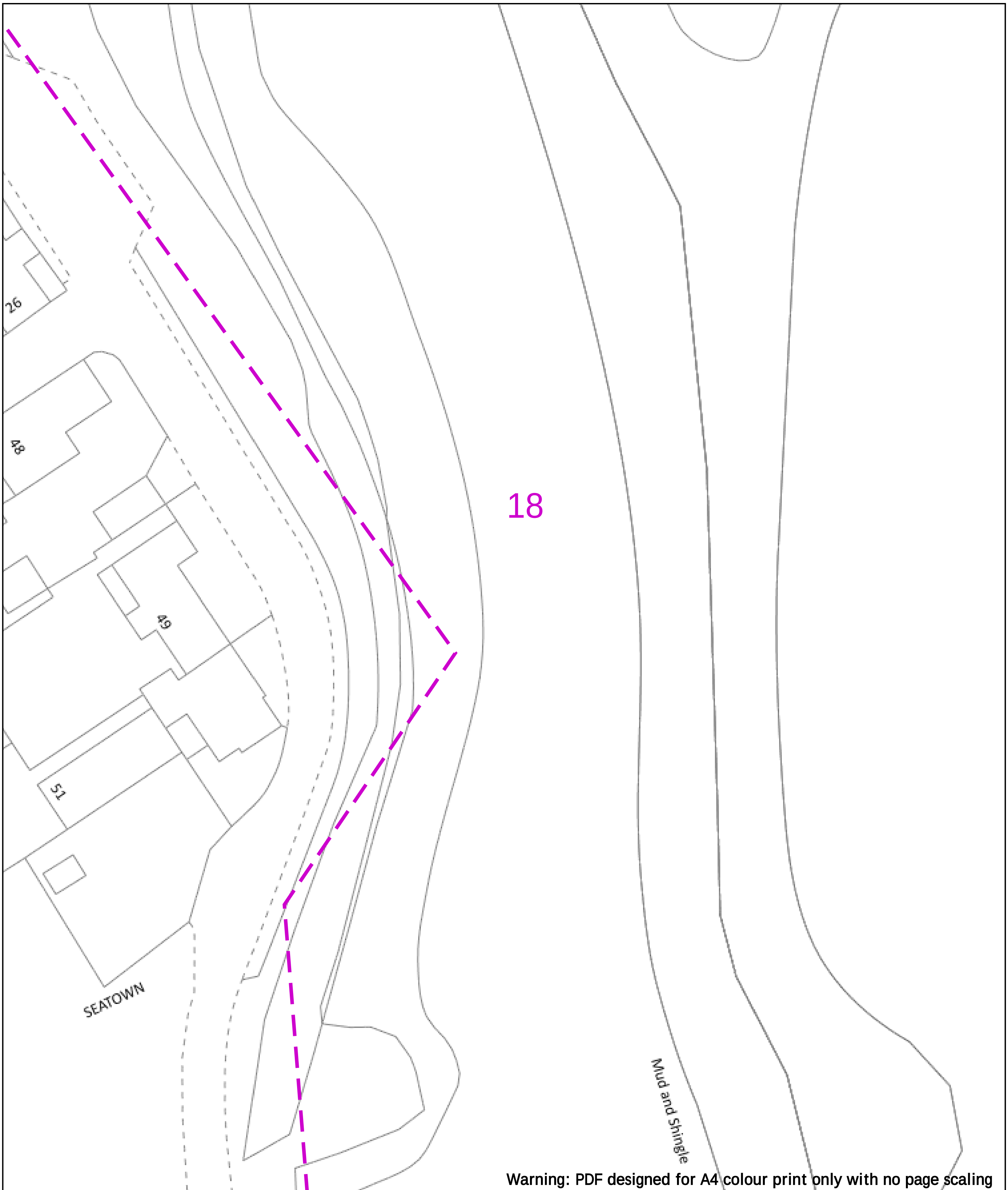

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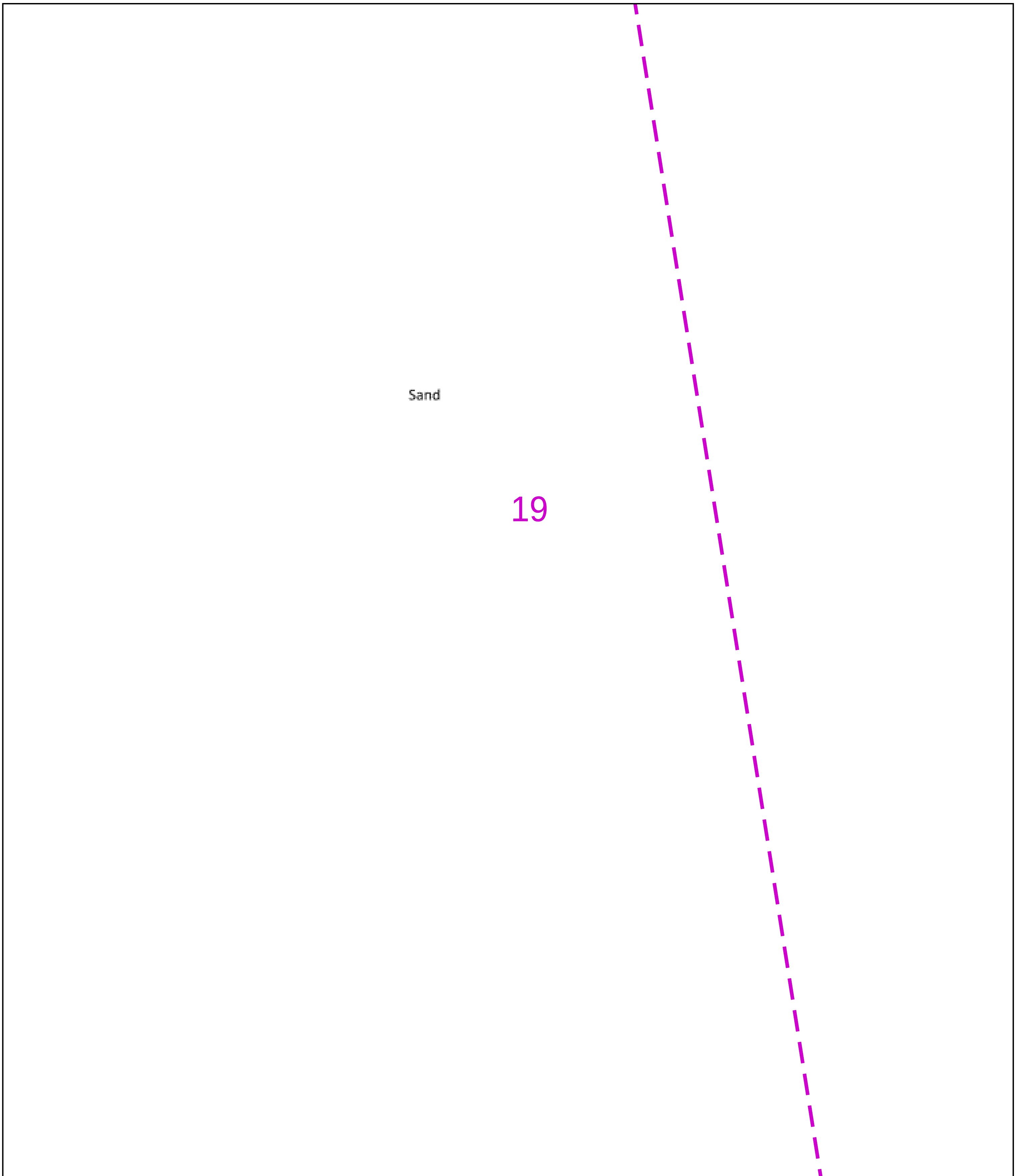

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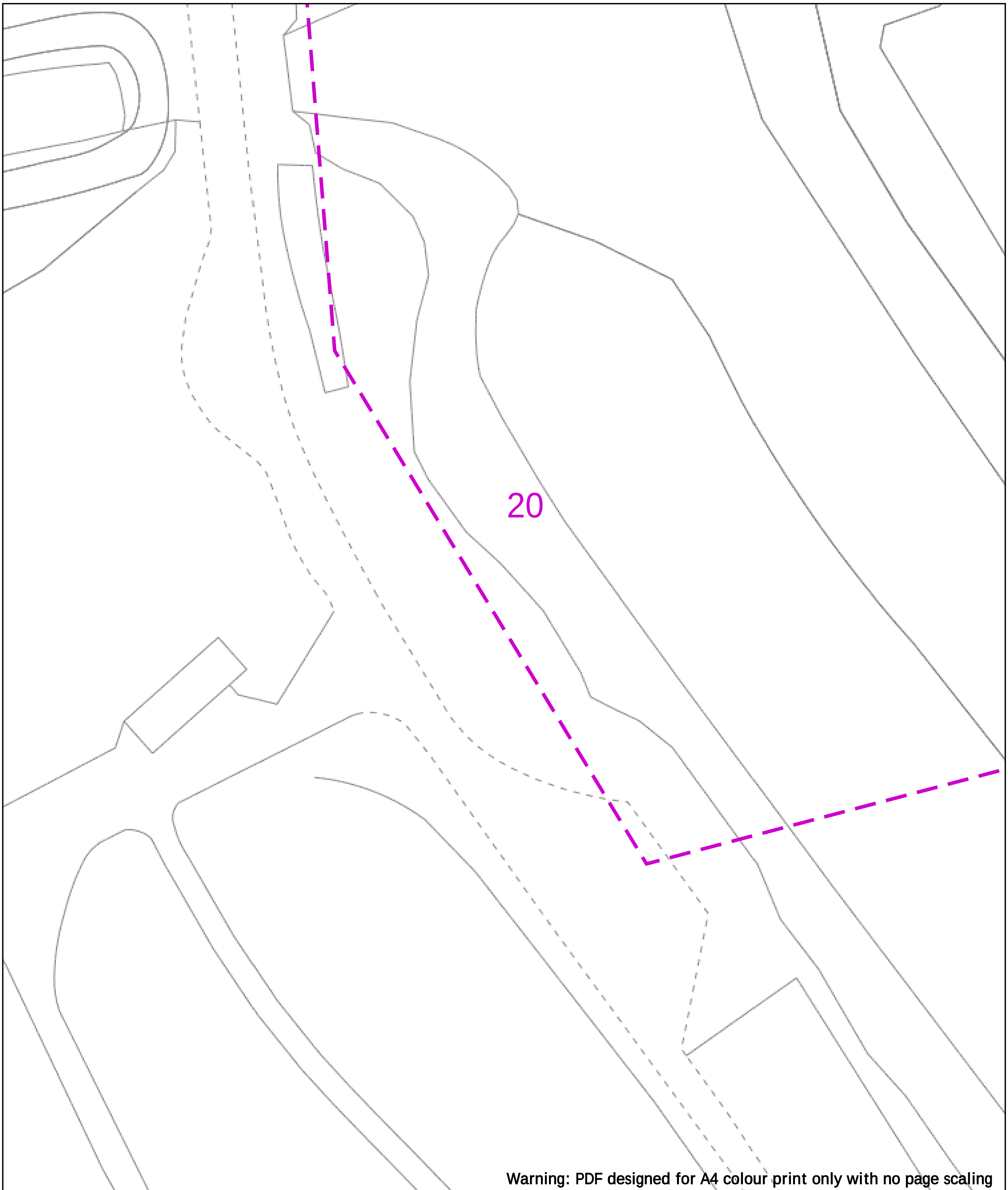

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- 132kV
- 275kV
- 400kV
- Fibre Optic
- Pilot Cable

Distribution Structures [Electric]

- Pole, Existing Location
- Pole Structure, Existing Location - Single
- Pole Structure, Existing Location - H
- Duct Route
- Cross Section Route

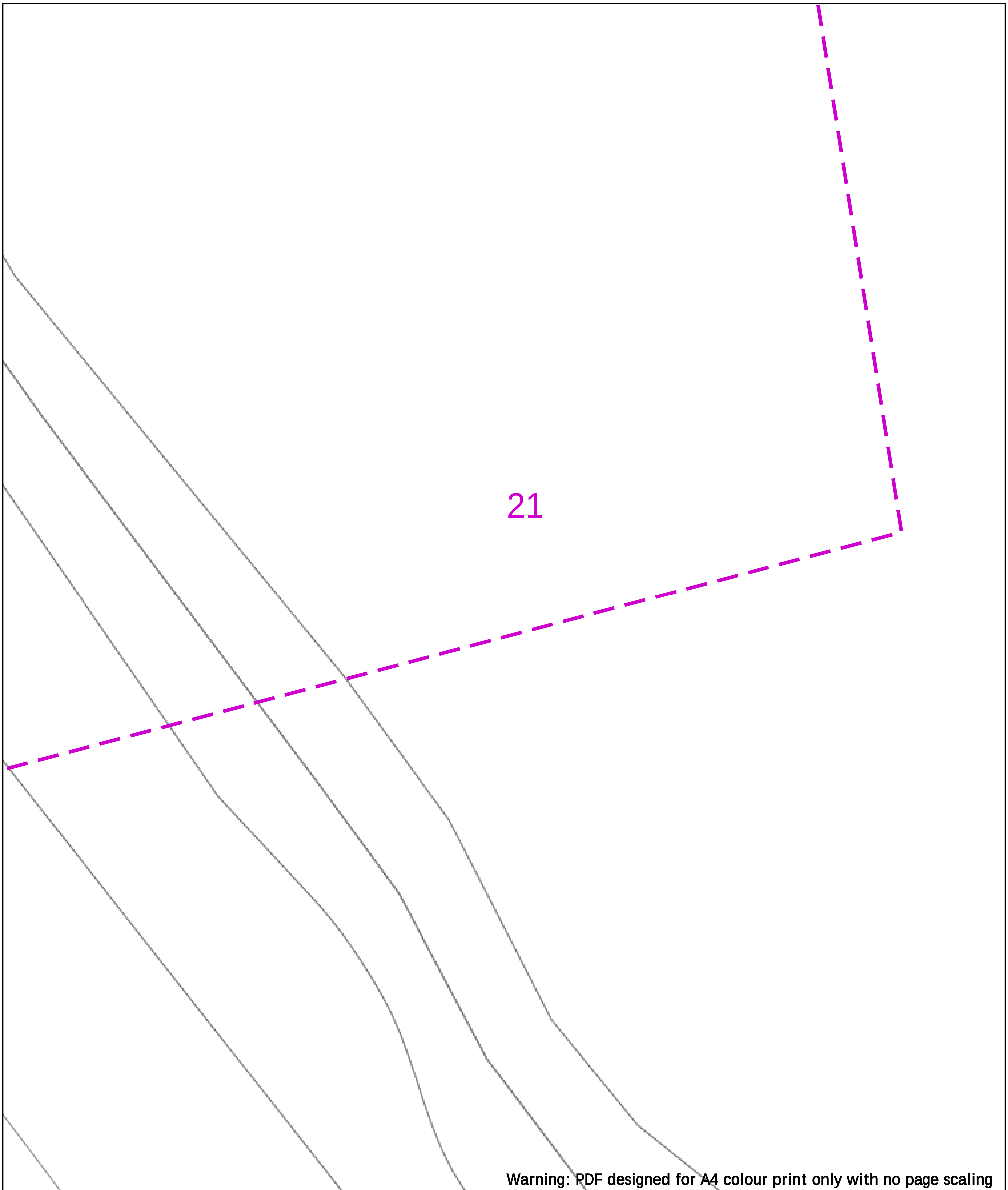
WARNING

There may have been subsequent alteration to the surface levels. Trial holes must be undertaken to determine position and depths of cables. HS (G) 47 Booklet from the Health and Safety Executive – Avoiding Danger from Buried Cables – should be consulted before commencing excavation work.
WHEN WORKING IN THE VICINITY OF OVERHEAD LINES THE HEALTH AND SAFETY GUIDANCE NOTES GS6 SHOULD BE CONSULTED (AVAILABLE FROM THE HSE WEBSITE)

Scottish and Southern Energy Power Distribution Ltd.
Registered Office: Inveralmond House,
200 Dunkeld Road, Perth, PH1 3AQ
Registered In Scotland No.SC213459

If you're unsure & need to seek advice before commencing excavations, please contact:
General Enquiries: 0800 048 3516

Subject to revision – Master held by SSEN Asset Data Team:
Asset.Data@sse.com
01256 337 294



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0 20m Dig Sites Area: Line:

Date Requested: 28/09/2020
Job Reference: 20047775
Site Location: 323778 870497
Requested by: Miss Alexa Band

Your Scheme/Reference: sts5161m

Scale: 1:500 (When plotted at A4)

Voltages (V)

LV (Low Voltage) and Services	Up to 1,000V
HV (High Voltage)	Over 1,000V to 11,000V
EHV (Extra High Voltage)	22,000V to 132,000V
Transmission	275,000V and 400,000V

NORMAL DEPTH TO THE TOP OF THE CABLE WHEN LAID

	Services	LV	HV	EHV
Footpath/Unmade	0.45m	0.45m	0.6m	0.8m
Road Crossing	0.6m	0.6m	0.75m	0.9m
Agricultural	1m	1m	1m	1.1m

Legend

Service Cable
LV Mains
2 – 3.3kV
6.6kV
11kV
22kV
33kV
66kV
132kV
275kV
400kV
Fibre Optic
Pilot Cable

Distribution Structures [Electric]

Pole, Existing Location
Pole Structure, Existing Location - Single
Pole Structure, Existing Location - H

Duct Route
Cross Section Route

WARNING

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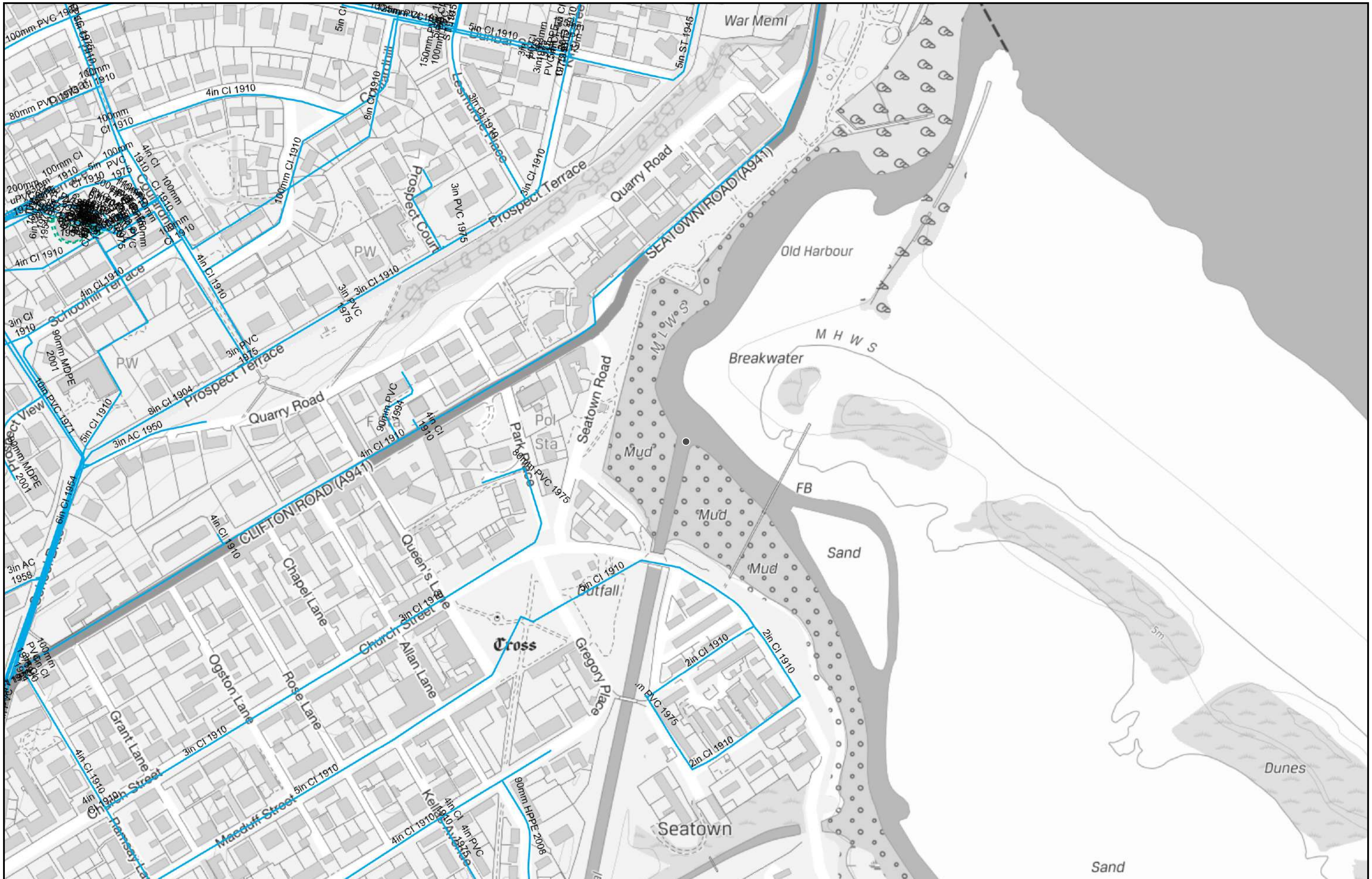

Warning! Damaging a large diameter trunk main (12"/300mm and above) can result in loss of life and major water supply and water quality problems. If you're planning any extension work in the vicinity of any large diameter mains shown on our maps, you must contact Scottish Water to arrange a site visit 08000 778 778 WELL IN ADVANCE OF THE WORKS.

Plotted By: phalliday@siteinvest.co.uk

N

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.

Date: 28/09/2020

Lossie mouth, scotland - Fresh Water

0 12.5 25 50 Meters

SCALE: 1:2,646

Scottish Water
Trusted to serve Scotland

Castle House,
6 Castle Drive,
Dunfermline,
KY118GG

Tel No: 08000 778 778

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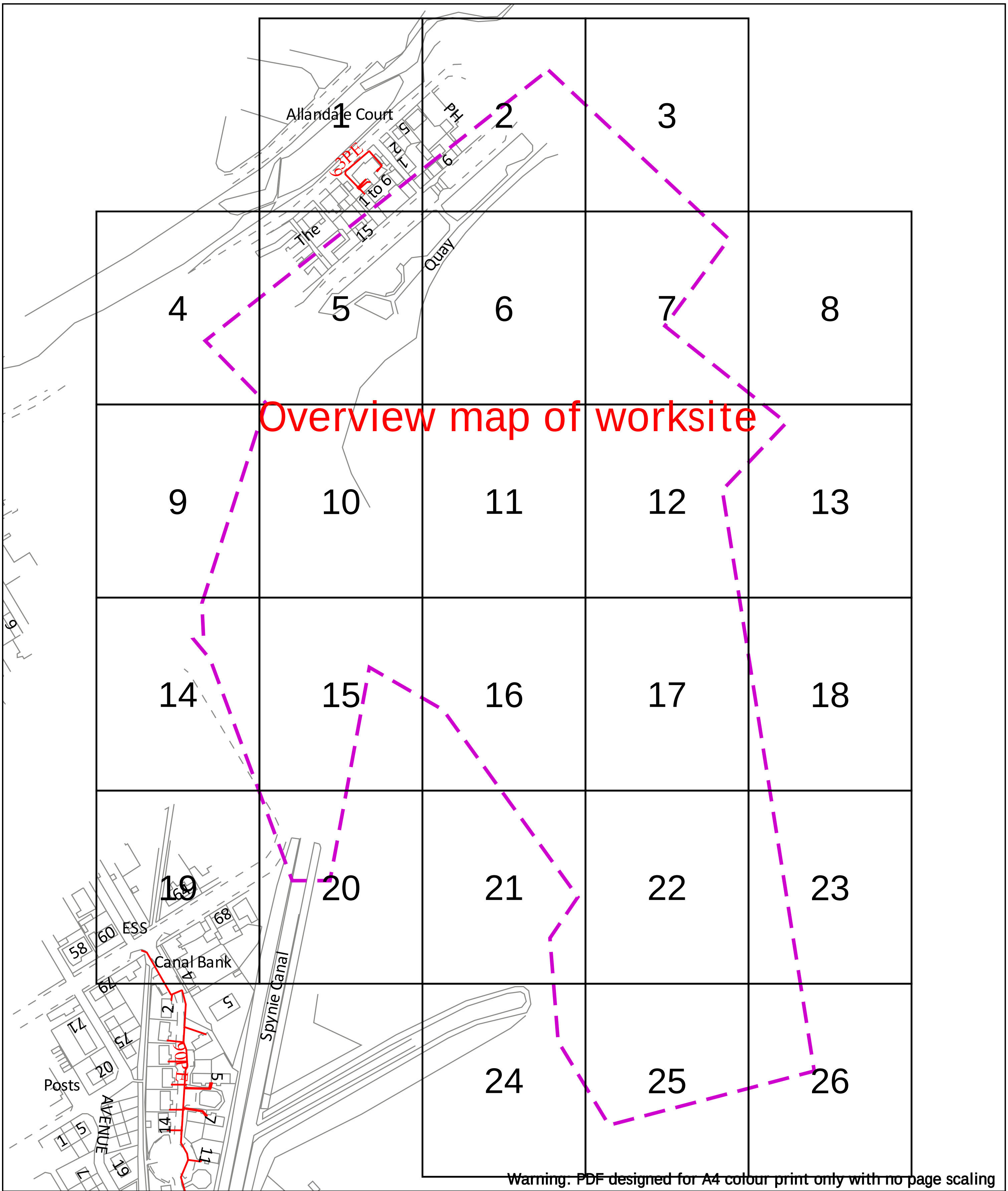
Date: 28/09/2020

Lossie mouth, scotland - Waste Water

0 12.5 25 50 Meters

SCALE: 1:2,646

Scottish Water
Trusted to serve Scotland
Castle House,
6 Castle Drive,
Dunfermline,
KY118GG
Tel No: 08000 778 778



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Dig Sites Area: Line:

Date Requested: 28/09/2020
Job Reference: 20047775
Site Location: 323778 870497
Requested by: Miss Alexa Band

Your Scheme/Reference: sts5161m

Scale: 1:3075 (When plotted at A4)

	LP Main		Valve Closed		Reducer
	LP Service		Valve Open		Ducting
	MP Main		CSEP		Gas Supply Point
	MP Service		Pressure Reduction Station		
	IP Main	]	End Closure		

IMPORTANT NOTICES

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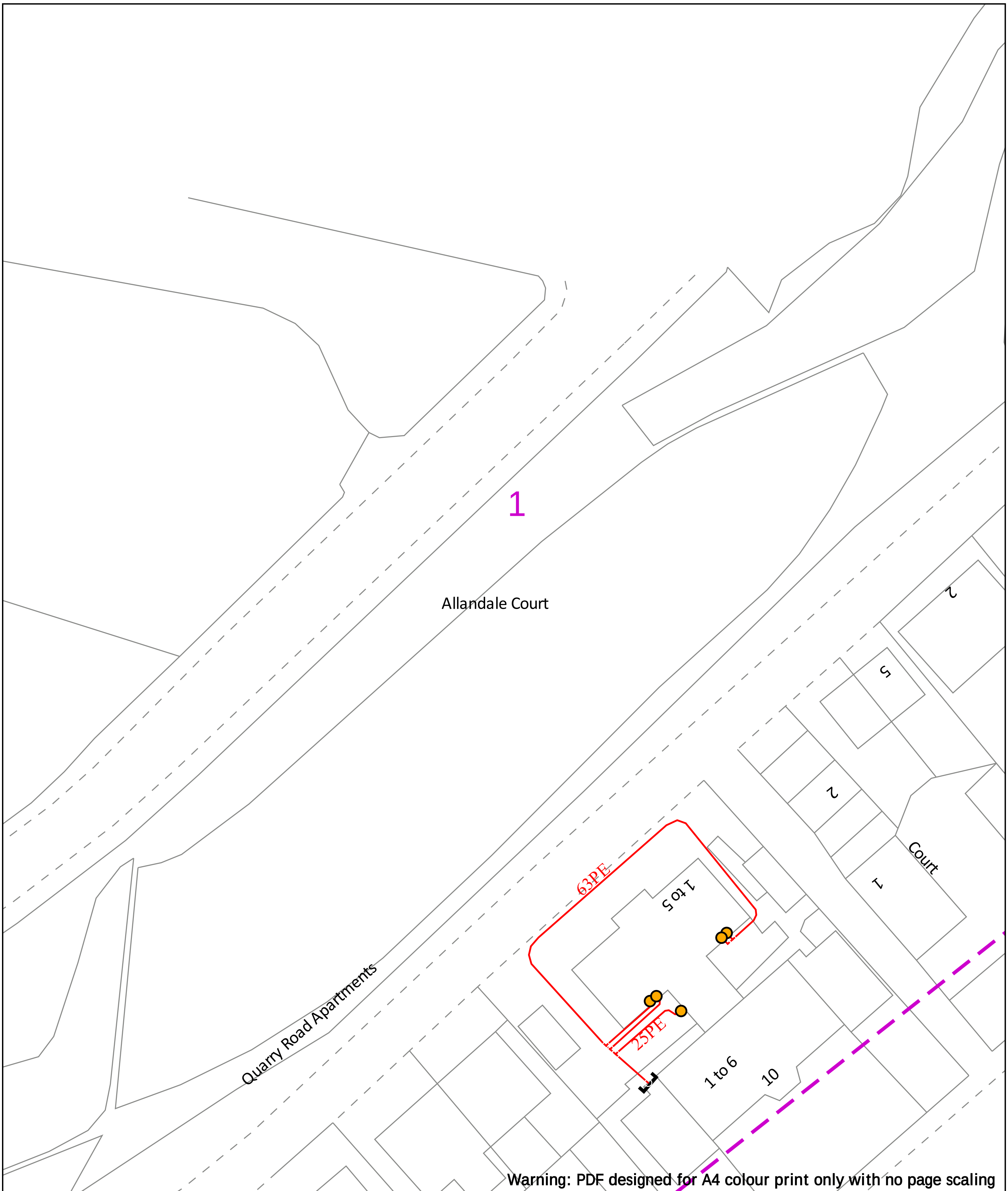

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LP Main	Valve Closed
LP Service	Valve Open
MP Main	CSEP
MP Service	Pressure Reduction Station
IP Main	End Closure
Reducer	
Ducting	
Gas Supply Point	

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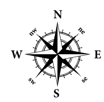

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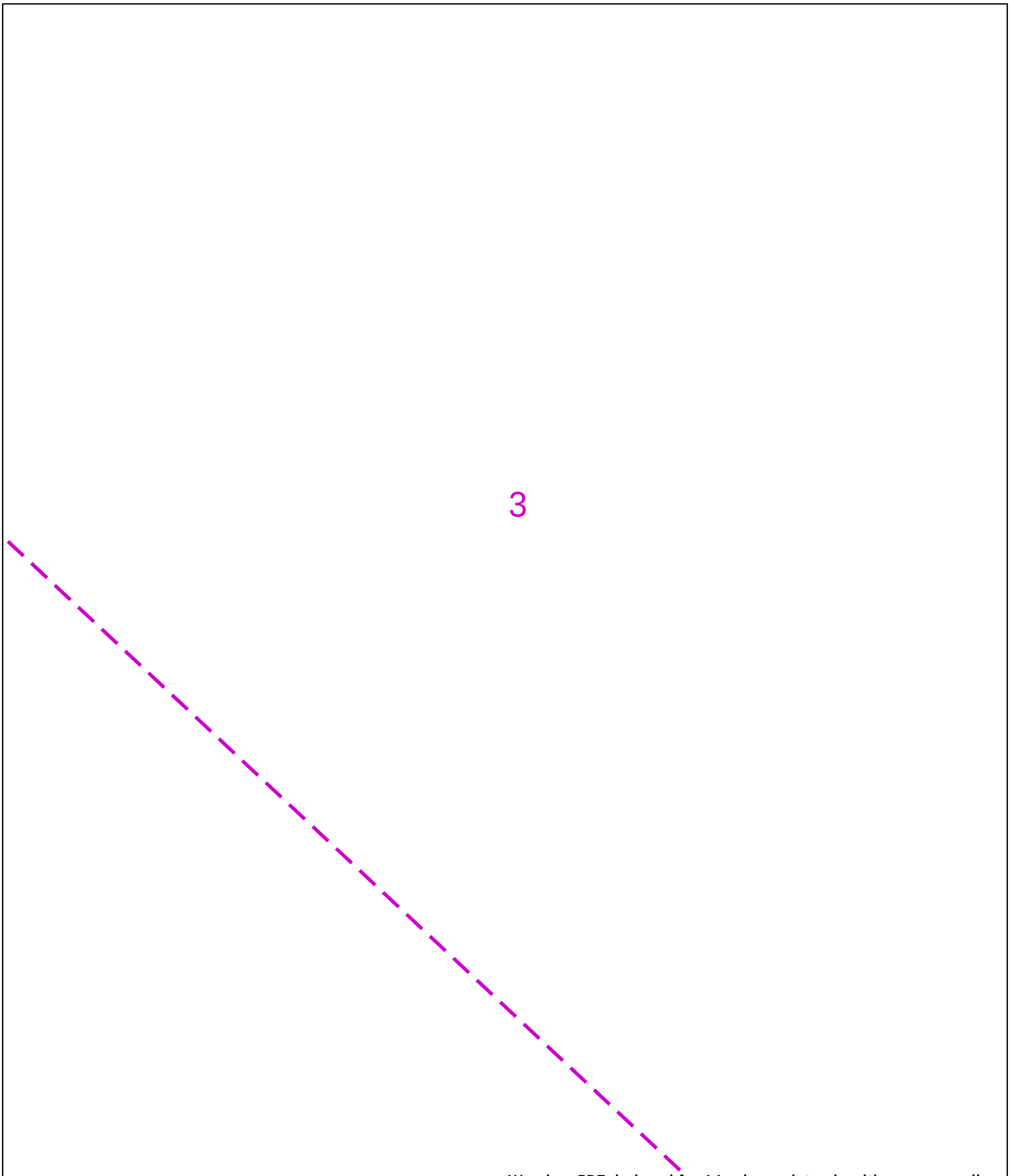

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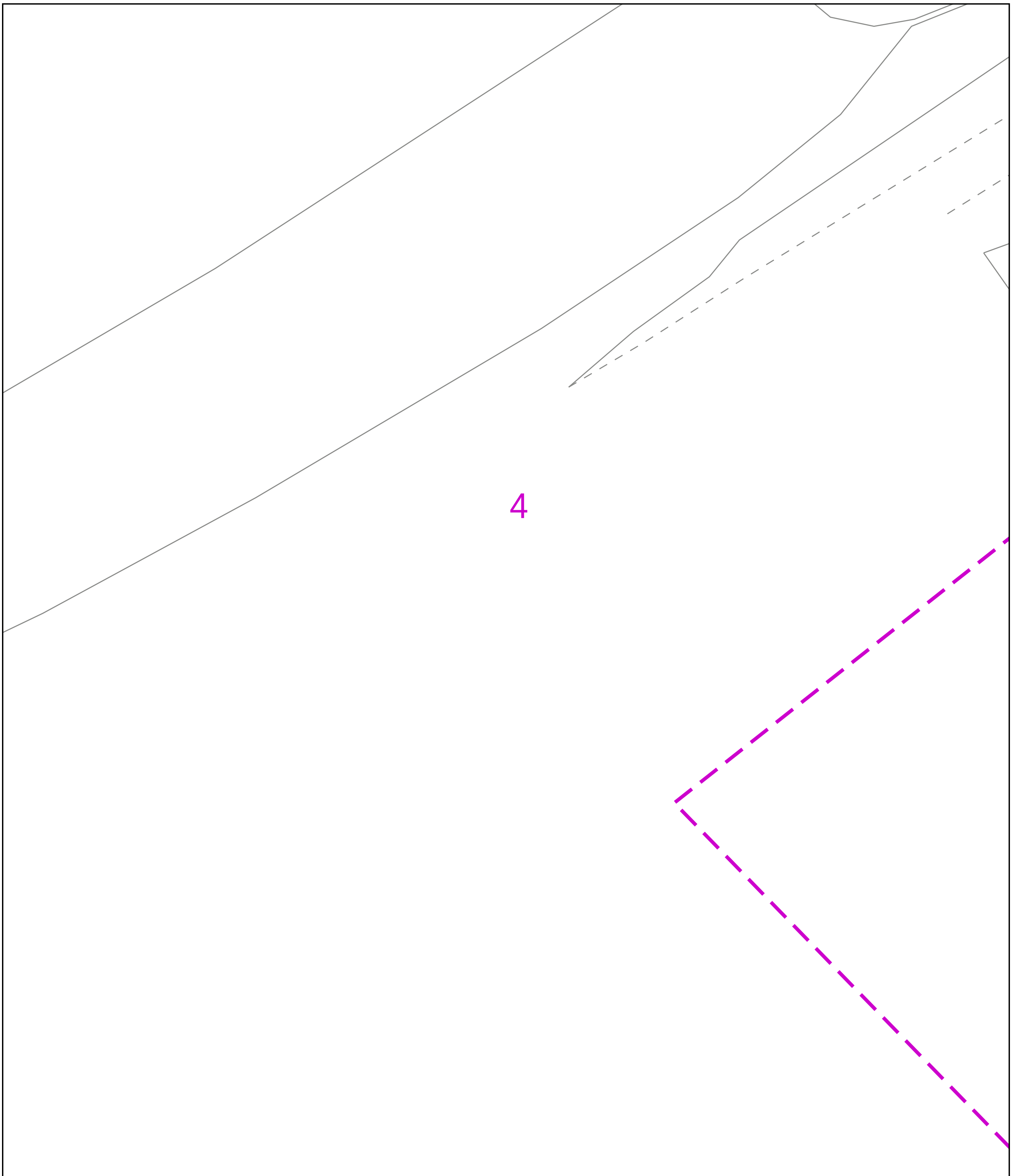

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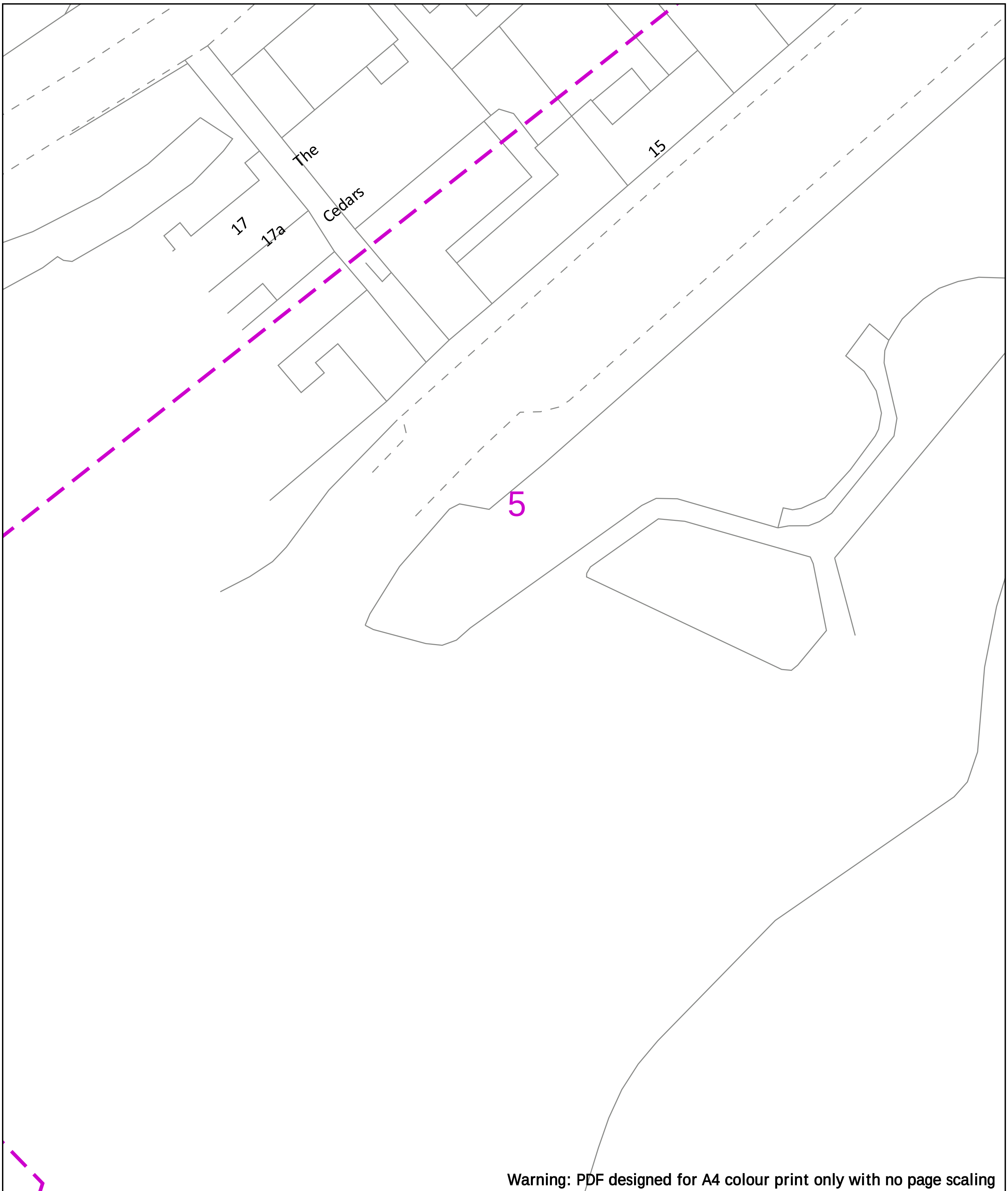

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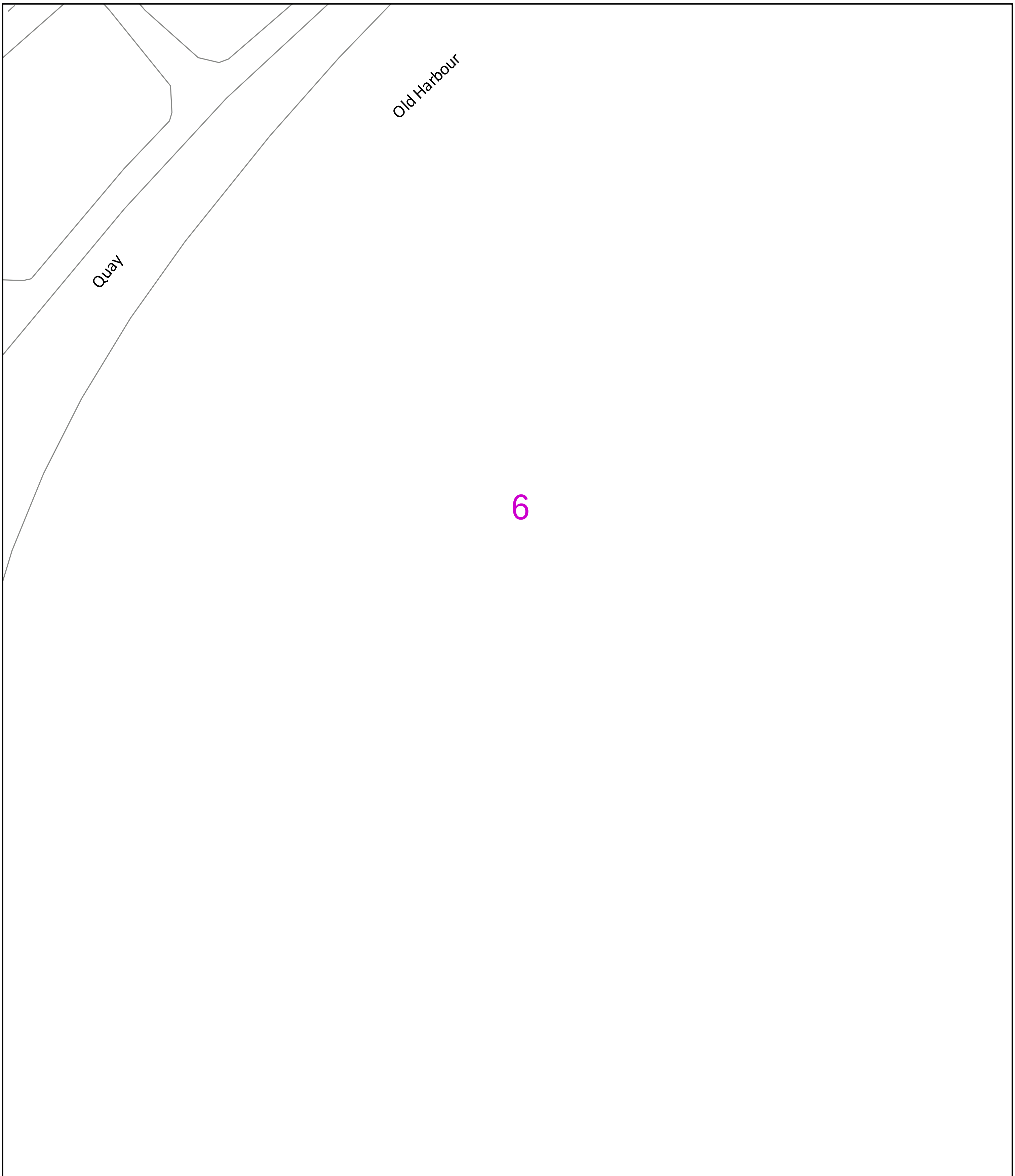

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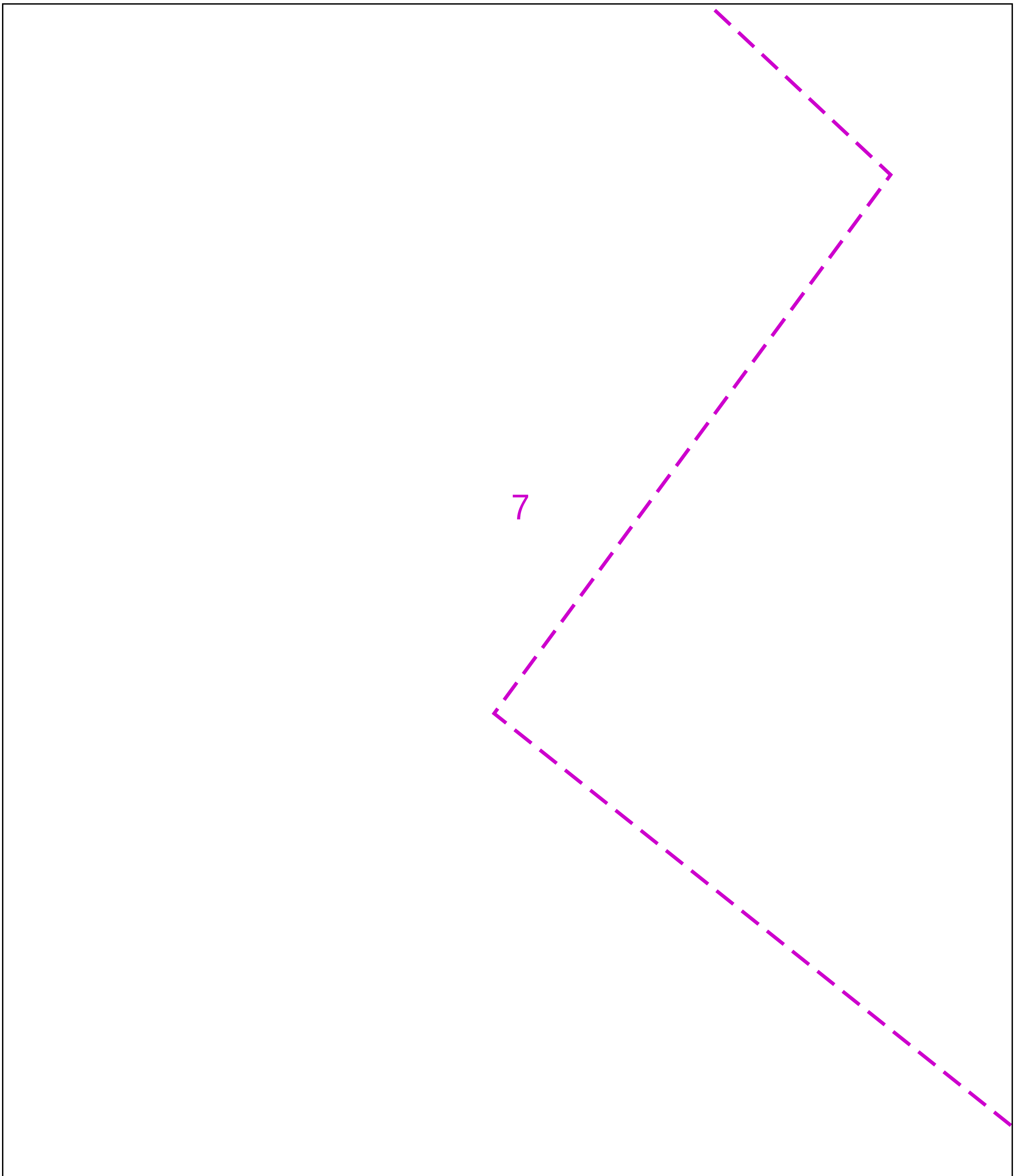

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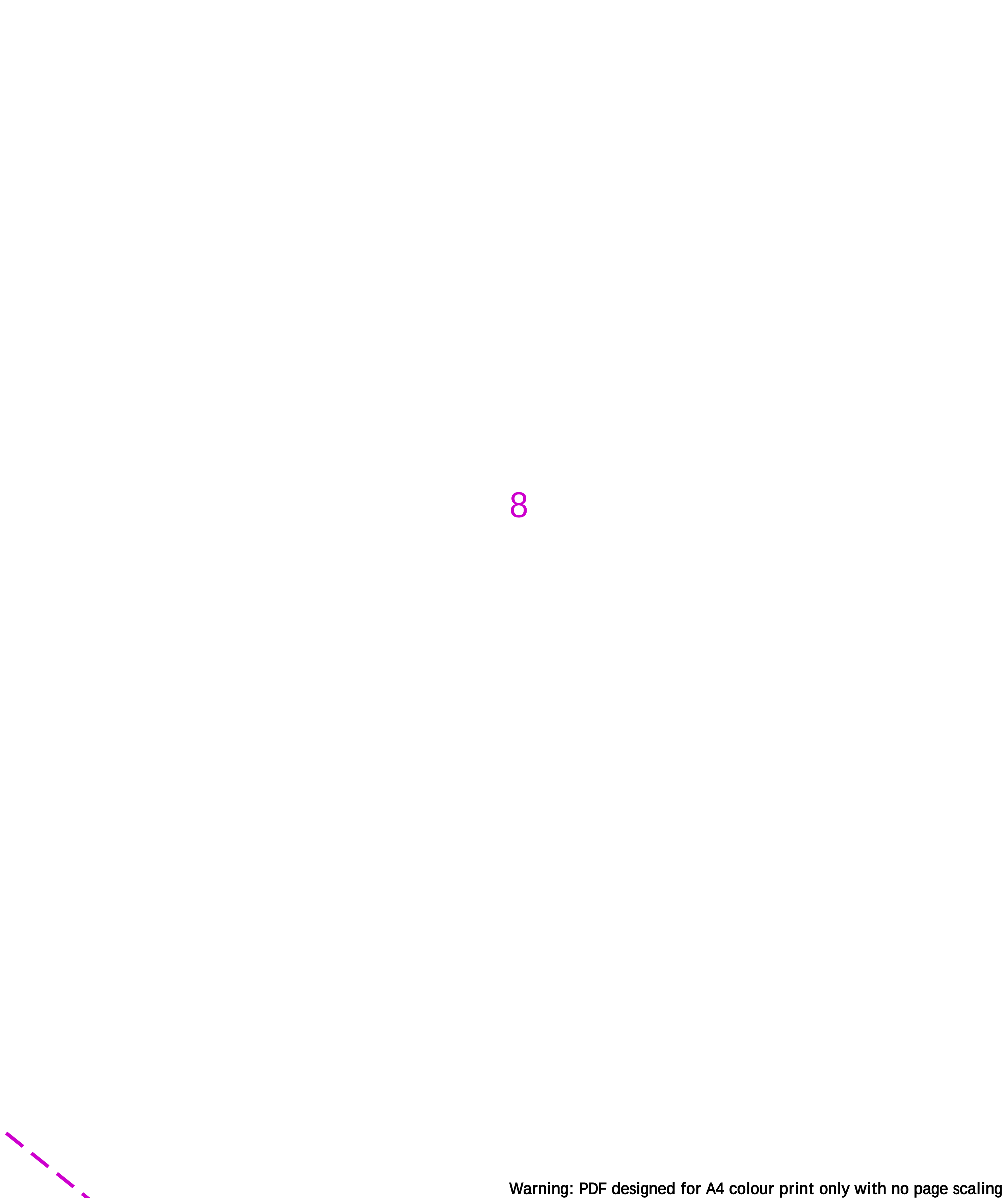

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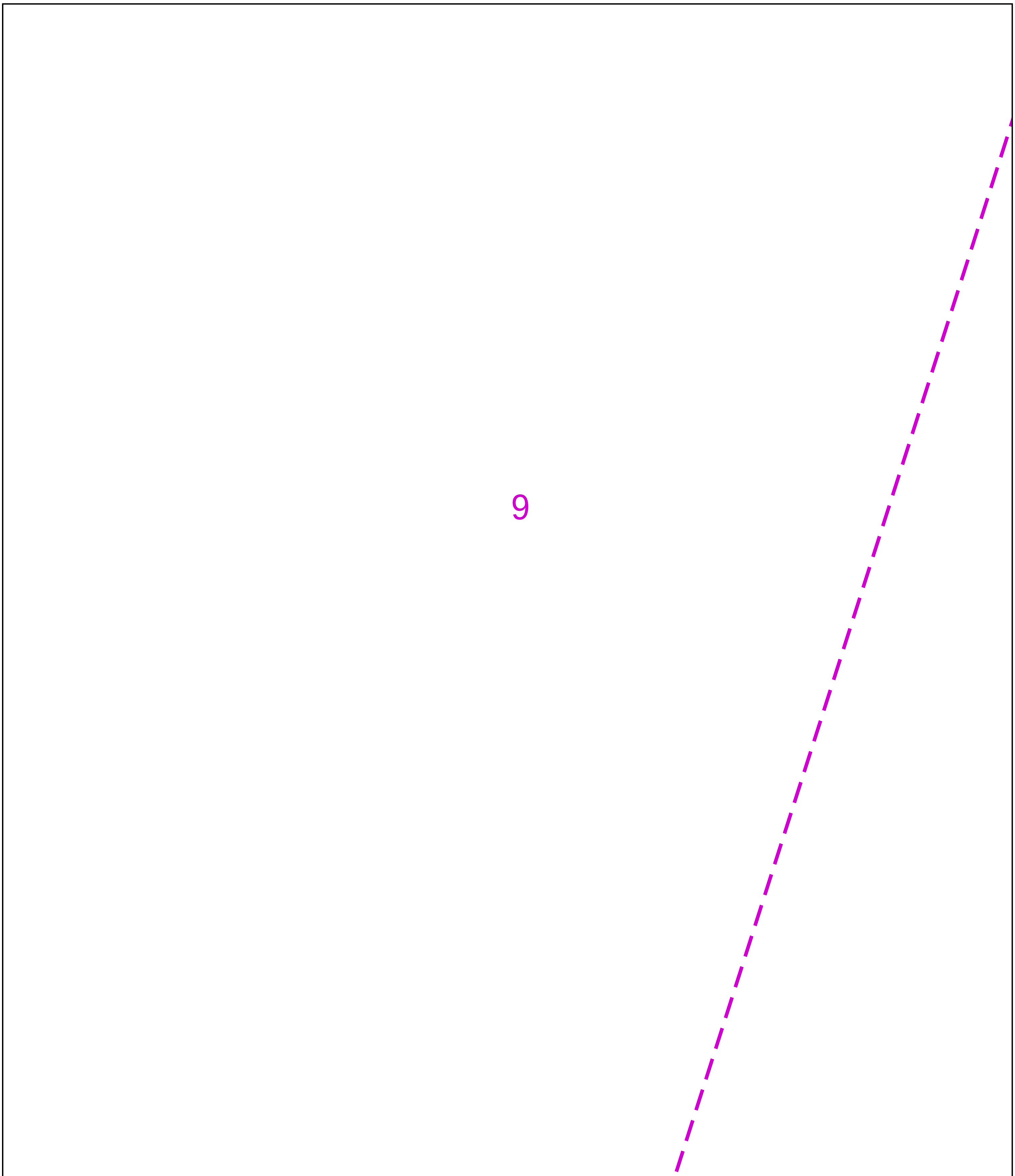

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LP Main
LP Service
MP Main
MP Service
IP Main

Valve Closed
Valve Open
CSEP
Pressure Reduction Station
End Closure

Reducer
Ducting
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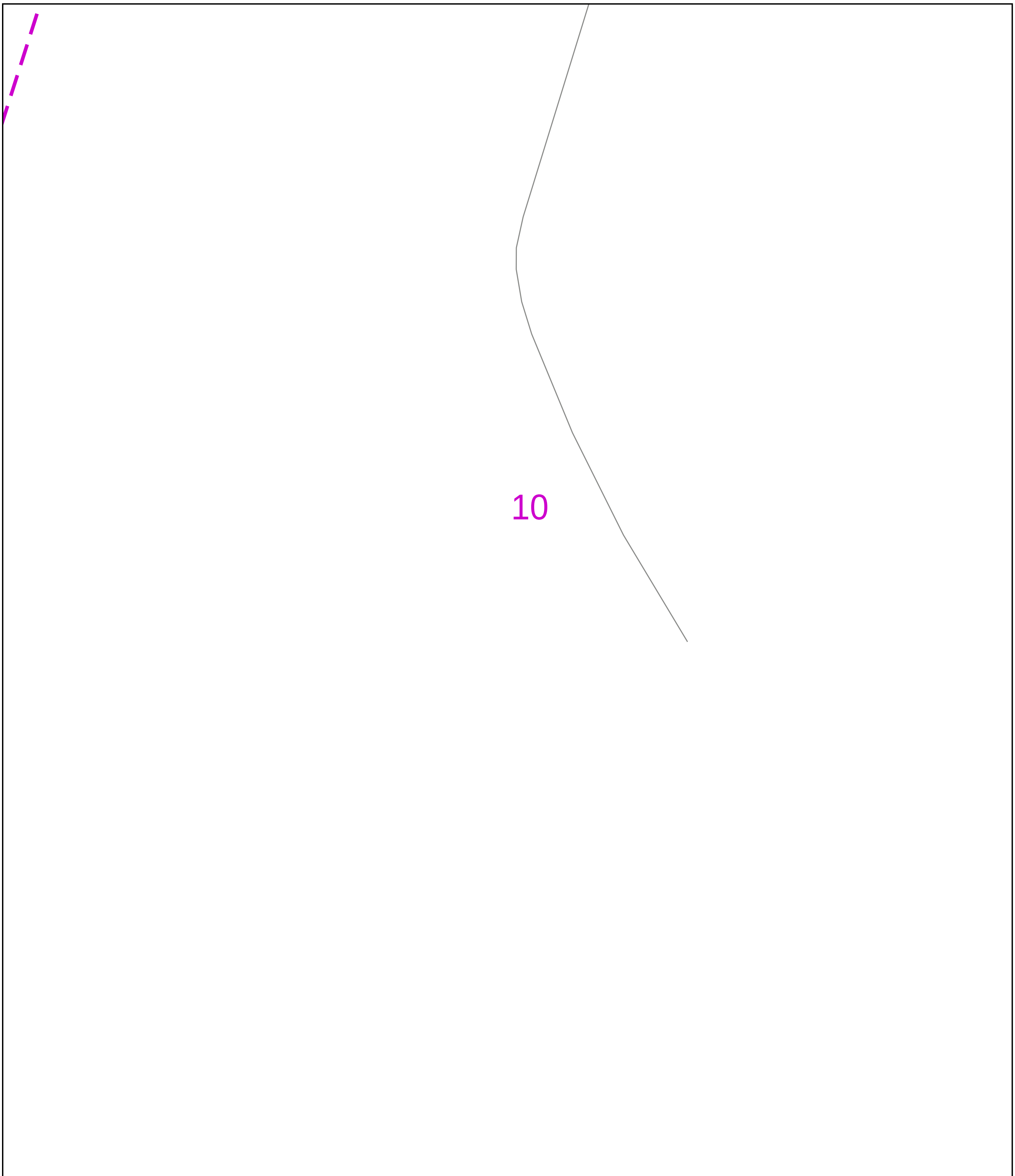

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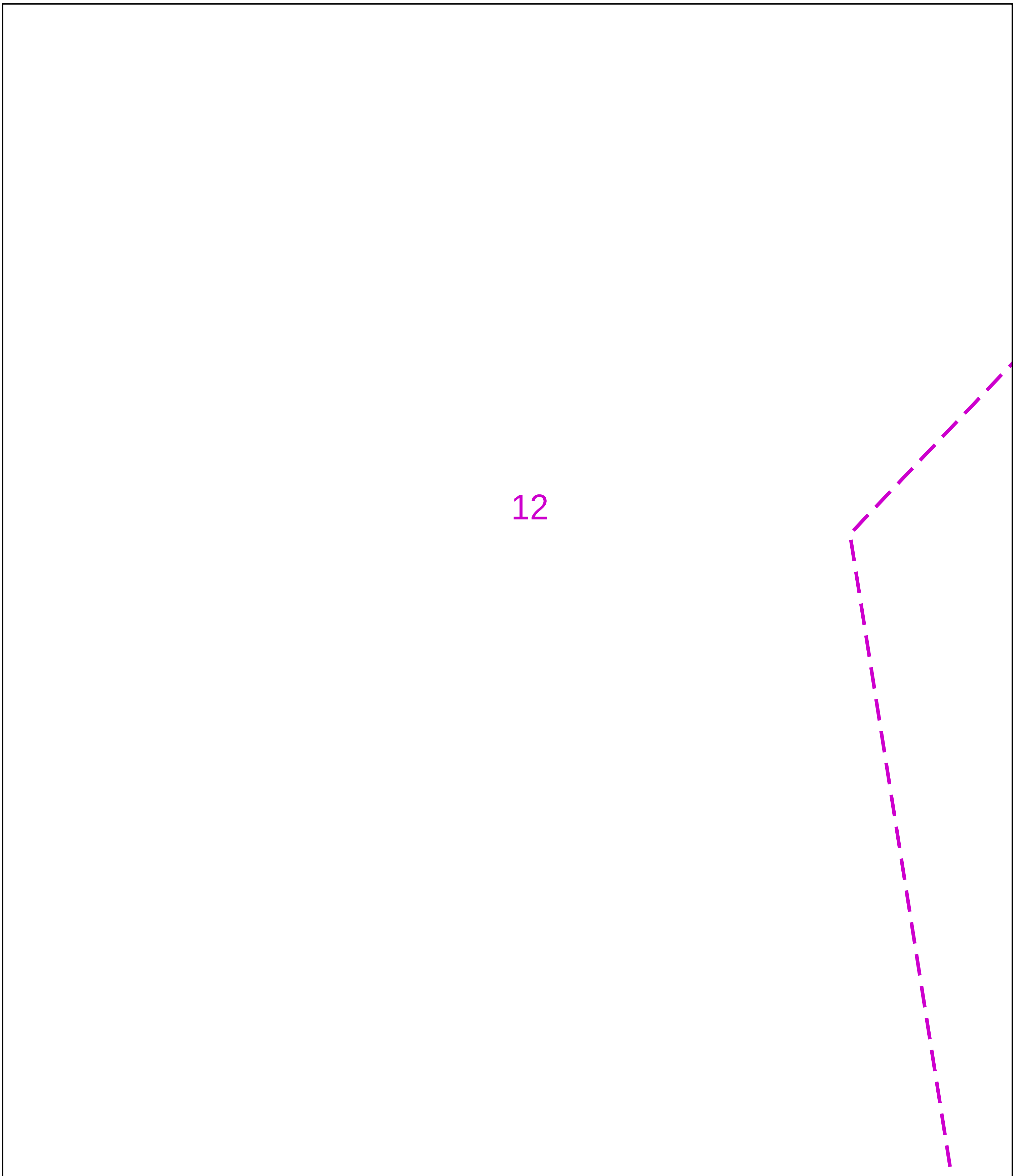

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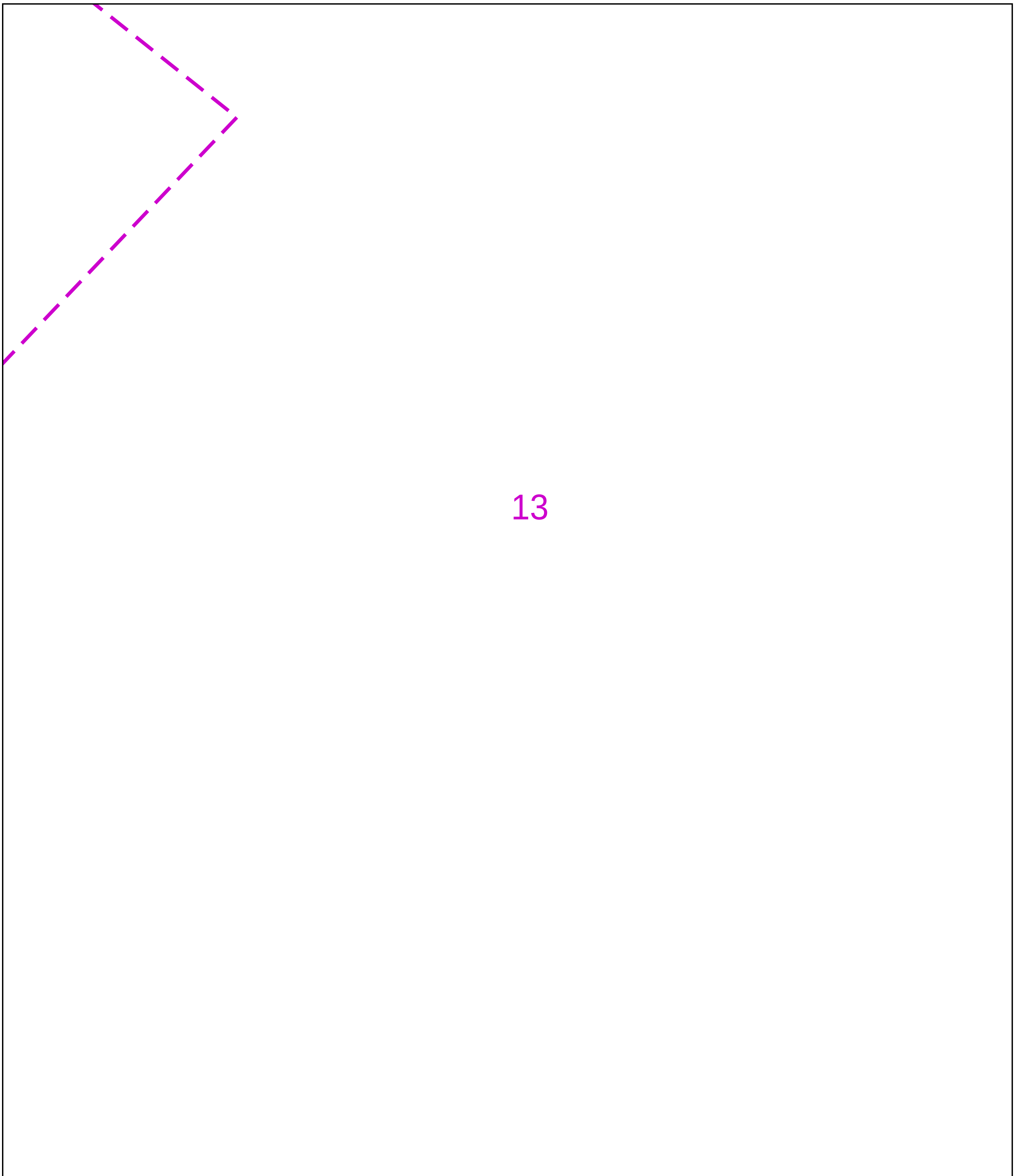

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Requested by: Miss Alexa Band

Your Scheme/Reference: sts5161m

Scale: 1:500 (When plotted at A4)

	LP Main		Valve Closed		Reducer
	LP Service		Valve Open		Ducting
	MP Main		CSEP		Gas Supply Point
	MP Service		Pressure Reduction Station		
	IP Main	]	End Closure		

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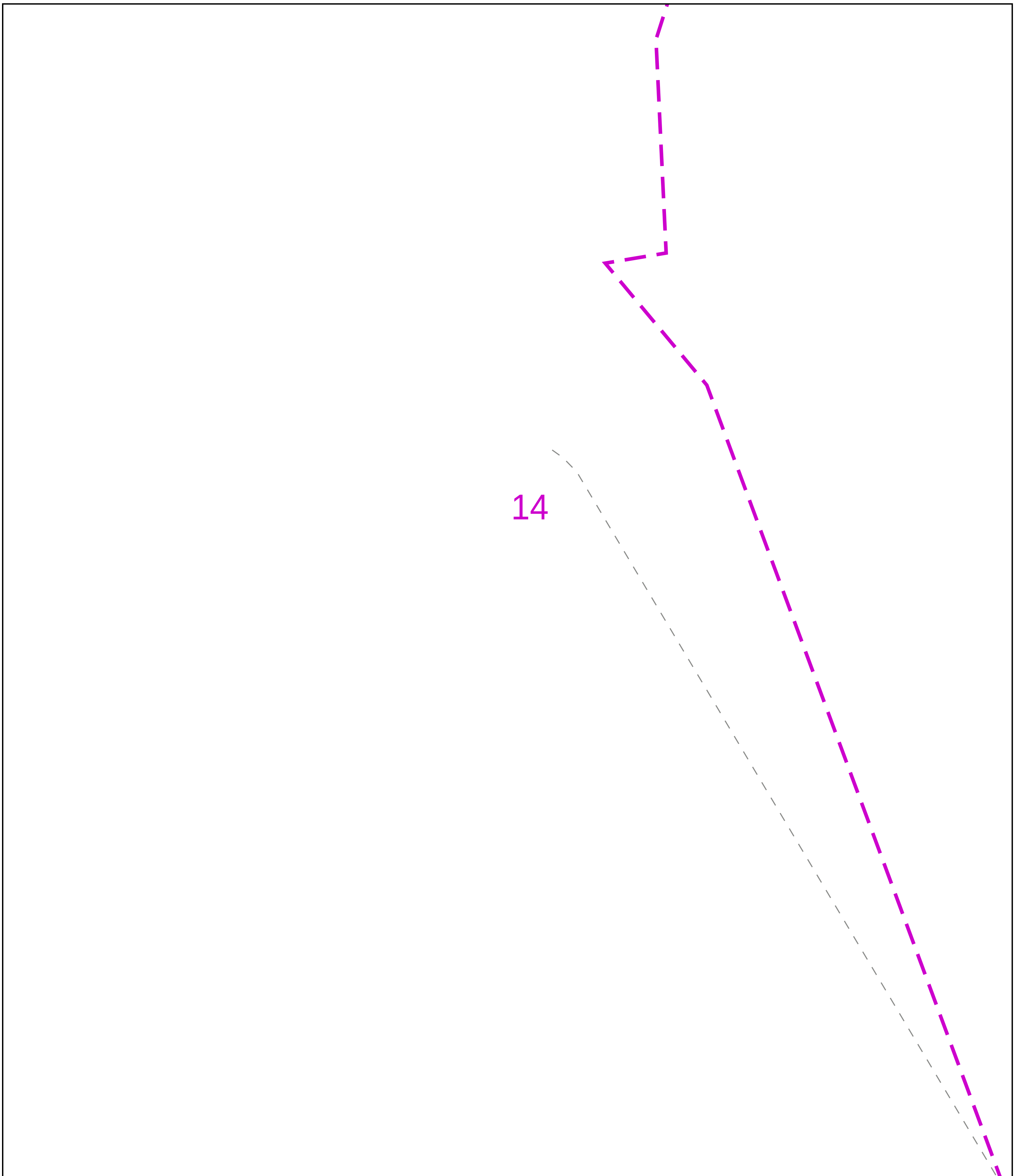
indigo pipelines

Indigo Pipelines Ltd.
Registered Office:
Loddon Reach,
Reading Road,
Arborfield,
Reading,
Bearkshire, RG2 9HU



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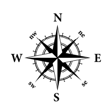
0 20m Dig Sites Area: Line:



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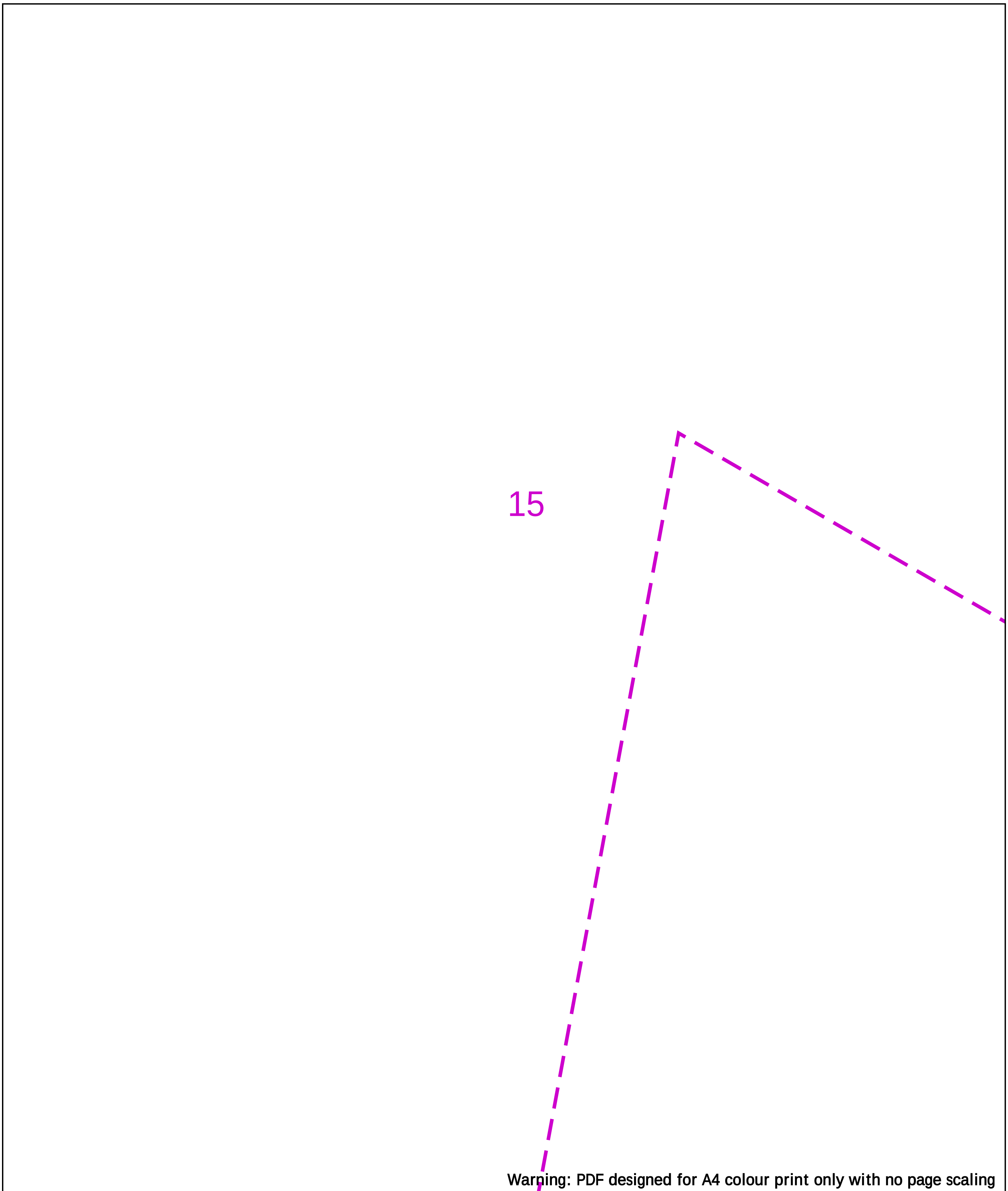

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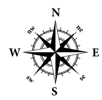

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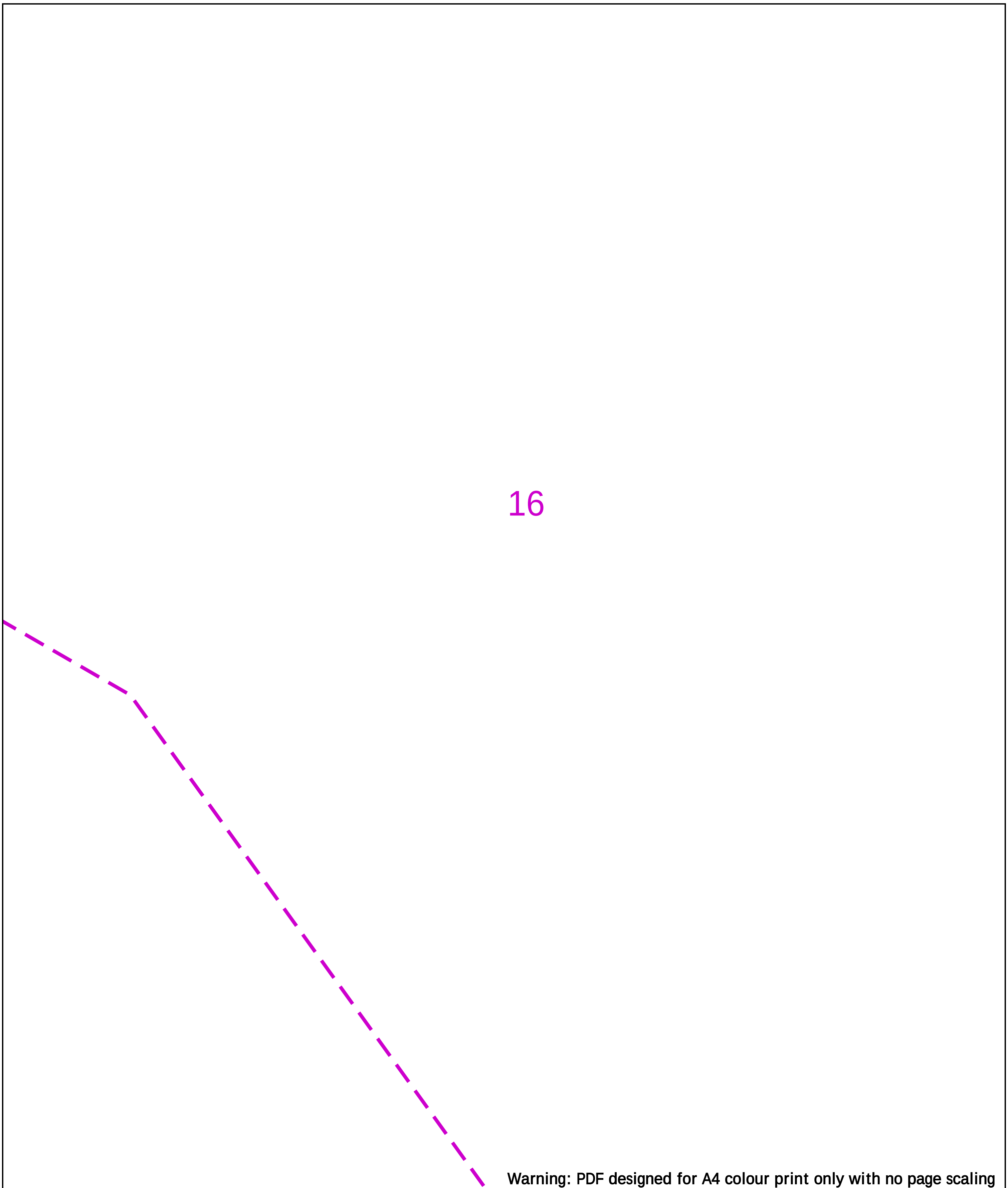

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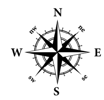

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LP Main
LP Service
MP Main
MP Service
IP Main
Valve Closed
Valve Open
CSEP
Pressure Reduction Station
End Closure
Reducer
Ducting
Gas Supply Point

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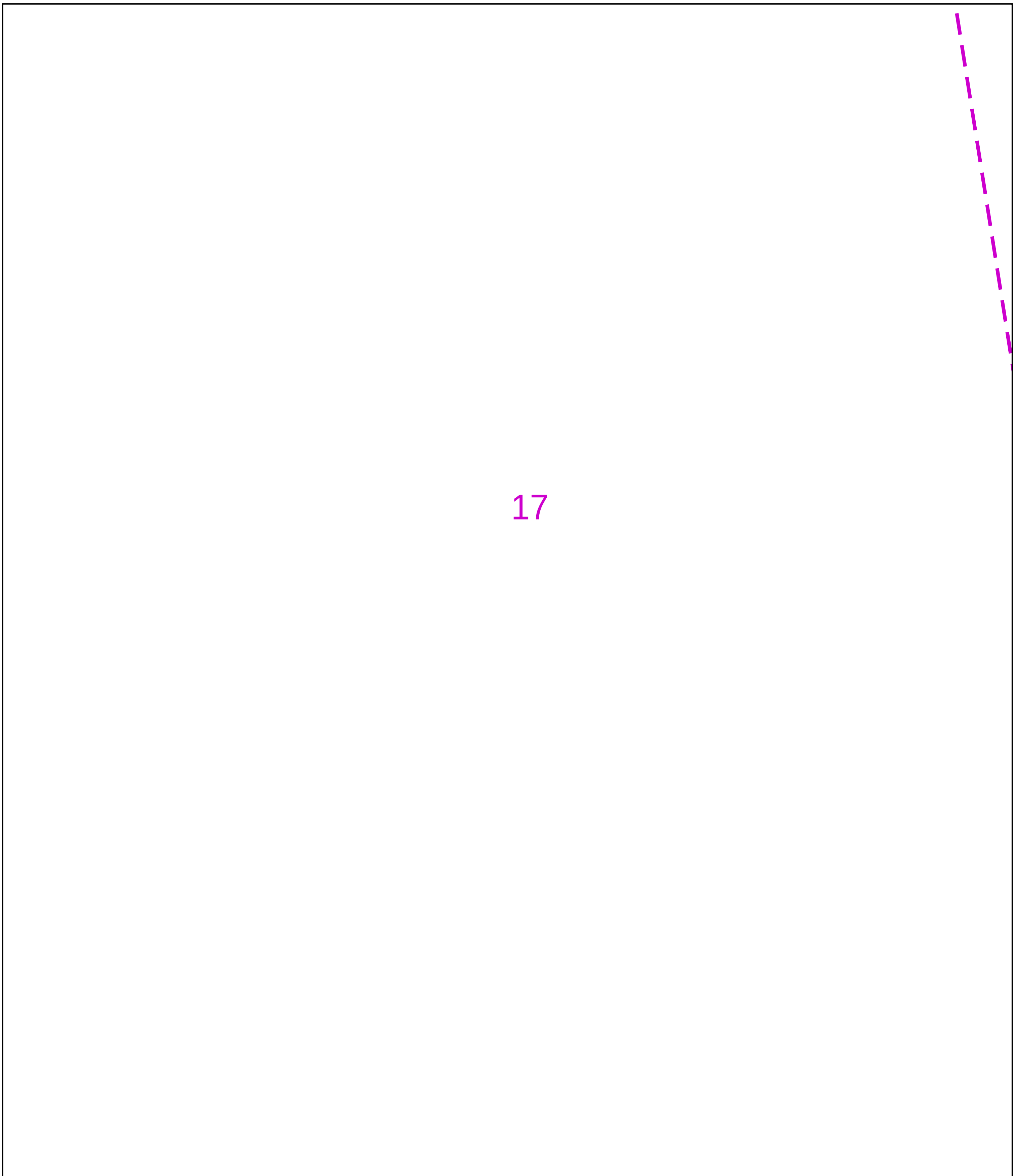

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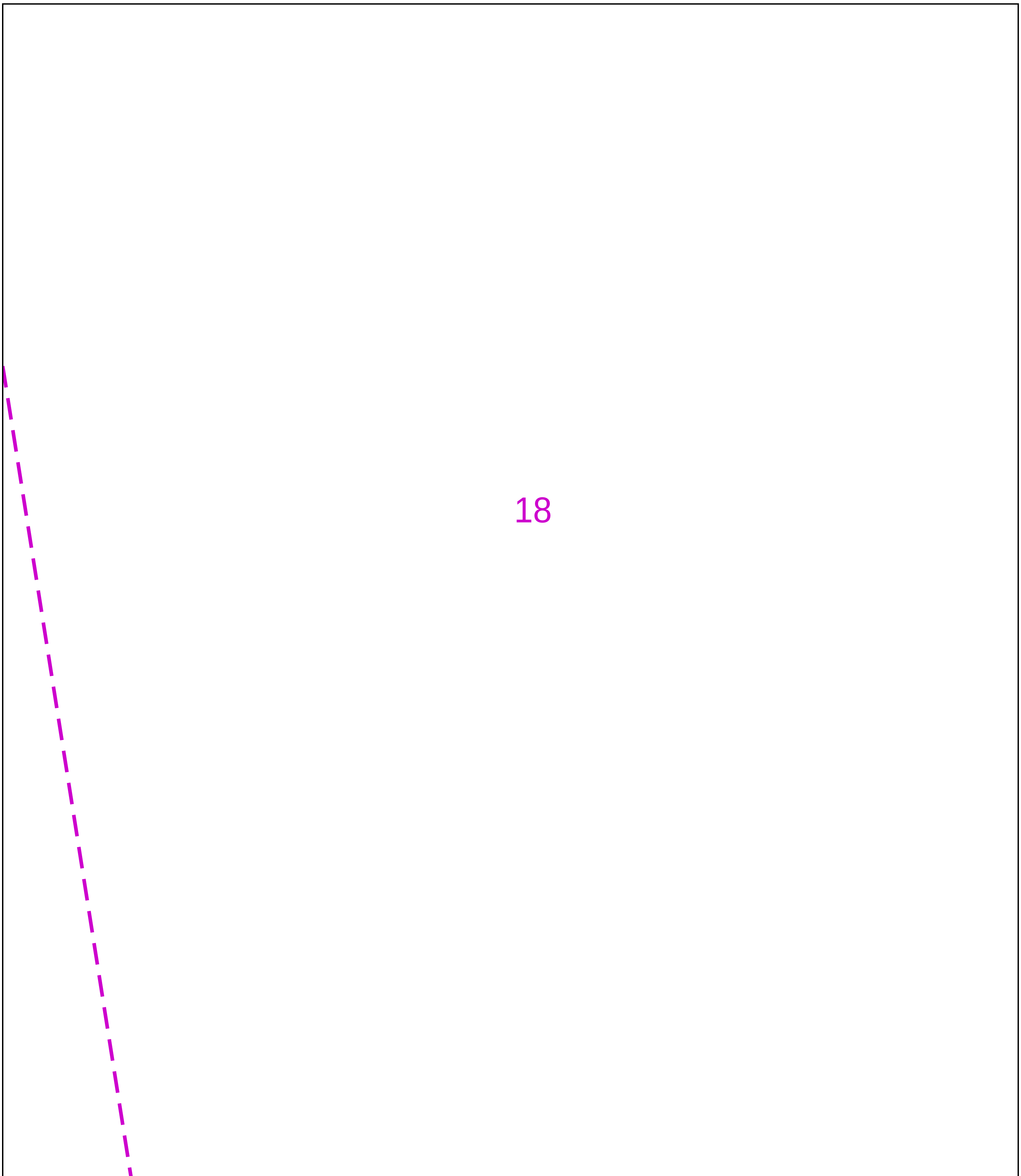

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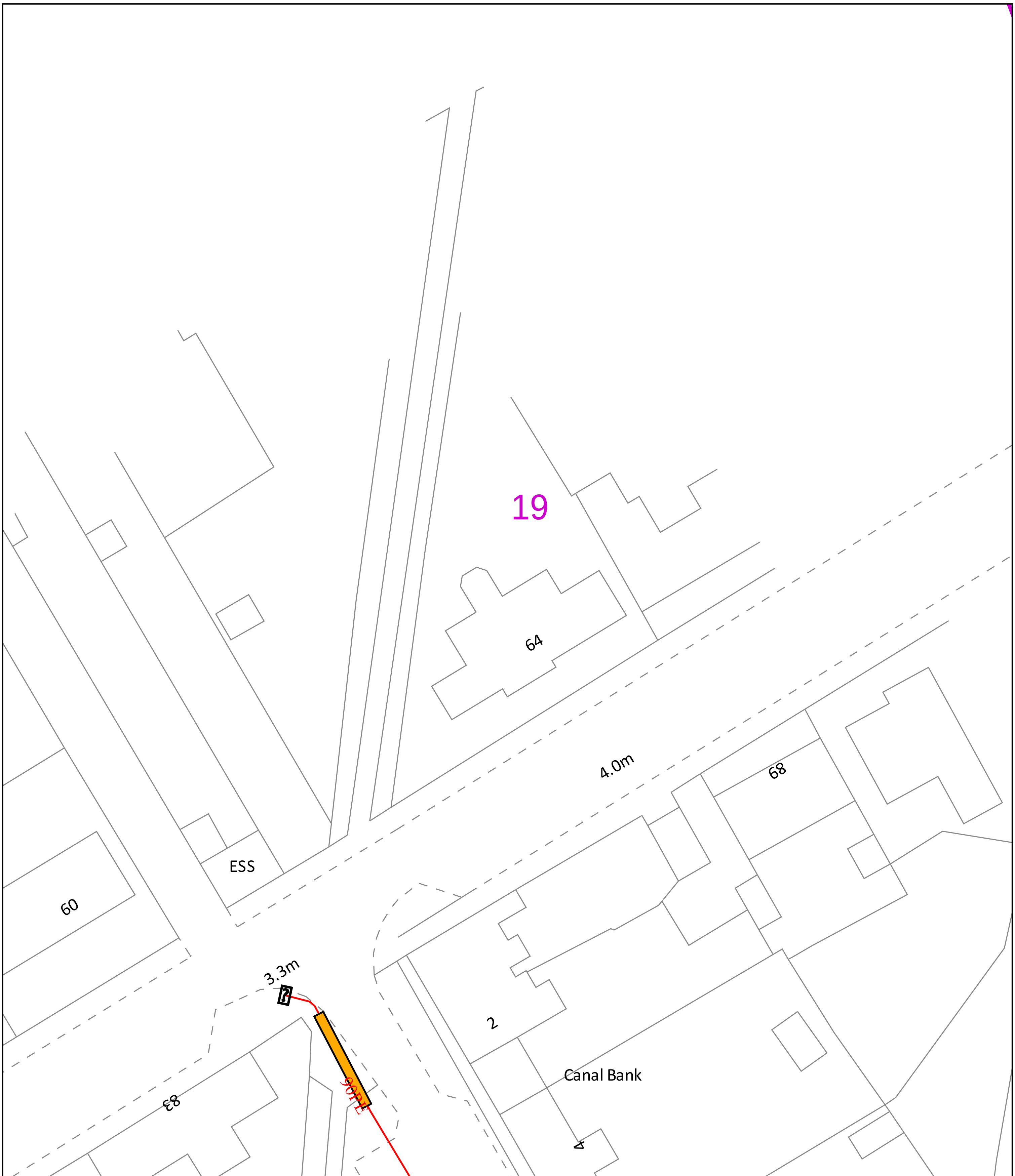

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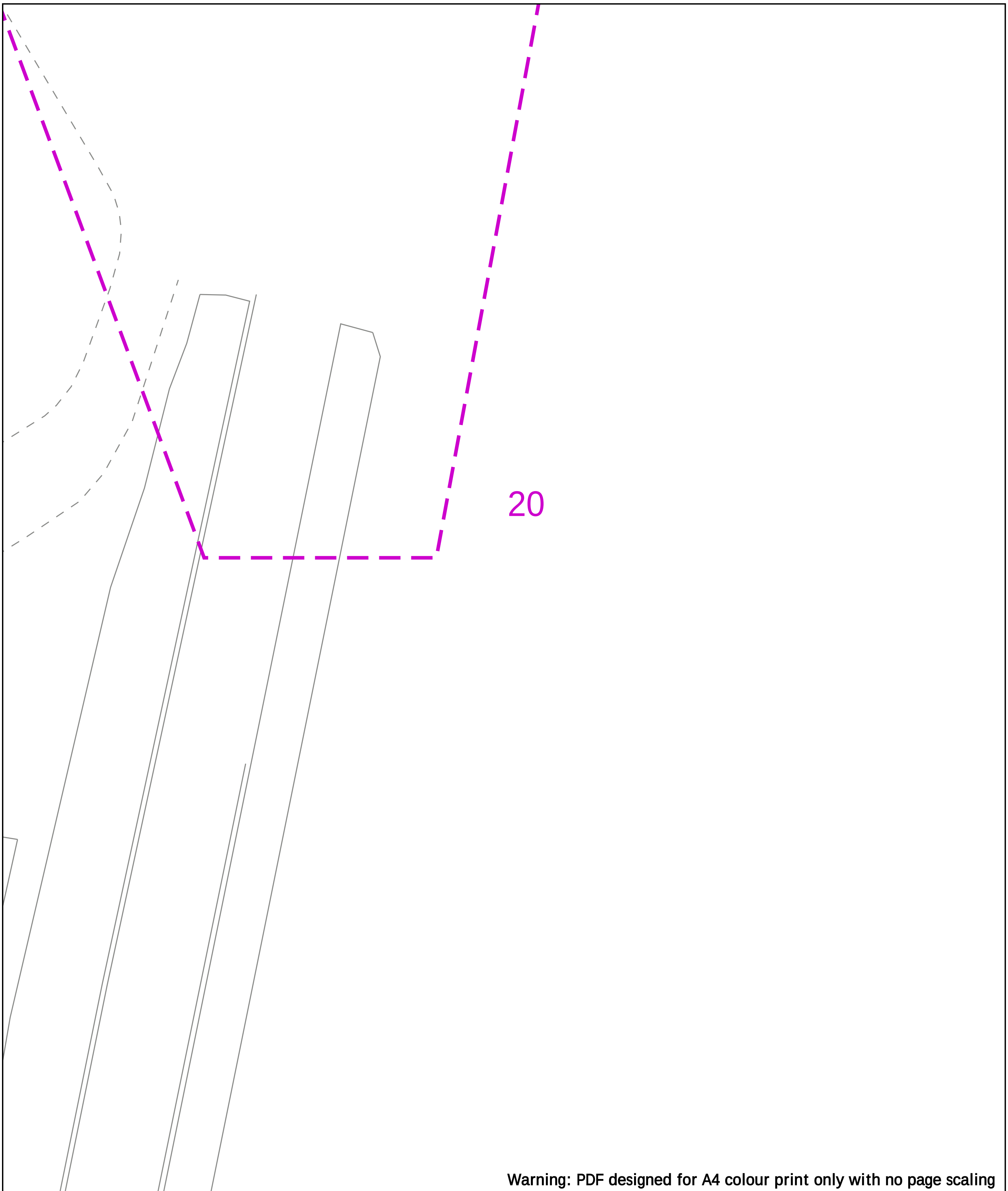

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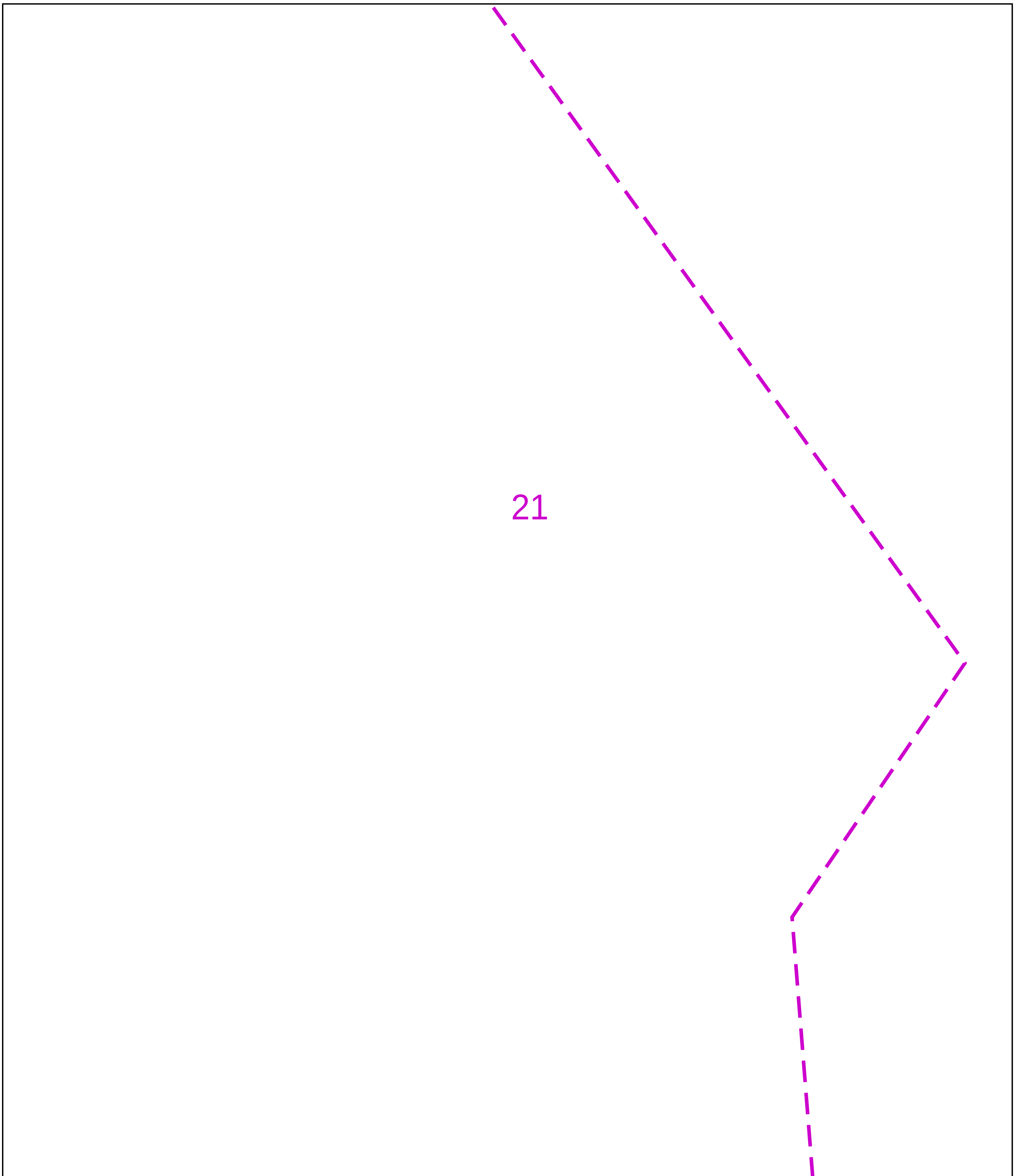

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LP Main
LP Service
MP Main
MP Service
IP Main

Valve Closed
Valve Open
CSEP
Pressure Reduction Station
End Closure

Reducer
Ducting
Gas Supply Point

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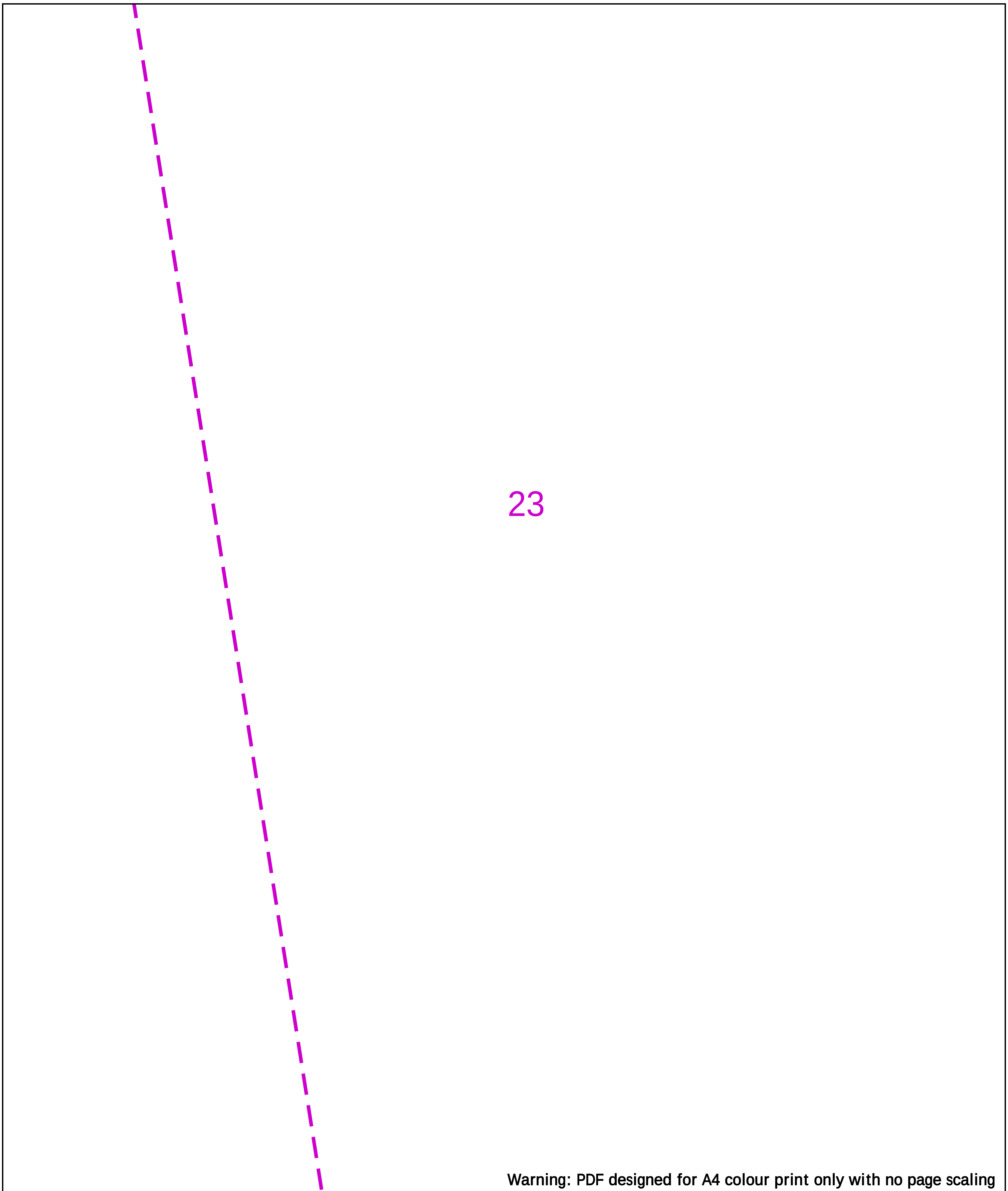

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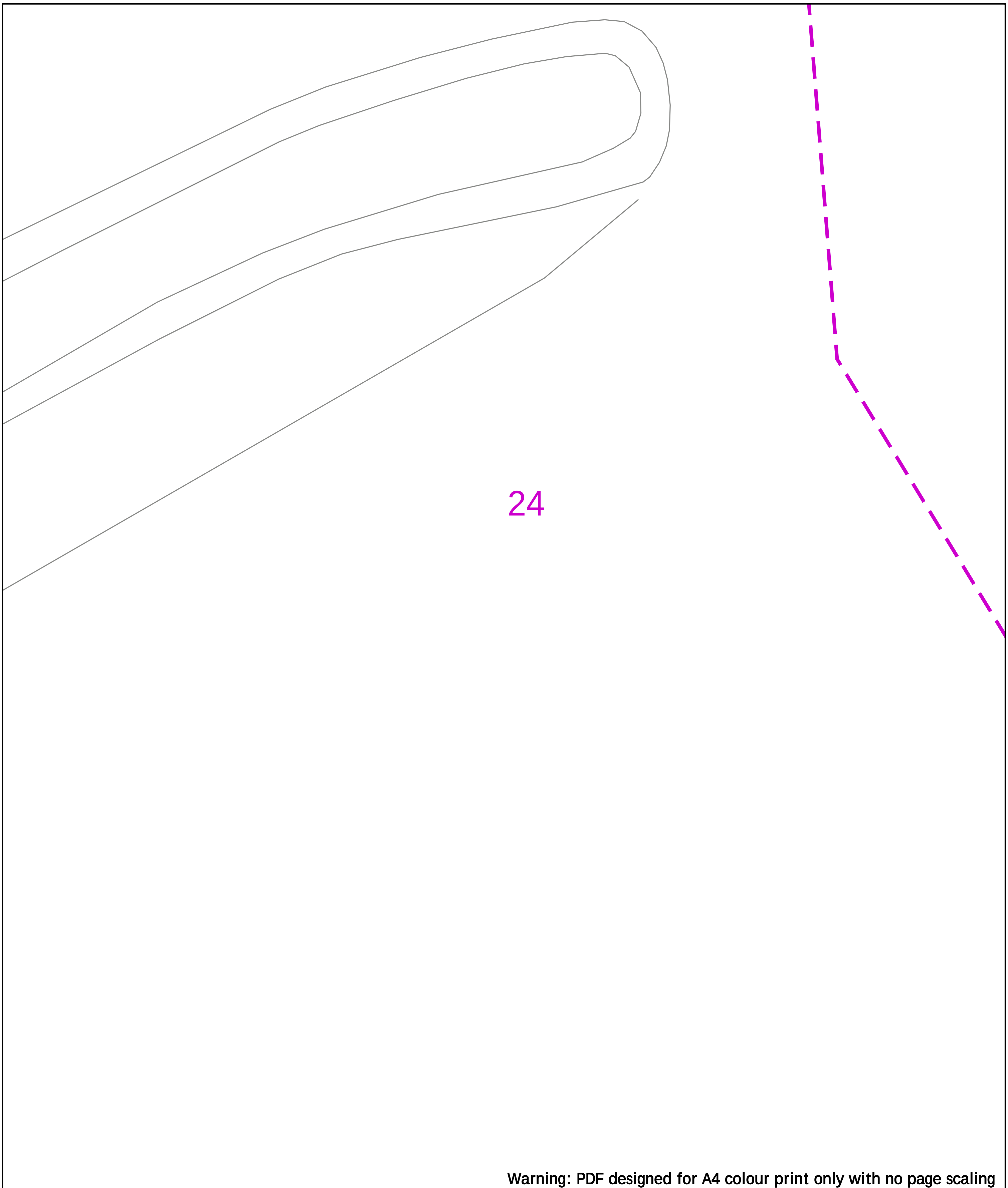

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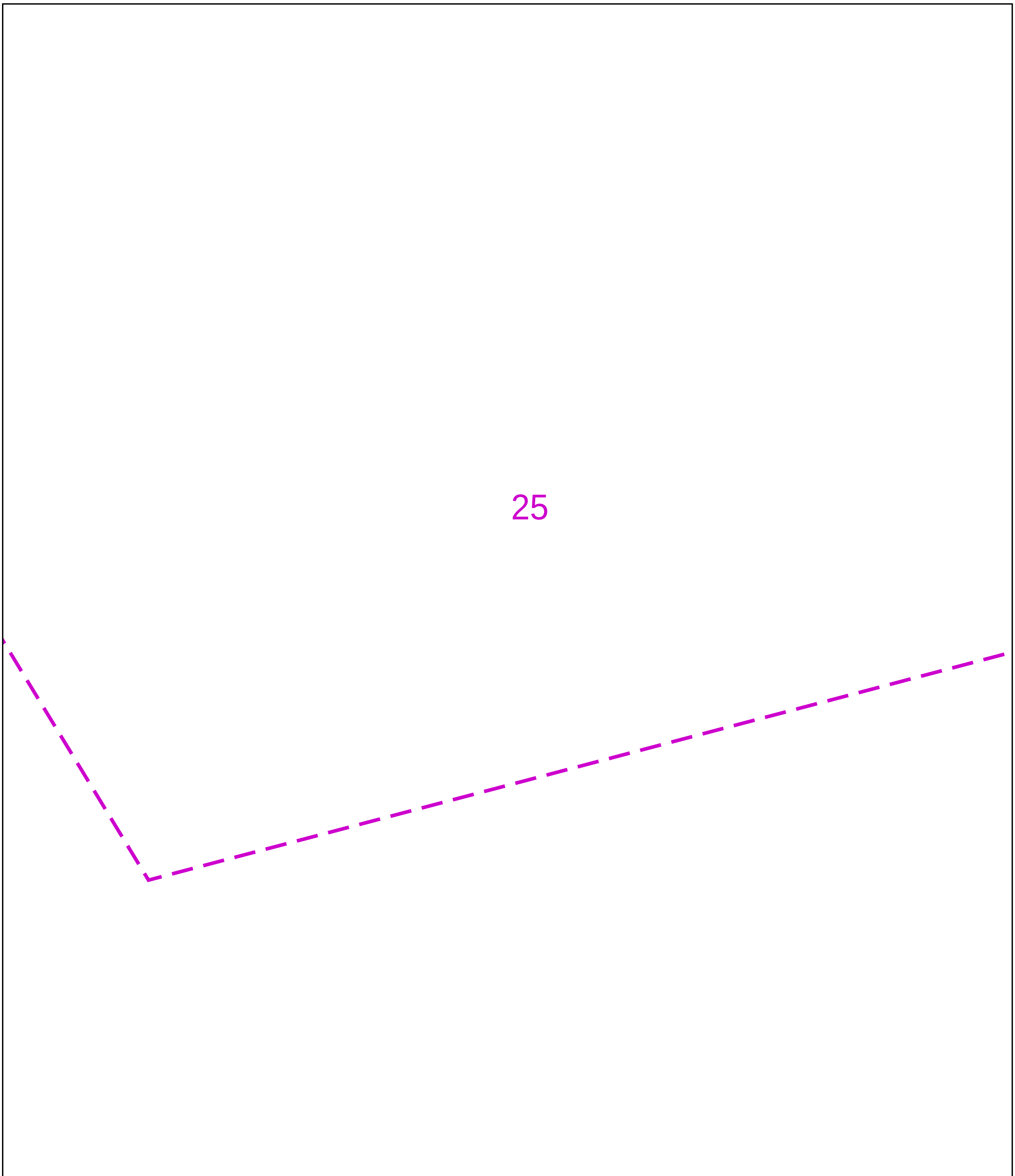

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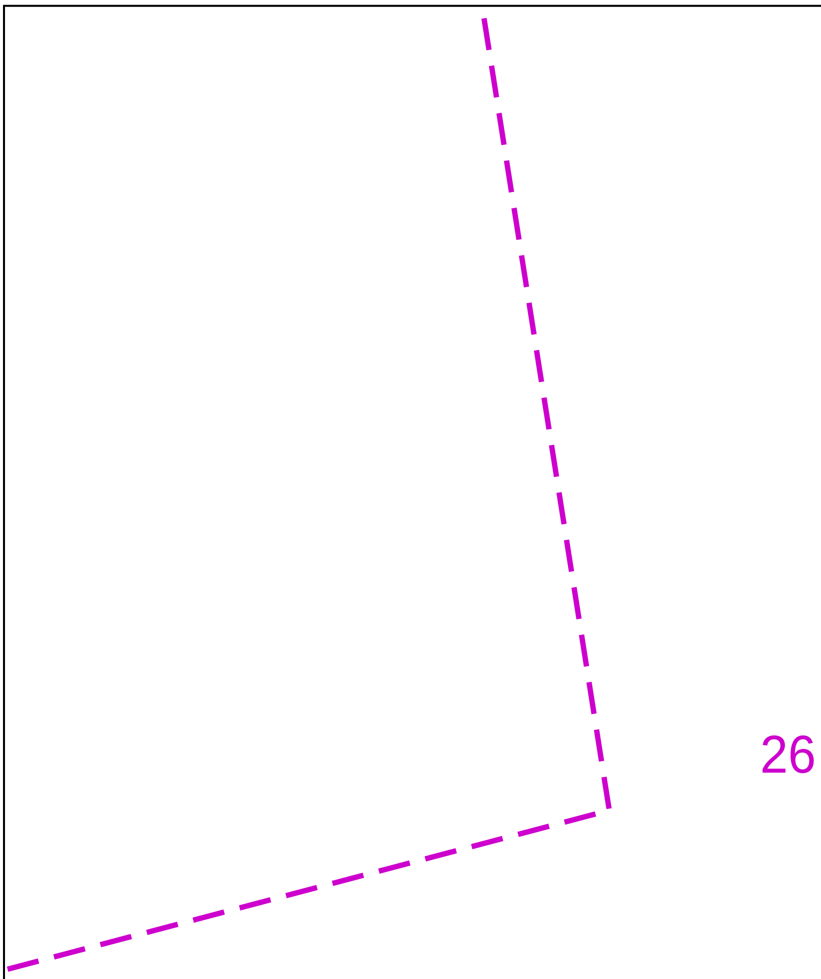

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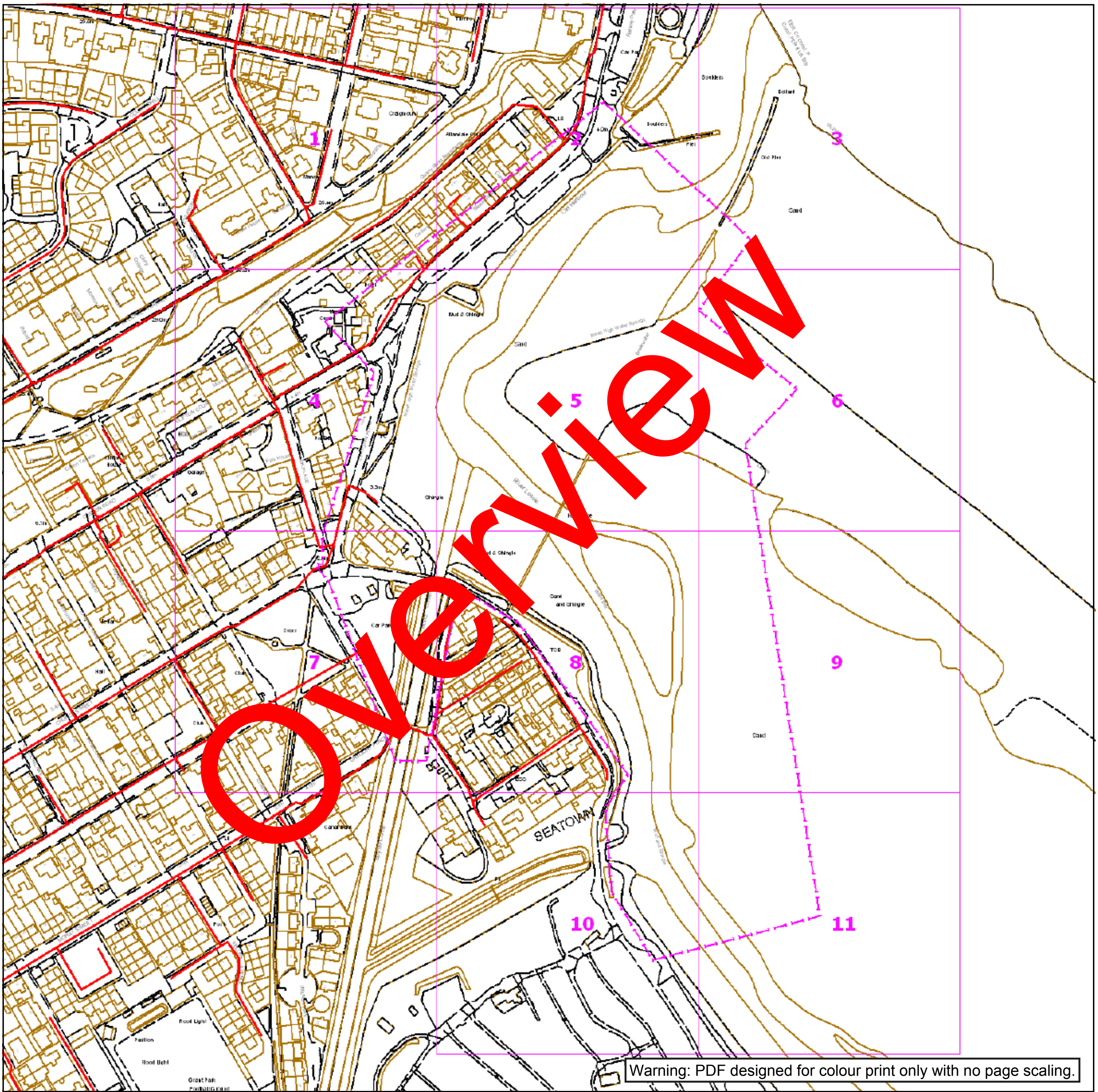

Low Pressure Mains

Medium Pressure Mains

Intermediate Pressure Mains

High Pressure Mains

Some Examples Of Plant Items

Valve | Syphon | Depth of Cover | Diameter Change | Material Change

Digsite:

Line: | Area:

LAs

GTs | SSSIs

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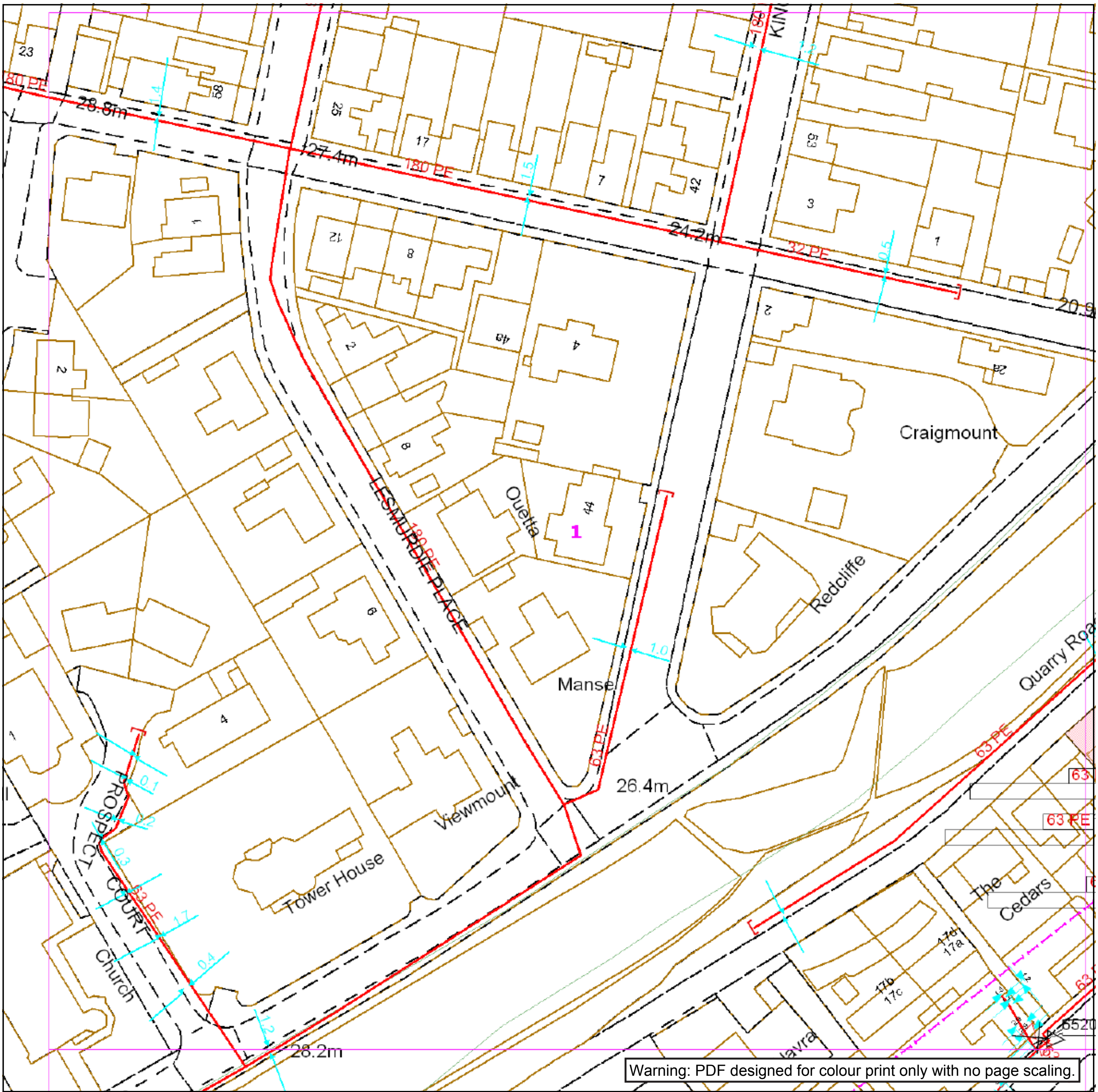
Contact Us

SGN Safety Admin Team:
0800 912 1722
Email:
plantlocation@sgn.co.uk

Date Requested: 28/09/2020
Job Reference: 20047775
Site Location: 323795 870466
Requested by:
Miss Alexa Band
Your Scheme/Reference:
sts5161m

This plan shows the location of those pipes owned by Scotia Gas Networks (SGN) by virtue of being a licensed Gas Transporter (GT). Gas pipes owned by other GTs or third parties may also be present in this area but are not shown on this plan. Information with regard to such pipes should be obtained from the relevant owners. No warranties are given with regard to the accuracy of the information shown on this plan. Service pipes, valves, siphons, sub-connections etc. are not shown but their presence should be anticipated. You should be aware that a small percentage of our pipes/assets may be undergoing review and will temporarily be highlighted in yellow. If your proposed works are close to one of these pipes, you should contact the SGN Safety Admin Team on 0800 912 1722 for advice. No liability of any kind whatsoever is accepted by SGN or its agents, servants or sub-contractors for any error or omission contained herein. Safe digging practices, in accordance with HS (G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that plant location information is provided to all persons (whether direct labour or sub-contractors) working for you on or near gas apparatus. Information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Report damage immediately – KEEP EVERYONE AWAY FROM THE AREA
0800 111 999



SGN
Your gas. Our network.

Low Pressure Mains		Digsite:	
Medium Pressure Mains		Line:	Area:
Intermediate Pressure Mains		LAs	
High Pressure Mains		GTs	SSSIs

Some Examples Of Plant Items

Valve | Syphon | Depth of Cover | Diameter Change | Material Change

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Linesearch beforeUdig

Contact Us

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Email:
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Date Requested: 28/09/2020
Job Reference: 20047775
Site Location: 323795 870466
Requested by:
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Your Scheme/Reference:
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Exact Scales:
1:1000 Area or Circle dig site
1:1000 Line dig site

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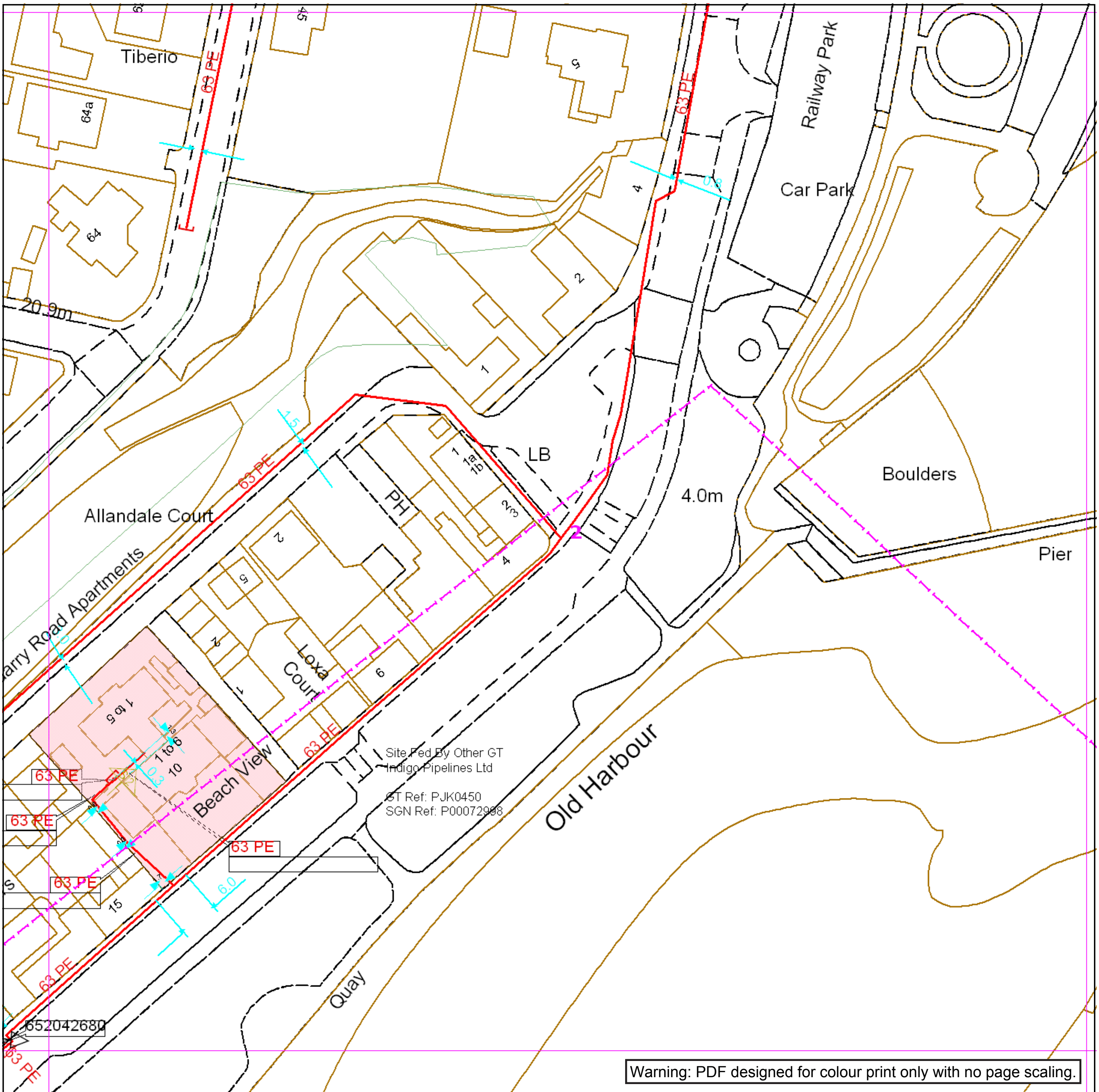
0800 111 999



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Low Pressure Mains		Digsite:	
Medium Pressure Mains		Line:	Area:
Intermediate Pressure Mains		LAs	
High Pressure Mains		GTs	SSSIs

Some Examples Of Plant Items

Valve · Syphon · Depth of Cover · Diameter Change · Material Change

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Linesearch before U dig

Contact Us

SGN Safety Admin Team:
0800 912 1722
Email:
plantlocation@sgn.co.uk

Date Requested: 28/09/2020
Job Reference: 20047775
Site Location: 323795 870466
Requested by:
Miss Alexa Band
Your Scheme/Reference:
sts5161m

Exact Scales:
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1:1000 Line dig site

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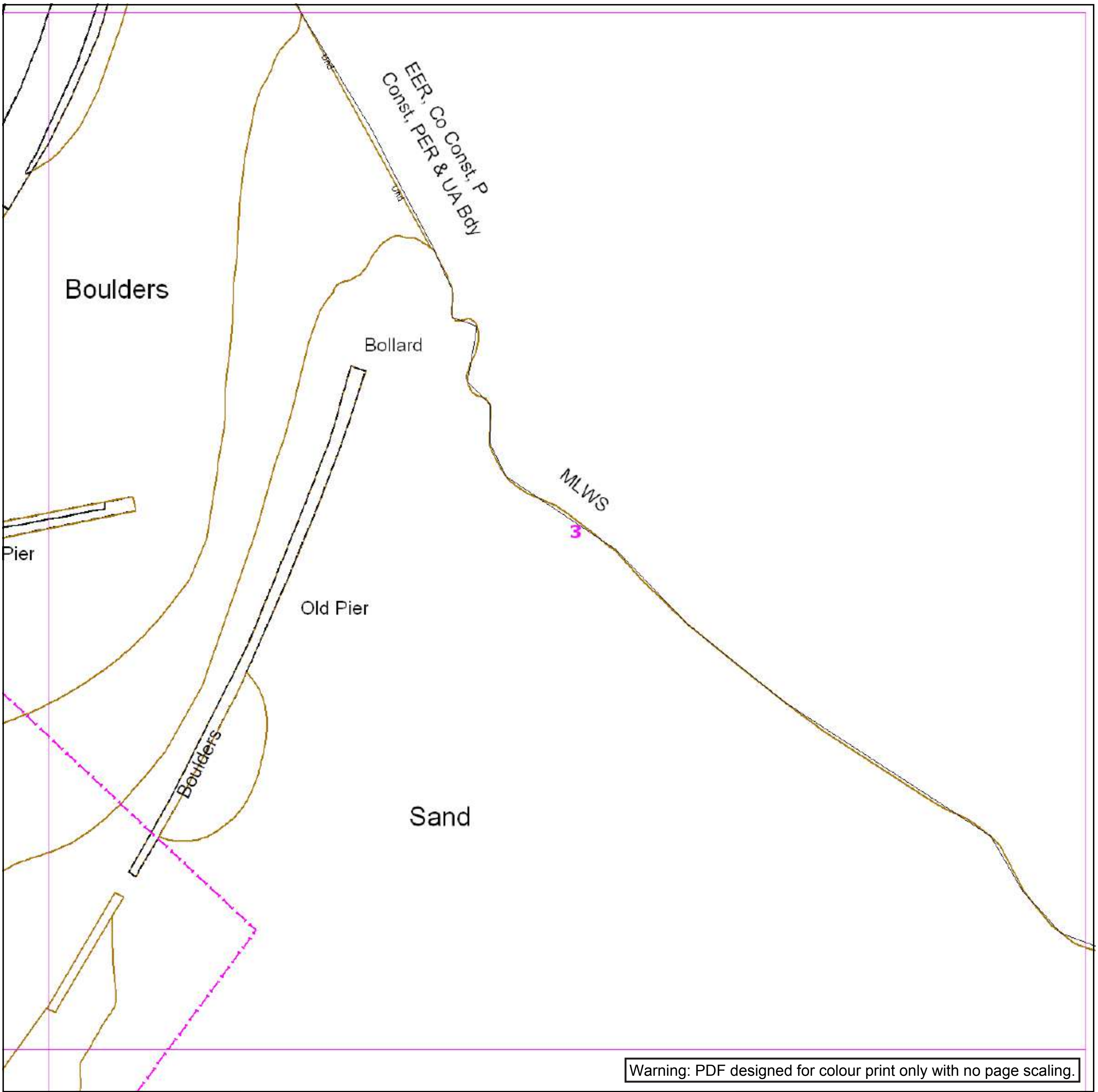

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Low Pressure Mains		Digsite:			
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Intermediate Pressure Mains					
		LAs			
High Pressure Mains		GTs		SSSIs	
Some Examples Of Plant Items					
Valve	Syphon	Depth of Cover	Diameter Change	Material Change	

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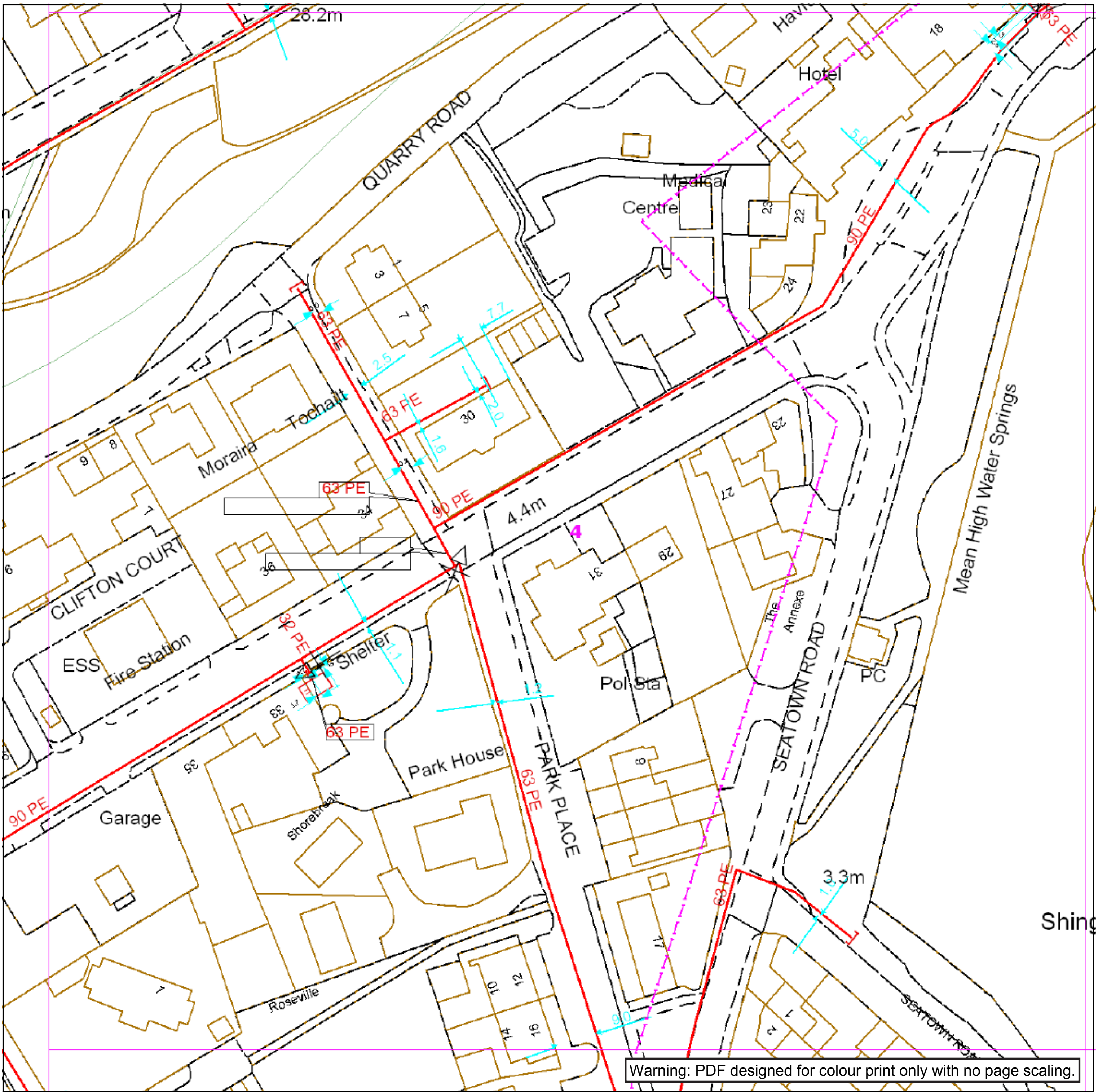

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Low Pressure Mains		Digsite:	
Medium Pressure Mains		Line:	Area:
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Some Examples Of Plant Items

Valve — Syphon — Depth of Cover — Diameter Change — Material Change

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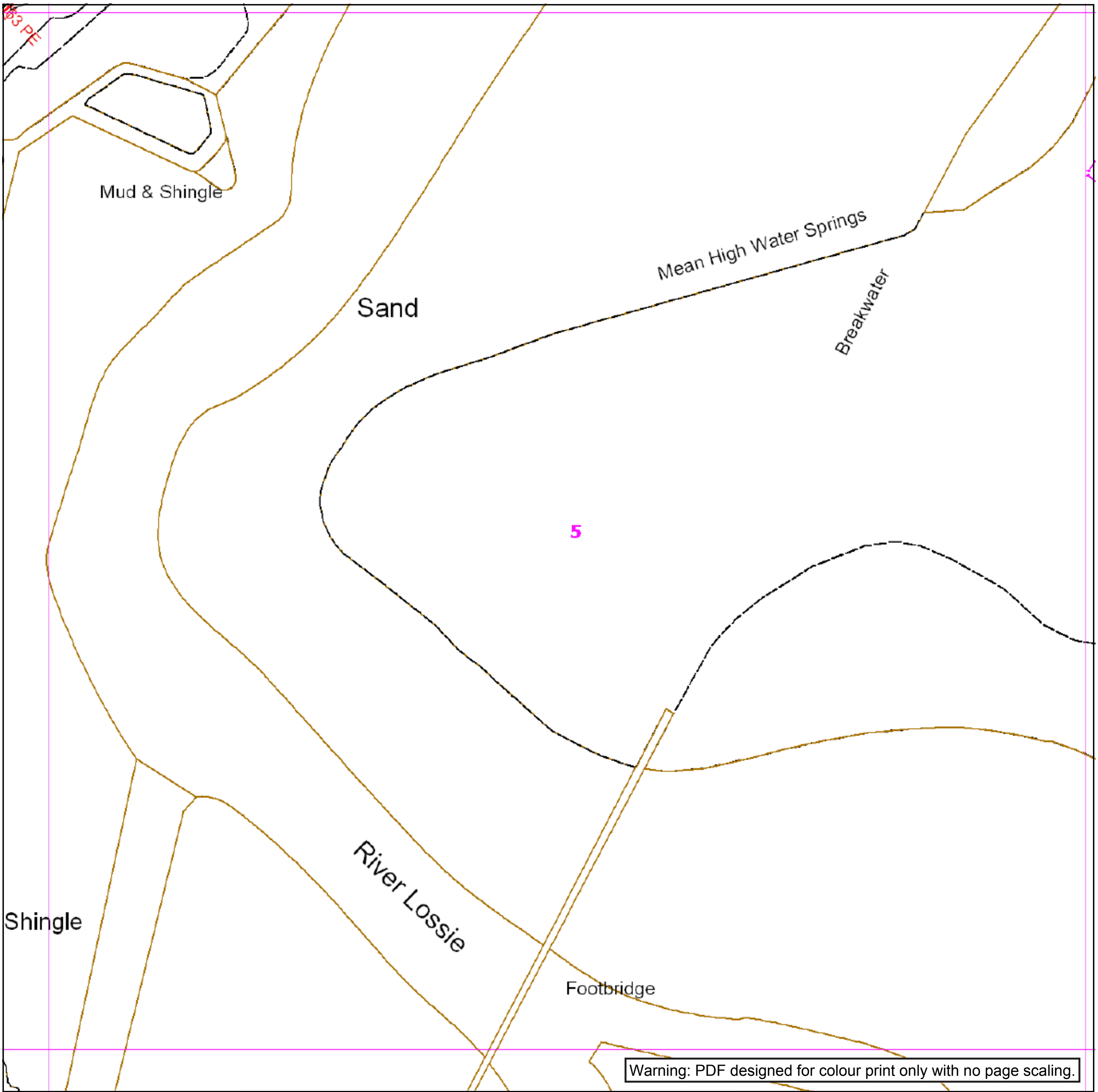

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Low Pressure Mains
Medium Pressure Mains
Intermediate Pressure Mains
High Pressure Mains
Some Examples Of Plant Items
Valve
Syphon
Depth of Cover
Diameter Change
Material Change

Digsite:
Line:
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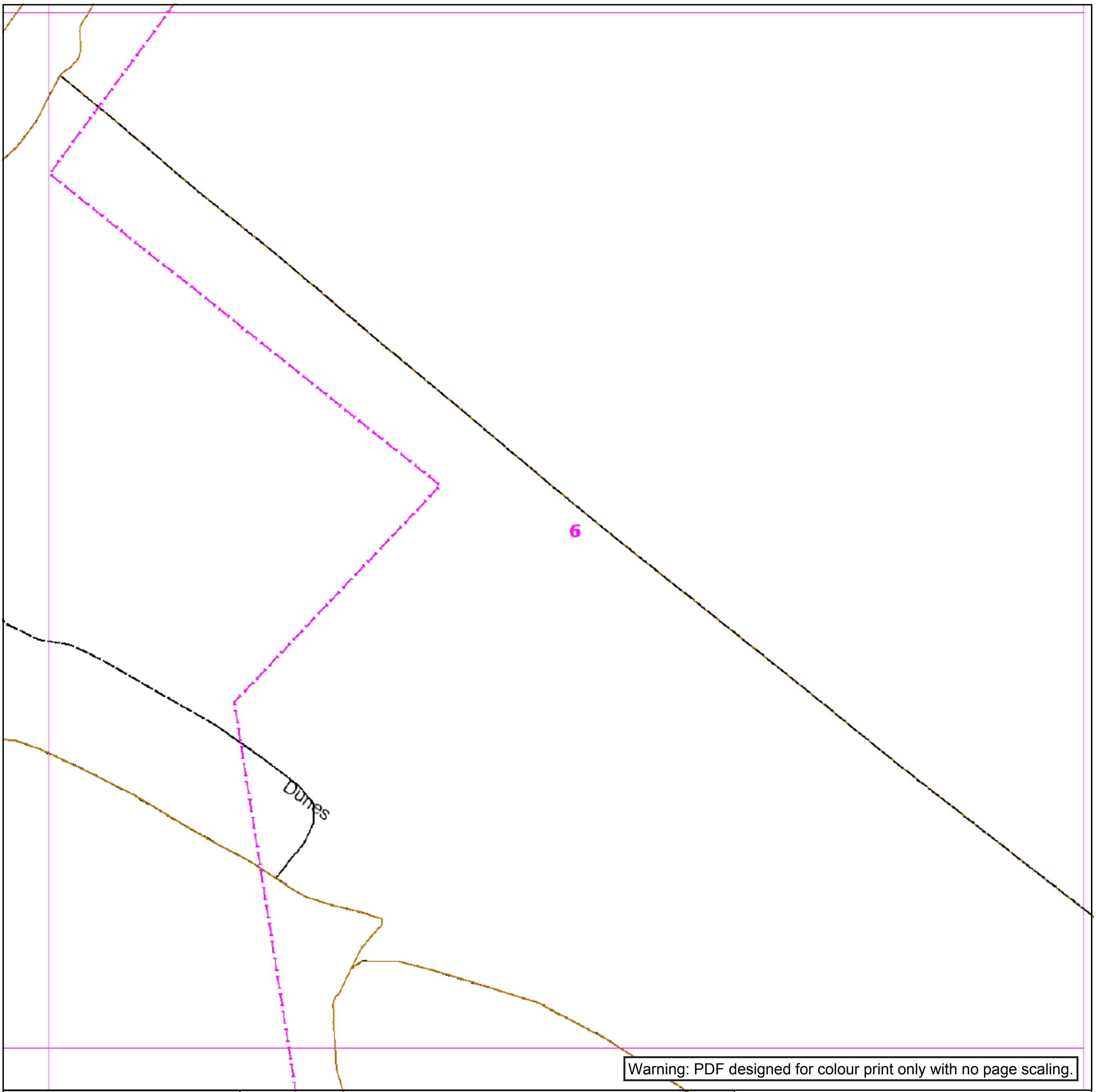

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Low Pressure Mains	Digsite:
Medium Pressure Mains	Line: Area:
Intermediate Pressure Mains	LAs
High Pressure Mains	GTs SSSIs
Some Examples Of Plant Items	
Valve Syphon Depth of Cover	Diameter Change Material Change

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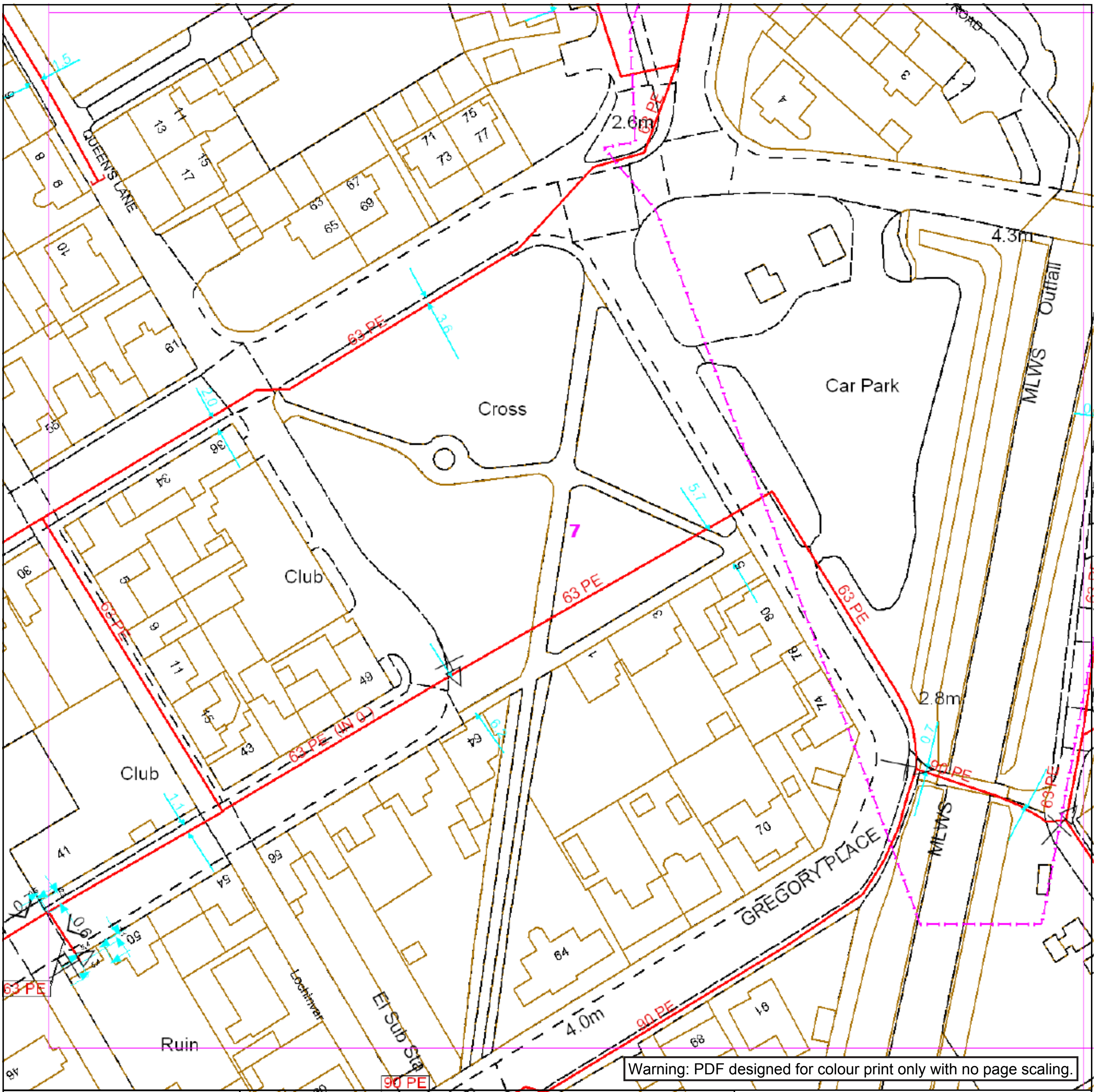

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Low Pressure Mains	Digsite:
Medium Pressure Mains	Line: / Area:
Intermediate Pressure Mains	
High Pressure Mains	LAs
Some Examples Of Plant Items	GTs / SSSIs
Valve / Syphon / Depth of Cover / Diameter Change / Material Change	

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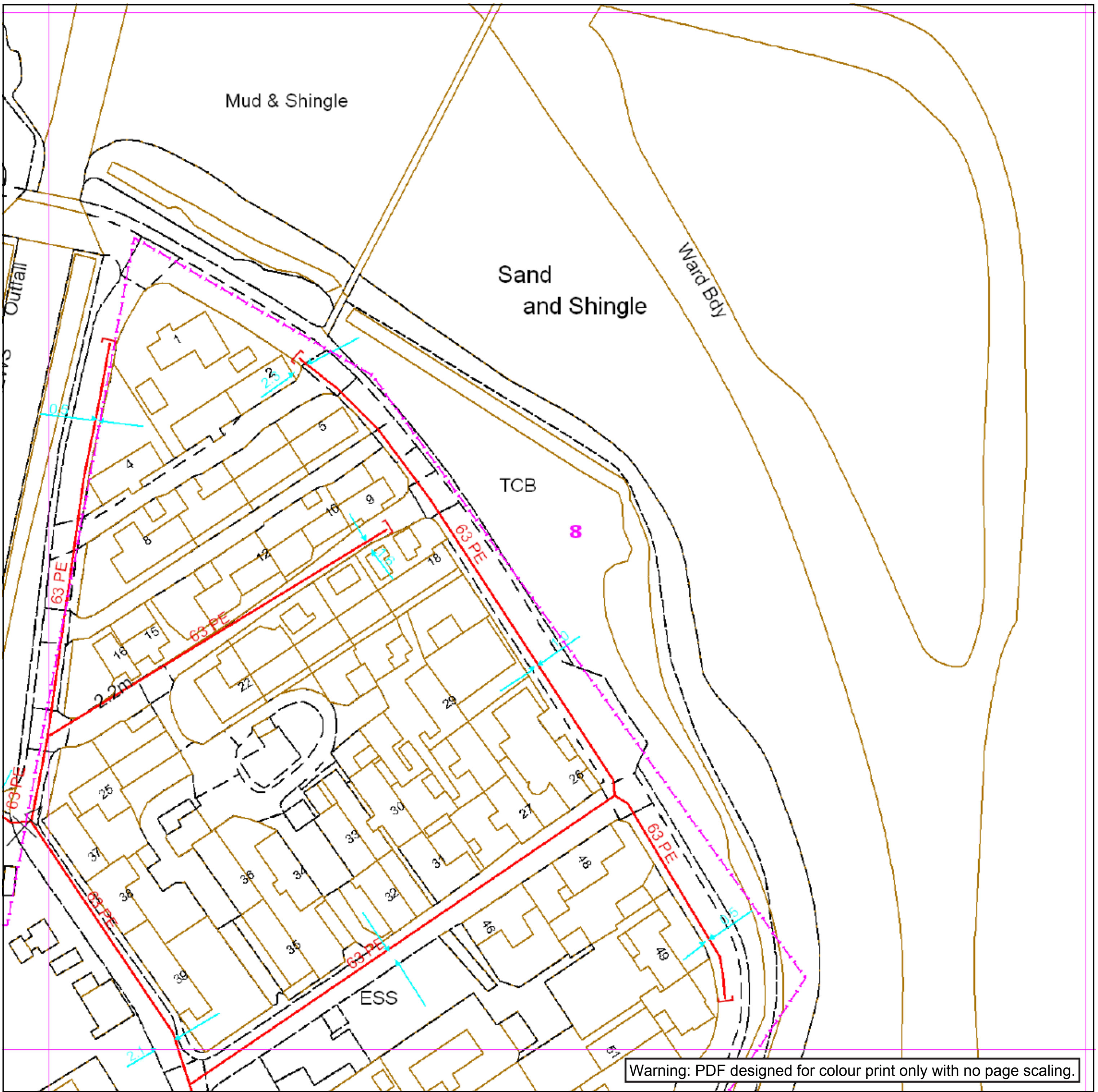

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Low Pressure Mains
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Intermediate Pressure Mains
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Valve · Syphon · Depth of Cover · Diameter Change · Material Change

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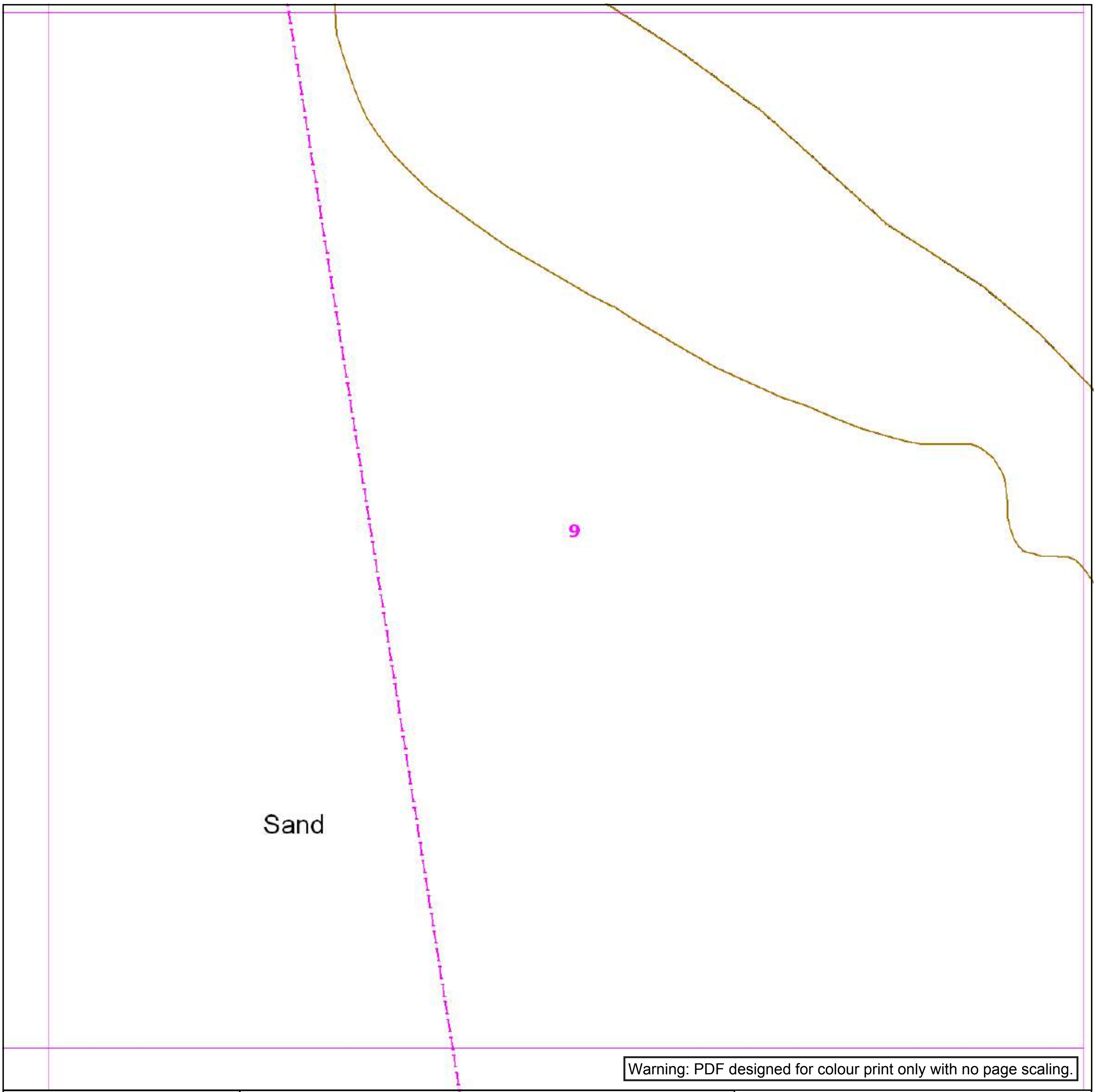

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Some Examples Of Plant Items
Valve | Syphon | Depth of Cover | Diameter Change | Material Change

Digsite:
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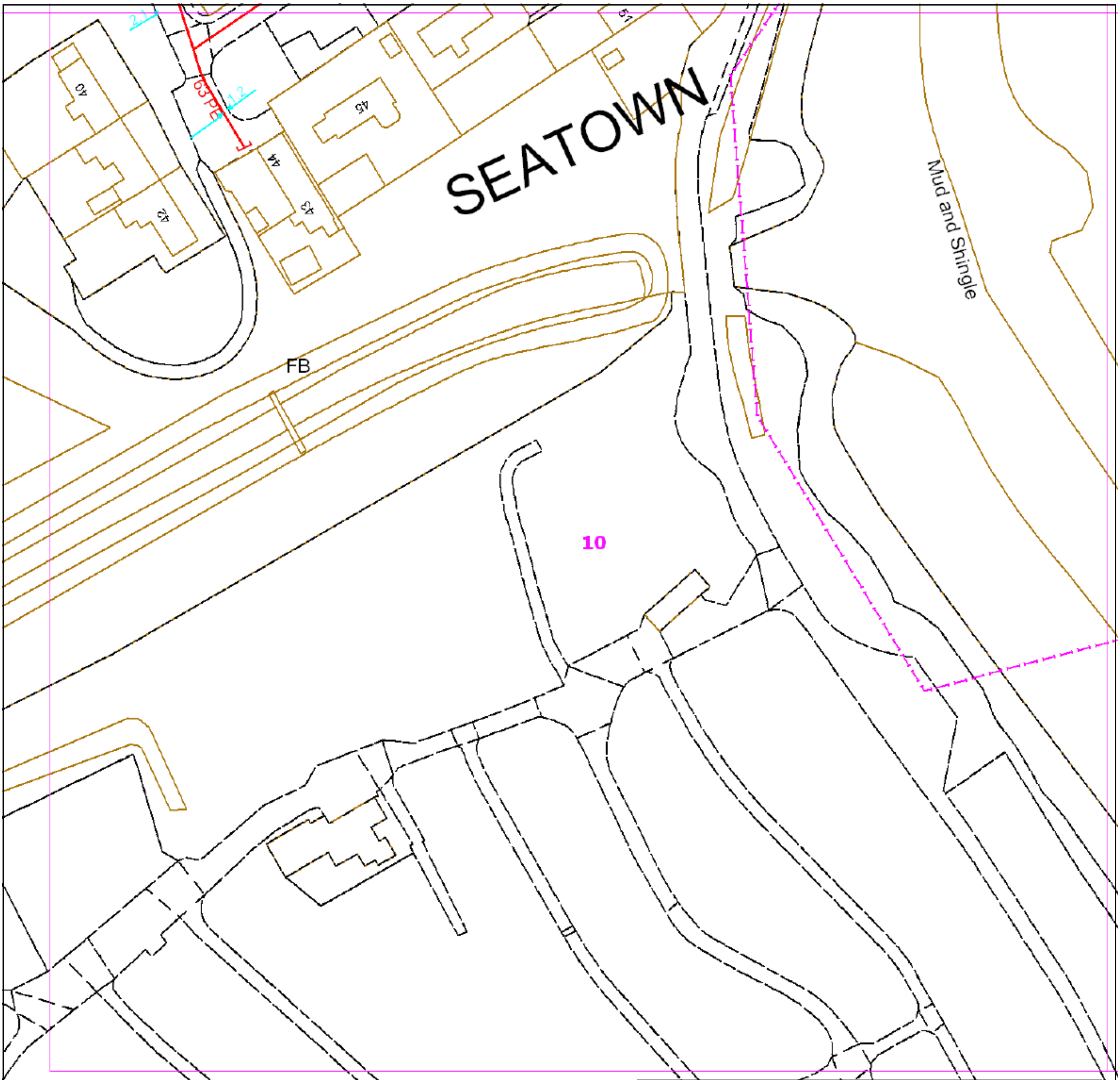

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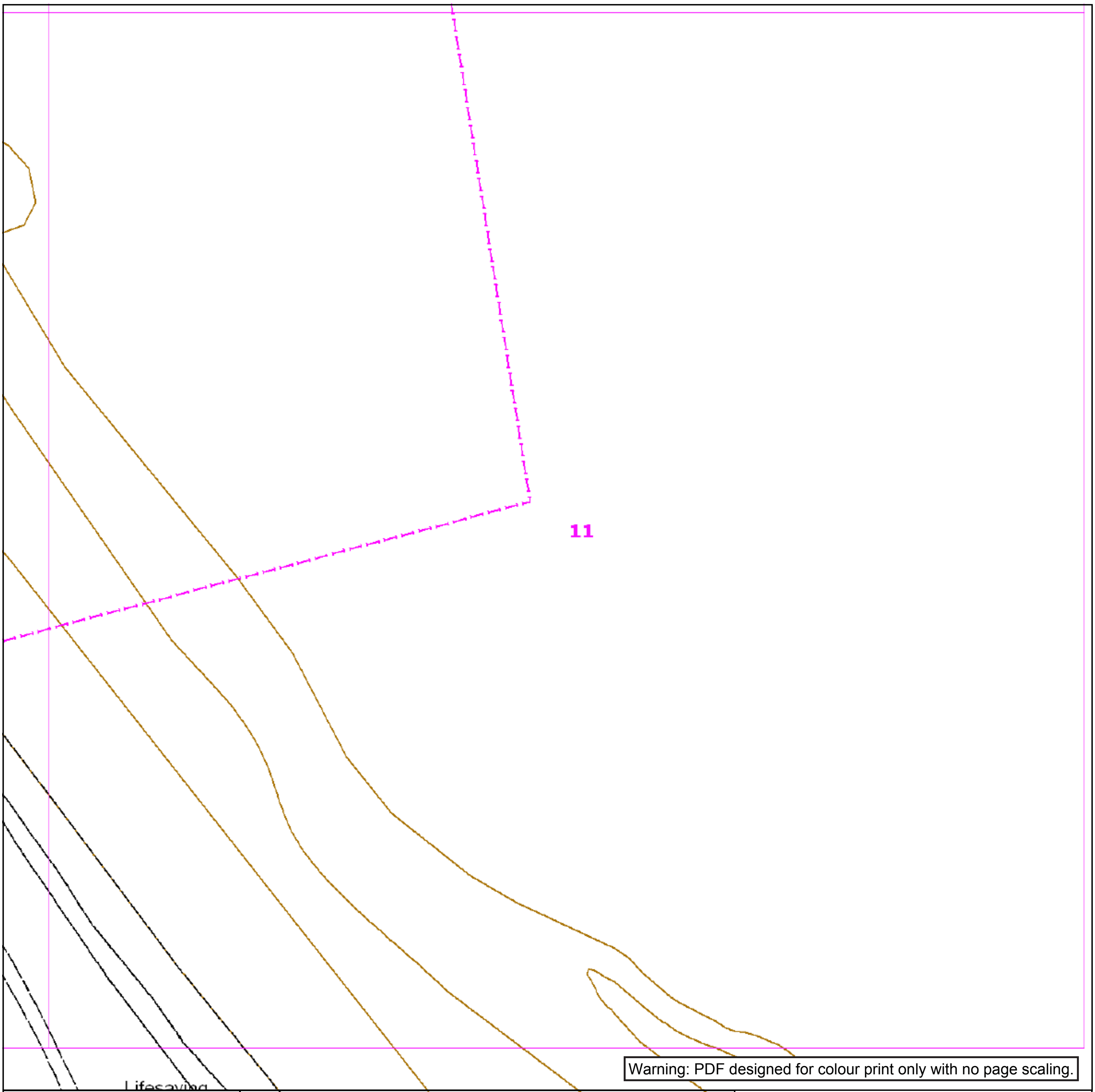

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Material Change

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soiltechnics
environmental ▪ geotechnical ▪ building fabric

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
262408444_1_1

Customer Reference:
STS5161M

National Grid Reference:
323760, 870540

Slice:
A

Site Area (Ha):
0.73

Search Buffer (m):
1000

Site Details:

Lossiemouth

Client Details:

Ms R Brown
Soiltechnics
Cedar Barn
White Lodge
Walgrave
Northampton
NN6 9PY

Landmark INFORMATION GROUP

soiltechnics
environmental ▪ geotechnical ▪ building fabric

Contents

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.
In this datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

Report Version v53.0

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Agency & Hydrological					
BGS Groundwater Flooding Susceptibility	pg 1	Yes	Yes	Yes	n/a
Contaminated Land Register Entries and Notices					
Discharge Consents	pg 4			5	8
Prosecutions Relating to Controlled Waters			n/a	n/a	n/a
Enforcement and Prohibition Notices					
Integrated Pollution Controls					
Integrated Pollution Prevention And Control					
Local Authority Integrated Pollution Prevention And Control					
Local Authority Pollution Prevention and Controls	pg 7		1		
Local Authority Pollution Prevention and Control Enforcements					
Nearest Surface Water Feature		Yes			
Pollution Incidents to Controlled Waters					
Prosecutions Relating to Authorised Processes					
Registered Radioactive Substances	pg 8				1
River Quality					
Substantiated Pollution Incident Register					
Water Abstractions					
Water Industry Act Referrals					
Groundwater Vulnerability	pg 8	Yes	n/a	n/a	n/a
Drift Deposits			n/a	n/a	n/a
Source Protection Zones					
River Flood Data (Scotland)	pg 8		Yes	n/a	n/a
OS Water Network Lines	pg 8	2	5	3	1
Waste					
BGS Recorded Landfill Sites					
Integrated Pollution Control Registered Waste Sites					
Licensed Waste Management Facilities (Landfill Boundaries)					
Licensed Waste Management Facilities (Locations)					
Local Authority Landfill Coverage	pg 10	1	n/a	n/a	n/a
Local Authority Recorded Landfill Sites					
Potentially Infilled Land (Non-Water)	pg 10		2		4
Potentially Infilled Land (Water)	pg 10				1
Registered Landfill Sites					
Registered Waste Transfer Sites					
Registered Waste Treatment or Disposal Sites					

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Hazardous Substances					
Control of Major Accident Hazards Sites (COMAH)					
Explosive Sites					
Notification of Installations Handling Hazardous Substances (NIHHS)					
Planning Hazardous Substance Consents					
Planning Hazardous Substance Enforcements					
Geological					
BGS 1:625,000 Solid Geology	pg 11	Yes	n/a	n/a	n/a
BGS Estimated Soil Chemistry	pg 11	Yes		Yes	Yes
BGS Recorded Mineral Sites	pg 11		4		3
BGS Urban Soil Chemistry					
BGS Urban Soil Chemistry Averages					
CBSCB Compensation District			n/a	n/a	n/a
Coal Mining Affected Areas			n/a	n/a	n/a
Mining Instability			n/a	n/a	n/a
Man-Made Mining Cavities	pg 13				4
Natural Cavities					
Non Coal Mining Areas of Great Britain	pg 13	Yes		n/a	n/a
Potential for Collapsible Ground Stability Hazards	pg 13		Yes	n/a	n/a
Potential for Compressible Ground Stability Hazards	pg 13		Yes	n/a	n/a
Potential for Ground Dissolution Stability Hazards				n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 13	Yes	Yes	n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 14	Yes	Yes	n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards				n/a	n/a
Radon Potential - Radon Affected Areas			n/a	n/a	n/a
Radon Potential - Radon Protection Measures			n/a	n/a	n/a
Industrial Land Use					
Contemporary Trade Directory Entries	pg 15		4	11	11
Fuel Station Entries	pg 17		1	1	
Points of Interest - Commercial Services	pg 17		8	4	3
Points of Interest - Education and Health					
Points of Interest - Manufacturing and Production	pg 18			6	6
Points of Interest - Public Infrastructure	pg 19		7	3	
Points of Interest - Recreational and Environmental	pg 20			1	6
Gas Pipelines					

Summary

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m (*up to 2000m)
Sensitive Land Use					
Ancient Woodland	pg 22				1
Areas of Adopted Green Belt					
Areas of Unadopted Green Belt					
Environmentally Sensitive Areas					
Forest Parks					
Local Nature Reserves					
Marine Nature Reserves					
National Nature Reserves					
National Parks					
National Scenic Areas					
Nitrate Sensitive Areas					
Nitrate Vulnerable Zones	pg 22	1			
Ramsar Sites					
Sites of Special Scientific Interest	pg 22		1		1
Special Areas of Conservation	pg 22				1
Special Protection Areas					
World Heritage Sites					

Map ID	Details		Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NE (E)	0	1	323800 870550
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A13NW (N)	0	1	323755 870550
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A13NW (SW)	0	1	323755 870541
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NW (NW)	0	1	323700 870650
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NW (N)	0	1	323750 870650
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NW (NW)	0	1	323700 870600
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SW (S)	1	1	323755 870400
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A13SW (S)	4	1	323750 870400
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A13NW (NW)	35	1	323650 870650
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NW (N)	35	1	323750 870700
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NW (NW)	37	1	323650 870600
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NW (N)	55	1	323755 870700
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NE (E)	56	1	323900 870541
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NW (W)	64	1	323650 870541
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SE (E)	80	1	323900 870500
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A13NW (N)	85	1	323750 870750
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A13NW (N)	85	1	323700 870750
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A13NW (W)	87	1	323600 870600
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A13SW (SW)	91	1	323650 870450
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NW (N)	98	1	323755 870750
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NE (E)	103	1	323950 870541
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A13SW (SW)	110	1	323650 870350

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding to Occur at Surface	A13SW (S)	115	1	323700 870300
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NE (N)	123	1	323800 870750
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SE (E)	124	1	323950 870500
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NW (N)	143	1	323755 870800
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NW (W)	147	1	323550 870550
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SE (E)	168	1	324000 870500
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding to Occur at Surface	A13SW (SW)	179	1	323600 870300
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NE (N)	210	1	323800 870850
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NW (W)	213	1	323500 870541
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding to Occur at Surface	A13SW (S)	227	1	323650 870200
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13NE (N)	235	1	323850 870850
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SE (E)	236	1	324050 870450
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SW (W)	241	1	323500 870500
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NW (W)	243	1	323450 870550
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding to Occur at Surface	A13SW (SW)	250	1	323550 870250
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A18SE (N)	255	1	323800 870900
	BGS Groundwater Flooding Susceptibility Flooding Type: Limited Potential for Groundwater Flooding to Occur	A13NW (W)	258	1	323450 870541
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SE (SE)	260	1	324050 870400
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A18SE (N)	278	1	323850 870900
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding to Occur at Surface	A13SE (SE)	284	1	324050 870350
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A18SE (N)	302	1	323800 870950
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SE (E)	303	1	324100 870400

Map ID	Details		Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A18SE (N)	303	1	323900 870900
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A13SW (SW)	320	1	323500 870200
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A12SE (W)	325	1	323400 870500
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A13SE (SE)	328	1	324100 870350
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A12SE (W)	341	1	323400 870450
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A8NW (SW)	355	1	323500 870150
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A14SW (SE)	371	1	324150 870350
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A12SE (W)	391	1	323350 870450
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A14SW (SE)	396	1	324150 870300
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A8NW (S)	401	1	323755 870000
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A12SE (SW)	407	1	323350 870300
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A18SE (N)	413	1	323850 871050
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A8NE (S)	413	1	323850 870000
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A14SW (SE)	415	1	324200 870350
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A8NW (S)	415	1	323650 870000
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding to Occur at Surface	A14SW (SE)	420	1	324150 870250
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A8NE (S)	427	1	323900 870000
	BGS Groundwater Flooding Susceptibility Flooding Type:	Potential for Groundwater Flooding of Property Situated Below Ground Level	A8NW (S)	430	1	323600 870000
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A18SW (N)	435	1	323755 871100
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A12SE (W)	437	1	323300 870450
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A14SW (SE)	439	1	324200 870300
	BGS Groundwater Flooding Susceptibility Flooding Type:	Limited Potential for Groundwater Flooding to Occur	A12SE (W)	441	1	323300 870400

Map ID	Details		Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding of Property Situated Below Ground Level	A12SE (SW)	444	1	323350 870200
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding of Property Situated Below Ground Level	A12SE (SW)	445	1	323300 870350
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding of Property Situated Below Ground Level	A8NW (S)	451	1	323750 869950
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding to Occur at Surface	A8NW (S)	455	1	323700 869950
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding of Property Situated Below Ground Level	A14SW (SE)	464	1	324200 870250
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding of Property Situated Below Ground Level	A7NE (SW)	470	1	323350 870150
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding to Occur at Surface	A8NE (SE)	471	1	324000 870000
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding of Property Situated Below Ground Level	A14SW (SE)	483	1	324250 870300
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding of Property Situated Below Ground Level	A18SW (N)	485	1	323755 871150
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Limited Potential for Groundwater Flooding to Occur	A18SW (N)	488	1	323650 871150
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Limited Potential for Groundwater Flooding to Occur	A12SE (W)	491	1	323250 870400
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Limited Potential for Groundwater Flooding to Occur	A12SE (W)	495	1	323250 870350
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding of Property Situated Below Ground Level	A18SE (N)	495	1	323800 871150
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding to Occur at Surface	A8NE (SE)	499	1	324050 870000
	BGS Groundwater Flooding Susceptibility Flooding Type:	 Potential for Groundwater Flooding of Property Situated Below Ground Level	A7NE (SW)	500	1	323350 870100
1	**Discharge Consents** Operator: Property Type: Location: Authority: Catchment Area: Reference: Permit Version: Effective Date: Issued Date: Revocation Date: Discharge Type: Discharge Environment: Receiving Water: **Status:** Positional Accuracy:	 A And H R Adams Not Given Sunbank, DUFFUS Scottish Environment Protection Agency, North Region Lossie L/73/56 Not Supplied Not Supplied 21st January 1974 Not Supplied Septic tank Ditch Ditch Of Spynie Canal **Not Supplied** Located by supplier to within 100m	A18SE (N)	349	2	323800 871000

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
2	**Discharge Consents** Operator: Grampian Regional Council Property Type: Not Given Location: Lossiemouth Sewerage System, Pitgaveny Street Pumping Station Authority: Scottish Environment Protection Agency, North Region Catchment Area: Lossie Reference: L/92/13/C/A Permit Version: Not Supplied Effective Date: Not Supplied Issued Date: 13th August 1992 Revocation Date: Not Supplied Discharge Type: Unknown Discharge Environment: Coastal Receiving Water: Not Supplied **Status: Not Supplied** Positional Accuracy: Located by supplier to within 100m	A18SE (NE)	367	2	323940 870950
2	**Discharge Consents** Operator: Grampian Regional Council Property Type: Not Given Location: Sea Outfall No 2 (Harbour), LOSSIEMOUTH Authority: Scottish Environment Protection Agency, North Region Catchment Area: Lossie Reference: L/93/31/C/X Permit Version: Not Supplied Effective Date: Not Supplied Issued Date: 22nd November 1993 Revocation Date: Not Supplied Discharge Type: Sewage Effluent Discharge Environment: Coastal Receiving Water: Not Supplied **Status: Not Supplied** Positional Accuracy: Located by supplier to within 100m	A18SE (NE)	381	2	323960 870955
2	**Discharge Consents** Operator: Grampian Regional Council Property Type: Not Given Location: Sea Outfall No2 (Harbour), LOSSIEMOUTH Authority: Scottish Environment Protection Agency, North Region Catchment Area: Lossie Reference: L/87/20/D* Permit Version: Not Supplied Effective Date: Not Supplied Issued Date: 15th October 1987 Revocation Date: Not Supplied Discharge Type: Sewage Effluent Discharge Environment: Coastal Receiving Water: Not Supplied **Status: Not Supplied** Positional Accuracy: Located by supplier to within 100m	A18SE (NE)	386	2	323960 870960
2	**Discharge Consents** Operator: Grampian Regional Council Property Type: Not Given Location: Sea Outfall No 2 (Harbour), LOSSIEMOUTH Authority: Scottish Environment Protection Agency, North Region Catchment Area: Lossie Reference: L/92/20/C/R* Permit Version: Not Supplied Effective Date: Not Supplied Issued Date: 26th August 1992 Revocation Date: Not Supplied Discharge Type: Sewage Effluent Discharge Environment: Coastal Receiving Water: Not Supplied **Status: Not Supplied** Positional Accuracy: Located by supplier to within 100m	A18SE (NE)	391	2	323970 870960

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Discharge Consents				
3	Operator: Elgin & Lossiemouth Harbour Co Property Type: Not Given Location: Fishmarket, Lossiemouth Harbour, LOSSIEMOUTH Authority: Scottish Environment Protection Agency, North Region Catchment Area: Lossie Reference: L/90/34/A Permit Version: Not Supplied Effective Date: Not Supplied Issued Date: 23rd January 1991 Revocation Date: Not Supplied Discharge Type: Trade Effluent Discharge Environment: Coastal Receiving Water: Not Supplied **Status: Not Supplied** Positional Accuracy: Located by supplier to within 100m	A18SW (N)	516	2	323730 871180
	Discharge Consents				
4	Operator: Grampian Regional Council Property Type: Not Given Location: Harbour Storm Sewage Overflow, LOSSIEMOUTH Authority: Scottish Environment Protection Agency, North Region Catchment Area: Lossie Reference: L/92/21/C/R* Permit Version: Not Supplied Effective Date: Not Supplied Issued Date: 26th August 1992 Revocation Date: Not Supplied Discharge Type: Storm Sewage Discharge Environment: Coastal Receiving Water: Not Supplied **Status: Not Supplied** Positional Accuracy: Located by supplier to within 100m	A18SE (N)	543	2	323820 871195
	Discharge Consents				
4	Operator: Grampian Regional Council Property Type: Not Given Location: Storm Sewage Overflow (Harbour), LOSSIEMOUTH Authority: Scottish Environment Protection Agency, North Region Catchment Area: Lossie Reference: L/87/21/D* Permit Version: Not Supplied Effective Date: Not Supplied Issued Date: 15th October 1987 Revocation Date: Not Supplied Discharge Type: Storm Sewage Discharge Environment: Coastal Receiving Water: Not Supplied **Status: Not Supplied** Positional Accuracy: Located by supplier to within 100m	A18SE (N)	544	2	323825 871195
	Discharge Consents				
4	Operator: Grampian Regional Council Property Type: Not Given Location: Storm Sewage Overflow (Harbour), LOSSIEMOUTH Authority: Scottish Environment Protection Agency, North Region Catchment Area: Lossie Reference: L/93/30/C/X Permit Version: Not Supplied Effective Date: Not Supplied Issued Date: 22nd November 1993 Revocation Date: Not Supplied Discharge Type: Storm Sewage Discharge Environment: Coastal Receiving Water: Not Supplied **Status: Not Supplied** Positional Accuracy: Located by supplier to within 100m	A18SE (N)	548	2	323820 871200

Map ID	Details		Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Discharge Consents					
5	Operator:	Grampian Regional Council	A18NW (N)	682	2	323550 871330
	Property Type:	Not Given				
	Location:	Lossiemouth Sewerage System, Shore Street Pumping Station				
	Authority:	Scottish Environment Protection Agency, North Region				
	Catchment Area:	Lossie				
	Reference:	L/92/14/C/A				
	Permit Version:	Not Supplied				
	Effective Date:	Not Supplied				
	Issued Date:	13th August 1992				
	Revocation Date:	Not Supplied				
	Discharge Type:	Unknown				
	Discharge Environment:	Coastal				
	Receiving Water:	Not Supplied				
	Status:	**Not Supplied**				
	Positional Accuracy:	Located by supplier to within 100m				
	Discharge Consents					
6	Operator:	Mr & Mrs R Conti	A17SE (NW)	768	2	323150 871200
	Property Type:	Not Given				
	Location:	Rianna Cottage, Shore Street, LOSSIEMOUTH				
	Authority:	Scottish Environment Protection Agency, North Region				
	Catchment Area:	Lossie				
	Reference:	L/89/22				
	Permit Version:	Not Supplied				
	Effective Date:	Not Supplied				
	Issued Date:	23rd November 1989				
	Revocation Date:	Not Supplied				
	Discharge Type:	Septic tank				
	Discharge Environment:	Onto Land				
	Receiving Water:	Not Supplied				
	Status:	**Not Supplied**				
	Positional Accuracy:	Located by supplier to within 100m				
	Discharge Consents					
7	Operator:	A And H R Adams	A17SW (NW)	906	2	322900 871100
	Property Type:	Not Given				
	Location:	Kinneddar, DUFFUS				
	Authority:	Scottish Environment Protection Agency, North Region				
	Catchment Area:	Lossie				
	Reference:	L/73/55				
	Permit Version:	Not Supplied				
	Effective Date:	Not Supplied				
	Issued Date:	21st January 1974				
	Revocation Date:	Not Supplied				
	Discharge Type:	Septic tank				
	Discharge Environment:	Ditch				
	Receiving Water:	Ditch Of Spynie Canal				
	Status:	**Not Supplied**				
	Positional Accuracy:	Located by supplier to within 100m				
	Discharge Consents					
8	Operator:	Mr John Cowe	A17SW (W)	922	2	322800 870900
	Property Type:	Not Given				
	Location:	Freelands, Stotfield, LOSSIEMOUTH				
	Authority:	Scottish Environment Protection Agency, North Region				
	Catchment Area:	Lossie				
	Reference:	L/85/3(CP)				
	Permit Version:	Not Supplied				
	Effective Date:	Not Supplied				
	Issued Date:	22nd January 1985				
	Revocation Date:	Not Supplied				
	Discharge Type:	Septic tank				
	Discharge Environment:	Onto Land				
	Receiving Water:	Not Supplied				
	Status:	**Not Supplied**				
	Positional Accuracy:	Located by supplier to within 100m				
	Local Authority Pollution Prevention and Controls					
9	Name:	Ian Watt Garage Limited	A18SW (NW)	233	2	323608 870879
	Location:	James Square, LOSSIEMOUTH, Morayshire, IV31				
	Authority:	Scottish Environment Protection Agency, North Region				
	Permit Reference:	MOR/WOB/5				
	Dated:	9th December 1993				
	Process Type:	Local Authority Air Pollution Control				
	Description:	PG1/1Waste oil burners, less than 0.4MW net rated thermal input				
	Status:	**Not Supplied**				
	Positional Accuracy:	Manually positioned to the address or location				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Nearest Surface Water Feature	A13SE (SE)	0	-	323803 870511
10	**Registered Radioactive Substances** Name: Grampian Regional Council Location: Lossiemouth Secondary School, Coularbank Road, LOSSIEMOUTH, Morayshire, IV31 6JU Authority: Scottish Environment Protection Agency, Head Office Permit Reference: IPB/3/6/GE/002 Dated: 1st December 1987 Process Type: Registration under S7 RSA for the keeping and use of Radioactive materials (was RSA60 S1) Description: Registration under S7 RSA for 1 or more closed sources **Status:** **Not Given** Positional Accuracy: Unknown	A12SE (W)	552	3	323150 870525
	Groundwater Vulnerability Geological Classification: Inland water or sea Soil Classification: Not classified Map Sheet: Sheet 54 Map Of Scotland Scale: 1:625,000	A13NW (SW)	0	3	323755 870541
	Groundwater Vulnerability Geological Classification: Major or Highly Permeable Aquifer - Highly permeable strata usually with a known or probable presence of significant fracturing Soil Classification: Soils of High Leaching Potential - Soils with little ability to attenuate diffuse source pollutants and in which non-absorbed diffuse source pollutants and liquid discharges will percolate rapidly Map Sheet: Map of Scotland Scale: 1:625,000	A13NW (W)	0	3	323737 870543
	Drift Deposits None				
	River Flood Data (Scotland) Type: Flood Plain Depth 0 -1 Metres Flood Plain Type: 0-1m estimated 100yr flood depth Source: Centre for Ecology and Hydrology	A13SW (S)	2	4	323739 870483
	River Flood Data (Scotland) Type: Flood Plain Depth 0 -1 Metres Flood Plain Type: 0-1m estimated 100yr flood depth Source: Centre for Ecology and Hydrology	A13SW (S)	4	4	323750 870400
	River Flood Data (Scotland) Type: Flood Plain Depth 1 - 2 Metres Flood Plain Type: 1-2m estimated 100yr flood depth Source: Centre for Ecology and Hydrology	A13SW (SW)	41	4	323700 870450
11	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 87.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Lossie Catchment Name: River Lossie Primacy: 1	A13SW (SW)	0	5	323738 870521
12	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 453.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Lossie Catchment Name: River Lossie Primacy: 1	A13SW (SW)	0	5	323728 870528
13	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 156.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Lossie Catchment Name: River Lossie Primacy: 1	A13SE (SE)	1	5	323794 870472

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
14	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 206.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Lossie Catchment Name: River Lossie Primacy: 2	A13SE (SE)	1	5	323794 870472
15	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 397.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Spynie Canal Catchment Name: Moray Coastal Primacy: 1	A13SW (SW)	46	5	323728 870528
16	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 364.7 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Lossie Catchment Name: River Lossie Primacy: 1	A13SE (SE)	127	5	323860 870333
17	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 186.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Moray Coastal Primacy: 1	A13SE (S)	187	5	323807 870222
18	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 2291.4 Watercourse Level: On ground surface Permanent: True Watercourse Name: Spynie Canal Catchment Name: Moray Coastal Primacy: 1	A8NW (S)	283	5	323639 870143
19	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 108.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Lossie Catchment Name: River Lossie Primacy: 2	A8NE (SE)	466	5	324041 870035
20	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 96.5 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Lossie Catchment Name: River Lossie Primacy: 1	A8NE (SE)	466	5	324041 870035
21	**OS Water Network Lines** Watercourse Form: Tidal river Watercourse Length: 579.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: River Lossie Catchment Name: River Lossie Primacy: 1	A9NW (SE)	558	5	324110 869972

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Local Authority Landfill Coverage Name: Moray Council - Has supplied landfill data		0	6	323755 870541
22	**Potentially Infilled Land (Non-Water)** Bearing Ref: NW Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1994	A13NW (NW)	92	-	323635 870730
23	**Potentially Infilled Land (Non-Water)** Bearing Ref: W Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1994	A13NW (W)	204	-	323488 870610
24	**Potentially Infilled Land (Non-Water)** Bearing Ref: W Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1994	A12SE (W)	538	-	323197 870429
25	**Potentially Infilled Land (Non-Water)** Bearing Ref: SW Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1991	A7NE (SW)	783	-	323171 869874
26	**Potentially Infilled Land (Non-Water)** Bearing Ref: NW Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1994	A17SW (NW)	840	-	323008 871145
27	**Potentially Infilled Land (Non-Water)** Bearing Ref: SW Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1991	A7SE (SW)	884	-	323268 869663
28	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1873	A17NE (NW)	780	-	323213 871274

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: New Red Sandstone Supergroup	A13NW (NW)	0	1	323711 870636
	BGS 1:625,000 Solid Geology Description: Upper Old Red Sandstone	A13NW (NW)	0	1	323711 870594
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Sediment Arsenic Concentration: <15 mg/kg Cadmium Concentration: no data Chromium Concentration: 40 - 60 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A13NW (SW)	0	1	323755 870541
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Sediment Arsenic Concentration: no data Cadmium Concentration: no data Chromium Concentration: no data Lead Concentration: <100 mg/kg Nickel Concentration: no data	A13NE (NE)	261	1	323924 870837
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Sediment Arsenic Concentration: <15 mg/kg Cadmium Concentration: no data Chromium Concentration: 40 - 60 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 15 - 30 mg/kg	A17NE (NW)	847	1	323344 871433
29	**BGS Recorded Mineral Sites** Site Name: Lossiemouth Quarries Location: Branderburgh, Lossiemouth, Morayshire Source: British Geological Survey, National Geoscience Information Service Reference: 163397 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Triassic Geology: Lossiemouth Sandstone Formation Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A13NW (NW)	78	1	323620 870690
29	**BGS Recorded Mineral Sites** Site Name: Lossiemouth Quarries Location: Branderburgh, Lossiemouth, Morayshire Source: British Geological Survey, National Geoscience Information Service Reference: 163397 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Triassic Geology: Burghead Sandstone Formation Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A13NW (NW)	78	1	323620 870690

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Recorded Mineral Sites				
30	Site Name: Lossiemouth Quarries Location: Branderburgh, Lossiemouth, Morayshire Source: British Geological Survey, National Geoscience Information Service Reference: 94084 Type: Opencast **Status:** **Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Triassic Geology: Lossiemouth Sandstone Formation Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A13NW (N)	108	1	323723 870771
	BGS Recorded Mineral Sites				
31	Site Name: Lossiemouth Quarries Location: Branderburgh, Lossiemouth, Morayshire Source: British Geological Survey, National Geoscience Information Service Reference: 94050 Type: Opencast **Status:** **Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Triassic Geology: Burghead Sandstone Formation Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A13NW (NW)	143	1	323545 870635
	BGS Recorded Mineral Sites				
32	Site Name: School Brae Location: Lossiemouth, Morayshire Source: British Geological Survey, National Geoscience Information Service Reference: 163723 Type: Opencast **Status:** **Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Triassic Geology: Lossiemouth Sandstone Formation Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A12SE (W)	548	1	323183 870437
	BGS Recorded Mineral Sites				
33	Site Name: Lossiemouth West Location: Stotfield, Lossiemouth, Morayshire Source: British Geological Survey, National Geoscience Information Service Reference: 94083 Type: Opencast **Status:** **Ceased** Operator: Individual'S Name Withheld Operator Location: Not Supplied Periodic Type: Triassic Geology: Lossiemouth Sandstone Formation Commodity: Sandstone Positional Accuracy: Located by supplier to within 10m	A12SE (W)	616	1	323112 870431
	BGS Recorded Mineral Sites				
34	Site Name: Sunbank Shingle Pits Location: Lossiemouth, Morayshire Source: British Geological Survey, National Geoscience Information Service Reference: 163727 Type: Opencast **Status:** **Ceased** Operator: Individual'S Name Withheld Operator Location: Not Supplied Periodic Type: Quaternary Geology: Storm Beach Deposits Commodity: Gravel Positional Accuracy: Located by supplier to within 10m	A7SW (SW)	977	1	323088 869684
	BGS Measured Urban Soil Chemistry No data available				
	BGS Urban Soil Chemistry Averages No data available				
	Coal Mining Affected Areas In an area that might not be affected by coal mining				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Man-Made Mining Cavities Easting: 322900 Northing: 871000 Distance: 861 Quadrant Reference: A17 Quadrant Reference: SW Bearing Ref: NW Cavity Type: Not supplied Commodity: Lead Solid Geology Detail: Permian and Triassic sandstones, Undifferentiated Superficial Geology Detail: No Details	A17SW (NW)	861	7	322900 871000
	Man-Made Mining Cavities Easting: 323000 Northing: 871200 Distance: 880 Quadrant Reference: A17 Quadrant Reference: SW Bearing Ref: NW Cavity Type: Not supplied Commodity: Galena Solid Geology Detail: No Details Superficial Geology Detail: No Details	A17SW (NW)	880	7	323000 871200
	Man-Made Mining Cavities Easting: 322900 Northing: 871100 Distance: 906 Quadrant Reference: A17 Quadrant Reference: SW Bearing Ref: NW Cavity Type: Not supplied Commodity: Lead Solid Geology Detail: Permian and Triassic sandstones, Undifferentiated Superficial Geology Detail: No Details	A17SW (NW)	906	7	322900 871100
	Man-Made Mining Cavities Easting: 322900 Northing: 871100 Distance: 906 Quadrant Reference: A17 Quadrant Reference: SW Bearing Ref: NW Cavity Type: Not supplied Commodity: Lead Solid Geology Detail: Permian and Triassic sandstones, Undifferentiated Superficial Geology Detail: No Details	A17SW (NW)	906	7	322900 871100
	Non Coal Mining Areas of Great Britain Risk: Rare Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	323755 870541
	Potential for Collapsible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	323755 870541
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (NW)	29	1	323667 870676
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	323755 870541
	Potential for Compressible Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (NW)	102	1	323642 870749
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	323755 870541
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	323755 870541
	Potential for Landslide Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (NW)	115	1	323598 870725

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	323755 870541
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NE (NE)	0	1	323826 870590
	Potential for Running Sand Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (W)	0	1	323682 870533
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (NW)	102	1	323642 870749
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	323755 870541
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	323755 870541
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13NW (SW)	0	1	323755 870541

Map ID	Details		Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Contemporary Trade Directory Entries					
35	Name:	R G Stewart Engineering Services	A13SE (S)	97	-	323771 870306
	Location:	31, Seatown, Lossiemouth, Morayshire, IV31 6JJ				
	Classification:	Engineers - General				
	Status:	**Active**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
36	Name:	Dry Cleaning Well	A13NE (N)	133	-	323775 870776
	Location:	1, Clifton Road, Lossiemouth, Morayshire, IV31 6DJ				
	Classification:	Dry Cleaners				
	Status:	**Inactive**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
37	Name:	Lossiemouth Garage	A13SW (W)	210	-	323530 870512
	Location:	35, Clifton Road, Lossiemouth, IV31 6DP				
	Classification:	Garage Services				
	Status:	**Active**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
37	Name:	Sureline Motors	A13SW (W)	255	-	323492 870487
	Location:	37, Clifton Road, Lossiemouth, Morayshire, IV31 6DP				
	Classification:	Garage Services				
	Status:	**Inactive**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
37	Name:	Shoreline Motors	A13SW (W)	255	-	323492 870487
	Location:	37, Clifton Road, Lossiemouth, Morayshire, IV31 6DP				
	Classification:	Car Dealers				
	Status:	**Inactive**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
38	Name:	Ian Watt Garage	A18SW (NW)	234	-	323610 870881
	Location:	James Street, Lossiemouth, Morayshire, IV31 6DD				
	Classification:	Garage Services				
	Status:	**Active**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
39	Name:	Morgans Of Lossiemouth	A13SW (W)	300	-	323448 870471
	Location:	61, Clifton Road, Lossiemouth, Morayshire, IV31 6DP				
	Classification:	Electrical Goods Sales, Manufacturers & Wholesalers				
	Status:	**Active**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
40	Name:	W F Liebnitz Ltd	A12NE (NW)	321	-	323423 870833
	Location:	Parklands, Dunbar Street, Lossiemouth, Morayshire, IV31 6AL				
	Classification:	Electronic Engineers				
	Status:	**Inactive**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
41	Name:	Bill Ellis	A18SW (NW)	346	-	323459 870911
	Location:	24b, Argyle Street, Lossiemouth, Morayshire, IV31 6AX				
	Classification:	Commercial Vehicle Dealers				
	Status:	**Inactive**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
42	Name:	Hendry Fleetwood & Sons Ltd	A18SE (N)	377	-	323797 871030
	Location:	Baker Street, Lossiemouth, Morayshire, IV31 6NZ				
	Classification:	Marine Engineers				
	Status:	**Inactive**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
42	Name:	Frith Heating Ltd	A18SE (N)	412	-	323786 871069
	Location:	13, High Street, Lossiemouth, Morayshire, IV31 6PH				
	Classification:	Boilers - Servicing, Replacements & Repairs				
	Status:	**Active**				
	Positional Accuracy:	Automatically positioned to the address				
	Contemporary Trade Directory Entries					
43	Name:	Bill Ellis	A18SW (NW)	378	-	323472 870965
	Location:	24, Argyle Street, Lossiemouth, Morayshire, IV31 6AX				
	Classification:	Commercial Vehicle Dealers				
	Status:	**Inactive**				
	Positional Accuracy:	Automatically positioned to the address				

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
44	**Contemporary Trade Directory Entries** Name: Chipsaway Location: 37, Queen Street, Lossiemouth, Morayshire, IV31 6PR Classification: Car Body Repairs **Status:** **Inactive** Positional Accuracy: Automatically positioned to the address	A18SW (NW)	403	-	323518 871023
45	**Contemporary Trade Directory Entries** Name: Lossie Location: 5, High Street, Lossiemouth, Morayshire, IV31 6PF Classification: Printers **Status:** **Inactive** Positional Accuracy: Automatically positioned to the address	A18SE (N)	482	-	323818 871132
46	**Contemporary Trade Directory Entries** Name: Harbour Service Station Ltd Location: 5, Shore Street, Lossiemouth, Morayshire, IV31 6PB Classification: Car Dealers - Used **Status:** **Active** Positional Accuracy: Manually positioned to the address or location	A18SW (N)	493	-	323746 871156
47	**Contemporary Trade Directory Entries** Name: Morscot Utilities Location: 57, Queen Street, Lossiemouth, IV31 6PY Classification: Electricity Companies **Status:** **Inactive** Positional Accuracy: Automatically positioned to the address	A17SE (NW)	506	-	323378 871054
48	**Contemporary Trade Directory Entries** Name: Elgin Express Location: 2, Argyle Street, Lossiemouth, Morayshire, IV31 6PS Classification: Dry Cleaners **Status:** **Inactive** Positional Accuracy: Automatically positioned to the address	A18SW (N)	508	-	323510 871136
49	**Contemporary Trade Directory Entries** Name: Elgin & Lossiemouth Harbour Co Location: Lossiemouth Marina,Shore St, Lossiemouth, Morayshire, IV31 6PB Classification: Ports, Docks & Harbours **Status:** **Inactive** Positional Accuracy: Manually positioned within the geographical locality	A18NW (N)	567	-	323545 871210
49	**Contemporary Trade Directory Entries** Name: Ace Tuning Location: Shore Street, Lossiemouth, IV31 6PB Classification: Garage Services **Status:** **Inactive** Positional Accuracy: Automatically positioned to the address	A18NW (N)	588	-	323556 871235
49	**Contemporary Trade Directory Entries** Name: Nor-Coat Location: Shore St, Lossiemouth, Morayshire, IV31 6PB Classification: Floorcoverings - Manufacturers & Wholesalers **Status:** **Inactive** Positional Accuracy: Automatically positioned to the address	A18NW (N)	592	-	323538 871234
49	**Contemporary Trade Directory Entries** Name: Shoreline Motors Location: Shore St, Lossiemouth, Morayshire, IV31 6PB Classification: Garage Services **Status:** **Inactive** Positional Accuracy: Automatically positioned to the address	A18NW (N)	592	-	323538 871234
49	**Contemporary Trade Directory Entries** Name: Lossie Pre-Cast Location: Shore Street, Lossiemouth, Morayshire, IV31 6PB Classification: Concrete Products **Status:** **Inactive** Positional Accuracy: Automatically positioned to the address	A18NW (N)	607	-	323515 871243
50	**Contemporary Trade Directory Entries** Name: L D L Location: 90, Queen Street, Lossiemouth, Morayshire, IV31 6PY Classification: Medical & Dental Laboratories **Status:** **Active** Positional Accuracy: Automatically positioned to the address	A17SE (NW)	572	-	323325 871096
51	**Contemporary Trade Directory Entries** Name: Mcandie Garage Services Location: Unit 13, Shore Street, Lossiemouth, IV31 6PB Classification: Garage Services **Status:** **Active** Positional Accuracy: Automatically positioned to the address	A18NW (NW)	654	-	323433 871262

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
52	**Contemporary Trade Directory Entries** Name: Netdatatel Location: Skerryview, Dunbar Street, Lossiemouth, IV31 6RD Classification: Telecommunications Equipment & Systems **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A12NW (W)	686	-	323007 870736
53	**Contemporary Trade Directory Entries** Name: Lossie Sails Location: Kinvara, Dunbar Street, Lossiemouth, Morayshire, IV31 6RD Classification: Sailmakers & Repairers **Status: Active** Positional Accuracy: Automatically positioned to the address	A12NW (W)	772	-	322916 870620
54	**Fuel Station Entries** Name: Ian Watt Garage Location: The Square , , Lossiemouth, Moray, IV31 6DD Brand: GLEANER Premises Type: Petrol Station **Status: Open** Positional Accuracy: Manually positioned to the address or location	A18SW (NW)	234	-	323610 870881
55	**Fuel Station Entries** Name: Harbour Service Station Location: 5, Shore Street , , Lossiemouth, Moray, IV31 6PB Brand: Gleaner Premises Type: Petrol Station **Status: Open** Positional Accuracy: Manually positioned to the address or location	A18SW (N)	492	-	323733 871156
56	**Points of Interest - Commercial Services** Name: Lossiemouth Garage Location: 35 Clifton Road, Lossiemouth, IV31 6DP Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A13SW (W)	210	8	323530 870512
56	**Points of Interest - Commercial Services** Name: Lossiemouth Garage Location: 35 Clifton Road, Lossiemouth, IV31 6DP Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A13SW (W)	211	8	323529 870512
57	**Points of Interest - Commercial Services** Name: Car Wash Location: James Street, Lossiemouth, IV31 6DD Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A18SW (NW)	234	8	323610 870881
57	**Points of Interest - Commercial Services** Name: Ian Watt Garage Location: James Street, Lossiemouth, Morayshire, IV31 6DD Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A18SW (NW)	234	8	323610 870881
57	**Points of Interest - Commercial Services** Name: Ian Watt Garage Location: James Street, Lossiemouth, IV31 6DD Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A18SW (NW)	234	8	323610 870881
57	**Points of Interest - Commercial Services** Name: Ian Watt Location: James Street, Lossiemouth, IV31 6DD Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A18SW (NW)	234	8	323610 870881
57	**Points of Interest - Commercial Services** Name: Ian Watt Garage Location: James Street, Lossiemouth, IV31 6DD Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A18SW (NW)	234	8	323610 870880

Industrial Land Use

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
57	**Points of Interest - Commercial Services** Name: Ian Watt Garage Location: James Street, Lossiemouth, IV31 6DD Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A18SW (NW)	234	8	323610 870881
58	**Points of Interest - Commercial Services** Name: Chipsaway Location: 37 Queen Street, Lossiemouth, IV31 6PR Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A18SW (NW)	403	8	323518 871023
58	**Points of Interest - Commercial Services** Name: Chipsaway Ltd Location: 37 Queen Street, Lossiemouth, IV31 6PR Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A18SW (NW)	403	8	323518 871023
59	**Points of Interest - Commercial Services** Name: Harbour Service Station Location: 5 Shore Street, Lossiemouth, Morayshire, IV31 6PB Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A18SW (N)	492	8	323733 871156
59	**Points of Interest - Commercial Services** Name: Car Wash Location: 5 Shore Street, Lossiemouth, IV31 6PB Category: Personal, Consumer and other Services Class Code: Vehicle Cleaning Services Positional Accuracy: Positioned to address or location	A18SW (N)	492	8	323733 871156
60	**Points of Interest - Commercial Services** Name: Ace Tuning Location: Shore Street, Lossiemouth, IV31 6PB Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A18NW (N)	589	8	323555 871236
61	**Points of Interest - Commercial Services** Name: McAndie Garage Services Location: 13 Shore Street, Lossiemouth, Morayshire, IV31 6PB Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A18NW (NW)	654	8	323434 871262
61	**Points of Interest - Commercial Services** Name: Ace Tuning Location: Commerce Street, Lossiemouth, IV31 6QH Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A17NE (NW)	683	8	323385 871270
62	**Points of Interest - Manufacturing and Production** Name: Works Location: IV31 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A18SE (N)	377	8	323800 871029
62	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A18SE (N)	378	8	323800 871030
62	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A18SE (N)	387	8	323822 871033
62	**Points of Interest - Manufacturing and Production** Name: Works Location: IV31 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A18SE (N)	387	8	323824 871032

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
63	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A18SE (N)	482	8	323821 871132
63	**Points of Interest - Manufacturing and Production** Name: Works Location: IV31 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A18SE (N)	482	8	323822 871132
64	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A18NW (N)	555	8	323637 871216
64	**Points of Interest - Manufacturing and Production** Name: Works Location: IV31 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A18NW (N)	558	8	323628 871218
65	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A18NW (NW)	619	8	323445 871228
65	**Points of Interest - Manufacturing and Production** Name: Works Location: IV31 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to address or location	A18NW (NW)	621	8	323447 871232
65	**Points of Interest - Manufacturing and Production** Name: Works Location: Not Supplied Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A17NE (NW)	632	8	323423 871233
65	**Points of Interest - Manufacturing and Production** Name: Works Location: IV31 Category: Industrial Features Class Code: Unspecified Works Or Factories Positional Accuracy: Positioned to an adjacent address or location	A17NE (NW)	632	8	323423 871233
66	**Points of Interest - Public Infrastructure** Name: Outfall Location: IV31 Category: Infrastructure and Facilities Class Code: Waste Storage, Processing and Disposal Positional Accuracy: Positioned to an adjacent address or location	A13SW (SW)	48	8	323693 870414
66	**Points of Interest - Public Infrastructure** Name: Outfall Location: IV31 Category: Infrastructure and Facilities Class Code: Waste Storage, Processing and Disposal Positional Accuracy: Positioned to an adjacent address or location	A13SW (SW)	53	8	323689 870404
67	**Points of Interest - Public Infrastructure** Name: Lossiemouth Police Station Location: Police Station 31a, Clifton Road, Lossiemouth, IV31 6DJ Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A13NW (W)	133	8	323601 870550
67	**Points of Interest - Public Infrastructure** Name: Lossiemouth Police Station Location: Clifton Rd, Lossiemouth, Morayshire, IV31 6DJ Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A13NW (W)	134	8	323600 870550

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
67	**Points of Interest - Public Infrastructure** Name: Lossiemouth Police Station Location: Clifton Road, Lossiemouth, Morayshire, IV31 6DJ Category: Central and Local Government Class Code: Police Stations Positional Accuracy: Positioned to address or location	A13NW (W)	134	8	323600 870550
67	**Points of Interest - Public Infrastructure** Name: Lossiemouth Fire Station Location: Clifton Road, Lossiemouth, IV31 6DP Category: Central and Local Government Class Code: Fire Brigade Stations Positional Accuracy: Positioned to address or location	A13NW (W)	204	8	323517 870540
68	**Points of Interest - Public Infrastructure** Name: Ian Watt Garage Location: James Street, Lossiemouth, Morayshire, IV31 6DD Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A18SW (NW)	234	8	323610 870881
69	**Points of Interest - Public Infrastructure** Name: Harbour Service Station Ltd Location: 5 Shore Street, Lossiemouth, IV31 6PB Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A18SW (N)	491	8	323732 871155
69	**Points of Interest - Public Infrastructure** Name: Harbour Service Station Location: 5 Shore Street, Lossiemouth, Morayshire, IV31 6PB Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A18SW (N)	492	8	323733 871156
69	**Points of Interest - Public Infrastructure** Name: Harbour Service Station Location: 5 Shore Street, Lossiemouth, IV31 6PB Category: Road And Rail Class Code: Petrol and Fuel Stations Positional Accuracy: Positioned to address or location	A18SW (N)	493	8	323746 871156
70	**Points of Interest - Recreational and Environmental** Name: Play Area Location: IV31 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A18SE (N)	327	8	323875 870942
71	**Points of Interest - Recreational and Environmental** Name: Play Area Location: Inchbroom Avenue, IV31 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to address or location	A8NW (SW)	565	8	323465 869916
71	**Points of Interest - Recreational and Environmental** Name: Play Area Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A8NW (SW)	577	8	323458 869906
72	**Points of Interest - Recreational and Environmental** Name: Playground Location: Coulardbank Road, IV31 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to address or location	A12SE (SW)	636	8	323130 870233
72	**Points of Interest - Recreational and Environmental** Name: Playground Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A12SE (SW)	647	8	323114 870250
73	**Points of Interest - Recreational and Environmental** Name: Playground Location: Not Supplied Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A17SE (NW)	728	8	323217 871208

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Points of Interest - Recreational and Environmental				
73	Name: Playground Location: Commerce Street, IV31 Category: Recreational Class Code: Playgrounds Positional Accuracy: Positioned to an adjacent address or location	A17SE (NW)	744	8	323185 871201

Map ID	Details		Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Ancient Woodland					
74	Name:	Not Supplied	A7SE (SW)	697	9	323373 869818
	Reference:	8404				
	Area(m²):	52804.58				
	Type:	Long-Established Woodland of Plantation Origin				
	Nitrate Vulnerable Zones					
75	Name:	Aberdeenshire, Banff, Buchan And Moray	A13NW (SW)	0	10	323755 870541
	Description:	Polluted Water				
	Source:	Scottish Government				
	Sites of Special Scientific Interest					
76	Name:	Lossiemouth East Quarry	A13NW (NW)	52	9	323656 870697
	Multiple Areas:	N				
	Total Area (m2):	12288.95				
	Source:	Scottish Natural Heritage				
	Reference:	1100				
	Designation Details:	Geological				
	Designation Date:	8th April 1987				
	Date Type:	Designated				
	Sites of Special Scientific Interest					
77	Name:	Lossiemouth Shore	A17SW (NW)	851	9	322920 871026
	Multiple Areas:	Y				
	Total Area (m2):	69030.26999999999				
	Source:	Scottish Natural Heritage				
	Reference:	1101				
	Designation Details:	Geological				
	Designation Date:	16th January 1989				
	Date Type:	Designated				
	Special Areas of Conservation					
78	Name:	Moray Firth	A18NE (N)	633	9	323816 871287
	Multiple Areas:	Y				
	Total Area (m2):	1512783523.43				
	Source:	Scottish Natural Heritage				
	Reference:	8327				
	Status:	**Designated**				

Agency & Hydrological	Version	Update Cycle
Contaminated Land Register Entries and Notices		
Scottish Environment Protection Agency - Head Office	June 2020	Annually
Moray Council	November 2013	Annual Rolling Update
Discharge Consents		
Scottish Environment Protection Agency - North Region	February 1998	Not Applicable
Enforcement and Prohibition Notices		
Scottish Environment Protection Agency - North Region	January 2012	Not Applicable
Integrated Pollution Controls		
Scottish Environment Protection Agency - Head Office	February 1998	Variable
Scottish Environment Protection Agency - North Region	March 2002	Variable
Local Authority Pollution Prevention and Controls		
Scottish Environment Protection Agency - North Region	March 2002	Not Applicable
Local Authority Pollution Prevention and Control Enforcements		
Scottish Environment Protection Agency - North Region	June 2001	Variable
Nearest Surface Water Feature		
Ordnance Survey	August 2020	
Prosecutions Relating to Authorised Processes		
Scottish Environment Protection Agency - North Region	March 2007	Not Applicable
Prosecutions Relating to Controlled Waters		
Scottish Environment Protection Agency - North Region	March 2007	Annual Rolling Update
Registered Radioactive Substances		
Scottish Environment Protection Agency - North Region	February 1998	Not Applicable
Scottish Environment Protection Agency - Head Office	January 1998	Not Applicable
River Quality		
Scottish Environment Protection Agency - Head Office	December 1990	Not Applicable
Scottish Environment Protection Agency - North Region	December 1990	Not Applicable
Water Abstractions		
Scottish Government - Agriculture, Environment and Fisheries Department	December 1997	Not Applicable
Water Industry Act Referrals		
Scottish Environment Protection Agency - North Region	April 1996	As Designated
Groundwater Vulnerability		
Scottish Environment Protection Agency - Head Office	December 1995	Not Applicable
Scottish Environment Protection Agency - North Region	December 1995	Not Applicable
Drift Deposits		
Scottish Environment Protection Agency - Head Office	December 1995	Not Applicable
Scottish Environment Protection Agency - North Region	December 1995	Not Applicable
River Flood Data (Scotland)		
Centre for Ecology and Hydrology	September 1999	Not Applicable
OS Water Network Lines		
Ordnance Survey	June 2020	Quarterly
BGS Groundwater Flooding Susceptibility		
British Geological Survey - National Geoscience Information Service	May 2013	Annually

Waste	Version	Update Cycle
BGS Recorded Landfill Sites		
British Geological Survey - National Geoscience Information Service	June 1996	Not Applicable
Integrated Pollution Control Registered Waste Sites		
Scottish Environment Protection Agency - North Region	February 1998	Not Applicable
Scottish Environment Protection Agency - Head Office	January 1998	Not Applicable
Local Authority Landfill Coverage		
Moray Council	May 2000	Not Applicable
Local Authority Recorded Landfill Sites		
Moray Council	May 2000	Not Applicable
Potentially Infilled Land (Non-Water)		
Landmark Information Group Limited	December 1999	Not Applicable
Potentially Infilled Land (Water)		
Landmark Information Group Limited	December 1999	Not Applicable
Registered Landfill Sites		
Scottish Environment Protection Agency - Head Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Aberdeen Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Elgin Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Fort William Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Fraserburgh Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Orkney Islands Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Shetland Islands Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Thurso Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Western Isles Office	December 2005	Not Applicable
Registered Waste Transfer Sites		
Scottish Environment Protection Agency - Head Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Aberdeen Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Elgin Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Fort William Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Fraserburgh Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Orkney Islands Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Shetland Islands Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Thurso Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Western Isles Office	December 2005	Not Applicable
Registered Waste Treatment or Disposal Sites		
Scottish Environment Protection Agency - Head Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Aberdeen Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Elgin Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Fort William Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Fraserburgh Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Orkney Islands Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Shetland Islands Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Thurso Office	December 2005	Not Applicable
Scottish Environment Protection Agency - North Region - Western Isles Office	December 2005	Not Applicable

Hazardous Substances	Version	Update Cycle
Control of Major Accident Hazards Sites (COMAH) Health and Safety Executive	April 2018	Bi-Annually
Explosive Sites Health and Safety Executive	March 2017	Annually
Notification of Installations Handling Hazardous Substances (NIHHS) Health and Safety Executive	November 2000	Not Applicable
Planning Hazardous Substance Enforcements Moray Council - Planning Department	February 2016	Variable
Planning Hazardous Substance Consents Moray Council - Planning Department	February 2016	Variable

Geological	Version	Update Cycle
BGS 1:625,000 Solid Geology British Geological Survey - National Geoscience Information Service	January 2009	Not Applicable
BGS Estimated Soil Chemistry British Geological Survey - National Geoscience Information Service	October 2015	Annually
BGS Recorded Mineral Sites British Geological Survey - National Geoscience Information Service	June 2020	Bi-Annually
CBSCB Compensation District Cheshire Brine Subsidence Compensation Board (CBSCB)	August 2011	Not Applicable
Coal Mining Affected Areas The Coal Authority - Property Searches	March 2014	Annual Rolling Update
Mining Instability Ove Arup & Partners	October 2000	Not Applicable
Non Coal Mining Areas of Great Britain British Geological Survey - National Geoscience Information Service	May 2015	Not Applicable
Potential for Collapsible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	April 2020	Annually
Potential for Compressible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Potential for Ground Dissolution Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Potential for Landslide Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Potential for Running Sand Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Potential for Shrinking or Swelling Clay Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	Annually
Radon Potential - Radon Affected Areas British Geological Survey - National Geoscience Information Service	July 2011	Annually
Radon Potential - Radon Protection Measures British Geological Survey - National Geoscience Information Service	July 2011	Annually

Industrial Land Use	Version	Update Cycle
Contemporary Trade Directory Entries Thomson Directories	July 2020	Quarterly
Fuel Station Entries Catalist Ltd - Experian	September 2020	Quarterly
Gas Pipelines National Grid	September 2020	
Points of Interest - Commercial Services PointX	September 2020	Quarterly
Points of Interest - Education and Health PointX	September 2020	Quarterly
Points of Interest - Manufacturing and Production PointX	September 2020	Quarterly
Points of Interest - Public Infrastructure PointX	September 2020	Quarterly
Points of Interest - Recreational and Environmental PointX	September 2020	Quarterly

Sensitive Land Use	Version	Update Cycle
Ancient Woodland Scottish Natural Heritage	July 2014	Bi-Annually
Areas of Adopted Green Belt Moray Council	June 2020	As notified
Areas of Unadopted Green Belt Moray Council	June 2020	As notified
Environmentally Sensitive Areas Scottish Government	January 2017	
Forest Parks Forestry Commission	April 1997	Not Applicable
Local Nature Reserves Moray Council	February 2018	Bi-Annually
Marine Nature Reserves Scottish Natural Heritage	July 2019	Bi-Annually
National Nature Reserves Scottish Natural Heritage	June 2018	Bi-Annually
National Parks Scottish Government	December 2013	Bi-Annually
National Scenic Areas Scottish Government	December 2013	Bi-Annually
Nitrate Vulnerable Zones Scottish Government	July 2019	Annually
Ramsar Sites Scottish Natural Heritage	April 2019	Bi-Annually
Sites of Special Scientific Interest Scottish Natural Heritage	March 2019	Bi-Annually
Special Areas of Conservation Scottish Natural Heritage	August 2020	Bi-Annually
Special Protection Areas Scottish Natural Heritage	September 2020	Bi-Annually

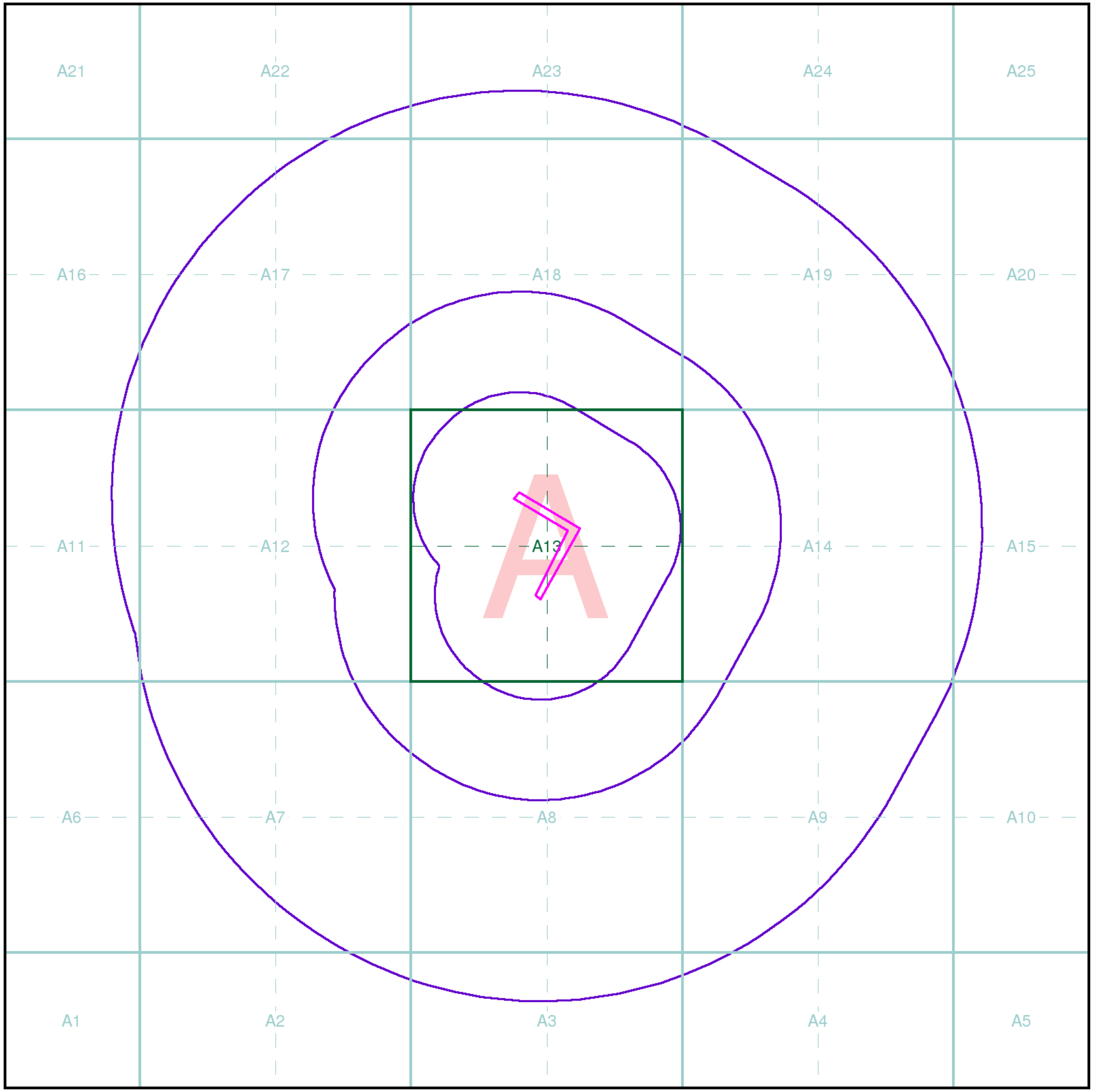
A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	
Environment Agency	
Scottish Environment Protection Agency	
The Coal Authority	
British Geological Survey	
Centre for Ecology and Hydrology	
Natural Resources Wales	
Scottish Natural Heritage	
Natural England	
Public Health England	
Ove Arup	
Stantec UK Ltd	

Useful Contacts

Contact	Name and Address	Contact Details
1	**British Geological Survey - Enquiry Service** British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
2	**Scottish Environment Protection Agency - North Region** Graesser House, Fodderty Way, Dingwall Business Park, Dingwall, Highland, IV15 9XB	Telephone: 01349 862021 Fax: 01349 863987
3	**Scottish Environment Protection Agency - Head Office** Erskine Court, The Castle Business Park, Stirling, Stirlingshire, FK9 4TR	Telephone: 01786 457700 Fax: 01786 446885
4	**Centre for Ecology and Hydrology** Maclean Building, Crowmarsh Gifford, WALLINGFORD, Oxfordshire, OX10 8BB	Telephone: 01491 838800 Fax: 01491 692424
5	**Ordnance Survey** Adanac Drive, Southampton, Hampshire, SO16 0AS	Telephone: 03456 05 05 05 Email: customerservices@ordnancesurvey.co.uk Website: www.ordnancesurvey.gov.uk
6	**Moray Council** District Headquarters, High Street, Elgin, Moray, IV30 1BX	Telephone: 01343 543451 Fax: 01343 540183 Website: www.moray.gov.uk
7	**Stantec UK Ltd** Caversham Bridge House, Waterman Place, Reading, RG1 8DN	Telephone: 0118 950 0761 Email: pba.reading@stantec.com Website: www.stantec.com
8	**PointX** 7 Abbey Court, Eagle Way, Sowton, Exeter, Devon, EX2 7HY	Website: www.pointx.co.uk
9	**Scottish Natural Heritage** 12 Hope Terrace, Edinburgh, Midlothian, EH9 2AS	Telephone: 01463 725000
10	**Scottish Government** St Andrews House, Regent Road, Edinburgh, EH1 3DG	Telephone: 0300 244 4000 Email: ceu@gov.scot Website: www.gov.scot
-	**Public Health England - Radon Survey, Centre for Radiation, Chemical and Environmental Hazards** Chilton, Didcot, Oxfordshire, OX11 0RQ	Telephone: 01235 822622 Fax: 01235 833891 Email: radon@phe.gov.uk Website: www.ukradon.org
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

Please note that the Environment Agency / Natural Resources Wales / SEPA have a charging policy in place for enquiries.



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Index Map

For ease of identification, your site and buffer have been split into Slices, Segments and Quadrants. These are illustrated on the Index Map opposite and explained further below.

Slice
Each slice represents a 1:10,000 plot area (2.7km x 2.7km) for your site and buffer. A large site and buffer may be made up of several slices (represented by a red outline), that are referenced by letters of the alphabet, starting from the bottom left corner of the slice "grid". This grid does not relate to National Grid lines but is designed to give best fit over the site and buffer.

Segment
A segment represents a 1:2,500 plot area. Segments that have plot files associated with them are shown in dark green, others in light blue. These are numbered from the bottom left hand corner within each slice.

Quadrant
A quadrant is a quarter of a segment. These are labelled as NW, NE, SW, SE and are referenced in the datasheet to allow features to be quickly located on plots. Therefore a feature that has a quadrant reference of A7NW will be in Slice A, Segment 7 and the NW Quadrant.

A selection of organisations who provide data within this report:

Map data

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

SEPA
Scottish Environment Protection Agency

SCOTTISH NATURAL HERITAGE

Envirocheck reports are compiled from 136 different sources of data.

Client Details

Ms R Brown, Soiltechnics, Cedar Barn, White Lodge, Walgrave, Northampton, NN6 9PY

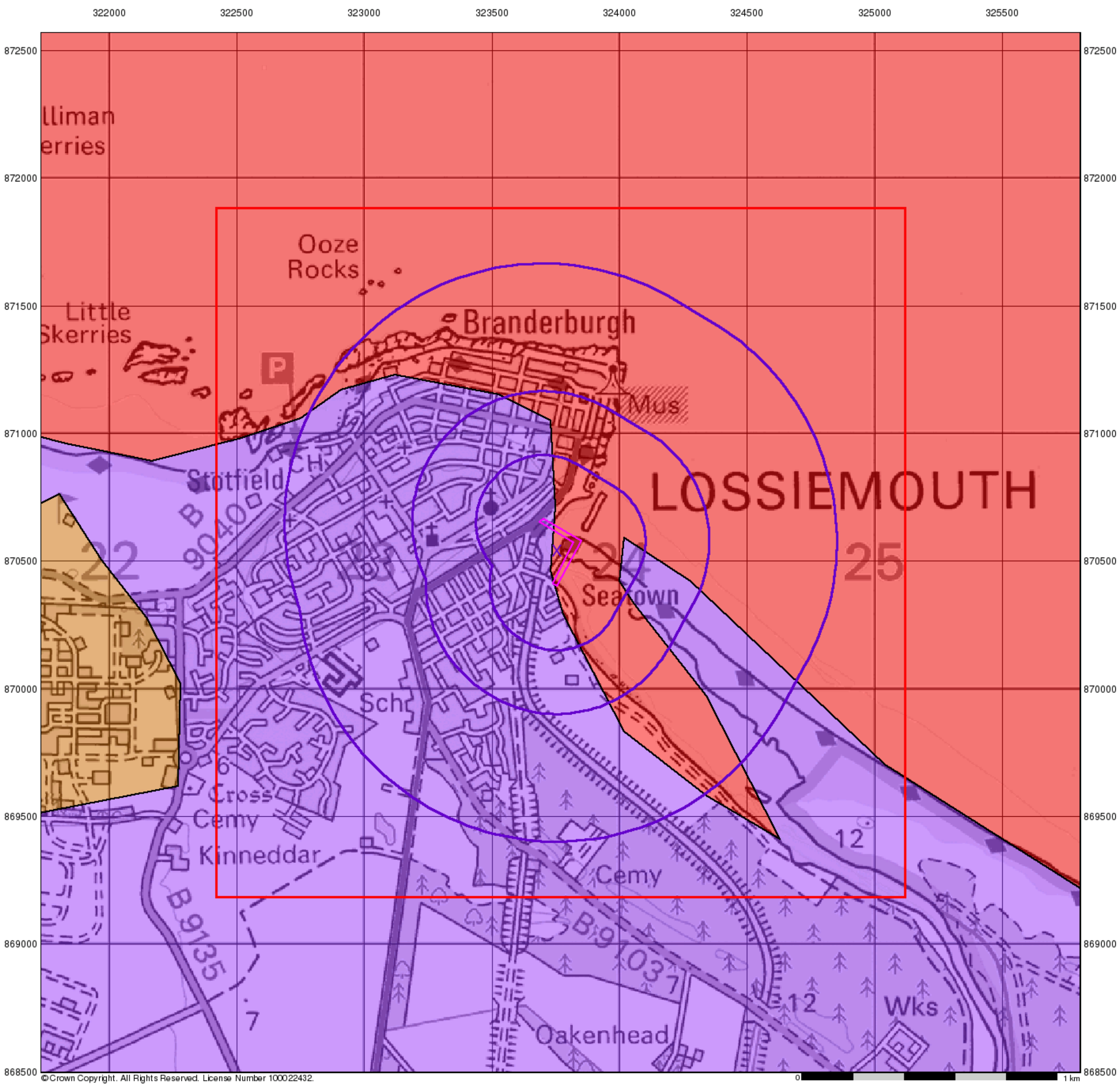
Order Details

Order Number:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323780, 870550
Site Area (Ha):	0.73
Search Buffer (m):	1000

Site Details

Lossiemouth

Full Terms and Conditions can be found on the following link:
http://www.landmarkinfo.co.uk/Terms/Show/515



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Groundwater Vulnerability

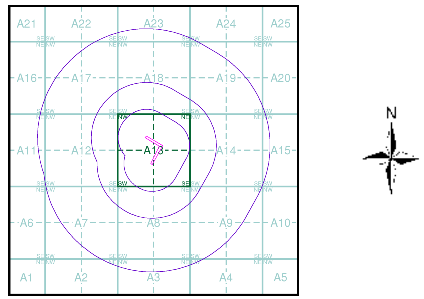
General

Specified Site
Specified Buffer(s)
Bearing Reference Point
Slice
Map ID

Agency and Hydrological

Geological Classes		Soil Classes
Highly Permeable		High
		Intermediate
		Low
Moderately Permeable		
Weakly Permeable		
Water or Sea		
Drift Deposit		

Site Sensitivity Context Map - Slice A



Order Details

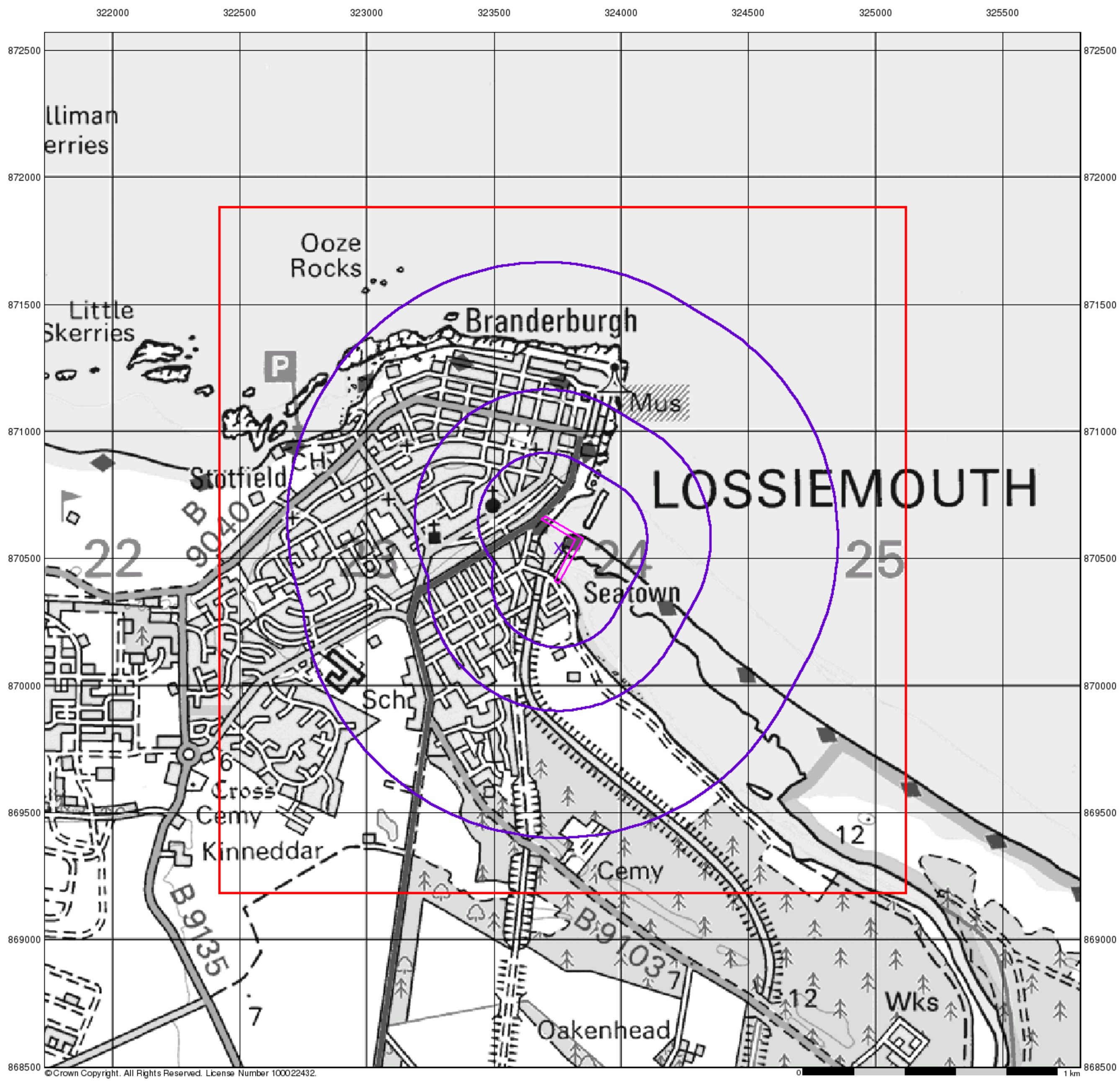
Order Number:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
Site Area (Ha):	0.73
Search Buffer (m):	1000

Site Details

Lossiemouth

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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Source Protection Zones

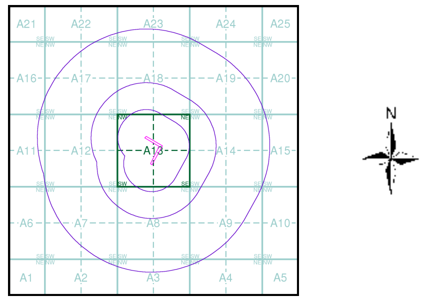
General

Specified Site
Specified Buffer(s)
Bearing Reference Point
Slice
Map ID

Agency and Hydrological

Inner zone (Zone 1)
Inner zone - subsurface activity only (Zone 1c)
Outer zone (Zone 2)
Outer zone - subsurface activity only (Zone 2c)
Total catchment (Zone 3)
Total catchment - subsurface activity only (Zone 3c)
Special interest (Zone 4)

Site Sensitivity Context Map - Slice A



Order Details

Order Number:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
Site Area (Ha):	0.73
Search Buffer (m):	1000

Site Details

Lossiemouth

Landmark
INFORMATION GROUP
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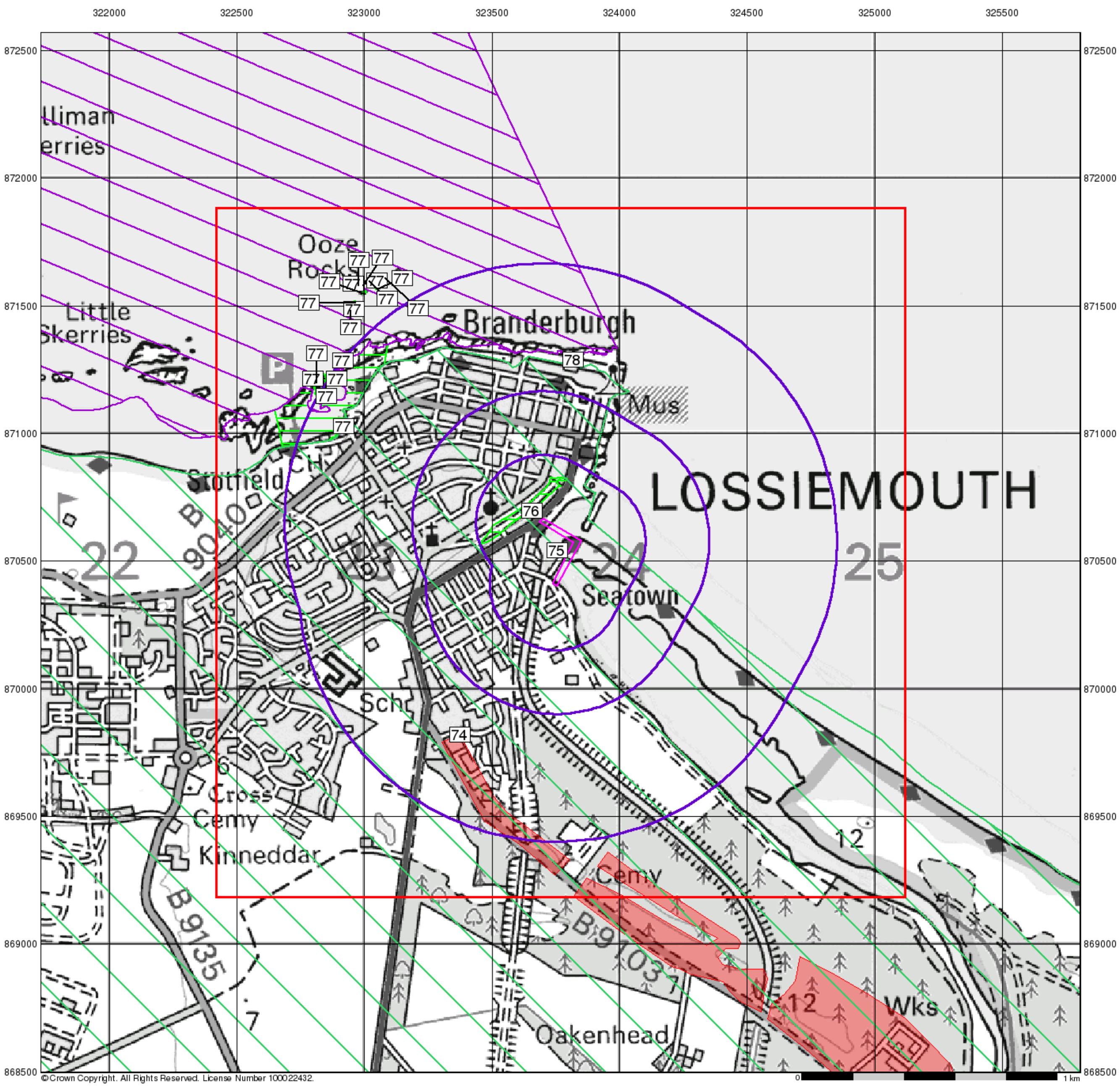

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Sensitive Land Uses

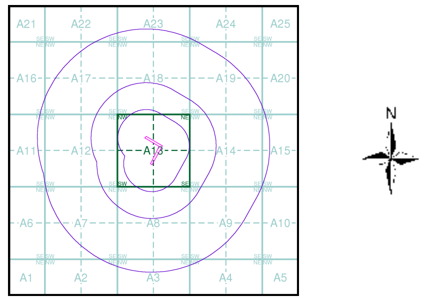
General

Specified Site
Specified Buffer(s)
Bearing Reference Point
Slice
Map ID

Sensitive Land Uses

Ancient Woodland
Area of Adopted Green Belt
Area of Unadopted Green Belt
Environmentally Sensitive Area
Forest Park
Local Nature Reserve
Marine Nature Reserve
National Nature Reserve
National Park
National Scenic Area
Nitrate Sensitive Area
Nitrate Vulnerable Zone
Ramsar Site
Site of Special Scientific Interest
Special Area of Conservation
Special Protection Area
World Heritage Sites

Site Sensitivity Context Map - Slice A



Order Details

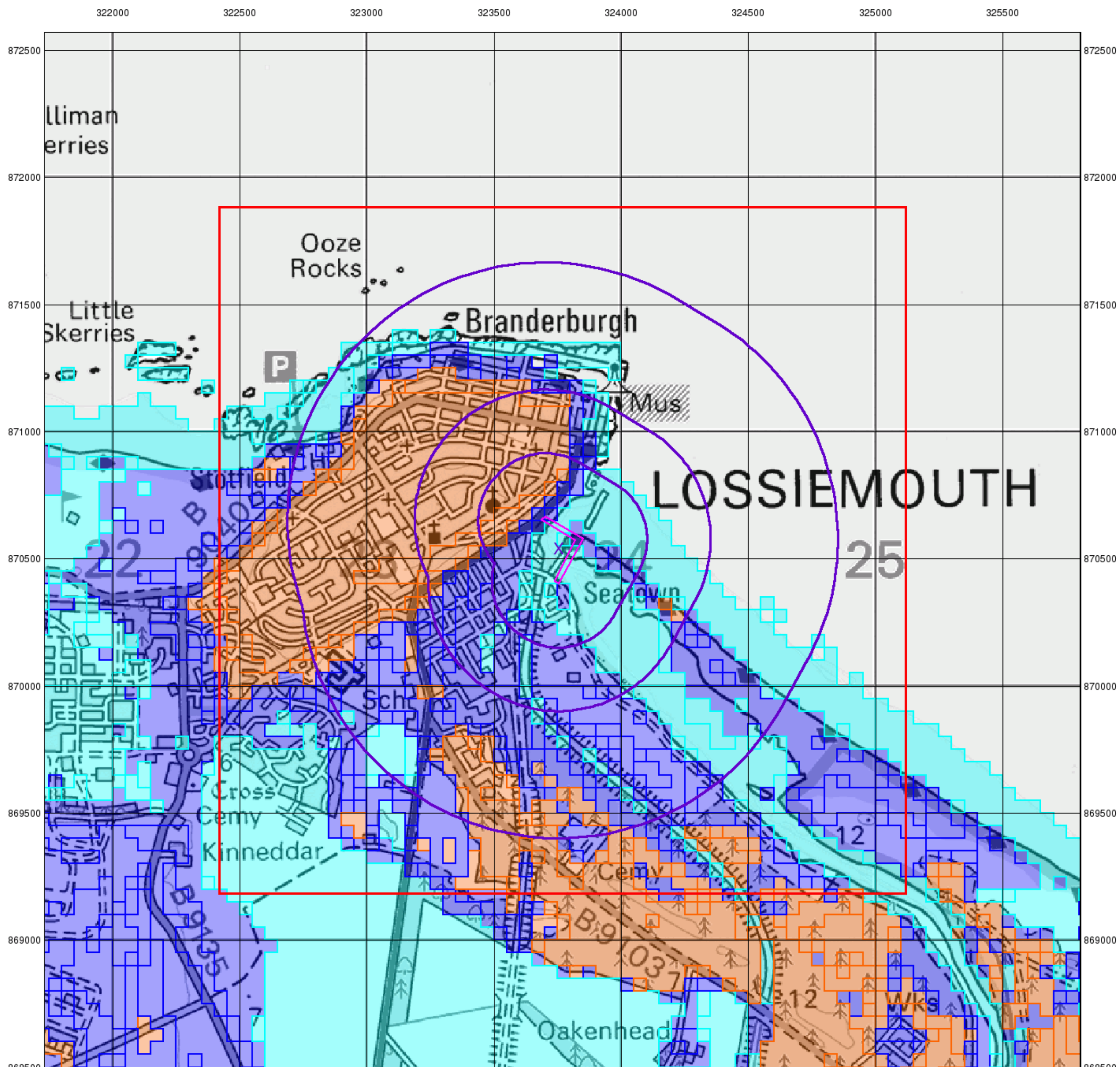
Order Number:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
Site Area (Ha):	0.73
Search Buffer (m):	1000

Site Details

Lossiemouth

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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BGS Flood GFS Data

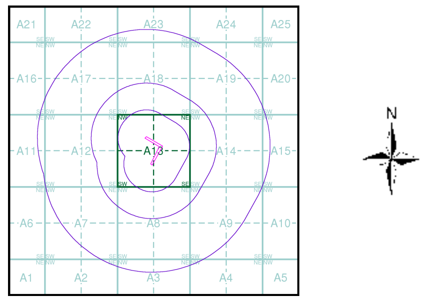
General

Specified Site
Specified Buffer(s)
Bearing Reference Point
Slice

Agency and Hydrological (Flood)

Limited Potential for Groundwater Flooding to Occur
Potential for Groundwater Flooding of Property Situated Below Ground Level
Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



Order Details

Order Number:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
Site Area (Ha):	0.73
Search Buffer (m):	1000

Site Details

Lossiemouth

Landmark INFORMATION GROUP

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Web: www.envirocheck.co.uk

Geology 1:50,000 Maps Legends

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	RMDF	RAISED MARINE DEPOSITS OF HOLOCENE AGE	Gravel, Sand and Silt	Not Supplied - Holocene
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	RMDV	Raised Marine Deposits, Devensian	Gravel, Sand and Silt	Not Supplied - Devensian
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	BSA	Blown Sand	Sand	Not Supplied - Quaternary
	MBD	Marine Beach Deposits	Gravel, Sand and Silt	Not Supplied - Quaternary
	STOB	Storm Beach Deposits	Gravel	Not Supplied - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	DRB	DUNRobin Bay Formation [See also DUNR]	Sandstone and Siltstone, Interbedded	Not Supplied - Hettangian
	STOT	Stotfield Cherty Rock Formation	Sandstone, Chert and Limestone	Not Supplied - Late Triassic
	LMSF	Lossiemouth Sandstone Formation	Sandstone	Not Supplied - Ladinian
	BRSF	Burghead Sandstone Formation	Sandstone	Not Supplied - Early Triassic
	KISA	Kingsteps Sandstone Formation	Sandstone, Pebbly (Gravelly)	Not Supplied - Late Devonian
		Faults		

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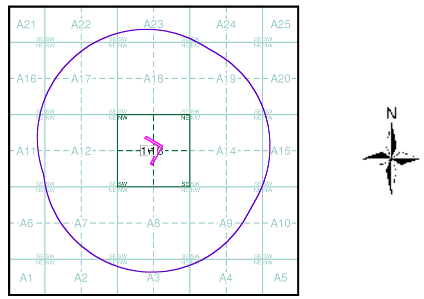
Geology 1:50,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	**1**
Map Sheet No:	**095**
Map Name:	**Elgin**
Map Date:	**1969**
Bedrock Geology:	**Not Available**
Superficial Geology:	**Available**
Artificial Geology:	**Not Available**
Faults:	**Not Supplied**
Landslip:	**Not Available**
Rock Segments:	**Not Supplied**

Geology 1:50,000 Maps - Slice A



Order Details:

Order Number:	262408444_1_1
Customer Reference:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
Site Area (Ha):	0.73
Search Buffer (m):	1000

Site Details:

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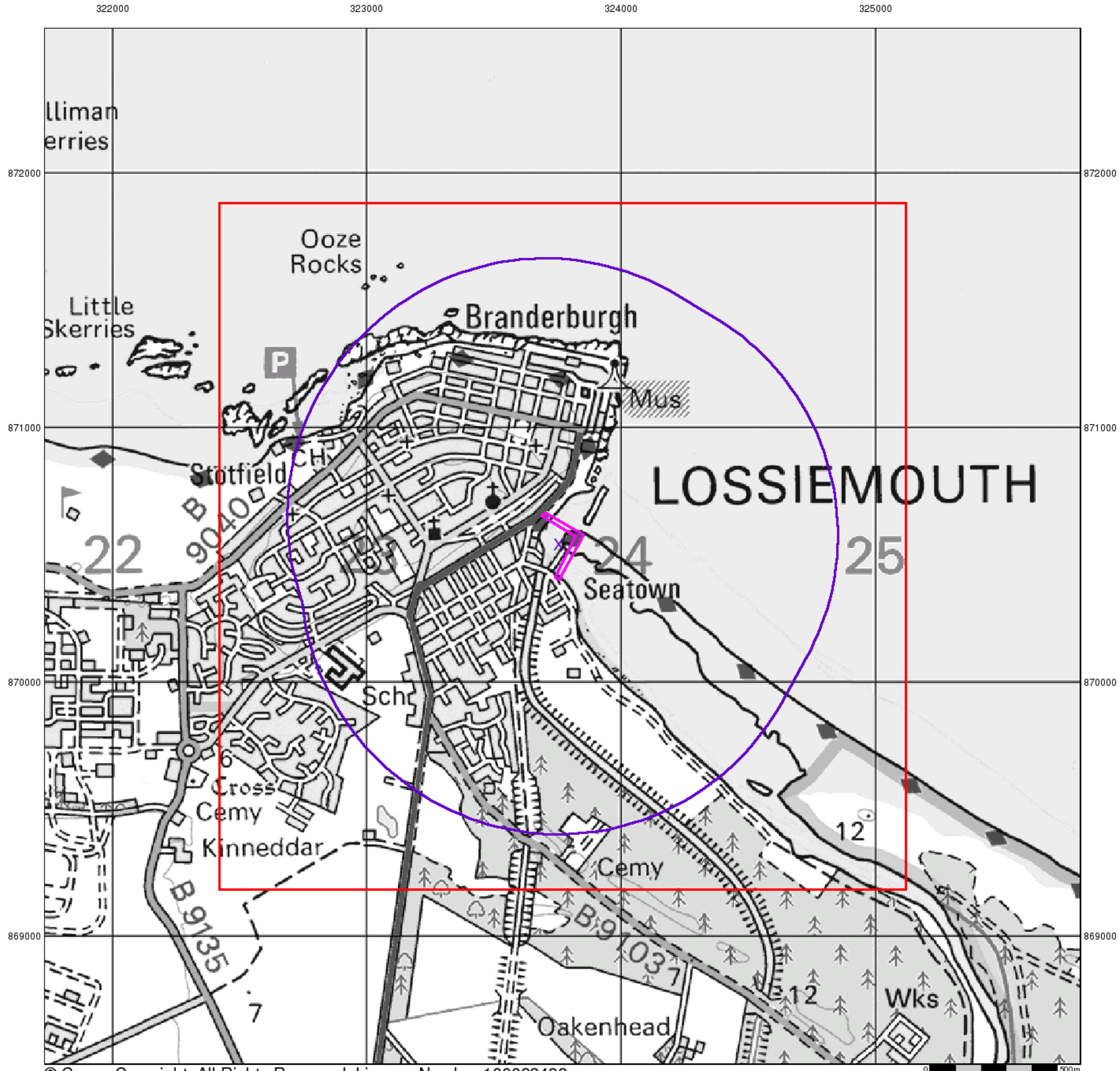
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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Artificial Ground and Landslip

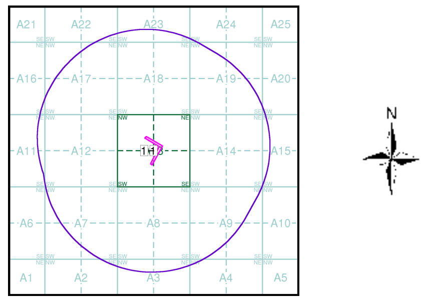
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



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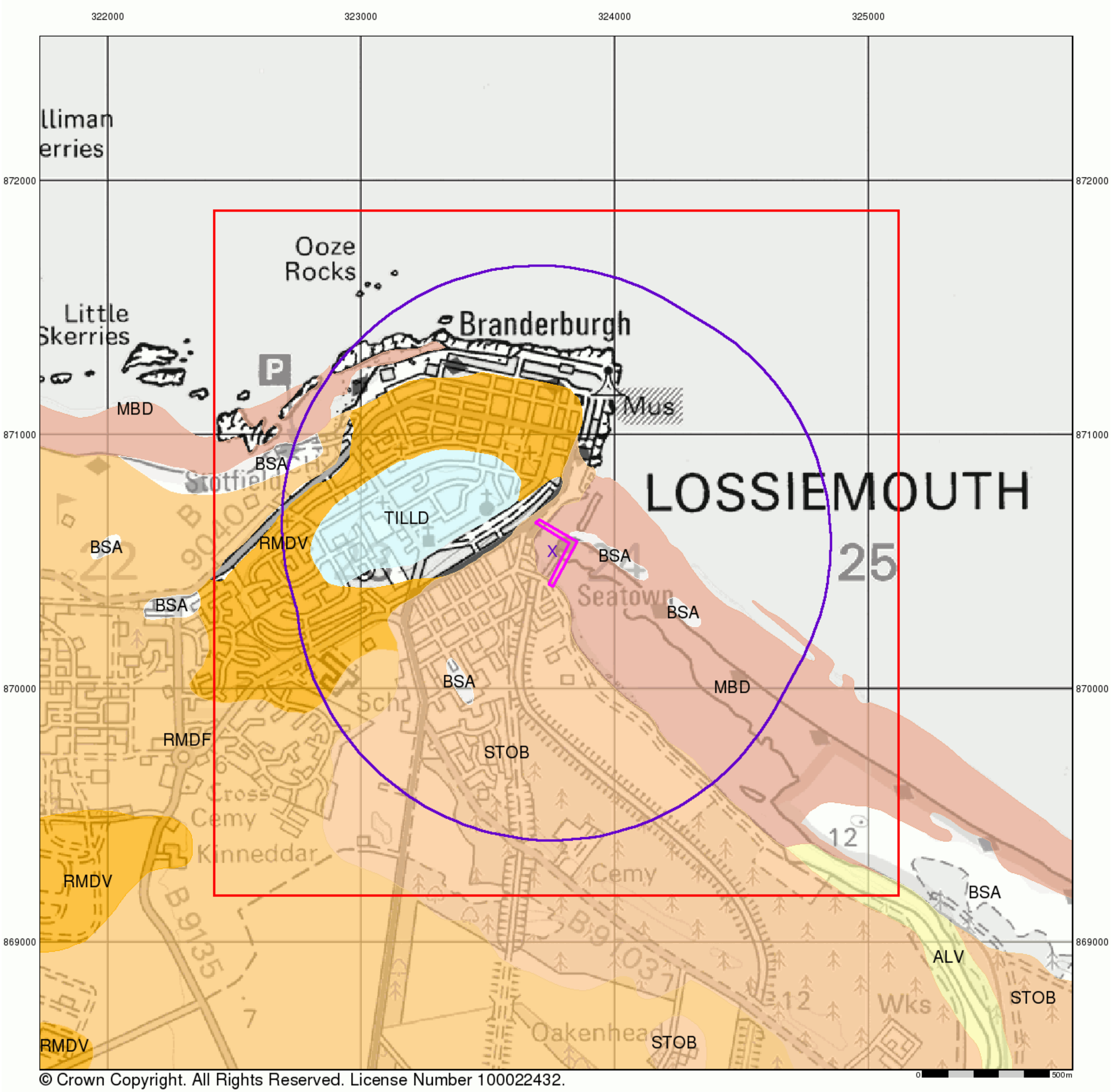

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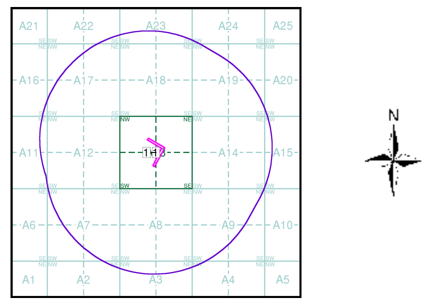
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



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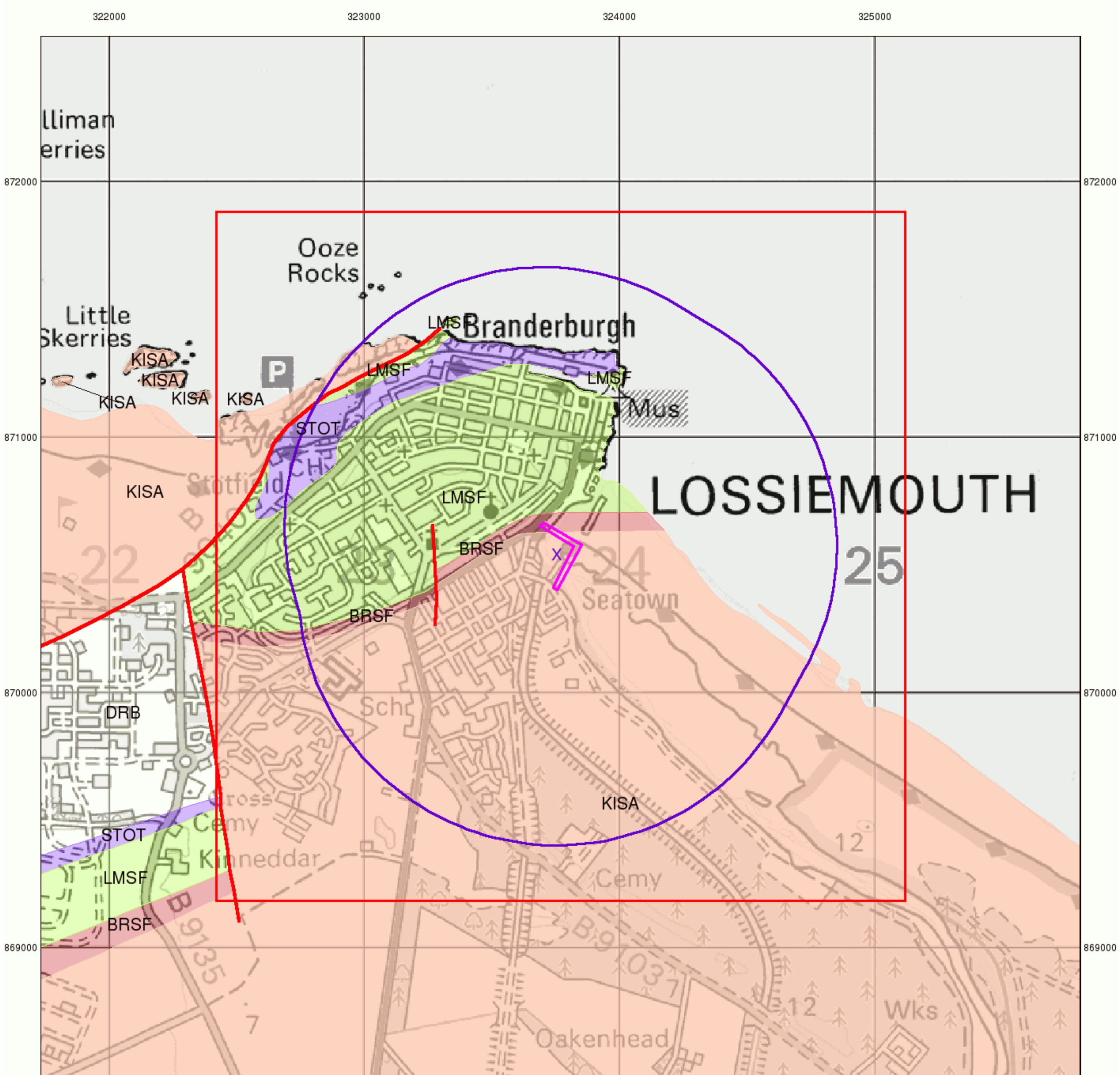

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Bedrock and Faults

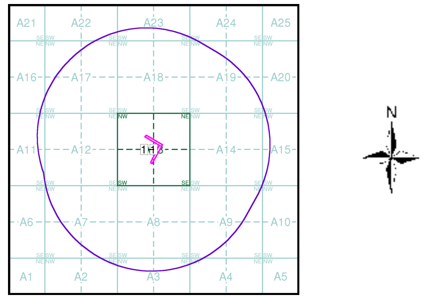
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



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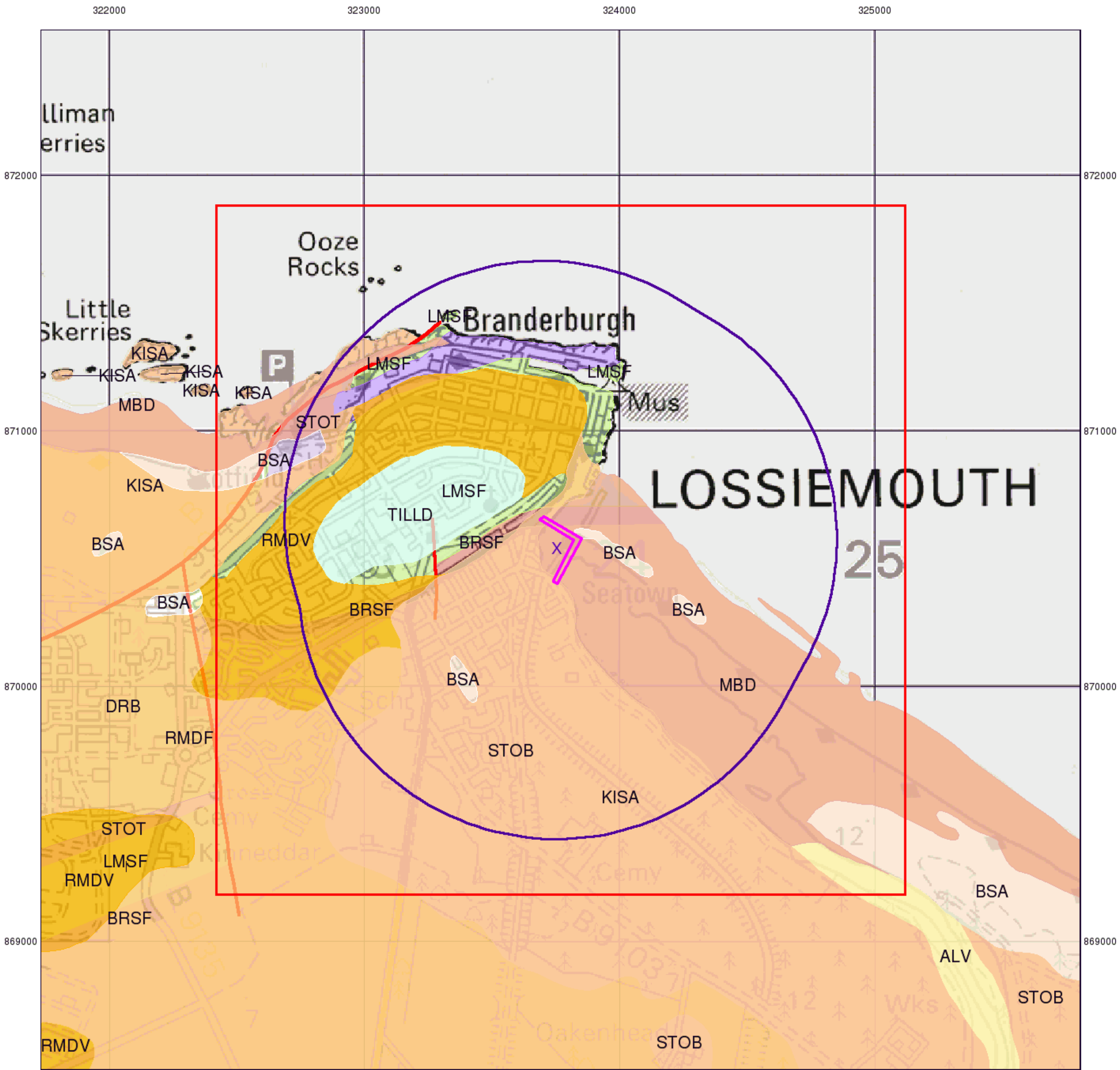

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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

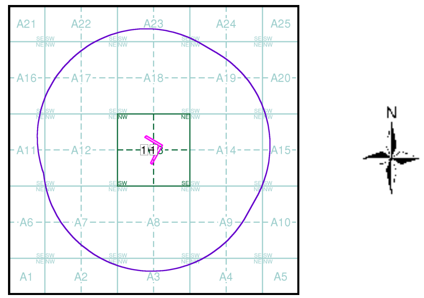
Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



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Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500

Quarry · Gravel Pit · Sand Pit
Clay Pit · Shingle · Refuse Heap
Sloping Masonry · Flat Rock
Marsh · Reeds · Osiers
Rough Pasture · Furze · Wood
Mixed Wood · Brushwood · Orchard
Fir · Ford · Stepping Stones
Ferry · Waterfall · Lock
Trig. Station · 507 Altitude at Trig. Station
B.M.325·9 Bench Mark · 342 Surface Level
Arrow denotes flow of water · Antiquities (site of)
Cutting · Embankment
Railway crossing Road · Level Crossing · Road crossing Railway
Railway crossing River or Canal · Road over single stream · Road over River or Canal

County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	Sl.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250

Inactive Quarry, Chalk Pit or Clay Pit · Active Quarry, Chalk Pit or Clay Pit
Rock · Boulders
Cliff · Slopes (Top)
Roofed Building · Glazed Roof Building
Sloping Masonry (Top) · Archway
Non-Coniferous Tree (surveyed) · Coniferous Tree (surveyed)
Non-Coniferous Trees (not surveyed) · Coniferous Trees (not surveyed)
Orchard Tree · Scrub · Bracken
Coppice, Osier · Reeds · Marsh, Saltings
Rough Grassland · Heath · Culvert
Direction of water flow · B M Bench Mark · Antiquity (site of)
Cave Entrance · Triangulation Station · Electricity Pylon
E T L Electricity Transmission Line

County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
L B Bdy London Borough Boundary
Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250

Cliff · Slopes (Top)
Rock · Rock (scattered)
Boulders · Boulders (scattered)
Positioned Boulder · Scree
Non-Coniferous Tree (surveyed) · Coniferous Tree (surveyed)
Non-Coniferous Trees (not surveyed) · Coniferous Trees (not surveyed)
Orchard Tree · Scrub · Bracken
Coppice, Osier · Reeds · Marsh, Saltings
Rough Grassland · Heath · Culvert
Direction of water flow · Triangulation Station · Antiquity (site of)
E T L Electricity Transmission Line · Electricity Pylon
BM 231.60m Bench Mark · Buildings with Building Seed
Roofed Building · Glazed Roof Building

Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

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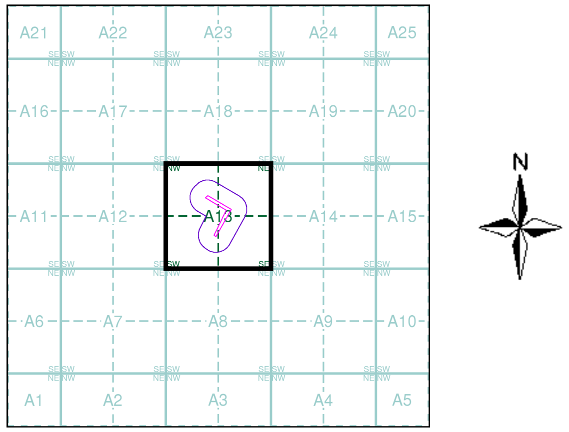
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Elginshire	1:2,500	1871 - 1878	2
Elginshire	1:2,500	1905	3
Ordnance Survey Plan	1:2,500	1965	4
Ordnance Survey Plan	1:2,500	1975	5
Additional SIMs	1:2,500	1983	6
Additional SIMs	1:2,500	1992	7
Large-Scale National Grid Data	1:2,500	1995	8
Historical Aerial Photography	1:2,500	2008	9

Historical Map - Segment A13



Order Details

Order Number: 262408444_1_1
Customer Ref: STS5161M
National Grid Reference: 323760, 870540
Slice: A
Site Area (Ha): 0.73
Search Buffer (m): 100

Site Details

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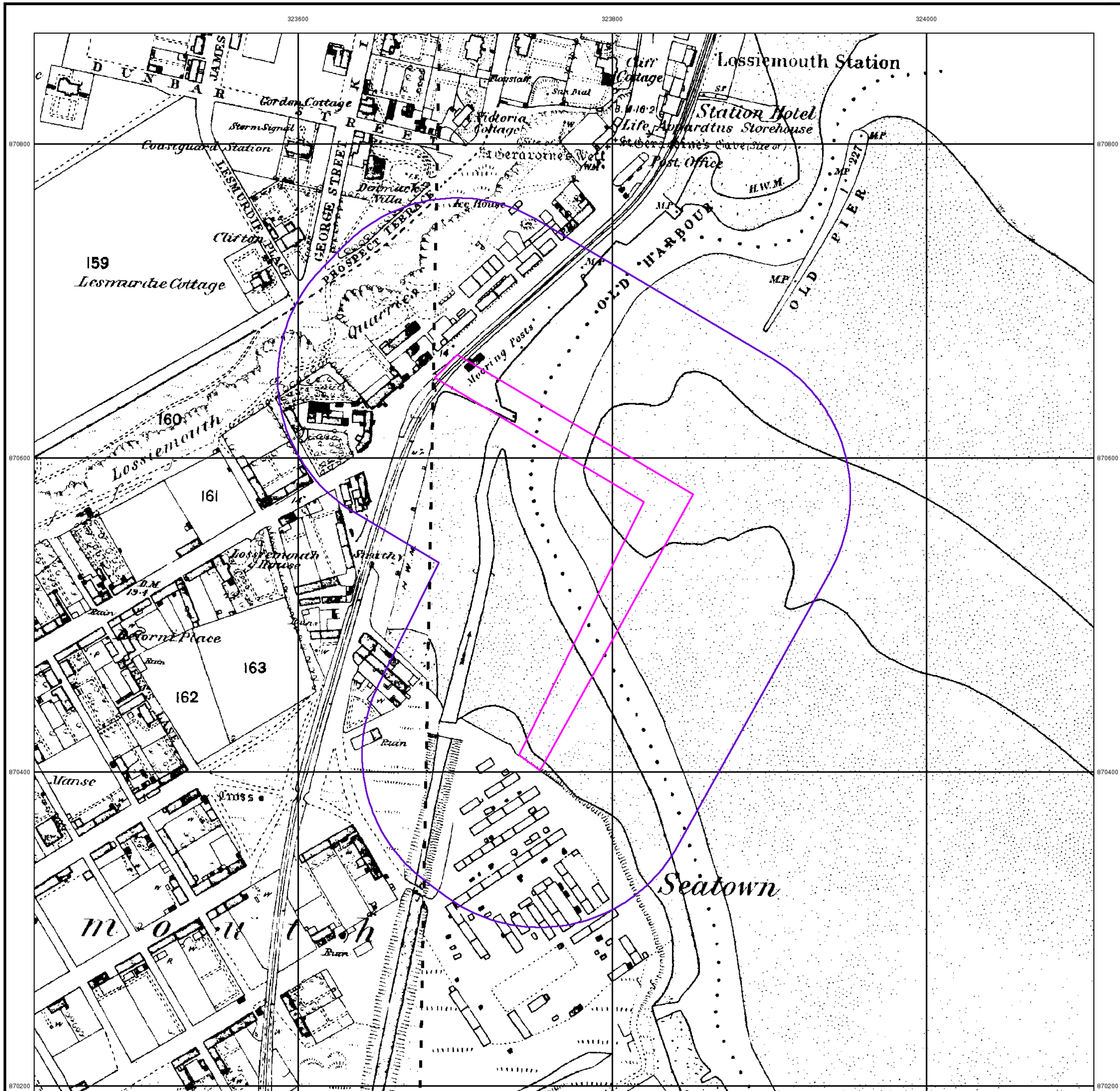

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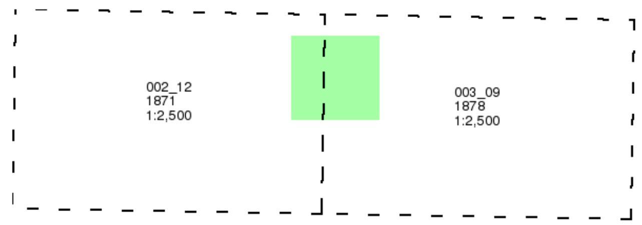
Elginshire
Published 1871 - 1878
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



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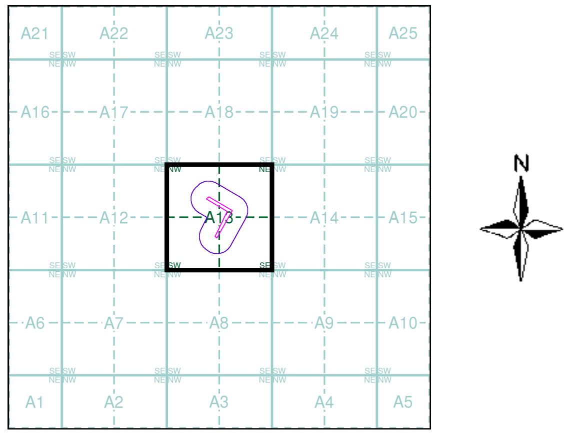

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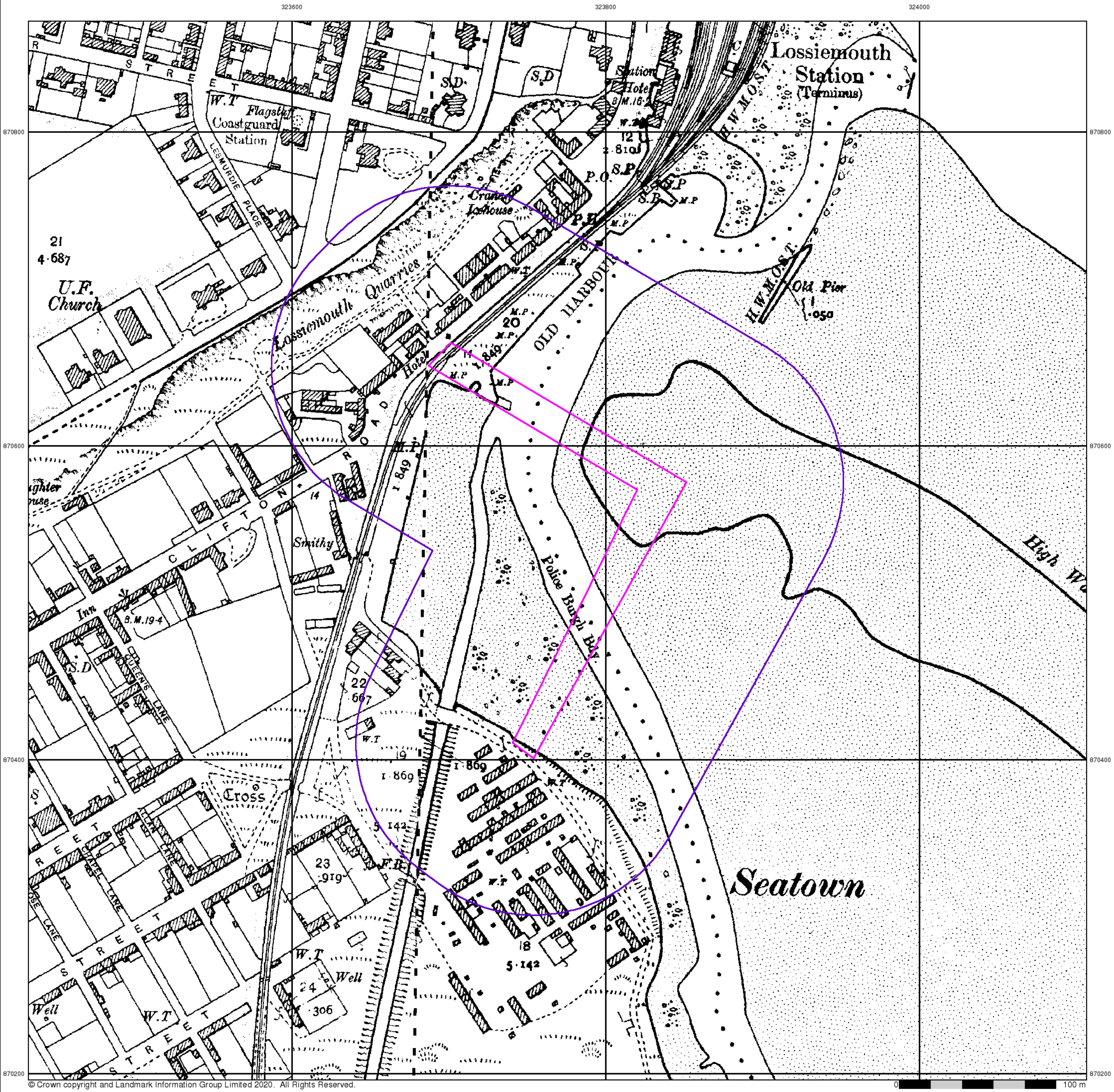

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Elginshire

Published 1905

Source map scale - 1:2,500

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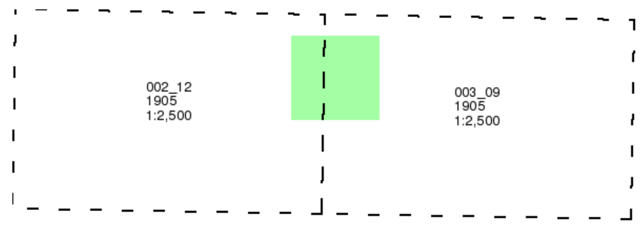

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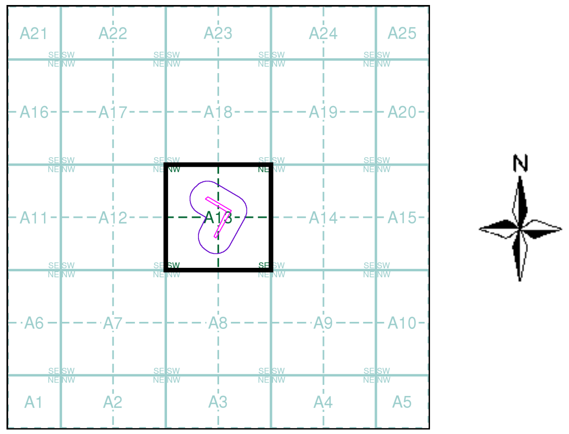

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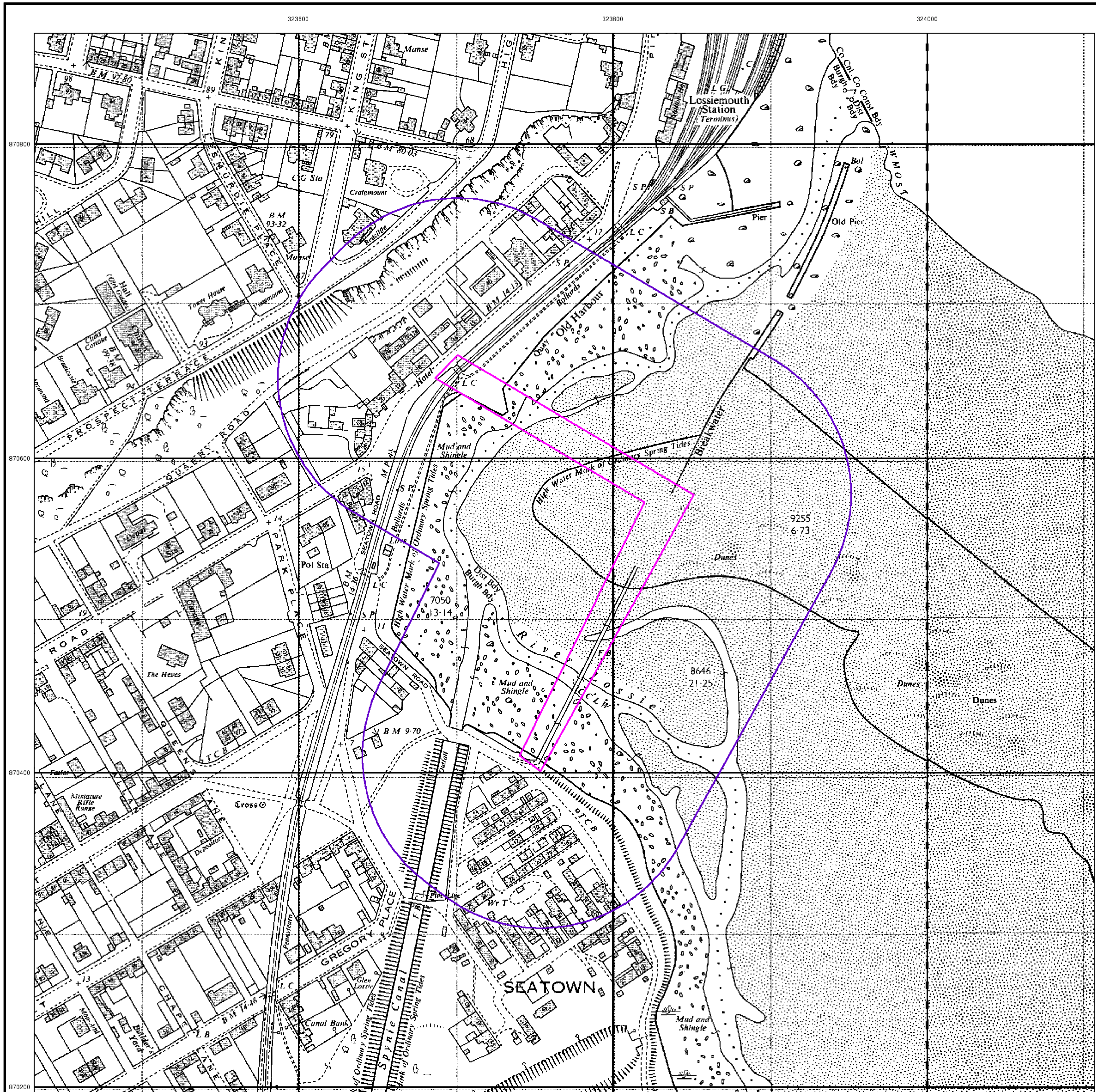

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Ordnance Survey Plan

Published 1965

Source map scale - 1:2,500

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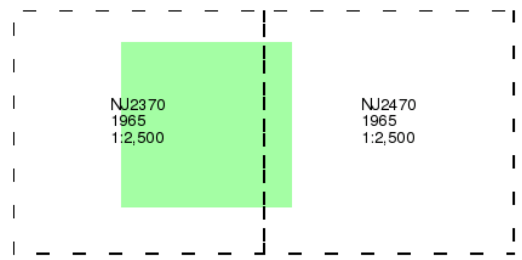
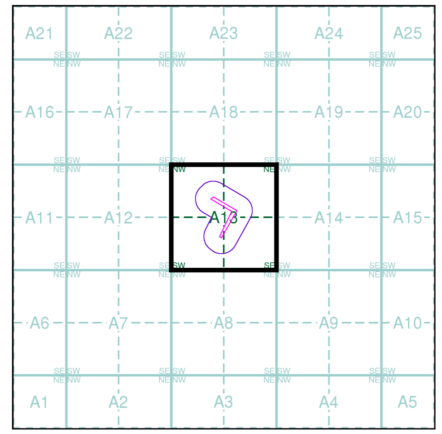


Historical Map - Segment A13



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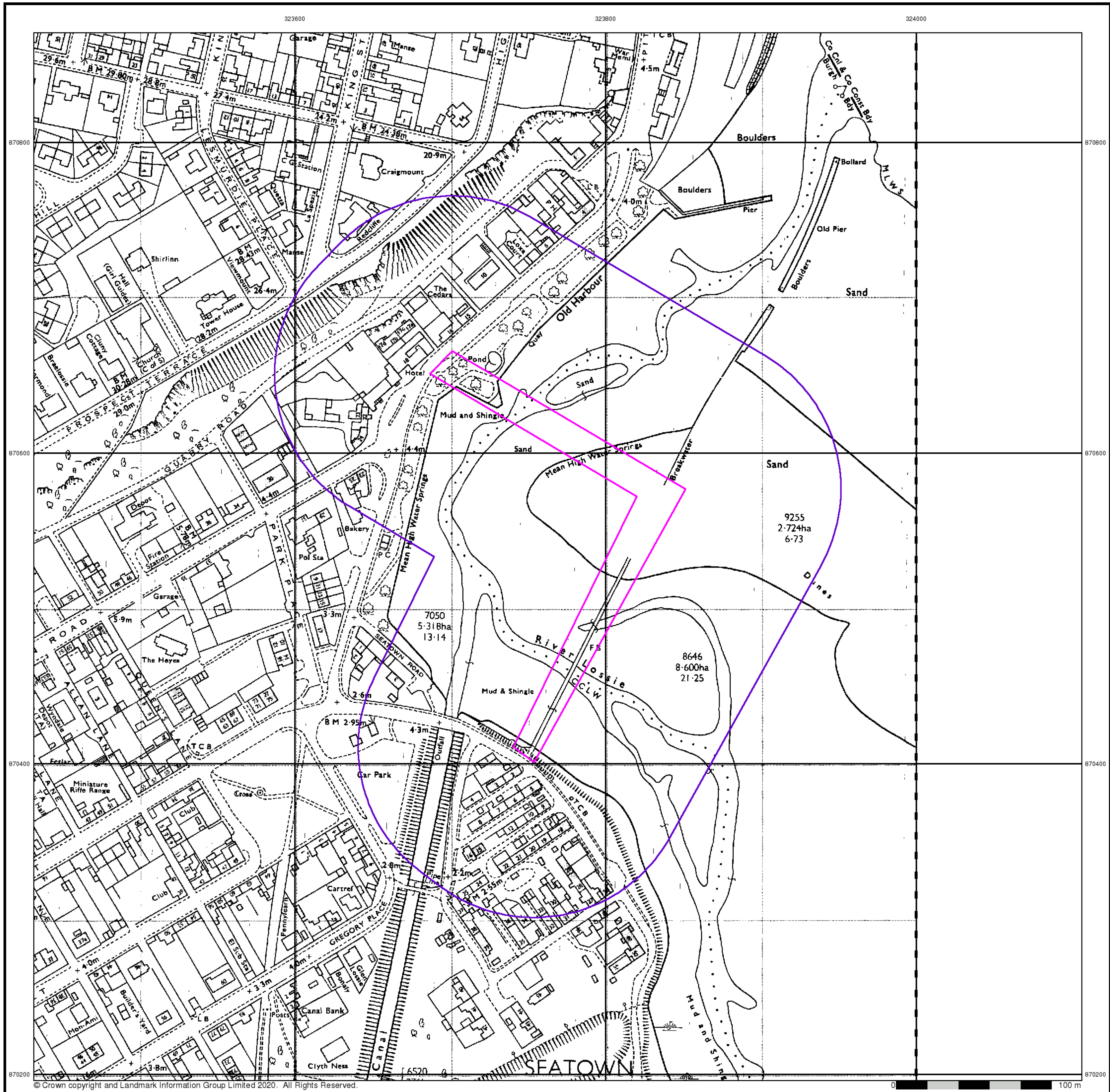

0 100 m

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Ordnance Survey Plan

Published 1975

Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

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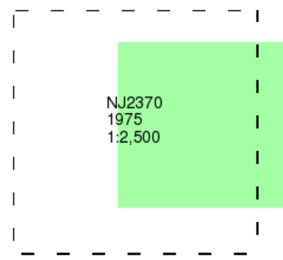
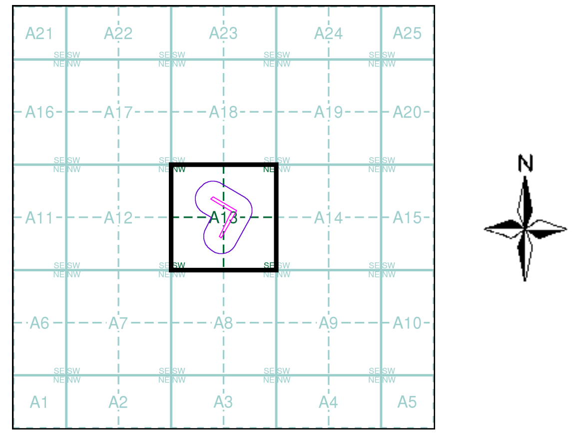


Historical Map - Segment A13



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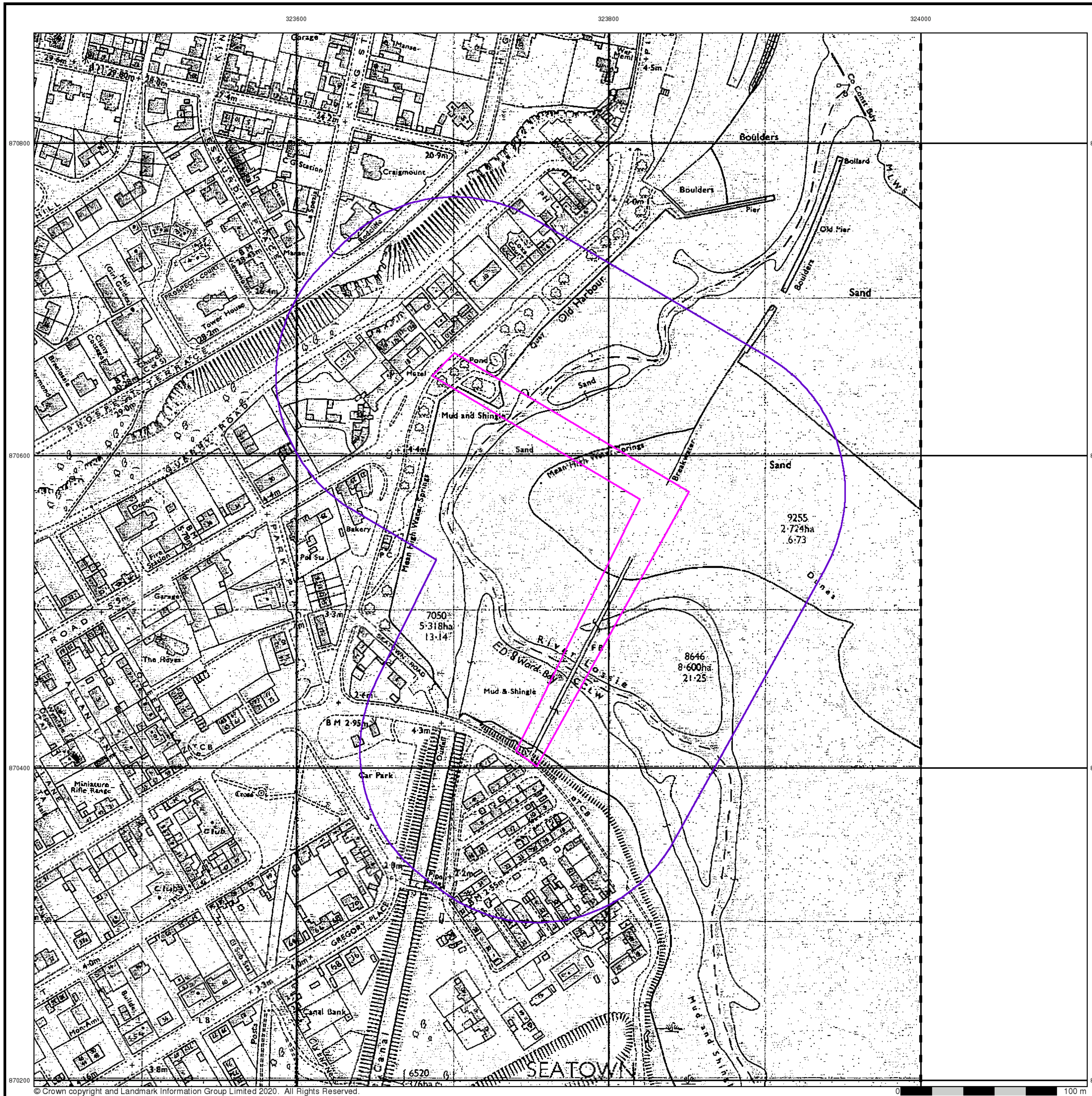

0 100 m

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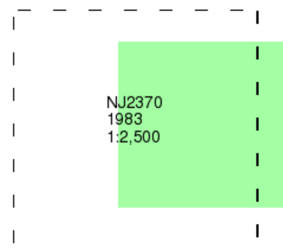
Additional SIMs

Published 1983

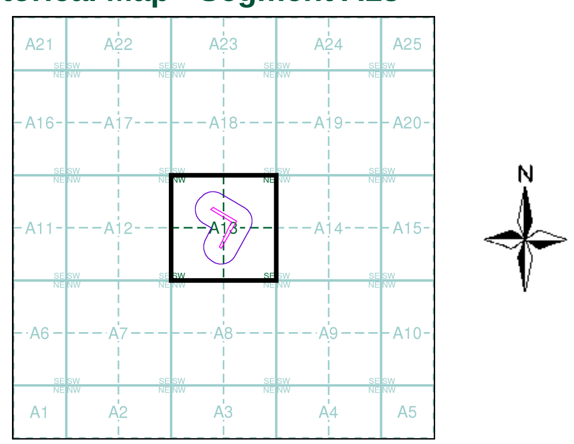
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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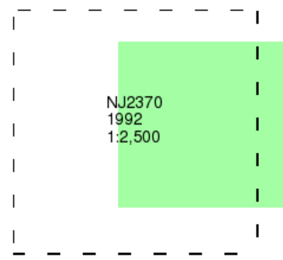
Additional SIMs

Published 1992

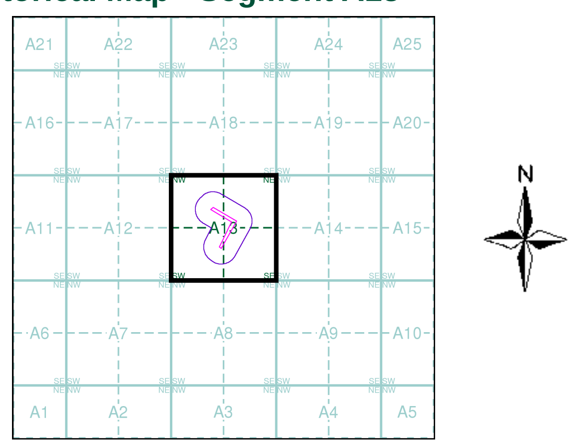
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



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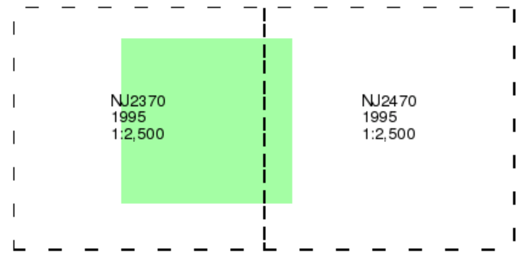
Large-Scale National Grid Data

Published 1995

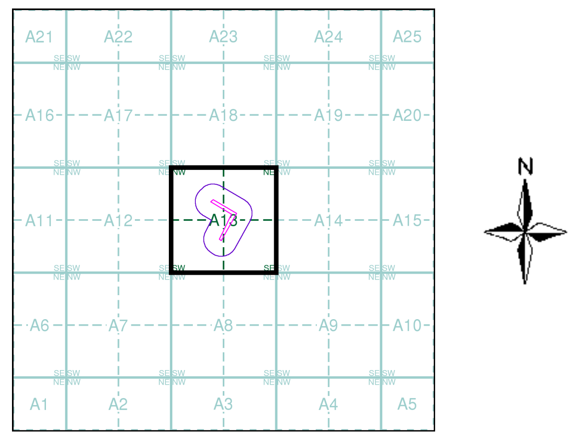
Source map scale - 1:2,500

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
Site Area (Ha):	0.73
Search Buffer (m):	100

Site Details

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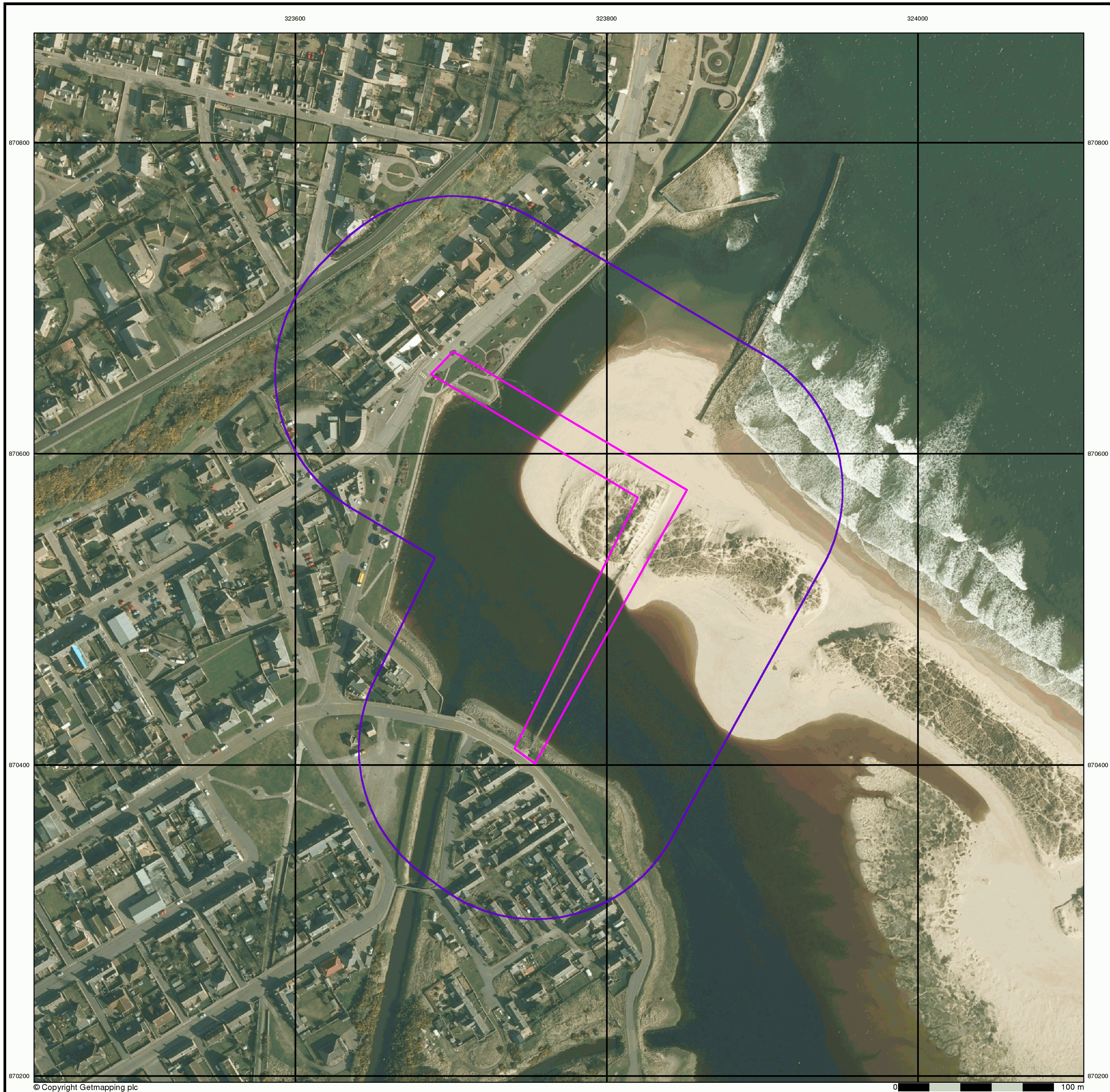
Fax:	0844 844 9951
Web:	www.envirocheck.co.uk



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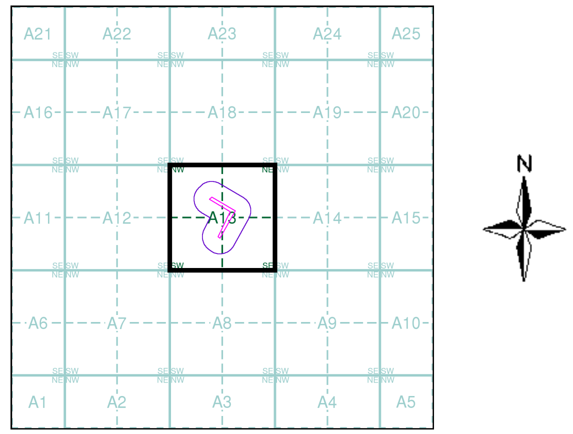
Historical Aerial Photography

Published 2008

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



Order Details

Order Number: 262408444_1_1
Customer Ref: STS5161M
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Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit | Sand Pit | Other Pits
Quarry | Shingle | Orchard
Osiers | Reeds | Marsh
Mixed Wood | Deciduous | Brushwood
Fir | Furze | Rough Pasture

Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
·285 Surface Level

Sketched Contour
Instrumental Contour

Main Roads (Fenced / Un-Fenced)
Minor Roads (Fenced / Un-Fenced)
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream

County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. — County Borough Boundary (England)
Co. Burgh Bdy. — County Burgh Boundary (Scotland)
RD. Bdy. — Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings

Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Pole
Electricity Transmission Line
Sloping Masonry

Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge

Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

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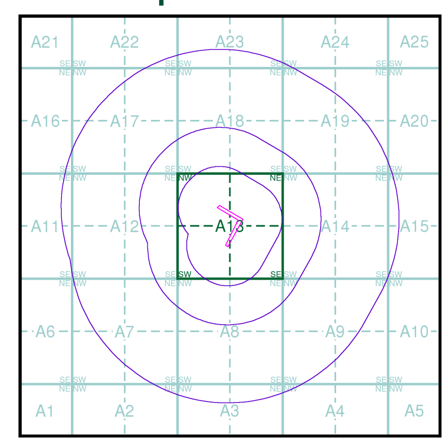
Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Elginshire	1:10,560	1873	2
Elginshire	1:10,560	1905 - 1906	3
Elginshire	1:10,560	1938	4
Ordnance Survey Plan	1:10,000	1959	5
Ordnance Survey Plan	1:10,000	1966 - 1968	6
Ordnance Survey Plan	1:10,000	1970 - 1975	7
Ordnance Survey Plan	1:10,000	1991 - 1994	8
10K Raster Mapping	1:10,000	2000	9
10K Raster Mapping	1:10,000	2006	10
VectorMap Local	1:10,000	2020	11

Historical Map - Slice A



Order Details

Order Number: 262408444_1_1
Customer Ref: STS5161M
National Grid Reference: 323760, 870540
Slice: A
Site Area (Ha): 0.73
Search Buffer (m): 1000

Site Details

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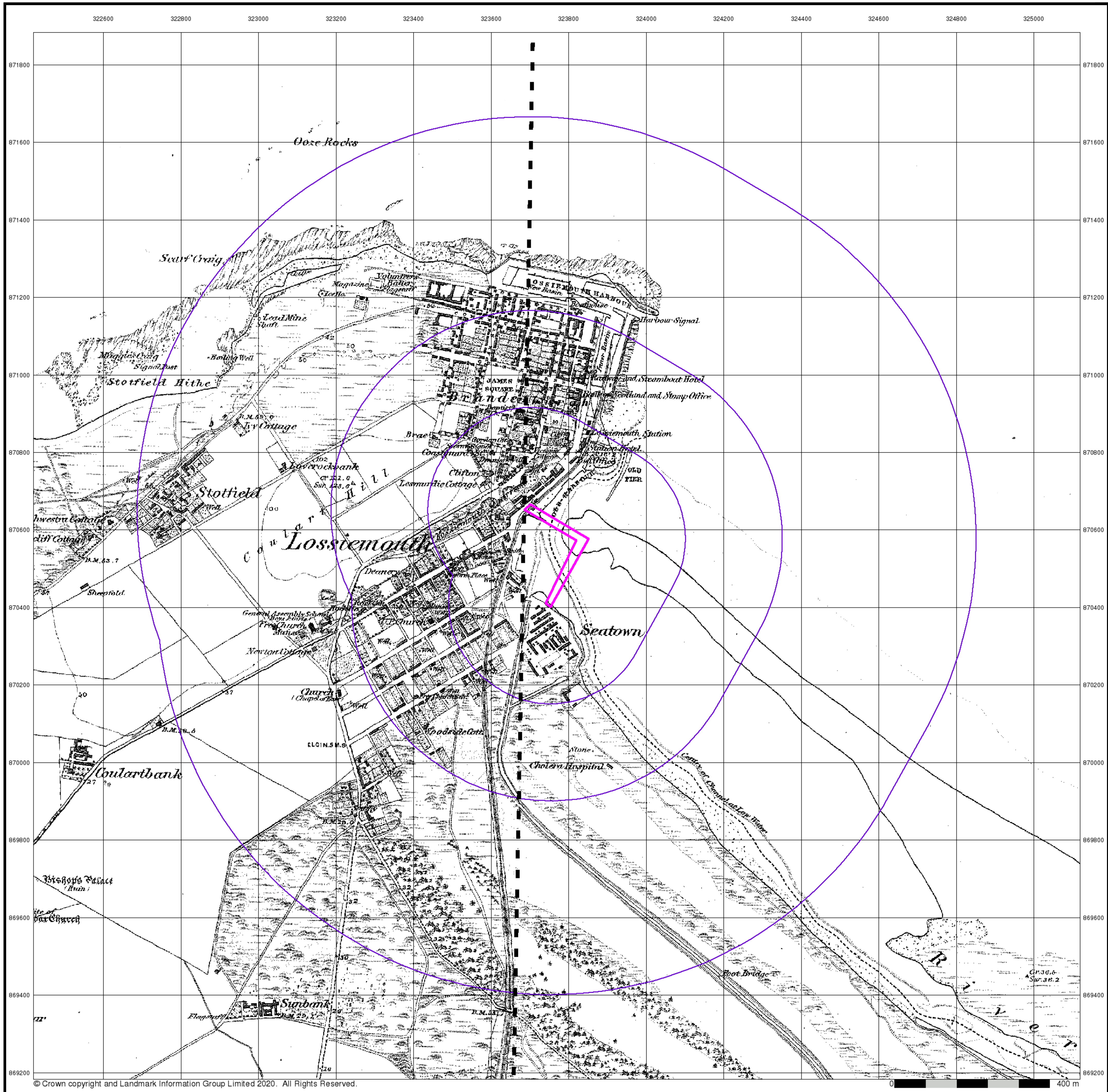

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Elginshire

Published 1873

Source map scale - 1:10,560

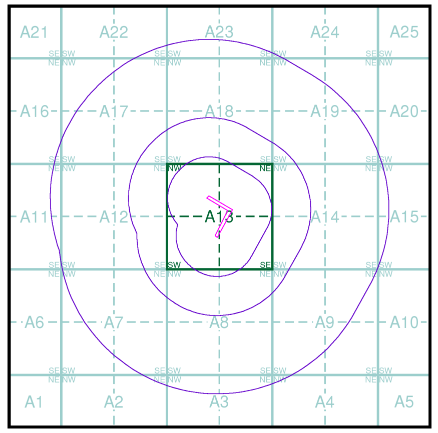
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

00200
1873
1:10,560

00300
1873
1:10,560

Historical Map - Slice A



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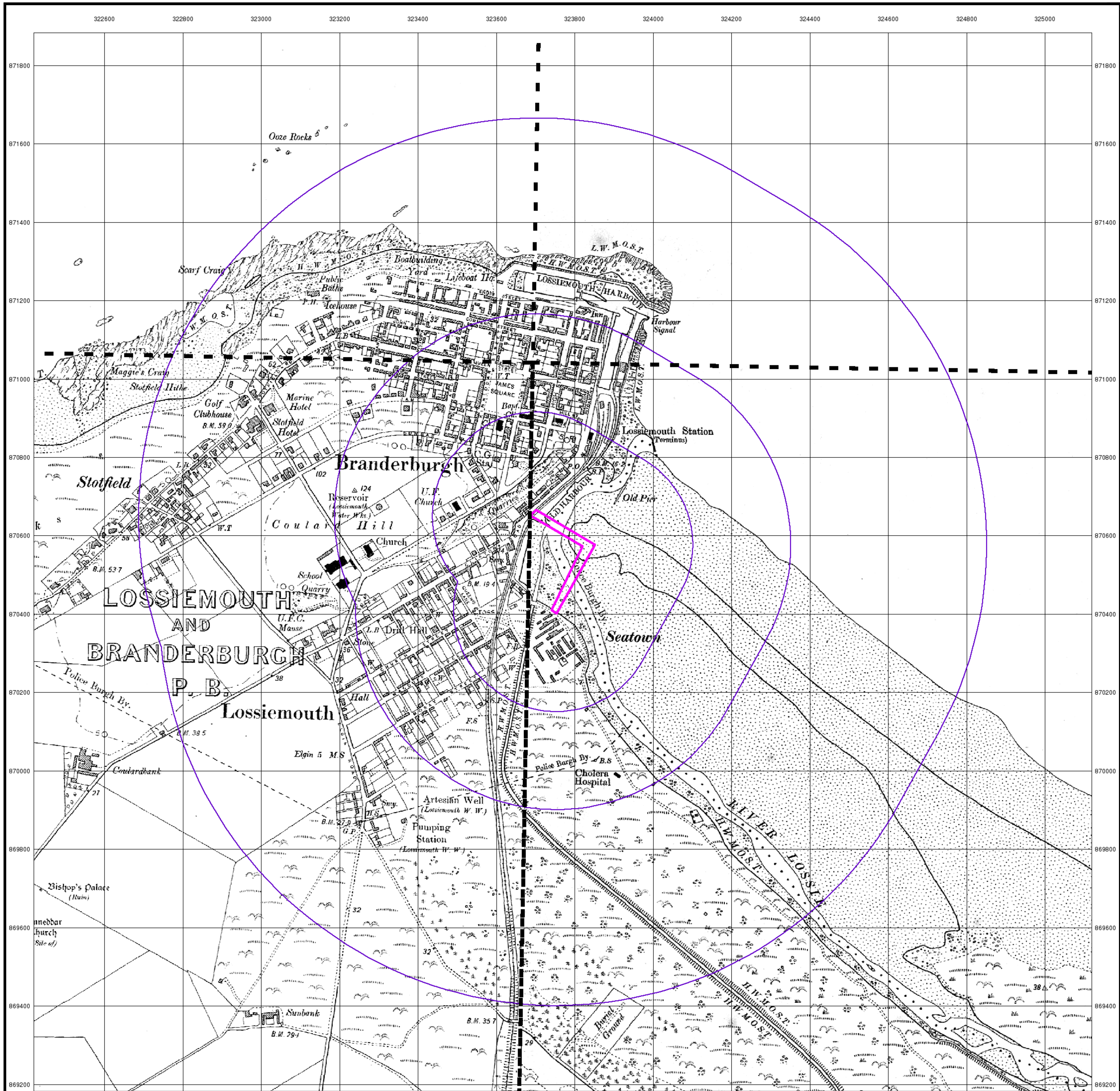

0 400 m

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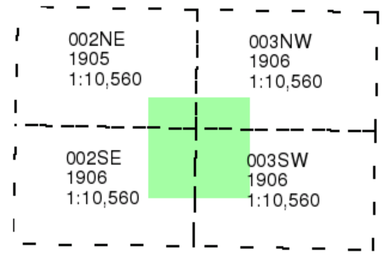
Elginshire

Published 1905 - 1906

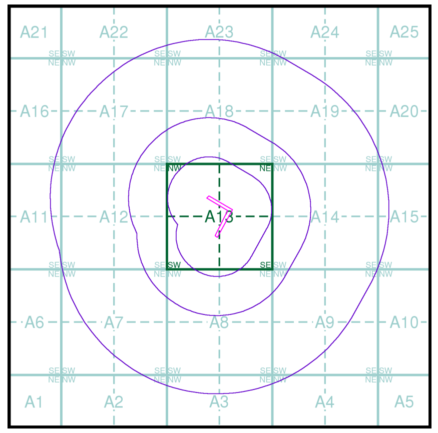
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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Order Details

Order Number: 262408444_1_1
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Slice: A
Site Area (Ha): 0.73
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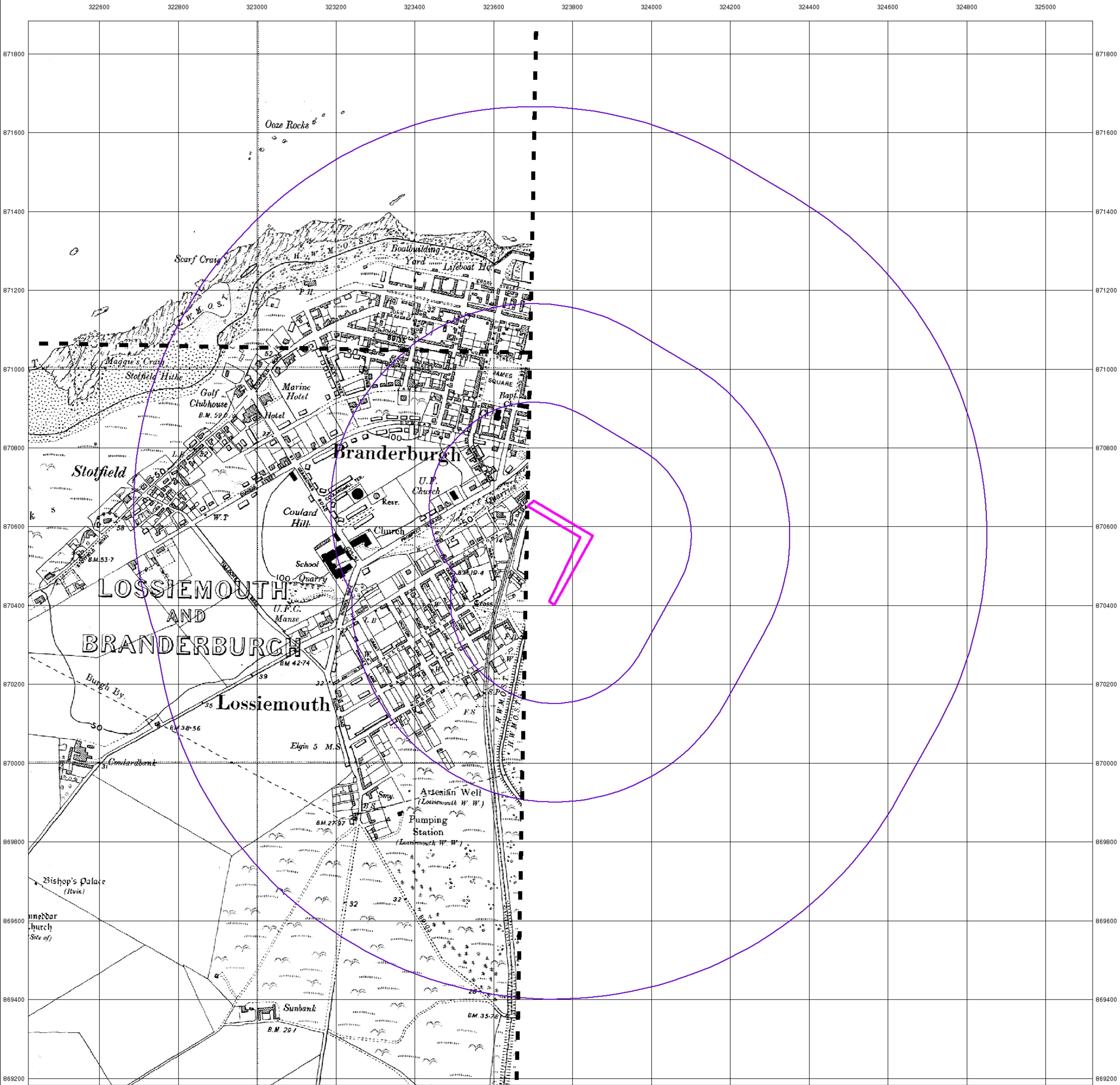

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Elginshire

Published 1938

Source map scale - 1:10,560

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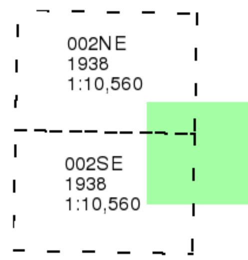
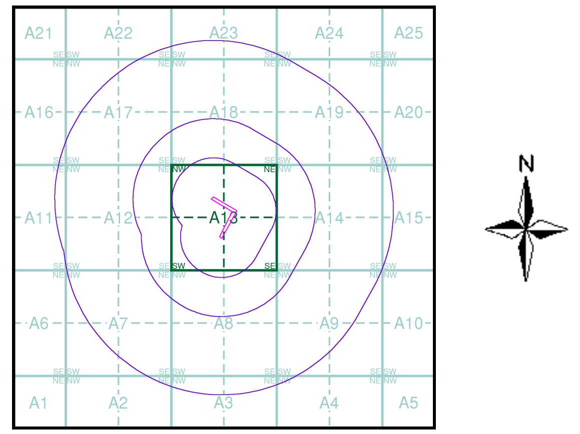


Historical Map - Slice A



Order Details

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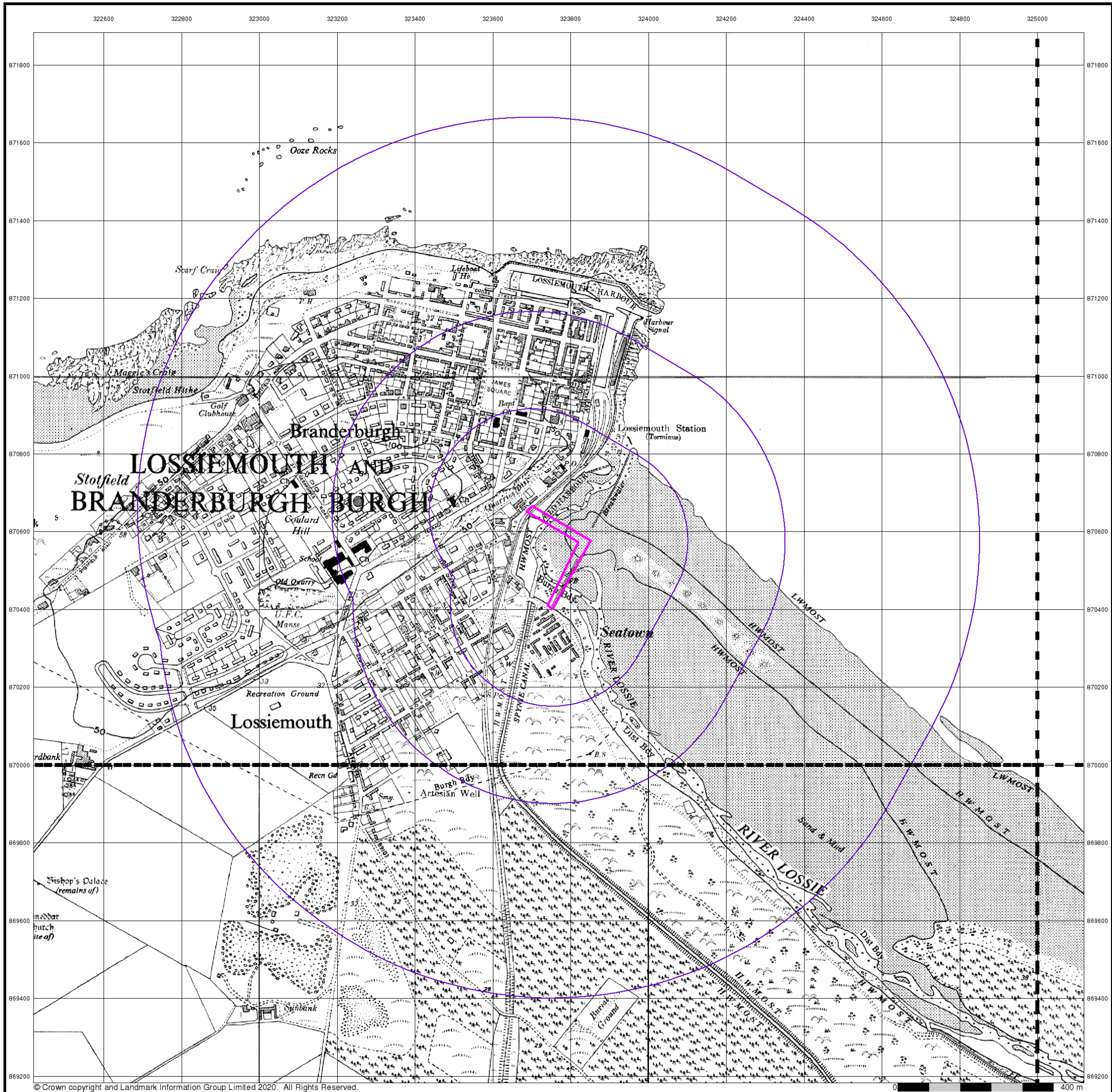

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Ordnance Survey Plan

Published 1959

Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

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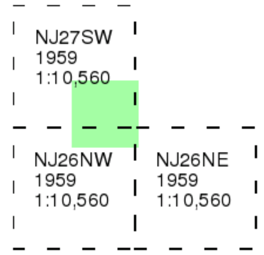
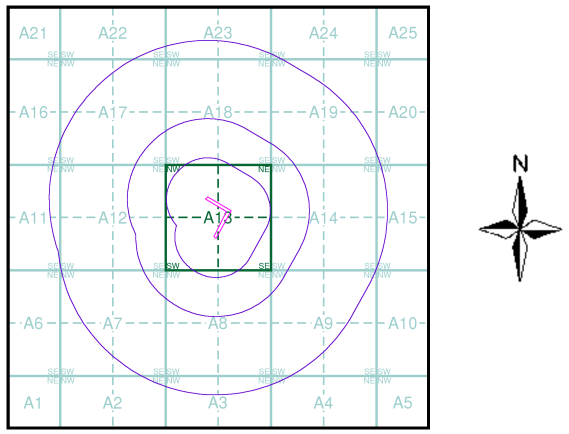


Historical Map - Slice A



Order Details

Order Number: 262408444_1_1
Customer Ref: STS5161M
National Grid Reference: 323760, 870540
Slice: A
Site Area (Ha): 0.73
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Site Details

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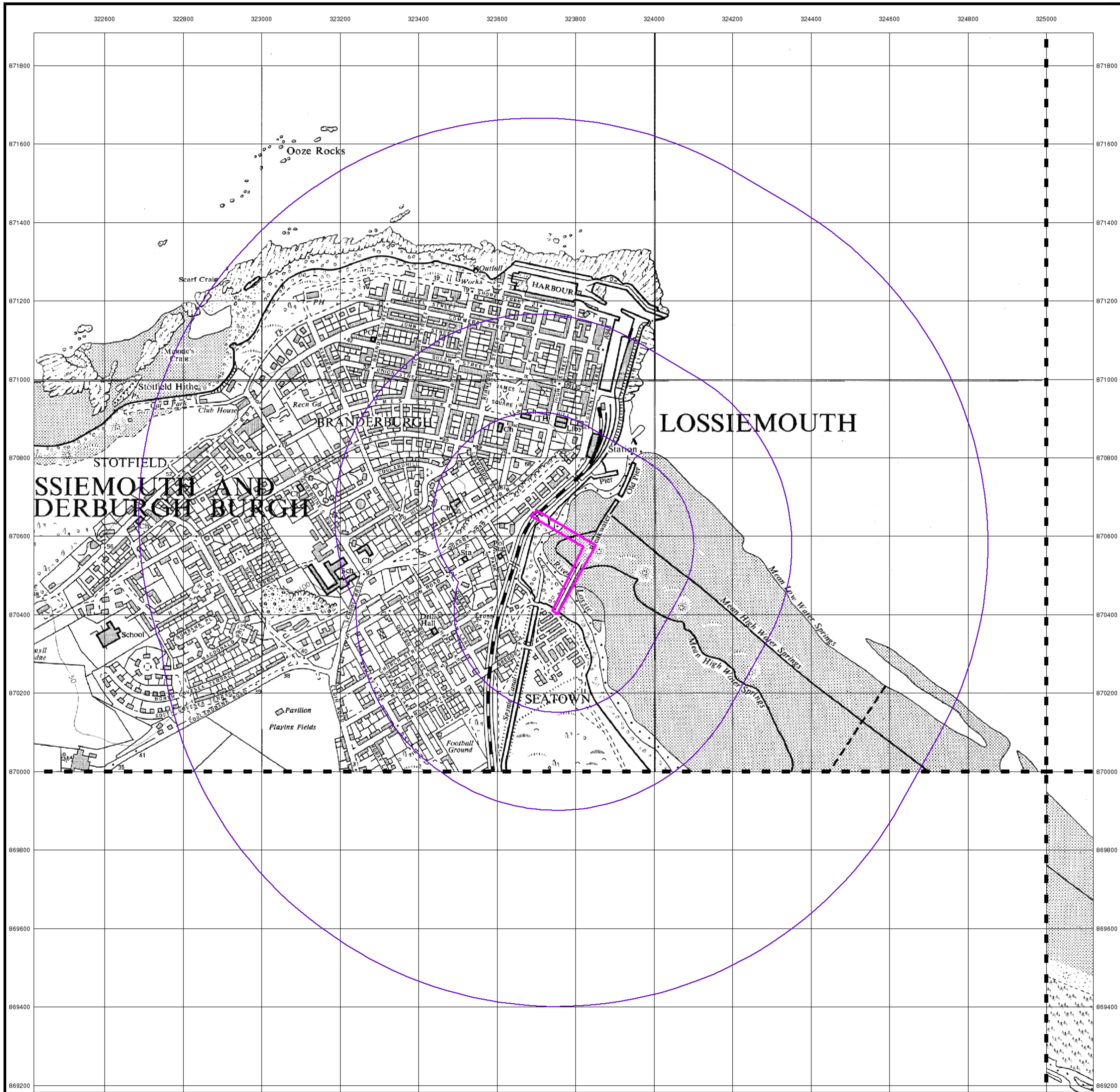

0 400 m

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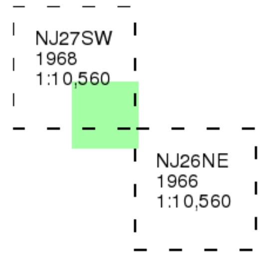
Ordnance Survey Plan

Published 1966 - 1968

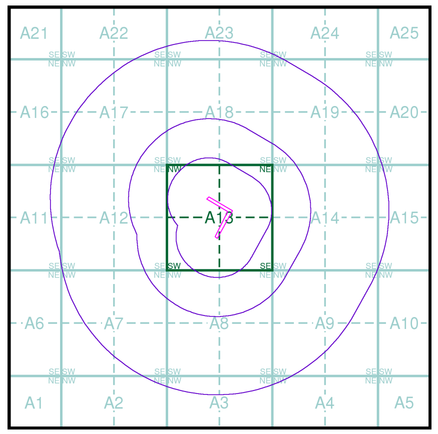
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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Order Details

Order Number:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
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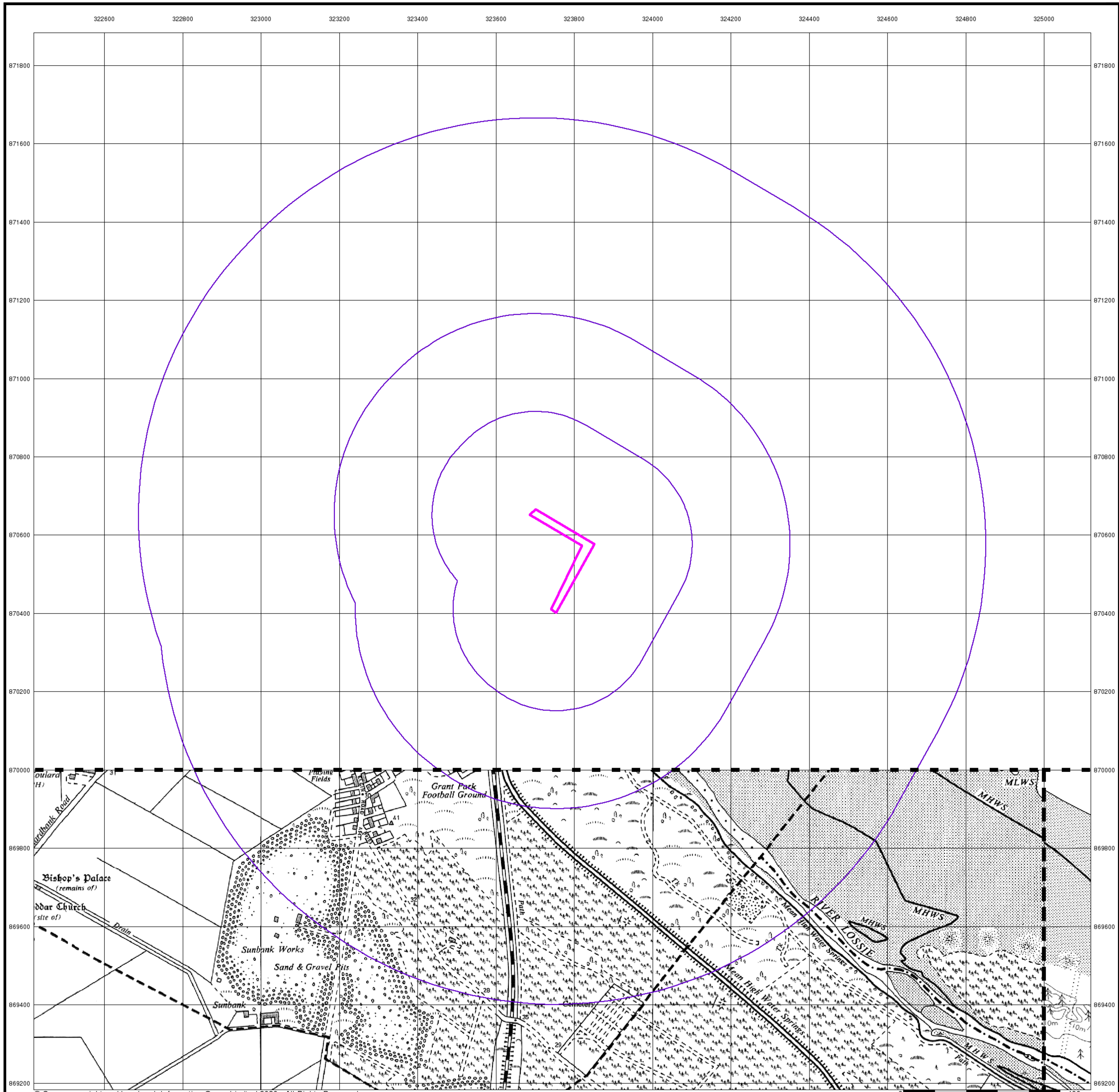

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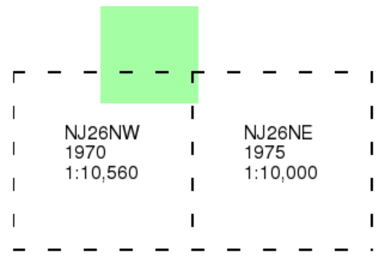
Ordnance Survey Plan

Published 1970 - 1975

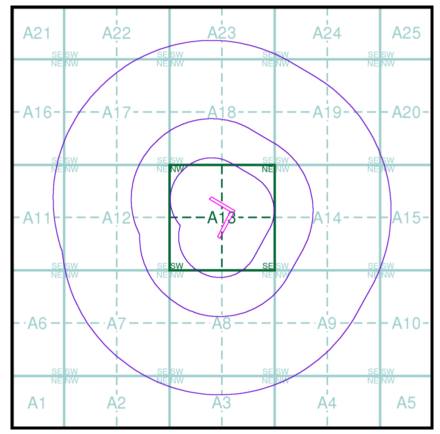
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



N

Order Details

Order Number:	262408444_1_1
Customer Ref:	STS5161M
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Slice:	A
Site Area (Ha):	0.73
Search Buffer (m):	1000

Site Details

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Ordnance Survey Plan

Published 1991 - 1994

Source map scale - 1:10,000

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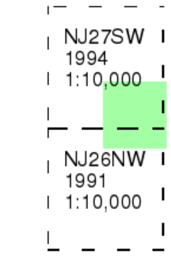
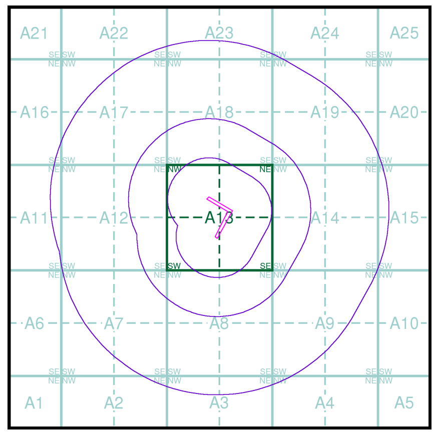
Map Name(s) and Date(s)



Historical Map - Slice A



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10k Raster Mapping

Published 2000

Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

NJ27SW 2000 1:10,000

NJ26NW 2000 1:10,000

NJ26NE 2000 1:10,000

Historical Map - Slice A

Order Details

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10k Raster Mapping

Published 2006

Source map scale - 1:10,000

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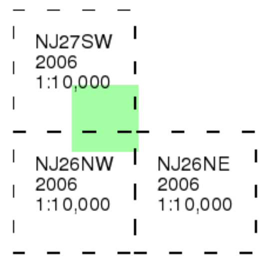
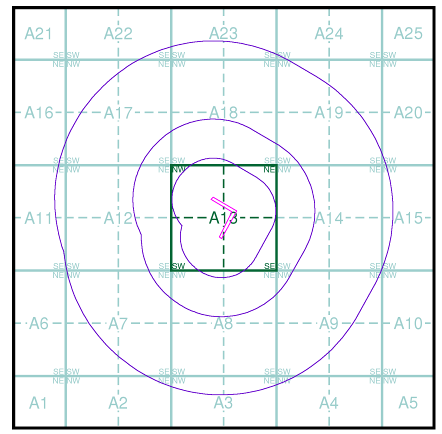
Map Name(s) and Date(s)



Historical Map - Slice A



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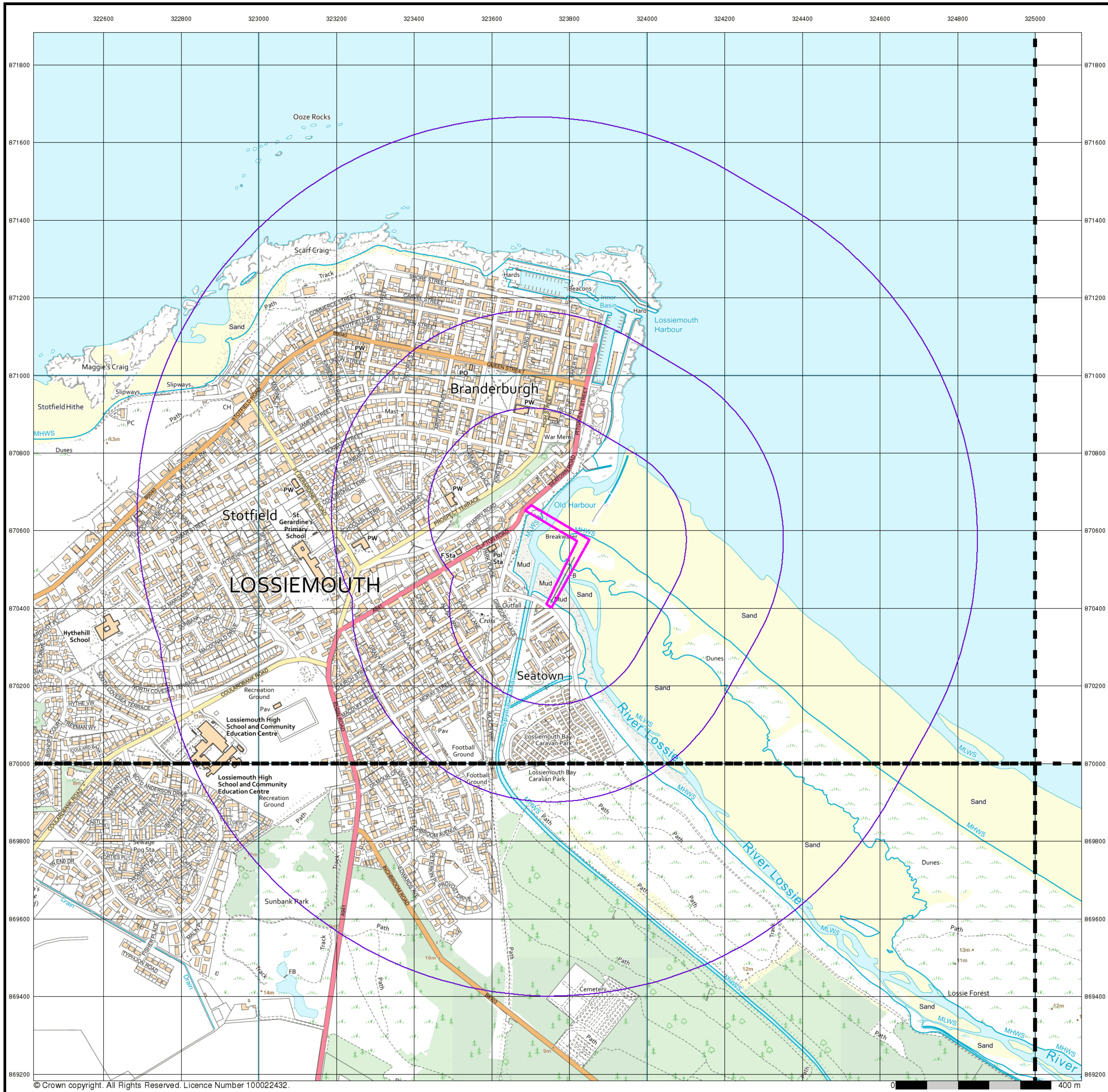

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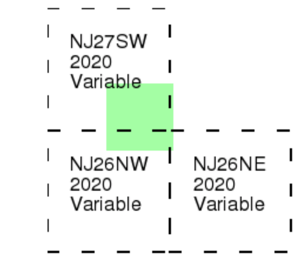
VectorMap Local

Published 2020

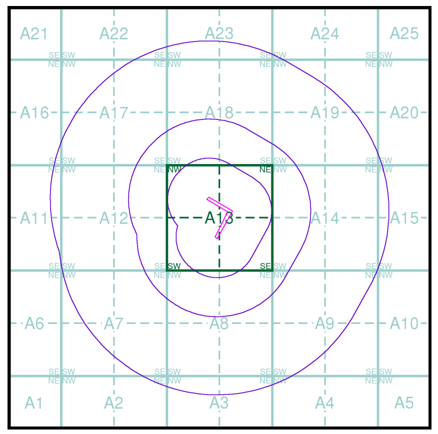
Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities),1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

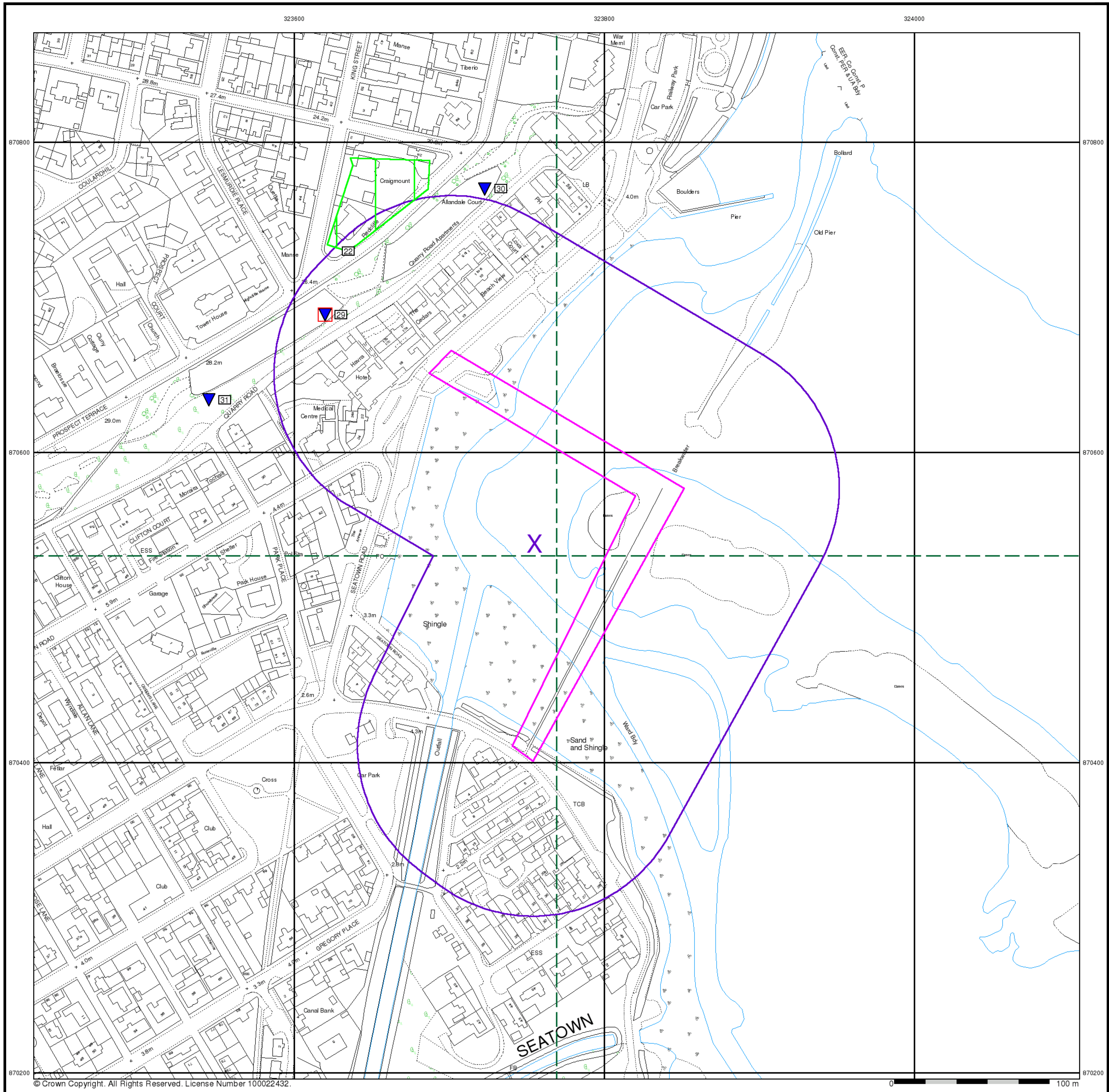
Order Number:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
Site Area (Ha):	0.73
Search Buffer (m):	1000

Site Details

Lossiemouth

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location
- Pylon
- Overhead Transmission Line

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- Integrated Pollution Control Registered Waste Site
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

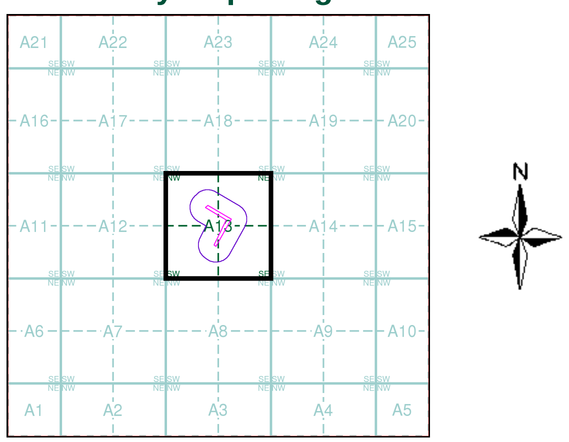
Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Geological

- BGS Recorded Mineral Site

Site Sensitivity Map - Segment A13



Order Details

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Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
Site Area (Ha):	0.73
Plot Buffer (m):	100

Site Details

Lossiemouth

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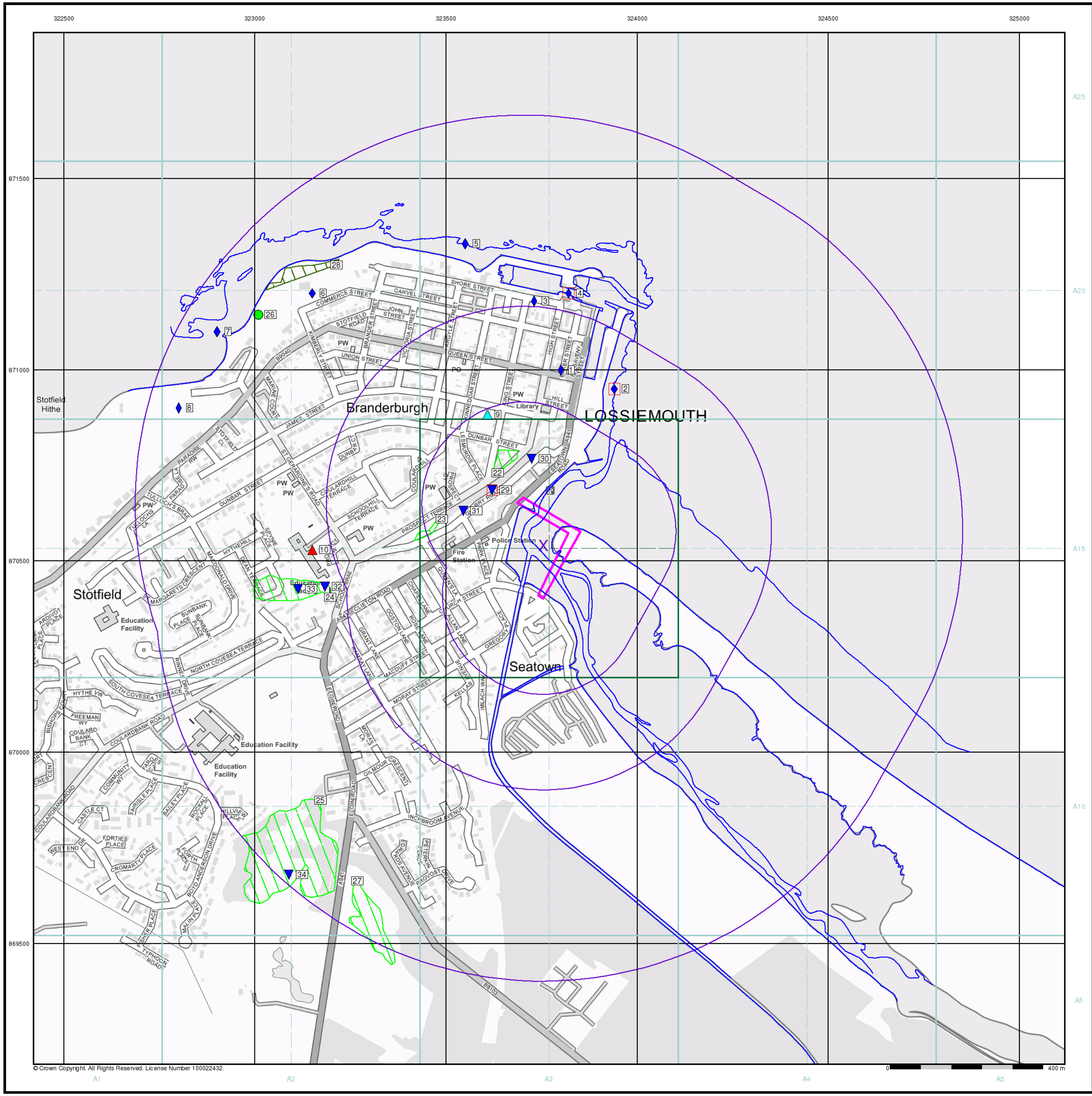

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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
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- Water Industry Act Referral

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- Integrated Pollution Control Registered Waste Site
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
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- Potentially Infilled Land (Water)
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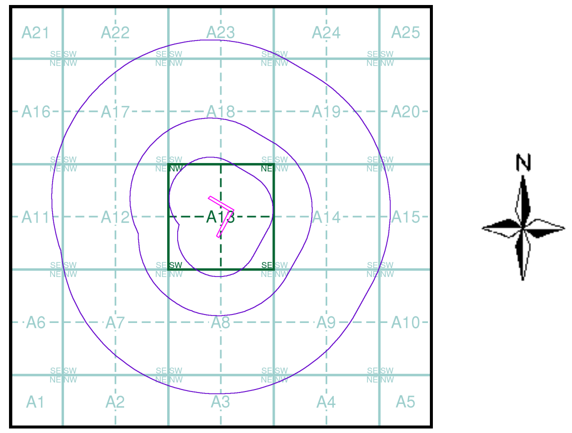
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Geological

- BGS Recorded Mineral Site

Site Sensitivity Map - Slice A



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Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
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Search Buffer (m):	1000

Site Details

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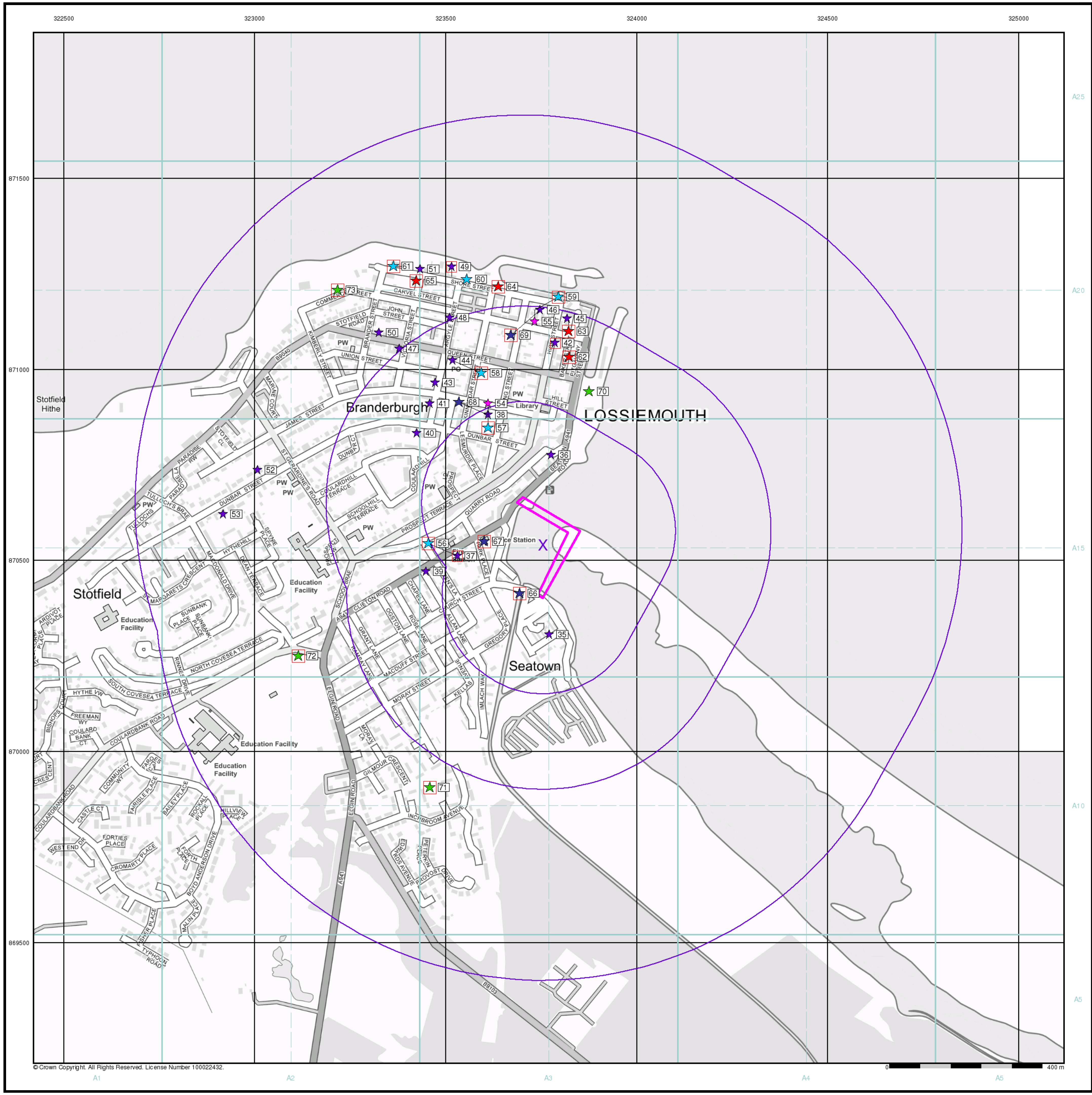

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Industrial Land Use Map

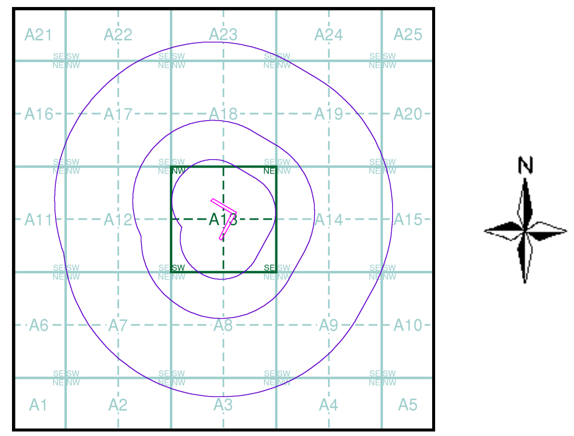
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry
- Gas Pipeline
- Points of Interest - Commercial Services
- Points of Interest - Education and Health
- Points of Interest - Manufacturing and Production
- Points of Interest - Public Infrastructure
- Points of Interest - Recreational and Environmental
- Underground Electrical Cables

Industrial Land Use Map - Slice A



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Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
Site Area (Ha):	0.73
Search Buffer (m):	1000

Site Details

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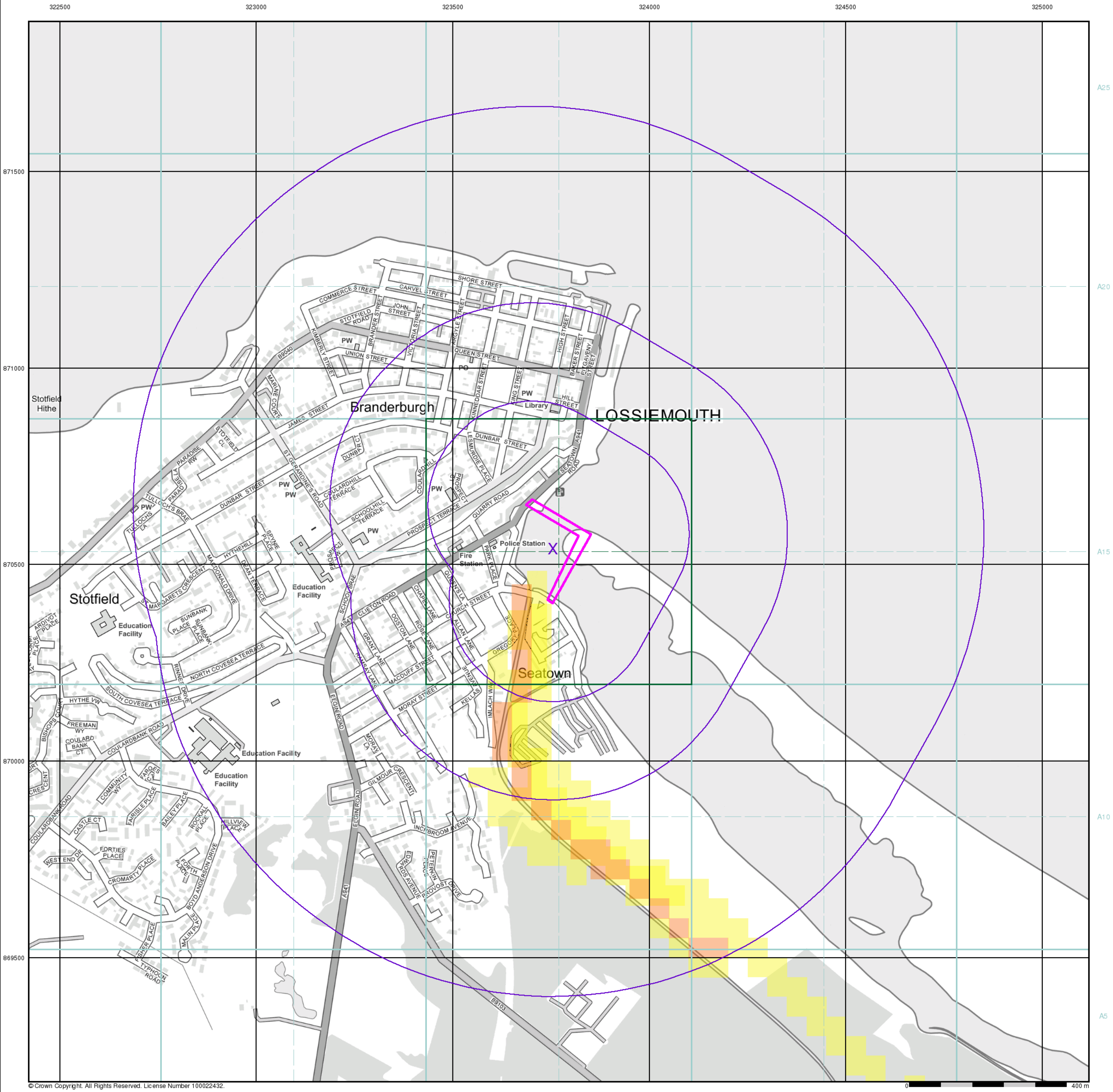

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General

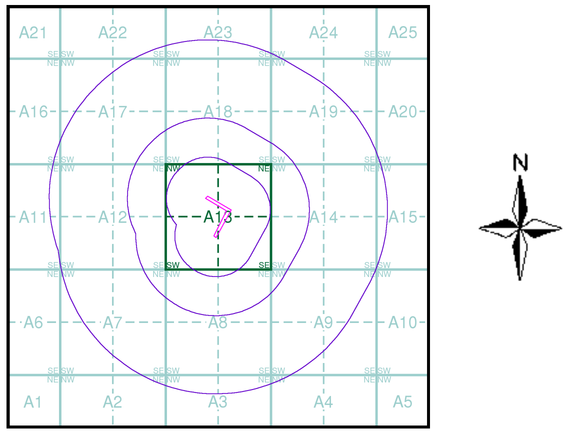
- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Agency and Hydrological (Flood)

- 0 - 1m estimated 100yr flood depth
- 1 - 2m estimated 100yr flood depth
- Over 2m estimated 100yr flood depth

The flooded areas have been generated using a generalised technique and should not, by themselves, be used to infer that specific areas are or are not at risk of inundation. Flood risk at any specific location may be influenced by local factors - not least flood defence - that have not been taken into account.

Flood Map - Slice A



Order Details

Order Number:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
Slice:	A
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Search Buffer (m):	1000

Site Details

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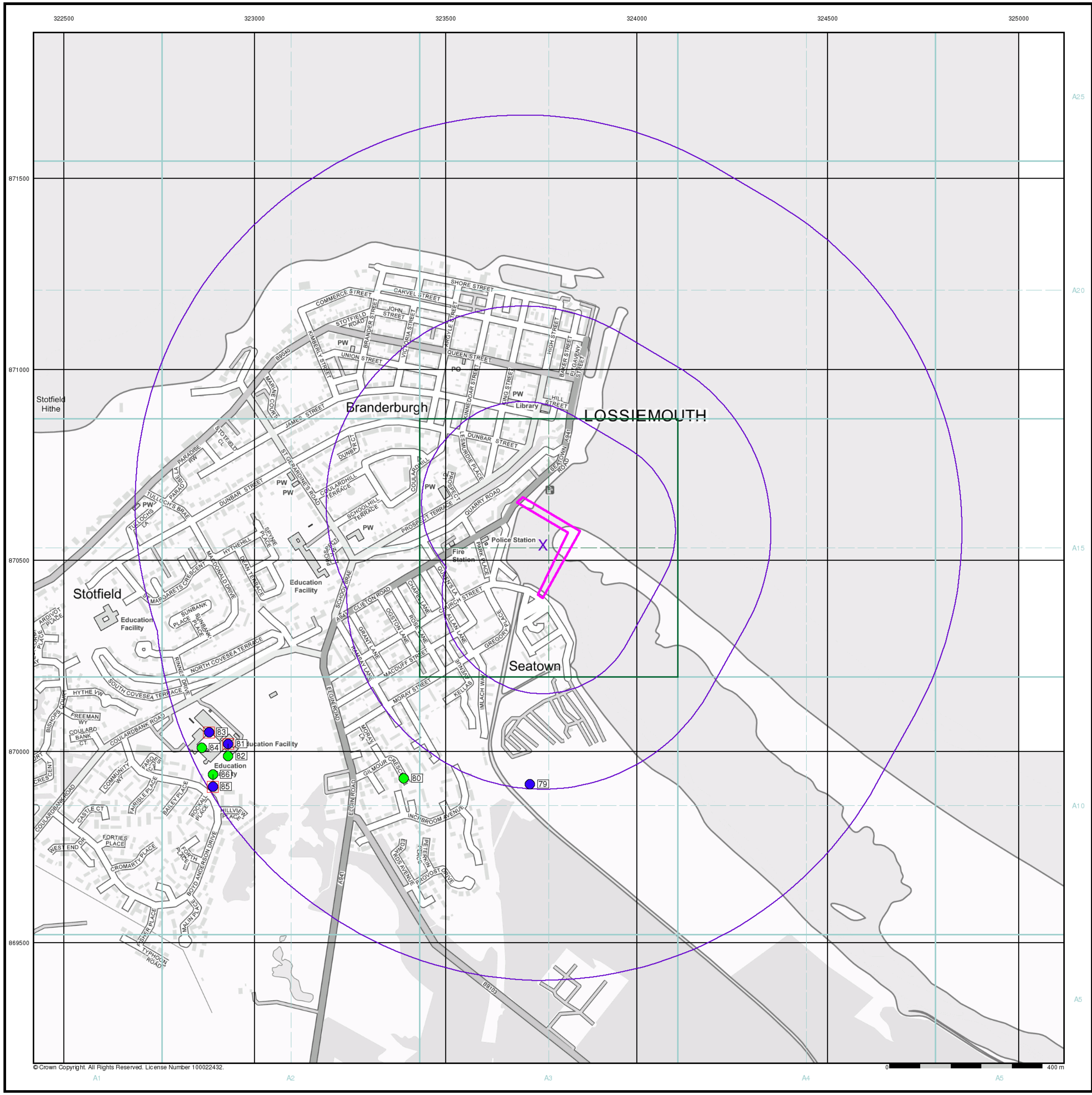

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General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

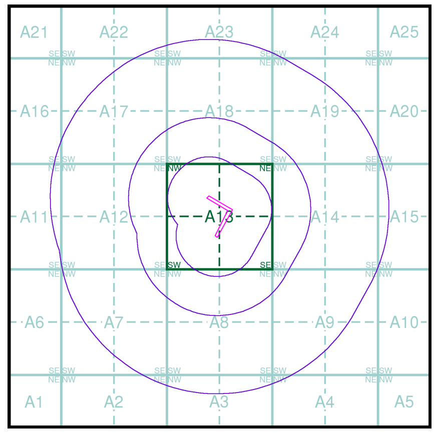
Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A



Order Details

Order Number: 262408444_1_1
Customer Ref: STS5161M
National Grid Reference: 323760, 870540
Slice: A
Site Area (Ha): 0.73
Search Buffer (m): 1000

Site Details

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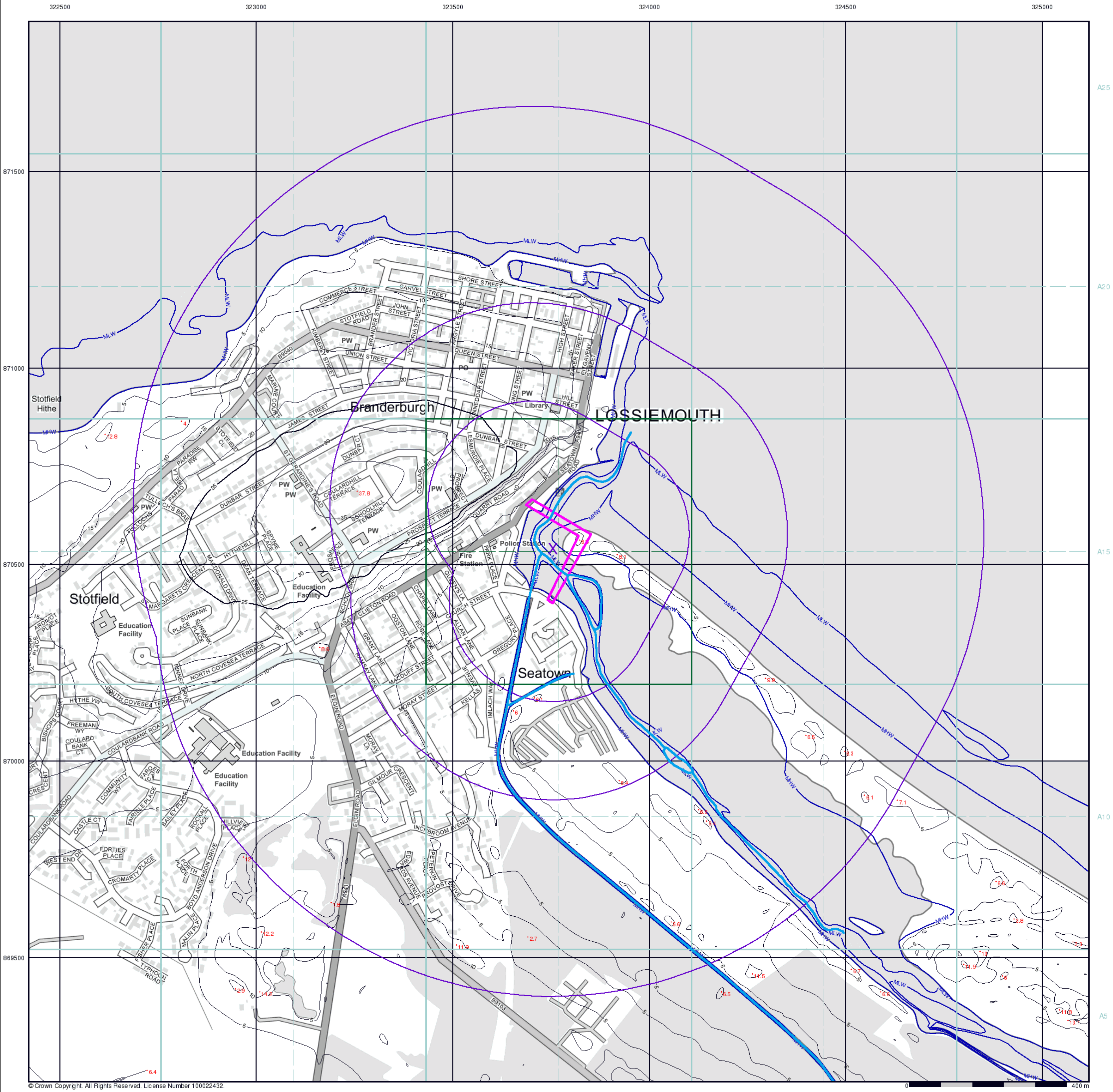

0 400 m

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General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

OS Water Network Data

Canal	Drain
Reservoir	Other
Foreshore	Lake
Marsh	Transfer
Tidal River	Lock Or Flight Of Locks
Inland River	Sea

Contours (height in meters)

Standard Contour — 105

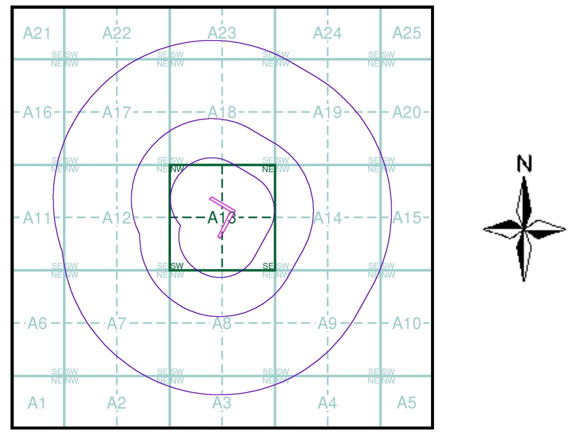
Master Contour — 100 — 95

Spot Height 167.3

MLW Mean Low Water Springs

MHW Mean High Water Springs

OS Water Network Map - Slice A



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Site Details

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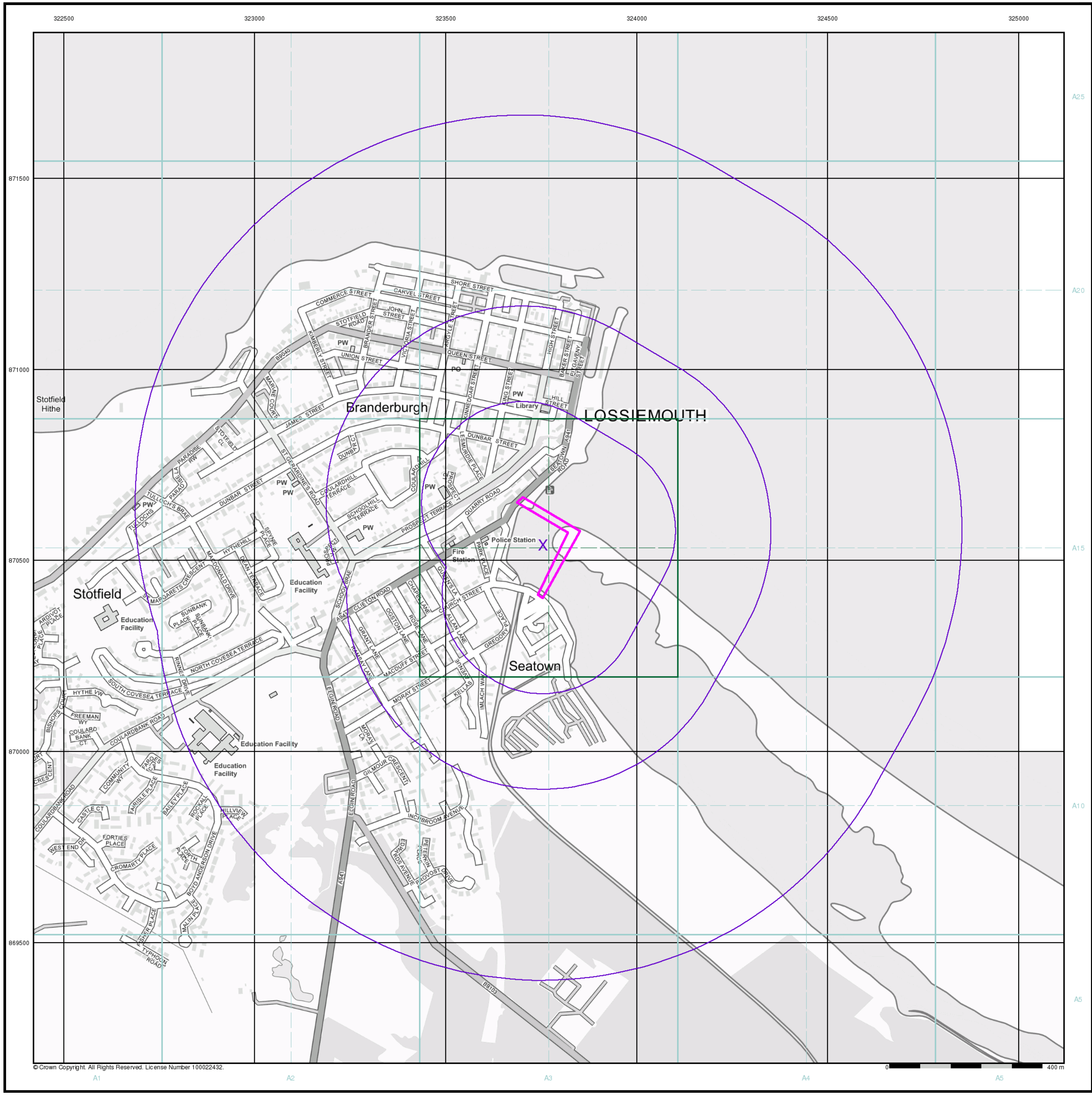

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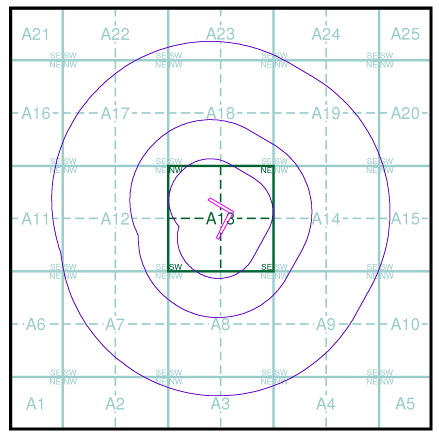
General
- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Risk of Flooding from Surface Water
- High - 30 Year Return
- Medium - 100 Year Return
- Low - 1000 Year Return

Suitability
See the suitability map below
- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



N

Order Details
Order Number: 262408444_1_1
Customer Ref: STS5161M
National Grid Reference: 323760, 870540
Slice: A
Site Area (Ha): 0.73
Search Buffer (m): 1000

Site Details
Lossiemouth

Landmark INFORMATION GROUP
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Fax: 0844 844 9951
Web: www.envirocheck.co.uk

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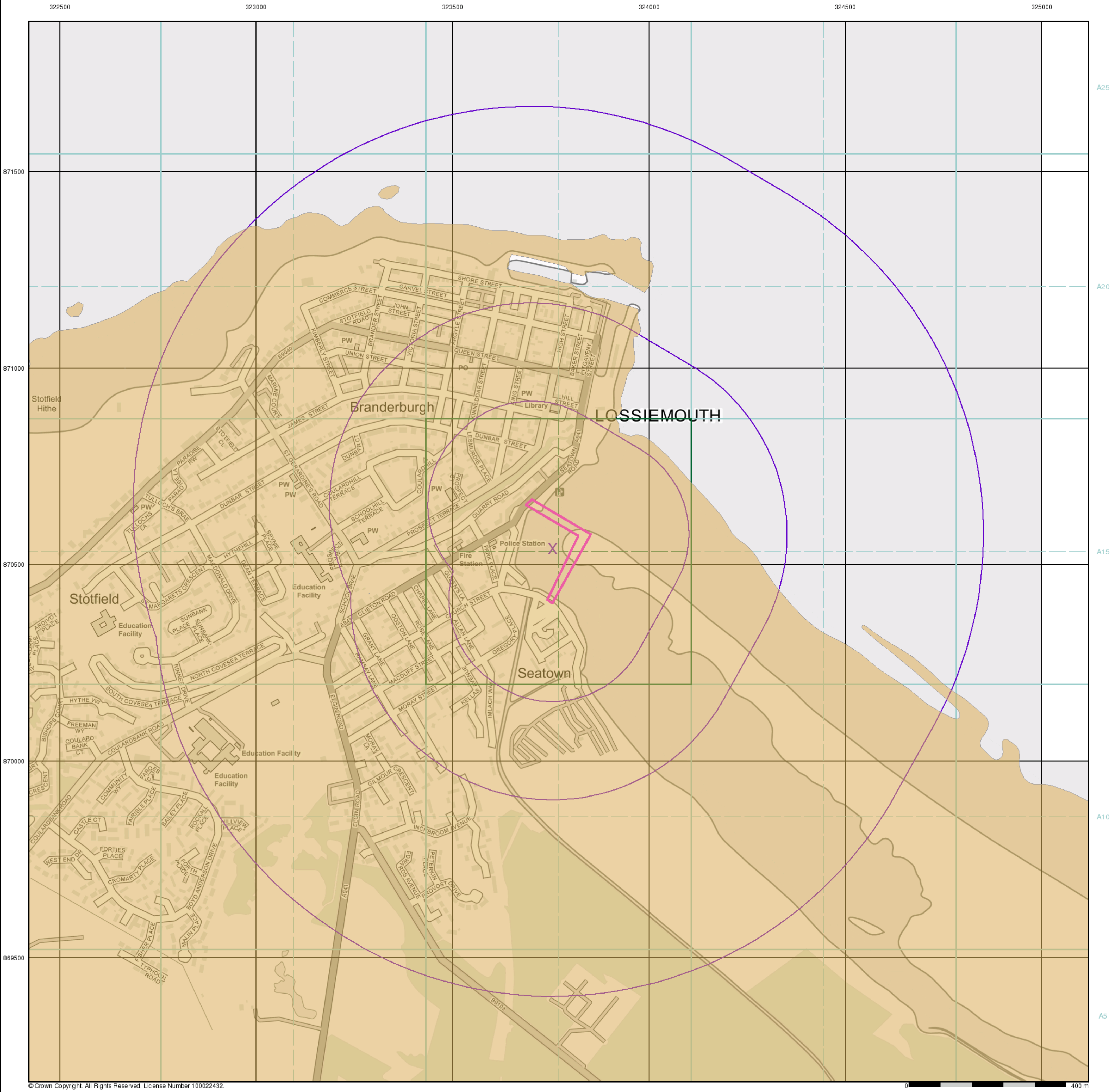


General

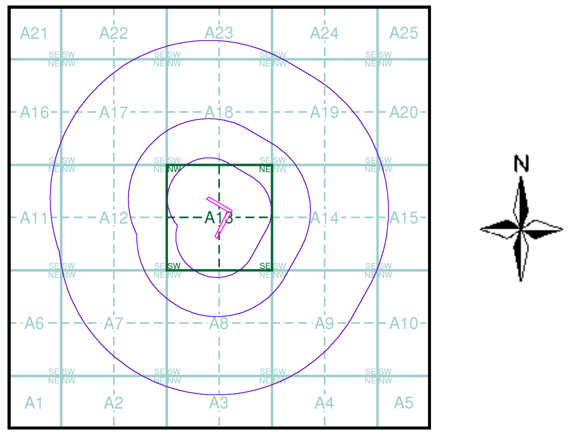
Specified Site — Specified Buffer(s) — X Bearing Reference Point

Estimated Soil Chemistry Arsenic

Arsenic Concentrations mg/kg

- < 15
- 15 - 25
- 25 - 35
- 35 - 45
- 45 - 60
- 60 - 120
- > 120

Estimated Soil Chemistry Arsenic - Slice A



Order Details

Order Details:	262408444_1_1
Customer Ref:	STS5161M
National Grid Reference:	323760, 870540
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Site Area (Ha):	0.73
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Site Details

Lossiemouth

Landmark INFORMATION GROUP

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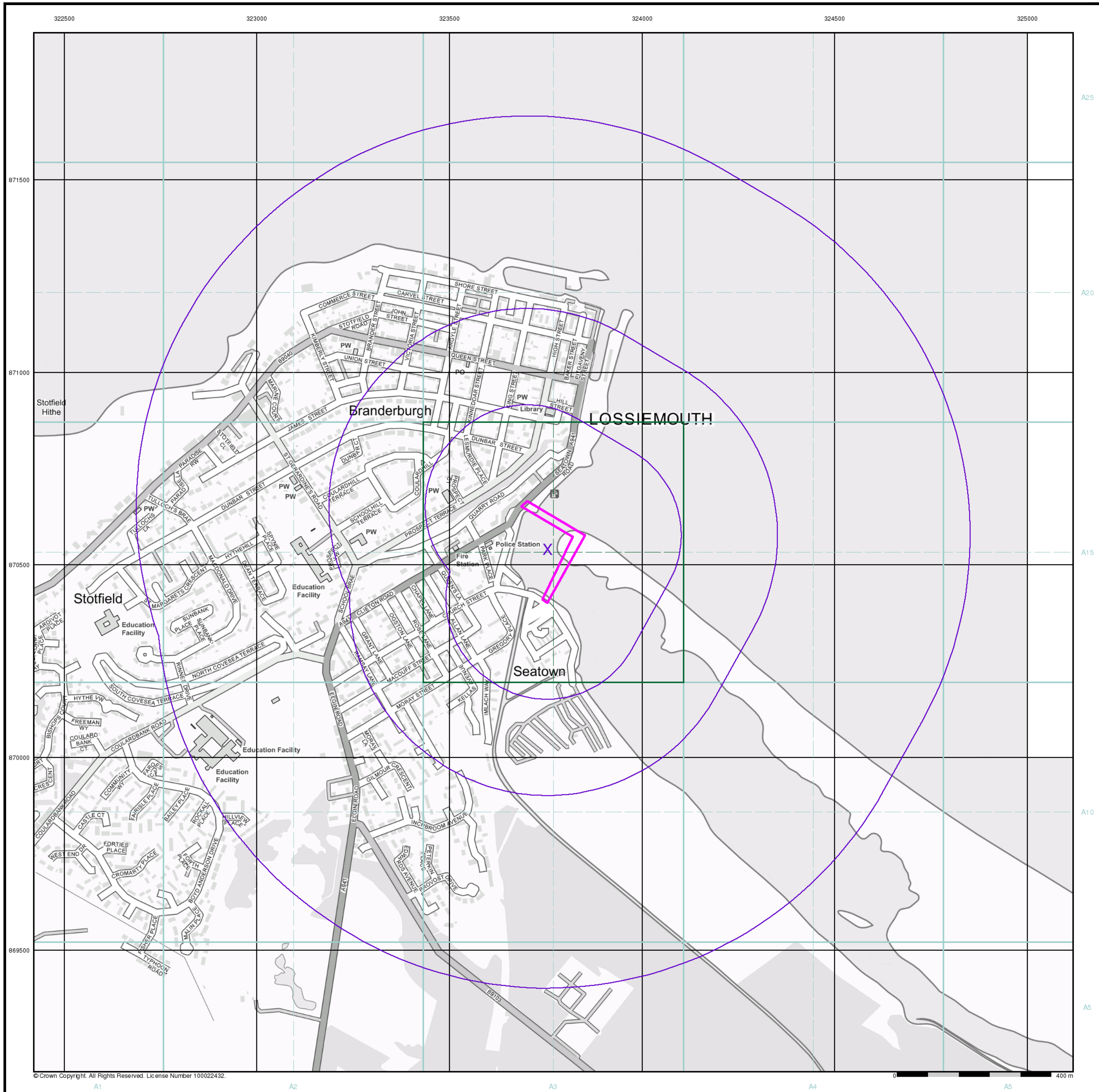

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General

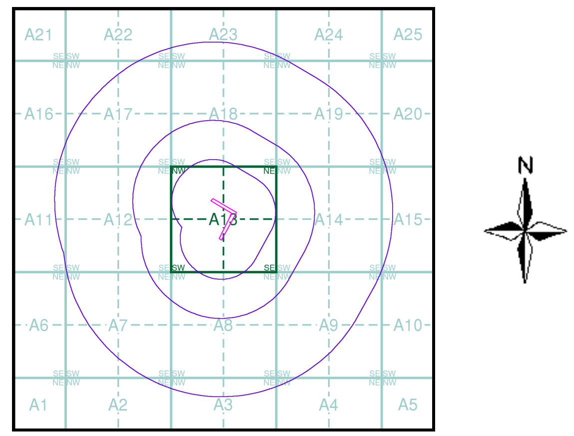
Specified Site   Specified Buffer(s)   X Bearing Reference Point

Estimated Soil Chemistry Cadmium

Cadmium Concentrations mg/kg

- < 1.8
- 1.8 - 2.2
- 2.2 - 3.0
- > 3.0

Estimated Soil Chemistry Cadmium - Slice A



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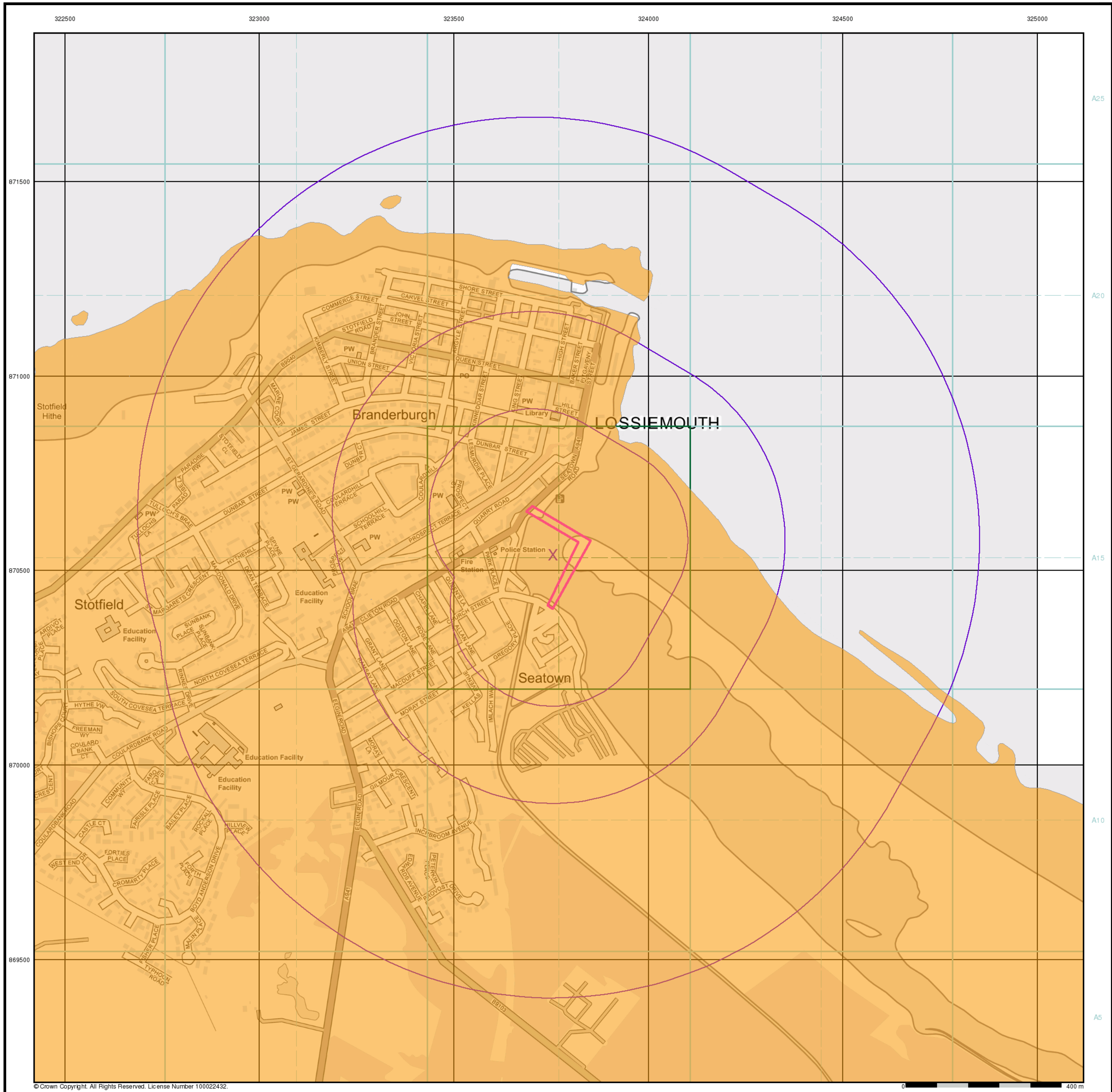

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General

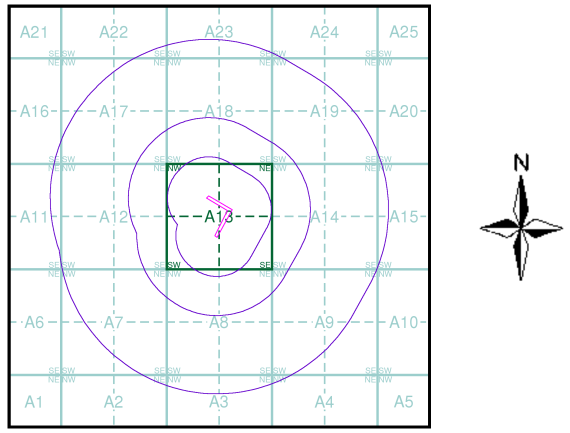
Specified Site — Specified Buffer(s) — X Bearing Reference Point

Estimated Soil Chemistry Chromium

Chromium Concentrations mg/kg

- < 20
- 20 - 40
- 40 - 60
- 60 - 90
- 90 - 120
- 120 - 180
- > 180

Estimated Soil Chemistry Chromium - Slice A



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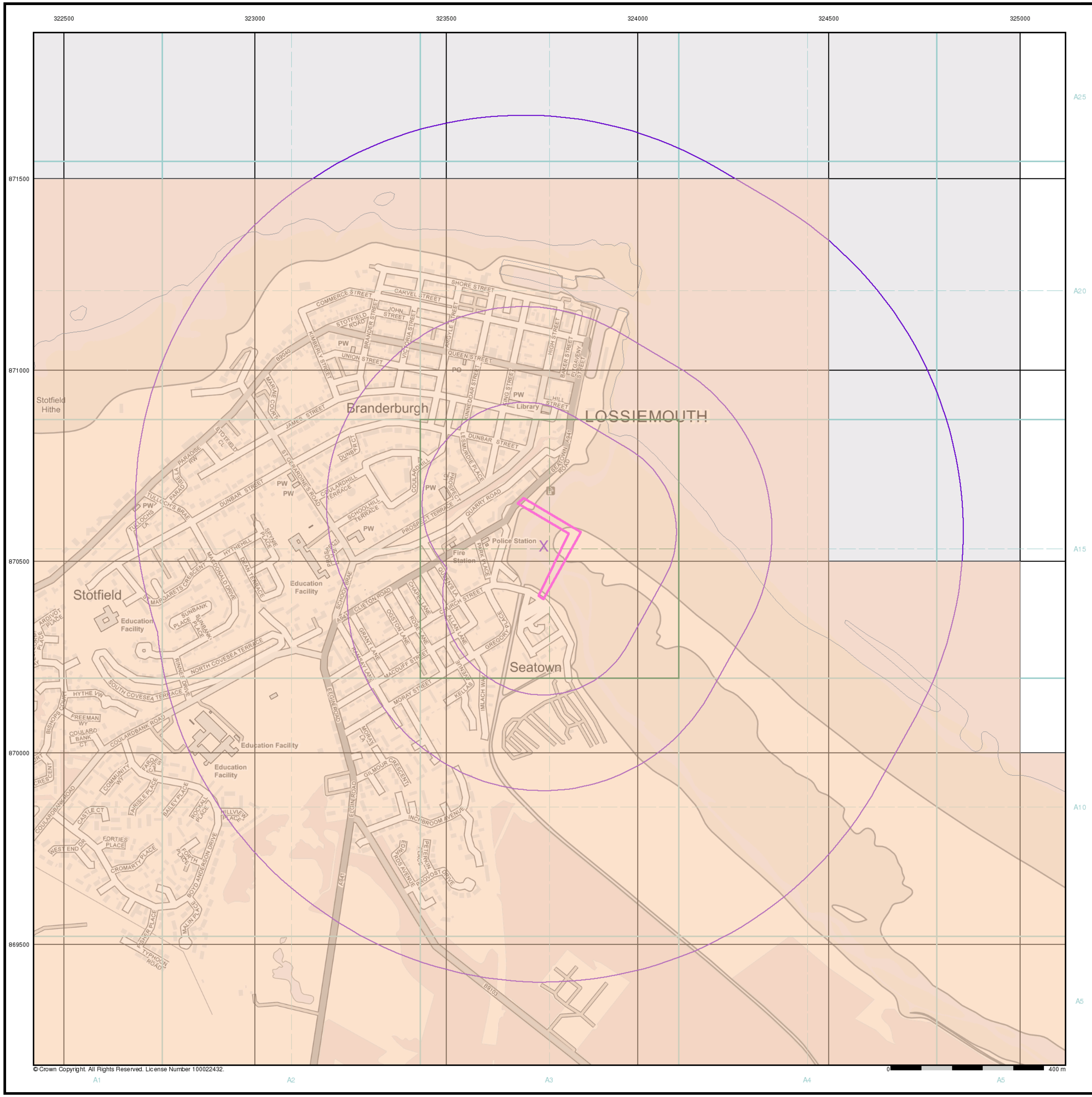

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General

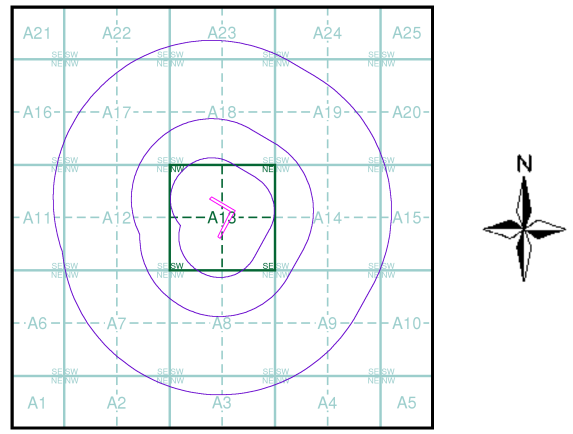
Specified Site   Specified Buffer(s)   X Bearing Reference Point

Estimated Soil Chemistry Lead

Lead Concentrations mg/kg

- <100 mg/kg
- 100 - 200
- 200 - 300
- 300 - 600
- 600 - 1200
- >1200

Estimated Soil Chemistry Lead - Slice A



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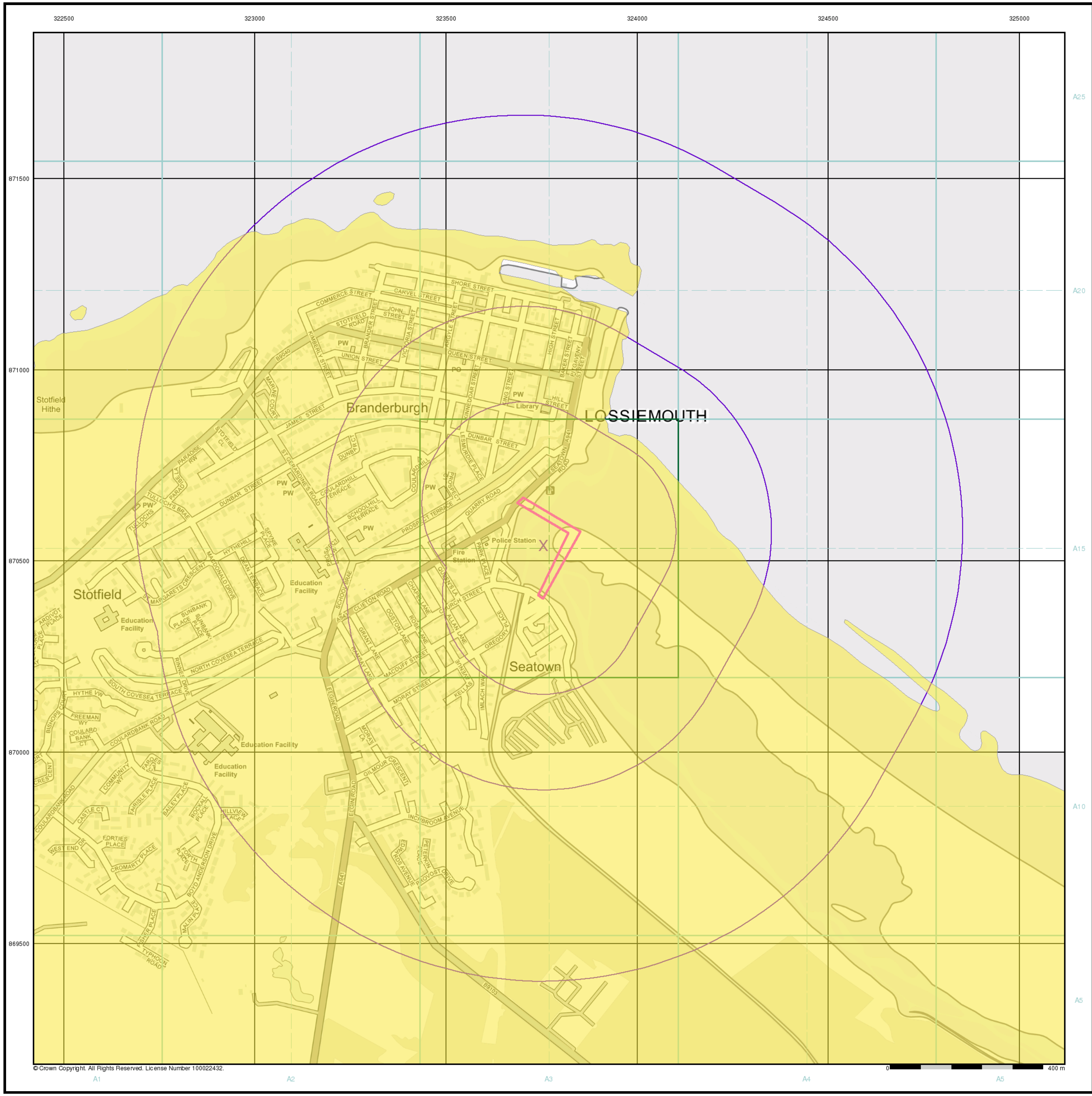

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General

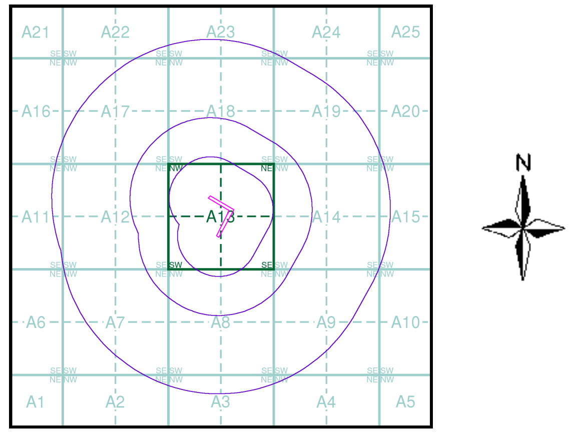
Specified Site
Specified Buffer(s)
X Bearing Reference Point

Estimated Soil Chemistry Nickel

Nickel Concentrations mg/kg

- < 15
- 15 - 30
- 30 - 45
- 45 - 60
- 60 - 80
- 80 - 100
- > 100

Estimated Soil Chemistry Nickel - Slice A



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Fax: 0844 844 9951
Web: www.envirocheck.co.uk

MACC International Ltd, Camilla Court, Nacton, Ipswich, Suffolk, IP10 0EU, UK

Alexa Band
Receptionist
Soiltechnics Ltd

Your Reference:

Our Reference: JM/3536/566

Email 1st Instance: Alexa.Band@soiltechnics.net

Date: 01/10/2020

Unexploded Ordnance Preliminary Risk Review
East Beach Footbridge, Lossiemouth, IV31 6JD

MACC International Ltd (MACC) has conducted a preliminary risk review for the site footprint. The review has drawn on open source and in-house information, references have been provided where available (See Annex A).

The review has been conducted to provide Soiltechnics Ltd with a review of the risk which may be posed by UXO while conducting investigations on the site.

This document has been produced in the United Kingdom by MACC International Limited and has been provided solely as an aid in decision making. It is not intended to be used by any person for any purpose other than that specified. Any liability arising out of use by a third party of this document for purposes not wholly connected with the above shall be the responsibility of that party, who shall indemnify MACC International Limited against all claims, costs, damages and losses arising out of such use.

Several HE bomb strikes were recorded within the immediate vicinity of the site during WWII. It is also considered possible for an item of UXO to have been imported onto the site due to tidal action. Whilst considering the history of the site and the level of post-war development, the following conclusions have been reached:

- It is considered that there is a credible likelihood of encountering UXO on the plot. Consequently, the UXO risk is considered to be Medium within the site boundary.

It is recommended that a Detailed UXO Study is conducted to more accurately define the risk levels within the site footprint. Alternatively, the stated preliminary risk level is accepted and the following mitigation procedures are implemented:

1. All site personnel are provided with a UXO Safety Awareness Talk before intrusive works are commenced.
2. All intrusive investigations into post war un-worked ground should be supported by specialist EOD services.

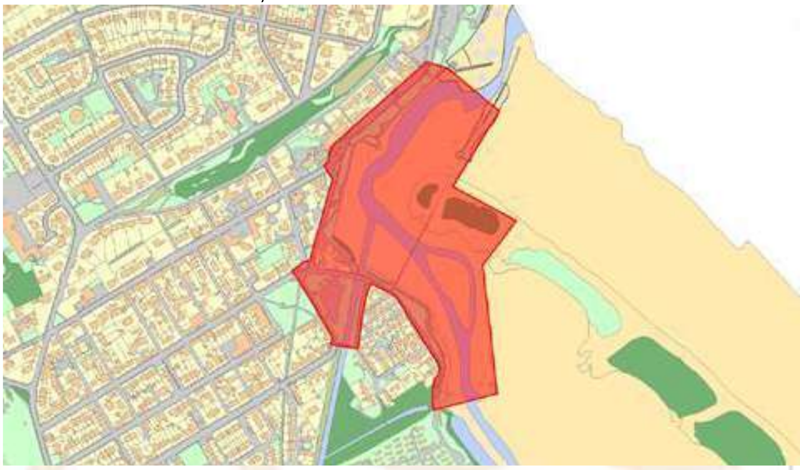
I trust this document has provided you with sufficient information to meet your immediate needs, should you require anything further, please do not hesitate to contact me.

Yours Sincerely

John Morrison
Operations Manager

Annex 'A' to
Document JM/3536/566
Dated 01/10/2020

Unexploded Ordnance Preliminary Risk Review

Site location	**Site Address:** East Beach Footbridge, Lossiemouth, IV31 6JD **Grid Reference:** 323767, 870383 
Scope of Intended works	Preliminary review of the risk that may be posed by UXO to geotechnical investigations.
History	**Wartime Use:** During WWII, the majority of the site was undeveloped land occupied by mud and shingle/beach areas. **Post War Development:** The majority of the site has undergone little post-war development.
Wartime History	**Enemy Bombing:** Lossiemouth did suffer enemy bombing raids during WWII. One raid affected RAF Lossiemouth (located approximately 1.7km to the south west of the site) in October 1940 and Lossiemouth Town was also raided in 1941. Several HE bomb strikes were recorded within the immediate vicinity of the site at Dunbar Street, Kinneddar Street, and at the junction of King Street and Prospect Terrace approximately 90m to the north-west of the site. Given the undeveloped marine nature of much of the site, it is considered more likely for munitions to have fallen unrecorded. It is also considered possible for an item of UXO to be imported onto the site due to tidal action. **Anti-Aircraft Guns:** No guns were recorded to have been positioned on the site. The nearest recorded Heavy Anti-Aircraft battery was located approximately 900m to the west. **Military Use:** RAF Lossiemouth is located approximately 1.7km to the south-west of the site. No records were found to confirm military use of the site footprint; however, the possibility that wartime coastal defences were positioned within the site cannot be ruled out.
Unexploded Ordnance (UXO) Finds	No records were found to confirm a UXO find within the site footprint.

IN SITU
SITE INVESTIGATION

STATIC CONE PENETRATION TEST

FACTUAL REPORT

CLIENT: Soiltechnics

PROJECT: Lossiemouth

Project	Lossiemouth
Project No.	1200410
Client	Soiltechnics
Address	Unit 9, Clarence Avenue, Westpoint Enterprise Park, Trafford Park, Manchester, M17 1QS

Attention: Mr Mark Hamill

Dear Mr Hamill,

We have pleasure in providing a digital copy of our report and data in AGS format for the above project.

We hope that you are satisfied with the performance of our staff, equipment and reporting on this project. If you should have any queries about any aspect of the works carried out, please do not hesitate to contact us. We look forward to being of service to you in the future.

Yours faithfully,

In Situ Site Investigation Limited

Darren Ward

Director

Report Issue

Issue	Date	Prepared	Sign	Checked	Sign	Approved	Sign
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1.0 INTRODUCTION

In Situ Site Investigation Limited (In Situ) was engaged in a geotechnical site investigation at Lossiemouth at the request of Soiltechnics. The site investigation consisted of completing 34 Static Piezocone Penetration Tests (CPTU) to provide information on the soil conditions and derived geotechnical parameters at:

Clifton Rd,
Lossiemouth
IV31 6DJ

All test locations were provided by the client. A site map is included in the end of Appendix A of this report (if provided by the client). The tests were stopped when they reached the target depth as per the client's technical specifications or for other technical reasons, as detailed in the *Project Summary Table* in *Appendix A.1* and on each CPTU log included in Appendix B of this report.

The fieldwork was carried out from 19th October 2020 to 20th October 2020 as per the client's request.

The work on site and the final factual reporting have been undertaken in accordance with the international technical standard *BS EN ISO 22476-1:2012*.

2.0 FIELDWORK

2.1 CONE PENETRATION TESTS

The fieldwork activity is summarised in Table 2.1.

Table 2.1 Fieldwork Summary	
CPT Operator/s	Roger Shepherd
Date Started	19th October 2020
Date Finished	20th October 2020
In Situ S.I. Project Manager	Darren Ward
Main Contractor's Site Manager	Farhad Qayum

2.1.1 Rig Information

Details of CPTU rig used in this project are shown in Table 2.2. Full data sheet for the rig is presented in *Appendix A.2*.

Table 2.2 Rig Summary	
Rig Name	**Rig Description**
CPT017	20 Tonne Track Mounted CPT Rig

2.1.2 CPTU Cone

Details of electric CPTU cone (Type TE2) used in this project conforming to the requirements of Application Class 2 of *ISO 22476-1:2012*, are shown in Table 2.3.

Table 2.3 Cone Summary		
Number	**Cross-section area**	**Filter position**
S15-CFIP.1858	15cm^2	u_2

A full datasheet of the cone used is shown in *Appendix A.3*.

The cone's measured parameters are shown in Table 2.4.

Table 2.4 Completed Fieldwork Summary
34 CPTU to a maximum depth of 6.67m. Each test measured Cone Resistance, q_c, Sleeve Friction, f_s, Porewater Pressure in the shoulder position, u_2, Inclination in X and Y axes. 34 MAG tests to a maximum depth of 6.67m. Each MAG test measured Magnetic Field X (nT), Magnetic Field Y (nT) and Magnetic Field Z (nT).
Provision of factual report with estimated soil type, derived geotechnical parameters & AGS data file.

2.1.3 CPTU Cone Calibration

The cone resistance and sleeve friction are recorded by calibrated load cells in the cone. The CPTU load cells and pressure transducers are regularly calibrated in line with *ISO 22476-1:2012* standard by the cone manufacturer. The cone calibration certificate for the cone used at this site are presented in *Appendix A.4*.

2.1.4 CPTU Cone Saturation

The pore water pressure is recorded using a calibrated pressure transducer located in the piezocone. To ensure pore water pressure measurements are not affected by the presence of air in the measuring transducer, a de-airing procedure is carried out prior to each test. The cone and filter are saturated using a glycerine fluid with a viscosity of 10,000 CST.

2.1.5 Test Procedure

The tests are carried out in accordance with the *International Standard for Electrical Cone and Piezocone Penetration Test (ISO 22476-1:2012)*.

The final depths of the tests were determined by either completion to the specified test depth or when the maximal safe capacity of the equipment was reached. A schedule of the tests performed is shown in *Appendix A.1*, which has been compiled from the operators' daily progress reports.

The data is transmitted from the digital CPTU through an umbilical cable that runs through the push rods to the data acquisition system. Results are displayed instantaneously on the computer logging screen. The results are recorded on the computer hard disc.

The rate of penetration is kept constant at 2cm/s ±10% except when penetrating very dense or hard strata. Before each test is carried out zero values are taken of the cone to check if it is within calibration. At the end of each test, zero values are taken again to see if there has been any drift during the test. These values are inspected during the post processing stage. This is a quality check on the data and the testing procedure. Individual test zero values are shown on their corresponding test results in *Appendix B*.

2.1.6 In Situ Pore Pressure (u_0)

The in situ or hydrostatic pore pressure is required for the calculation of several derived parameters included in this report. For this report, the groundwater level is assumed at 2.00 m below ground surface, for calculation purposes. The in situ pore pressure (u_0) values are presented on the pore pressure plot, on *CPT Log 01,* which is included in *Appendix B*.

2.2 POSITIONING

Positioning and surveying of all investigated locations was the responsibility of the client.

3.0 CONE PENETRATION MEASURED PARAMETERS

All measured parameters of tests carried with the CPTU cone are shown in *Appendix B* and all the information about data processing and results are given in sections *3.1*, *3.2* and *3.3*.

3.1 DATA PROCESSING

The measured parameters, cone end resistance, q_c, sleeve friction, f_s, porewater pressure measurements with filter in shoulder position, u_2 and inclination for x and y axis, I_x, I_y, were recorded for every *10 mm* of penetration keeping a constant speed of *20 mm/s* ± *2 mm/s*, which may slightly change when the cone is penetrating hard strata.

The measured data from the site works is processed and presented using specialised CPT software. The interpretations on the CPTU results were carried out following the recommendations of *Lunne et al. (1997)*, *Robertson (2015)* and *BS EN ISO 22476-1:2012.* Measured parameters, mentioned in *Sections 3.2* and *3.3*, were used to derive all the geotechnical parameters, which are presented in *Chapter 4.0*. The soil behaviour type method used on this report is *Robertson et al. (1986)*, shown in *Figure 3.2*.

3.1.1 Zero Measurements

Before and after each CPTU test, zero measurements are recorded for each channel of the cone. The zero measurements are presented on the logs in *Appendix B*. This is a routine quality check carried out on site.

3.2 MEASURED PARAMETERS

3.2.1 Cone Resistance (q_c)

Cone resistance, q_c, is measured as the total force acting on the cone, divided by the projected area of the cone. The results are presented in *MPa*, on *CPT Log 01*, in *Appendix B*, scale *0-20 MPa* with a minor scale printing on the same graph at *0-4 MPa*.

3.2.2 Sleeve Friction (f_s)

Sleeve friction, f_s, is measured as the total frictional force acting on the friction sleeve divided by its surface area. The results are presented in *kPa*, on *CPT Log 01*, in *Appendix B*, using a scale of *0-500 kPa*.

3.2.3 Porewater pressure (u_2)

The pore pressure, u_2, is measured during the test. If the material is free draining and saturation is maintained it will normally measure hydrostatic pore pressure. In materials that are not free draining, it will record the total pore pressure (hydrostatic plus any excess pore pressures generated) created by the cone penetration through this material.

The filter element can be mounted in one of three positions. For all tests carried out in this project the filter was mounted in the u_2 position (see *Figure 3.1*).

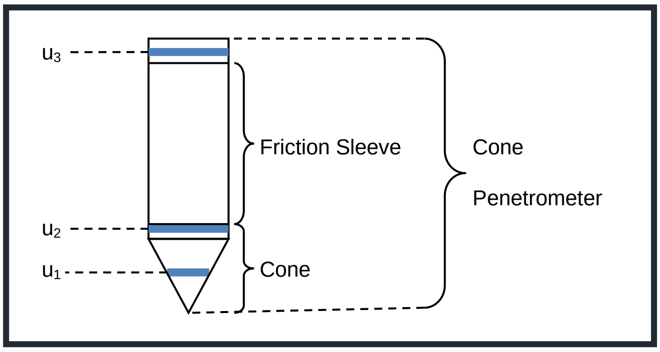

Figure 3.1: *Diagram showing pore pressure filter locations (after Lunne et al., 1997)*

3.2.4 Inclination (I_x, I_y)

The CPT rig was set up to obtain a thrust direction as near as possible to vertical. The CPTU cones have inclinometers incorporated to measure the non-verticality of the test. For test depths less than *15 m*, significant non-verticality is unusual, provided the initial thrust direction is vertical.

3.3 ESTIMATED SOIL BEHAVIOUR TYPE

3.3.1 Friction Ratio (R_f)

The friction ratio, R_f is the ratio between the sleeve friction and the cone resistance (Lunne *et al.,* 1997).

$$Fricton\ Ratio\ (R_f) = \left(\frac{Sleeve\ Friction\ (f_s)}{Cone\ Resistance\ (q_c)}\right) \times 100$$

3.3.2 Estimated Soil Behaviour Type (SBT)

The estimation of soil behaviour type, *SBT*, using measurements of cone resistance and sleeve friction is based upon the variations of the friction ratio and cone resistance. The friction ratio varies depending upon whether the soil is cohesive or granular. The cone resistance varies depending on the strength and densities of the soil.

The interpretation used in this report is *Robertson et al. (1986)*, which is shown in Figure 3.2. The results are presented on *CPT Log 01*, in *Appendix B*.

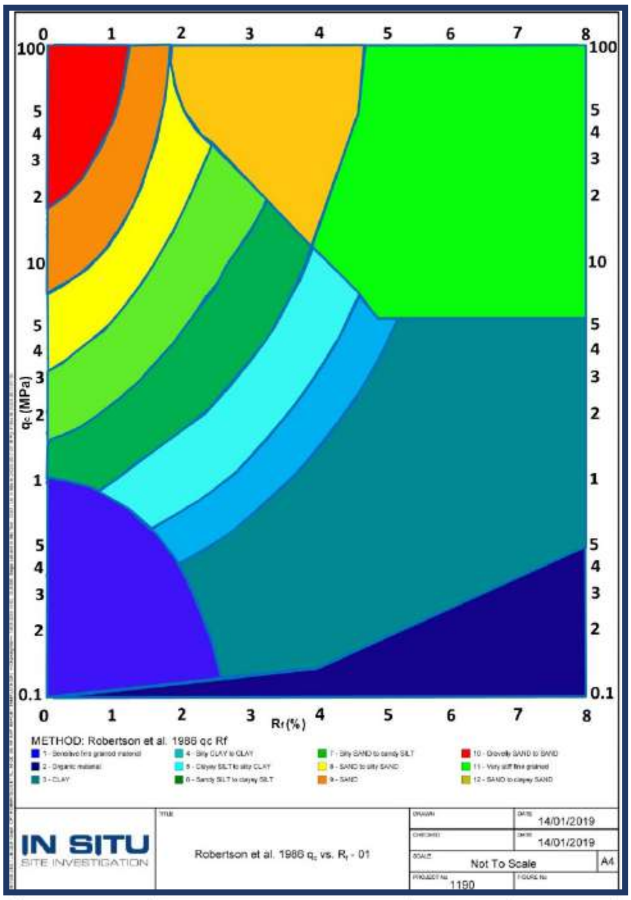

Figure 3.2: *Robertson et al., 1986 soil behaviour type chart.*

3.3.3 Pore Pressure Ratio (B_q)

Pore pressure ratio, B_q is the ratio between the measured pore pressure generated during penetration and the corrected cone resistance minus the total overburden stress.

Pore pressure ratio as defined by *Senneset and Janbu (1985)* is defined as:

$$B_q = \frac{u_2 - u_0}{q_t - \sigma_{vo}}$$

where

u_2	is pore pressure measured between the cone and the friction sleeve
u_0	is equilibrium pore pressure
σ_{vo}	is total overburden stress
q_t	is cone resistance corrected for unequal end area effects

3.4 APPLIED CORRECTIONS

3.4.1 Corrected Cone Resistance (q_t)

For each penetration test, the measured cone resistance, q_c, can be corrected for the ''unequal area effect'' due to the influence of the ambient pore water pressure acting on the cone.

The correction has been applied using the following equation by Lunne et *al.,* 1997:

$$q_t = q_c + [u_2.(1 - \alpha)]$$

where

α is the cone area ratio

The cone used on this project has a cone area ratio of *0.79*. This value is geometrically measured.

3.4.2 Depth Correction

All tests in the report have been corrected for depth difference caused by inclination. This has been calculated using the method described in *ISO 22476-1:2012*.

To calculate the corrected depth the following formula is used:

$$z = \int_0^l C_{inc} \cdot dl$$

where

z is penetration depth, in *m*
l is penetration length, in *m*
C_{inc} is correction factor for the effect of the inclination of the CPTU relative to the vertical axis.

The equation for calculating the correction factor for the influence of the inclination for a bi-axial inclinometer is:

$$C_{inc} = \frac{1}{\sqrt{(1 + tan^2\beta_1 + tan^2\beta_2}}$$

where

β_1 is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane, in degrees
β_2 is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane that is perpendicular to the plane of angle β_1, in degrees

4.0 GEOTECHNICAL DERIVED PARAMETERS

A number of empirical correlations can be used to derive geotechnical parameters from CPTU data. This report includes only the parameters which are described in this chapter. The results of all correlations used to obtain the geotechnical derived parameters are presented on *CPT Log 02* and *CPT Log 03* in *Appendix B*.

Please, note that each empirical correlation is derived for a certain type of soil, and may not be appropriate for all the soil types encountered on this project.

4.1 SOIL BEHAVIOUR TYPE INDEX (I_c)

The soil behaviour type index, I_c, was derived by *Jefferies and Davies (1991)*, and was created to simplify the application of CPTU SBT chart shown in *Chapter 3*, *Figure 3.2*. This approach has been modified for use with the *Robertson (1990)* normalised CPT soil classification chart, *Figure 4.1*. The normalised cone parameters Q_t and F_r (for definitions see *Appendix A5* Symbol List) can be combined into one Soil Behaviour Type Index, I_c, *(Lunne et al., 1997)*.

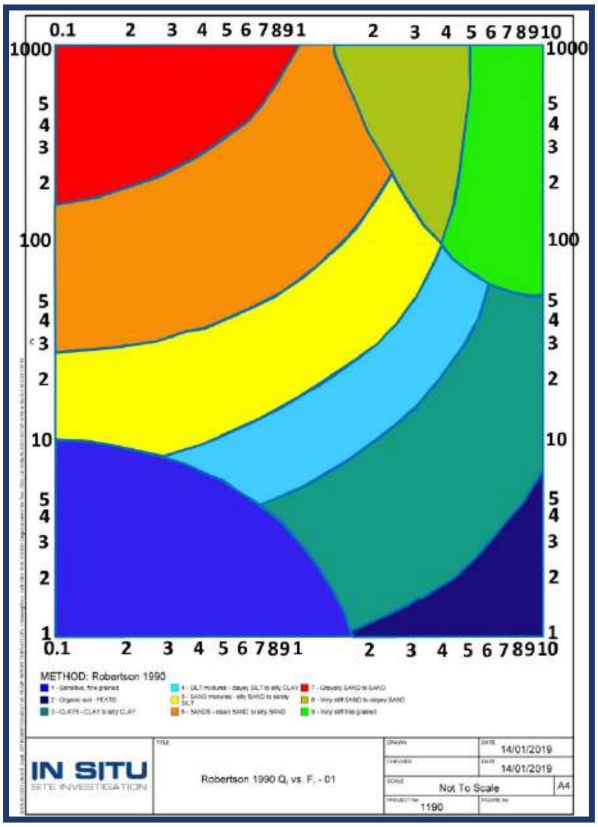

Figure 4.1: *Robertson 1990 soil behaviour type chart.*

The soil behaviour type index, I_c, can then be defined using *Robertson (2010)* formula, given below:

$$I_c = ((3.47 - logQ_t)^2 + (logF_r + 1.22)^2)^{0.5}$$

where

Q_t is the normalized cone resistance which represents the simple normalization with a stress exponent (n) of *1.0*, which applies well to clay-like soils

F_R is the normalized friction ratio, in *%*

The boundaries of soil behaviour type are then given in terms of the index, I_c, presented in *Table 4.1* below.

The soils behaviour type index does not apply to zones *1*, *8* and *9*. The profiles of I_c provide a simple guide to the continuous variation of soil behaviour type in a given soil profile based on CPTU results, with a reliability greater than *80%* compared with soil samples *(Robertson, 2015).*

Zone	**Soil Behaviour Type**	**I_c**
1	Sensitive fine grained	N/A
2	Organic Soils – clay	>3.6
3	Clays – silty clay to clay	2.95 – 3.6
4	Silt mixtures – clayey silt to silty clay	2.60 – 2.95
5	Sand mixtures – silty sand to sandy silt	2.05 – 2.6
6	Sands – clean sand to silty sand	1.31 – 2.05
7	Gravelly sand to dense sand	<1.31
8	Very stiff sand to clayey sand*	N/A
9	Very stiff fine grained *	N/A

** Heavily over consolidated or cemented*

Table 4.1: *Normalized CPTU Soil Behaviour Type (SBT_n) Index values, I_c.(Robertson, 2010)*

4.2 N VALUE OF STANDARD PENETRATION TEST (SPT) (N_{60})

The derived *N* value of *SPT, N_{60}*, is strongly and directly related to the cone resistance, q_c.

In this report the N_{60} value is derived using the following correlations, developed by *Robertson and Wride (1998)* and *Jefferies and Davies (1998)*

1) *Robertson & Wride (1998)*

$$N_{60} = \frac{q_c}{8.5 \cdot p_a \left(1 - \frac{I_C}{4.6}\right)}$$

2) *Jefferies and Davies (1993)*

$$N_{60} = \frac{q_c}{0.85 \cdot \left(1 - \frac{I_C}{4.75}\right)}$$

where

q_c is the cone resistance
p_a is the atmospheric pressure equal to *100 kPa*
I_c is the soil behaviour type index calculated as given in *section 4.1*

It is suggested that this method provides a better estimation of the *N* value than the actual *SPT* test, due to its poor repeatability. But in fine grained soil with high sensitivity these methods of estimating N_{60} may overestimate it *(Jefferies and Davies, 1991).*

4.3 RELATIVE DENSITY (D_r)

Relative density, D_r, is an intermediate parameter for coarse grained soils, widely used to describe sand deposits. All the research on deriving the relative density from CPTU tests results are carried out for ***clean predominantly quartz sands***. The studies have shown that CPTU resistance in granular soils is controlled by sand relative density, in situ effective stresses and compressibility. The more compressible sands tend to give lower penetration resistance for a given relative density then less compressible sands.

In this report relative density is calculated using the methods suggested by *Baldi et al., (1986)*, *Jamiolkowski et al., (2001)* and *Kulhawy and Mayne (1990)* as shown in the equations below:

1) Baldi et al., (1986)

$$D_r = \frac{1}{C_2} \cdot ln\left(\frac{q_c \cdot Wehr}{C_1 \cdot (\sigma'_{v0})^{0.55}}\right) \cdot 100$$

where

C_1 is a consolidation coefficient which is *157* for normally consolidated soils and *181* for over consolidated soils

C_2 is a consolidation coefficient which is *2.41* for normally consolidated soils and *2.46* for over consolidated soils

Wehr is a correction coefficient for calcareous soils

2) Jamiolkowski et al., (2001)

$$D_r = 100 \cdot \left[0.268 \cdot ln\left(\frac{q_t/\sigma_{atm}}{\sqrt{\sigma'_{v0}/\sigma_{atm}}}\right) + C_1\right]$$

where

C_1 is a compressibility coefficient which is *-0.675* for average compressible soils, ≤*1.0* for high compressible soils and carbonate or calcareous sands and ≥*-2.0* for low compressible soils

q_t is corrected cone resistance

σ_{atm} is the atmospheric pressure

3) Kulhawy and Mayne, (1990)

$$D_r = \left[\frac{q_{c1}}{305 \cdot C_1 \cdot OCR^{0.18} \cdot \left(1.2 + 0.05 \cdot log(t/100)\right)}\right]^{0.5} \cdot 100$$

where

q_{c1} is the cone resistance corrected for initial vertical effective stress and atmospheric pressure, calculated by the following formula

$$q_{c1} = \frac{q_c}{\sqrt{\sigma'_{v0} \cdot \sigma_{atm}}}$$

where

q_c is the cone resistance in *kPa*

σ'_{v0} is the initial vertical effective stress in *kPa*

C_1 is a compressibility coefficient which is *-0.91* for low compressible sands, *1.0* for medium compressible sands and *1.09* for high compressible sands

t is time in years

4.4 FRICTION ANGLE (φ')

Friction angle, *φ*', is used to express the shear strength of uncemented, coarse grained soils. In this report friction angle is derived by the correlations of *Mayne and Campanella (2005)*, *Robertson and Campanella (1983)* and *Kulhawy and Mayne (1990)*.

1) Mayne and Campanella, (2005)

$$\varphi' = 29.5^0 \cdot B_q^{0.121} \cdot \left[0.256 + 0.336 \cdot B_q + logQ_t\right]$$

where

B_q is the pore pressure ratio, calculated as in Session 3.3

Q_t is the normalized cone resistance

2) Robertson and Campanella, (1983)

$$\varphi' = \tan^{-1}\left(0.1 + 0.38 \cdot log\left(\frac{q_t}{\sigma'_{v0}}\right)\right)$$

where

q_c is the cone resistance in *kPa*
σ'_{v0} is the initial vertical effective stress in *kPa*

3) Kulhawy and Mayne, (1990)

$$\varphi' = 17.6^0 + 11.0^0 \cdot log(q_{t1})$$

where

q_{t1} is the corrected cone resistance corrected for initial vertical effective stress and atmospheric pressure, calculated by the following formula

$$q_{t1} = \frac{q_t}{\sqrt{\sigma'_{v0} \cdot \sigma_{atm}}}$$

The method suggested by *Mayne and Campanella (2005)* will not provide reliable results for heavily over consolidated soils, fissured geomaterials and highly cemented or structures clays. This approach gives reliable results when pore pressure is positive and varies $0.1 < B_q < 1.0$. The correlation suggested by *Robertson and Campanella (1983)* estimates the peak friction angle for uncemented, unaged, moderately compressible, predominately quartz sands. For sands of higher compressibility, the method will tend to predict low friction angles. The method suggested by *Kulhawy and Mayne (1990)* is an alternate relationship for clean, rounded, uncemented, quartz sands.

4.5 FINES CONTENT (*FC*)

The fines content, *FC*, in this report is estimated using two different methods, one from *Robertson and Wride (1998)* and the other, *Suzuki et al. (1998)* as presented below:

1) Robertson and Wride (1998)

$$I_C < 1.26: FC = 0$$
$$1.26 \le I_C \le 3.5: FC(\%) = 1.75 I_C^{3.25} - 3.7$$
$$3.5 < I_C: \ FC = 100\%$$

2) Suzuki et al. (1998)

$$FC(\%) = 2.8 I_C^{2.6}$$

where

I_c is the soil behaviour type index, calculated as in section 4.1

4.6 UNDRAINED SHEAR STRENGTH (s_u)

Estimation of undrained shear strength, s_u, from CPTU tests using corrected cone resistance is carried out using the following correlation from *Lunne et al. (1981)*:

$$S_u = \frac{(q_t - \sigma_{v0})}{N_{kt}}$$

where

N_{kt} is the empirical cone factor, which varies from *10* (*6* for very soft sensitive fine grained soils) to *20*. In this report 3 values are considered: *15*, *17.5* and *20*. N_{kt} tends to increase with increasing plasticity and decrease with increasing soil sensitivity. It decreases as B_q increases. (*Lunne et al., 1997*)

σ_{vo} = total overburden stress.

This report only presents the undrained shear strength data on soils with soil behaviour type index, I_c values greater than *2.60*.

The value of undrained shear strength, s_u to be used in analysis depends on the design problem. In general, the simple shear in the direction of loading often represents the average undrained strength. For larger, moderate to high risk projects, where high quality field and laboratory data may be available, site specific correlations should be developed based on appropriate and reliable values of s_u.

4.7 SENSITIVITY (S_t)

The sensitivity, S_t of clays is defined as the ratio of undisturbed peak undrained shear strength to totally remoulded undrained shear strength.

In this report S_t is calculated using two correlations developed by *Schmertmann (1978)* and *Mayne (2007)*.

1) Schmertmann (1978)

$$S_t = \frac{s_u}{s_{u(rem)}} = \frac{q_t - \sigma_v}{N_{kt}} (\frac{1}{f_s})$$

where

$s_{u(rem)}$ is the remoulded undrained shear strength. It can be assumed equal to the sleeve resistance, f_s.

2) Mayne (2007)

$$S_t = \frac{0.073 \cdot (q_t - \sigma_{v0})}{f_s}$$

For relatively sensitive clays, $S_t > 10$, the value of f_s can be very low and not very accurate, hence the estimate of sensitivity should be used as a guide only.

4.8 SOIL UNIT WEIGHT (γ)

Soil unit weight, *γ* in this report is calculated by using one method for sands, considered under dry conditions and two methods for clays, considered under saturated conditions. These relationships are developed by *Mayne (2007)* and the equations are presented below:

1) Mayne (2007)

Dry unit weight for sands:

$$\gamma_{dry} = 1.89 \cdot log(q_{t1}) + 11.82$$

Saturated unit weight for clays method 1

$$\gamma_{sat} = 8.32 \cdot log(V_S) - 1.61 \cdot log(z)$$

Saturated unit for clays method 2

$$\gamma_{sat} = 2.60 \cdot log(f_s) + 15 \cdot G_s - 26.5$$

where

q_{t1} is the corrected cone resistance corrected for initial vertical effective stress and atmospheric pressure, calculated by the following formula:

$$q_{t1} = \frac{q_t}{\sqrt{\sigma'_{v0} \cdot \sigma_{atm}}}$$

z is the depth

V_s is the shear wave velocity, calculated as $V_S = 118.8 \cdot log(f_s) + 18.5$

G_s is the specific gravity of solids, typically between *2.40* and *2.90*

5.0 MAGNETOMETER TESTS MEASUREMENTS

All measured parameters of MAG tests carried with the combined CPTU and MAG cone are shown in *Appendix B*.

5.1 DATA PROCESSING

The measured parameters, Magnetic Field X (nT), Magnetic Field Y (nT) and Magnetic Field Z (nT) were recorded for every *10 mm* of penetration.

The measured magnetometer data from the site works is processed and presented using specialised CPT software. During processing the three measured components are combined to give the total magnetic field strength.

5.1.1 Zero Measurements and Data quality

Before and after each MAG test, zero measurements are recorded for each magnetic channel of the cone. The zero measurements are presented on the logs in *Appendix B*. This is a routine quality check carried out on site.

The summary of MAG tests is presented in *Appendix A.1*

5.2 MEASURED AND DERIVED PARAMETERS

5.2.1 Magnetic Field X, Magnetic Field Y and Magnetic Field Z

The measured parameters, Magnetic Field X, Magnetic Field Y and Magnetic Field Z are measured on site. The results are presented in *nT*, on *MAG Log*, in *Appendix B*, scale *-100000 to 100000 nT*.

5.2.2 Total Magnetic Field

Total Magnetic Field is calculated based on each measured Magnetic Field, using the formula below:

$$Magnetic\ Field\ Total = \sqrt{MAGX^2 + MAGY^2 + MAGZ^2}$$

where

MAGX is the Magnetic Field measured in X direction

MAGY	is the Magnetic Field measured in Y direction
MAGZ	is the Magnetic Field measured in Z direction

The results are presented in *nT*, on *MAG Log*, in *Appendix B*, using a scale of *0-100000 nT*.

5.2.3 Magnetic Field Gradient

Magnetic Field Gradient is calculated as the difference between two consecutive values of Total Magnetic Field.

The results are presented in *nT/cm*, on *MAG Log*, in *Appendix B*, using a scale of *-500 to 500 nT/cm*.

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APPENDIX A

APPENDIX A1 – Project Summary Sheet

Piezocone Tests Summary Sheet

HOLE ID	Final Depth (m)	Date of Test	Cone Used	Test Remarks
1	1.76	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
2	1.89	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
3	5.17	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
4	4.26	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
5	4.81	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
6	2.97	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
7	4.25	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
8	6.42	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
9	3.76	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
10	3.31	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
11	6.55	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
12	6.67	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
13	5.52	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
14	5.44	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
15	5.99	19/10/2020	S15-CFIP.1858	Test refused on tip resistance.
16	4.66	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
17	3.10	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
18	2.96	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
19	2.74	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
20	3.39	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
21	3.34	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
22	3.24	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
23	2.93	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
24	2.92	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
25	3.01	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
26	3.43	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
27	3.77	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
28	3.87	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.

29	4.81	20/10/2020	S15-CFIP.1858	Test refused on total pressure.
30	5.36	20/10/2020	S15-CFIP.1858	Test refused on total pressure.
31	4.59	20/10/2020	S15-CFIP.1858	Test refused on total pressure.
32	2.47	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
33	5.73	20/10/2020	S15-CFIP.1858	Test refused on tip resistance.
34	1.74	20/10/2020	S15-CFIP.1858	Test refused on inclination.

MAG Tests Summary Sheet

HOLE ID	Final Depth (m)	Date of Test	MAG Status	Test Remarks
1	1.76	19/10/2020		Test refused on tip resistance.
2	1.89	19/10/2020		Test refused on tip resistance.
3	5.17	19/10/2020	Clear 3.4m onwards	Test refused on tip resistance.
4	4.26	19/10/2020	Clear 2.0m onwards	Test refused on tip resistance.
5	4.81	19/10/2020	Clear 2.6m onwards	Test refused on tip resistance.
6	2.97	19/10/2020		Test refused on tip resistance.
7	4.25	19/10/2020	Clear 3.0m onwards	Test refused on tip resistance.
8	6.42	19/10/2020		Test refused on tip resistance.
9	3.76	19/10/2020		Test refused on tip resistance.
10	3.31	19/10/2020	Clear 2.8m onwards	Test refused on tip resistance.
11	6.55	19/10/2020	Clear 2.0m onwards	Test refused on tip resistance.
12	6.67	19/10/2020	Clear 4.0m onwards	Test refused on tip resistance.
13	5.52	19/10/2020	Clear 0.2m onwards	Test refused on tip resistance.
14	5.44	19/10/2020	Clear 3.4m onwards	Test refused on tip resistance.
15	5.99	19/10/2020	Clear 0.6m onwards	Test refused on tip resistance.
16	4.66	20/10/2020	Clear 1.0m onwards	Test refused on tip resistance.
17	3.10	20/10/2020		Test refused on tip resistance.
18	2.96	20/10/2020		Test refused on tip resistance.
19	2.74	20/10/2020		Test refused on tip resistance.
20	3.39	20/10/2020		Test refused on tip resistance.
21	3.34	20/10/2020	Clear 1.0m onwards	Test refused on tip resistance.
22	3.24	20/10/2020	Clear 1.4m onwards	Test refused on tip resistance.
23	2.93	20/10/2020	Clear 0.2m onwards	Test refused on tip resistance.
24	2.92	20/10/2020	Clear 1.2m onwards	Test refused on tip resistance.
25	3.01	20/10/2020	Clear 1.2m onwards	Test refused on tip resistance.
26	3.43	20/10/2020	Clear 0.2m onwards	Test refused on tip resistance.
27	3.77	20/10/2020	Clear 1.0m onwards	Test refused on tip resistance.
28	3.87	20/10/2020		Test refused on tip resistance.
29	4.81	20/10/2020	Clear 1.8m onwards	Test refused on total pressure.
30	5.36	20/10/2020	Clear 2.0m onwards	Test refused on total pressure.

31	4.59	20/10/2020	Clear 2.0m onwards	Test refused on total pressure.
32	2.47	20/10/2020	Clear 1.6m onwards	Test refused on tip resistance.
33	5.73	20/10/2020	Clear 3.2m onwards	Test refused on tip resistance.
34	1.74	20/10/2020		Test refused on inclination.

KEY for MAG Status	
Clear	Clear of UXO.
Clear 1.0m onwards	Disturbance of magnetic field to depth shown due to artificial ground but otherwise clear.
Obstruction	Buried obstruction or refused test due to geology. Change location, then re-test.
Low risk 2.3m	Low risk anomaly at depth shown. Unlikely to be UXB, and clear below.
Suspected existing pile	Disturbance of magnetic field at depth of 0-7.0m, clear below.
Anomaly x metres	Significant magnetic anomaly at depth shown.

APPENDIX A2 – CPT Rig Datasheet

RIGS

20 TONNE CPT TRACK MOUNTED RIG (CPT017)

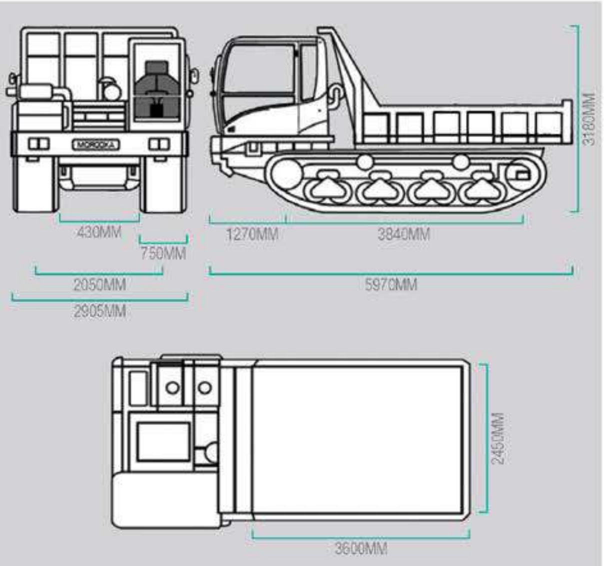
We have a variety of rigs giving us the capacity to meet our clients' needs and specifications for each individual project.

This rubber tracked rig weighs 20 tonnes and is able to push up to a depth of 40 metres, depending on the ground conditions. It has low ground bearing pressure and is ideal for soft, boggy sites which are inaccessible for our wheeled rigs.

CPT RIG DETAILS

DRIVE SYSTEM	RUBBER TRACKED
TOTAL WEIGHT	20 TONNES
GROUND BEARING PRESSURE	35kPA
CPT RAM THRUST CAPACITY	20 TONNES
MAXIMUM PENETRATION	30-40M DEPENDING ON THE GROUND CONDITIONS.
PERFORMANCE RATES	100-150M OF TESTING A DAY, DEPENDING ON ACCESS TO POSITIONS.
TYPICAL SITES FOR THIS RIG	SOFT, BOGGY SITES. THE RIG HAS LOW GROUND BEARING PRESSURE.

CPT RIG DIMENSIONS




Shrewsbury

Heading North on our low loader


Falkirk, Scotland

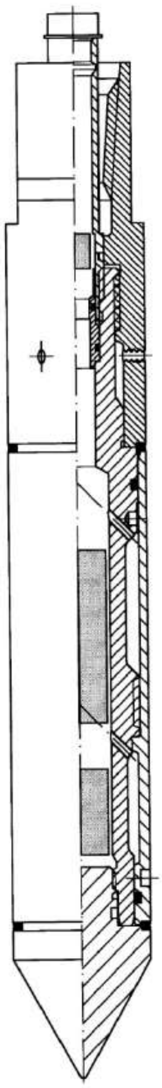
IN SITU SITE INVESTIGATION

INSITUSI.COM

APPENDIX A3 – Cone Datasheet

GeoPoint Systems bv

Rijksstraatweg 22F
2171 AL Sassenheim
Tel. : +31 71 301 92 51
Fax : +31 71 301 92 52
E-mail : info@geopoint.nl
ING bank : 68.23.01.396
Postbank : 5226758
BTW nr. : NL806331677B01



SPECIFICATIONS S15 SERIES ELECTRICAL CONES

The electronic subtraction cones have been developed to address the durability problems inherent in other cone designs. The unit consists of a single element temperature compensated strain gauge transducer for measuring both cone resistance and local sleeve friction. This design is therefore more robust than a compression type cone. The cone support electronics package is located directly behind the transducer. The precision strain gauge amplifiers and power supply eliminate the effects of cable resistance on the measurements. A standard subtraction cone is capable of measuring simultaneously the following channels: Tip, Local friction, Pore pressure, Temperature and Inclination.

GENERAL SPECIFICATIONS

Cone Tip Section Area	1,500 mm2
Friction Sleeve Surface	22,500 mm2
Total Length	325 mm
Weight	4200 g
Power Supply	± 15 VDC, 100 mA.
Output	0 – 10 VDC*
Working Temperature	0 - 60˚C
Storage Temperature	- 40 to + 85˚C
Connector	Lemo 10 pins (others on request)

TIP RESISTANCE

Range	100/150* kN
Accuracy	0.25 % FS
Maximum Load	150 % of range
Cone Area Ratio	0.75

LOCAL SLEEVE FRICTION

Range	100/150* kN
Accuracy	0.50 % FS
Maximum Load	150 %
Sleeve Area Ratio	1.0 (EA)

PORE PRESSURE

Range	1/2/5/10* MPa
Accuracy	0.5 % FS
Maximum Load	150 % of range

INCLINATION

Range	25 ˚ (biaxial)
Accuracy	< 2 ˚

All our equipment complies with the ISSMGE, ASTM, DIN and NEN Standards.

Other output and voltage ranges available on request. Loadcells may be calibrated for lower ranges.

APPENDIX A4 – Cone Calibration Certificate

Eijkelkamp GeoPoint SoilSolutions

Rijkstraatweg 22F
2171 AL Sassenheim
The Netherlands

T +31 71 301 9251
E info@eijkelkamp-geopoint.com
I eijkelkamp-geopoint.com

Cone Calibration Certificate

Certificate:	**GS-1858-003**	
Instrument Type:	Electric Subtraction Cone	
Model:	S15-CFIIP-MAG	
Serial number:	1858	
Calibration date:	06-10-2020	
Client:	Insitu	
Calibrated by:	M.de Bruin	
Calibration instruments		
Manufacturer:	Hottinger Baldwin Messtechnik GmbH	
NMi certificate	2461165.00501	
Calibration conditions		
Ambient temperature:	18.5	°C
Atmospheric pressure:	995	mBar
Cone specifications		
Cone base area:	1500	mm2
Load tip resistance (nom.):	50	kN
Friction sleeve area:	22500	mm2
Load tip + local friction (nom.):	50	kN
Load friction sleeve (nom.):	22.5	kN
Load pore pressure (nom.):	2	MPa
Inclination (nom.):	+/- 20	°
Temperature compensation (all channels):	0...+40	°C
Maximum overload capacity (all channels):	50	%
Cone area ratio (a):	0.79	
Max. Inaccuracy, relative to measurement value:	1.0	%

	Tip:		Sleeve:		Pore Pressure:		Inclinometer:		
	qc in kN	mV	fs in kN	mV	MPa	mV	Degrees	X (mV)	Y (mV)
Zero points:		0209		0217		0225			
	0	0	0	0	0	0	0	2454	2426
	5	0308	5	0319	0.4	1623	-20	0465	0363
	10	0617	10	0637	0.8	3249	20	4460	4470
	15	0926	15	0956	1.2	4854			
	20	1235	20	1276	1.6	6447			
	25	1543	25	1594	2.0	8042			
	30	1851	30	1912					
	35	2155	35	2226					
	40	2461	40	2542					
	45	2767	45	2858					
	50	3073	50	3174					

Max. eror, abs. qc:	35 kPa
Max. error, abs. fs:	2 kPa
Max. error, abs. u2:	10 kPa
Max. error, abs. I:	1 °

This calibration is compliant with Eijkelkamp GeoPoint SoilSolutions internal quality system, internal calibration procedures and meets the requirements of NEN2649, NEN-EN-ISO 22476-1, NORSOK G-001, ISSMFE and ASTM using calibration equipment traceable to (Inter-)National Standards.

Approved by: B. Kop
Date: 06-10-2020

Eijkelkamp GeoPoint SoilSolutions
V.A.T. NO. NL 8584.21.422.B01
Trade Reg. Arnhem no. 70686149

IBAN NL43 RABO 0326 7904 38
BIC: RABONL2U

APPENDIX A5 – Symbol List

English

a	is area ratio of the cone $(= {A_n}/{A_c})$
A	is area
A_c	is projected area of the cone
A_n	is cross sectional area of load cell or shaft
A_s	is area of friction sleeve
A_{sb}	is bottom end area of friction sleeve
A_{st}	is top end area of friction sleeve
B_q	is pore pressure parameter $(= {(u_2 - u_0)}/{(q_t - \sigma_{v0})})$
c_h	is horizontal coefficient of consolidation
c_v	is vertical coefficient of consolidation
D	is diameter
D_r	is relative density $(= \frac{e_{max}-e}{e_{max}-e_{min}} x100\%)$
e	is void ratio
e_{max}	is maximum void ratio
e_{min}	is minimum void ratio
E	is Young's modulus
f_s	is unit sleeve friction resistance
f_t	is sleeve friction corrected for pore pressure effects
F_s	is total force acting on friction sleeve
F_R	is normalized friction ratio $(={f_s}/{(q_t - \sigma_{v0})})$
FoS	is factor of safety
FC	is fines content
g	is acceleration due to gravity
G_0	is initial or maximum shear modulus, shear stiffness
I_c	is soil behavior type index
I_r	is rigidity index $(= {G}/{s_u})$
I_p	is plasticity index
k	is coefficient of permeability
k_h	is coefficient of permeability in horizontal direction
k_v	is coefficient of permeability in vertical direction
K_0	is coefficient of earth pressure at rest $(= {\sigma'_{h0}}/{\sigma'_{v0}})$
L	is length
m_v	is coefficient of volume change
M	is constrained deformation modulus
M7.5	is earthquake magnitude of 7.5 Richter scale
N	is number of blows of SPT
N_{60}	is SPT energy ratio
N_k	is cone factor
N_{ke}	is cone factor
N_{kt}	is cone factor
$N_{\Delta u}$	is cone factor
p_a	is reference stress $(= 100\ kPa)$
q_c	is measured cone resistance
q_e	is effective cone resistance $(= q_t - u_2)$
q_n	is net cone resistance $(= q_t - \sigma_{v0})$
q_t	is corrected cone resistance $(= q_c - (1-a)u_2)$
Q_c	is total force acting on the cone
Q_t	is normalized cone resistance $(= {q_t - \sigma_{v0}}/{\sigma'_{v0}})$

R_f	is friction ratio $(= \left({}^{f_t}/_{q_t}\right) x100\%$ or alternatively $= \left({}^{f_t}/_{q_t}\right) x100\%)$
s_u	is undrained shear strength
s_{ur}	is remoulded undrained shear strength
S_t	is sensitivity
t	is time
t_{50}	is time for 50% dissipation of excess pore water pressure
T_{50}	is time factor at $U = 50\ \%$
u	is pore water pressure
u_0	is in situ pore pressure
u_1	is pore pressure measured on the cone
u_2	is pore pressure measured behind the cone
u_3	is pore pressure measured behind sleeve friction
Δu	is excess pore water pressure
U	is normalized excess pore pressure
V_s	is shear wave velocity
z	is depth

Greek

α	is constant
α	is cone roughness
β	is constant
β_1	is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane, in degrees
β_2	is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane that is perpendicular to the plane of angle β_1, in degrees
γ	is unit weight of soil
γ_w	unit weight of water
Δ	is change
Δu	is excess pore pressure $(= u - u_0)$
μ	is Poisson's ratio
ρ	is density
ψ	is state parameter
σ, σ'	is normal stress (total, effective)
σ_h, σ_h'	is horizontal stress (total, effective)
σ_v, σ_v'	is horizontal stress (total, effective)
σ_{v0},σ_{v0}'	is overburden stress (total, effective)
τ_{av}	is average cyclic shear stress
τ_{cy}	is cyclic shear stress
φ'	is effective friction angle

APPENDIX A6 – Abbreviations

ASTM	American Society for Testing and Materials
CPTU	Cone Penetration Test with Pore Pressure Measurement (Piezocone Test)
CRR	Cyclic Resistance Ratio
CSR	Cyclic Stress Ratio
GWT	Ground Water Table
NC	Normally Consolidated
OC	Over consolidated
OCR	Over consolidation Ratio
PL	Limit Pressure
SDMT	Seismic Dilatometer Marchetti
SPT	Standard Penetration Test
TC	Technical Committee

APPENDIX A7 – Glossary

CPT
Cone Penetration Test.

Cone
The part of the cone penetrometer on which the end bearing is developed.

Cone Penetrometer
The assembly containing the *cone*, *friction sleeve*, any other sensors and measuring systems, as well as the connections to the *push-rods.*

Cone resistance, q_c
The total force acting on the cone, Q_c, divided by the projected area of the cone, A_c. $q_c = Q_c/A_c$

Corrected cone resistance, q_t
The *cone resistance*, q_c corrected for pore water pressure effects.

Corrected sleeve friction, f_t
The *sleeve friction* corrected for pore water pressure effects on the ends of the *friction sleeve*.

Data acquisition system
The system used to measure and record the measurements made by the *cone penetrometer*.

Dissipation Test
A test when the decay of the pore water pressure is monitored during a pause in penetration.

Filter element
The porous element inserted into the cone penetrometer to allow transmission of the pore water pressure to the pore pressure sensor, while maintaining the correct profile of the *cone penetrometer*.

Friction ratio, R_f
The ratio, expressed as a percentage of the *sleeve friction*, f_s, to the *cone resistance*, q_c, both measured at the same depth.

Friction reducer
A local enlargement on the push-rod surface, placed at a distance above the cone penetrometer, and provided to reduce the friction on the *push-rods*.

Friction sleeve
The section of the *cone penetrometer* upon which the *sleeve friction* is measured.

Normalized cone resistance, Q_c or Q_t
The *cone resistance* expressed in a non-dimensional form and taking account of stress changes *in situ*, $Q_c = (q_c - \sigma_{v0})/\sigma'_{v0}$, or when the *corrected cone resistance* is used $Q_t = (q_t - \sigma_{v0})/\sigma'_{v0}$. where σ_{v0} and σ'_{v0} are the total and effective vertical stress respectively.

Net cone resistance, q_n
The *corrected cone resistance* minus the vertical total stress. $q_n = q_t - \sigma_{v0}$

Normalized friction ratio, F_r
The *sleeve friction* normalized by the *net cone resistance*.

Piezocone
A *cone penetrometer* containing a pore pressure sensor.

Pore pressure, *u*
The pore pressure generated during penetration and measured by a pore pressure sensor, u_1 when measured on the cone, u_2 when measured just behind the cone and u_3 when measured just behind the friction sleeve.

Pore pressure ratio, B_q
The *net pore pressure* normalized with respect to the *net cone resistance*.

Push-rods
The thick-walled tubes or rods used for advancing the cone penetrometer.

Rig machine
The equipment which pushes the cone penetrometer and rods into the ground.

Sleeve friction, f_s
The total frictional force acting on the *friction sleeve*, F_s, divided by its *surface area*, A_s. $f_s = F_s/A_s$

APPENDIX A8 – Soils Description Tables

GRANULAR SOILS (Sands and Gravels)

Description	Relative Density D_r (%)	SPT N value, N_{SPT}
Very Loose	0 – 15	0 - 4
Loose	15 – 35	4 - 10
Medium Dense	35 – 65	10 - 30
Dense	65 – 85	30 - 50
Very Dense	>85	>50

COHESIVE SOILS (Clays and Silts)

Term based on measurement	Undrained Shear Strength Classification, s_u (kPa)
Extremely low	<10
Very low	10 - 20
Low	20 - 40
Medium	40 - 75
High	75 - 150
Very high	150 - 300
Extremely high	>300

APPENDIX A9 – Site Map and Pictures from Site Works

APPENDIX B

Cone Penetration Measured Parameters and Geotechnical Derived Parameters

IN SITU
SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

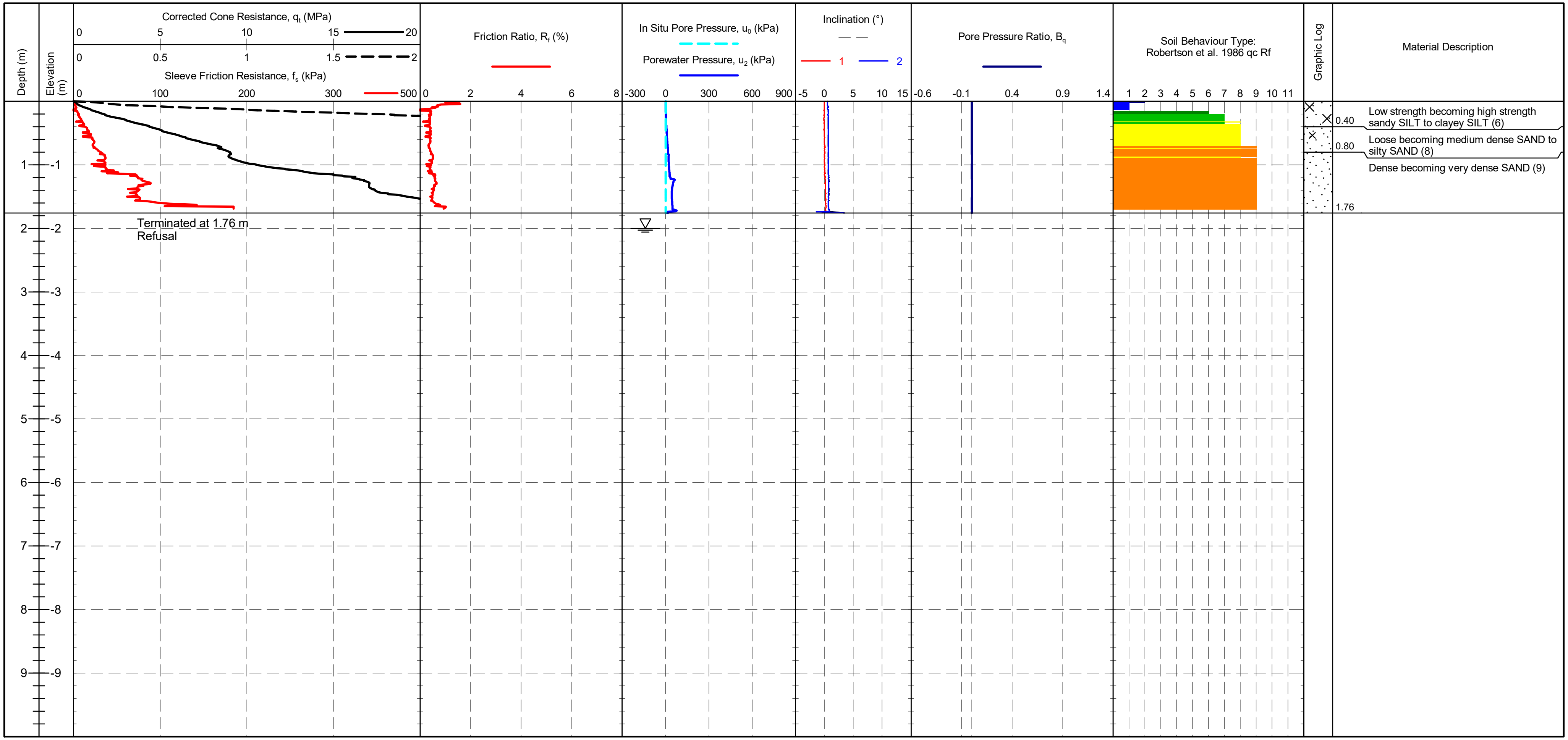
CPT LOG 01

PointID **01**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 19/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	209 mV	203 mV	-0.065 MPa
Sleeve	208 mV	204 mV	-0.003 kPa
Pore Pressure 2	282 mV	242 mV	-0.01 kPa
X-Y Inclinometer	2463 mV	2473 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

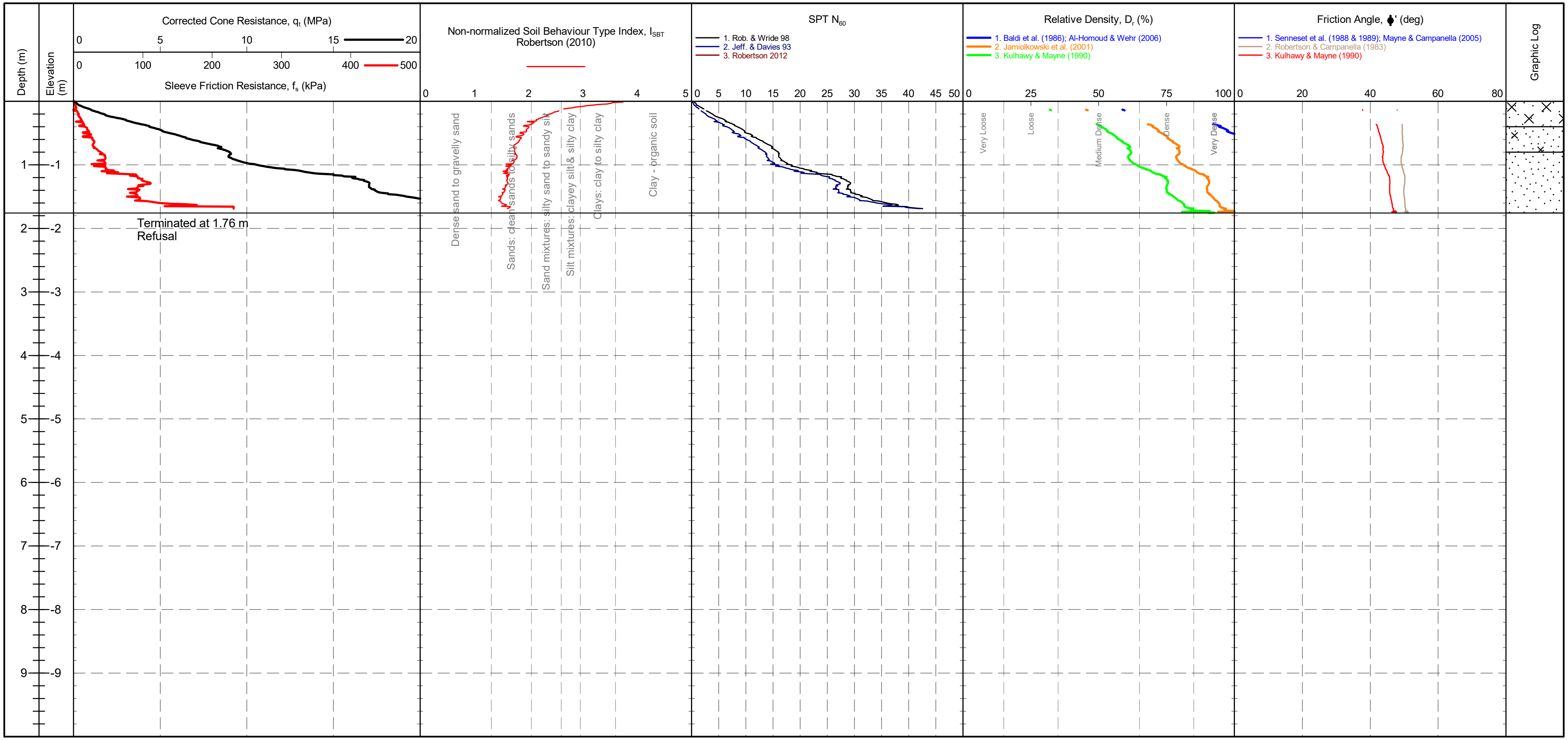
Dissipation Test

CPT LOG 02

Working with: soiltechnics environmental and geotechnical consultants

PointID **01**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	209 mV	203 mV	-0.065 MPa
Sleeve	208 mV	204 mV	-0.003 kPa
Pore Pressure 2	282 mV	242 mV	-0.01 kPa
X-Y Inclinometer	2463 mV	2473 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

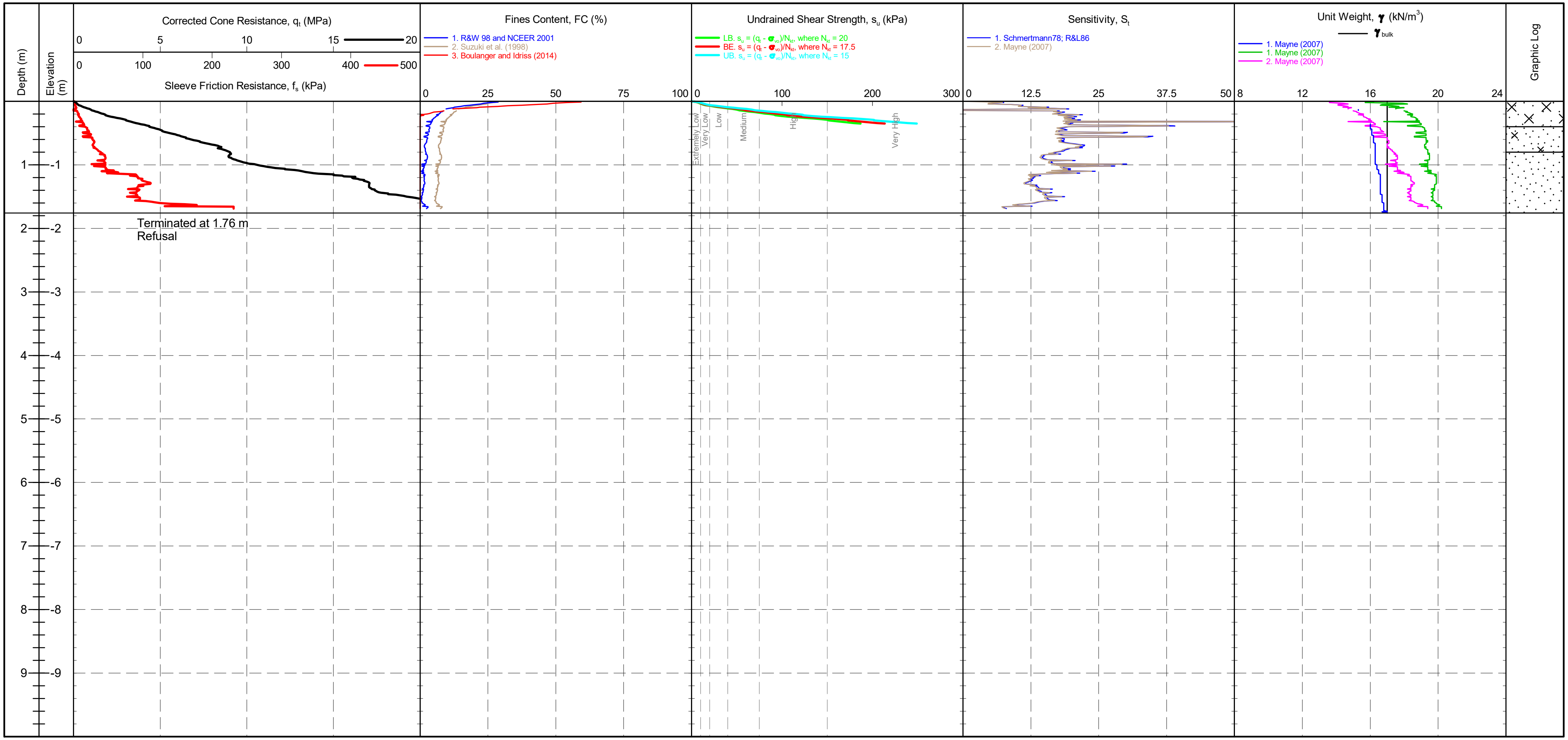
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID **01**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

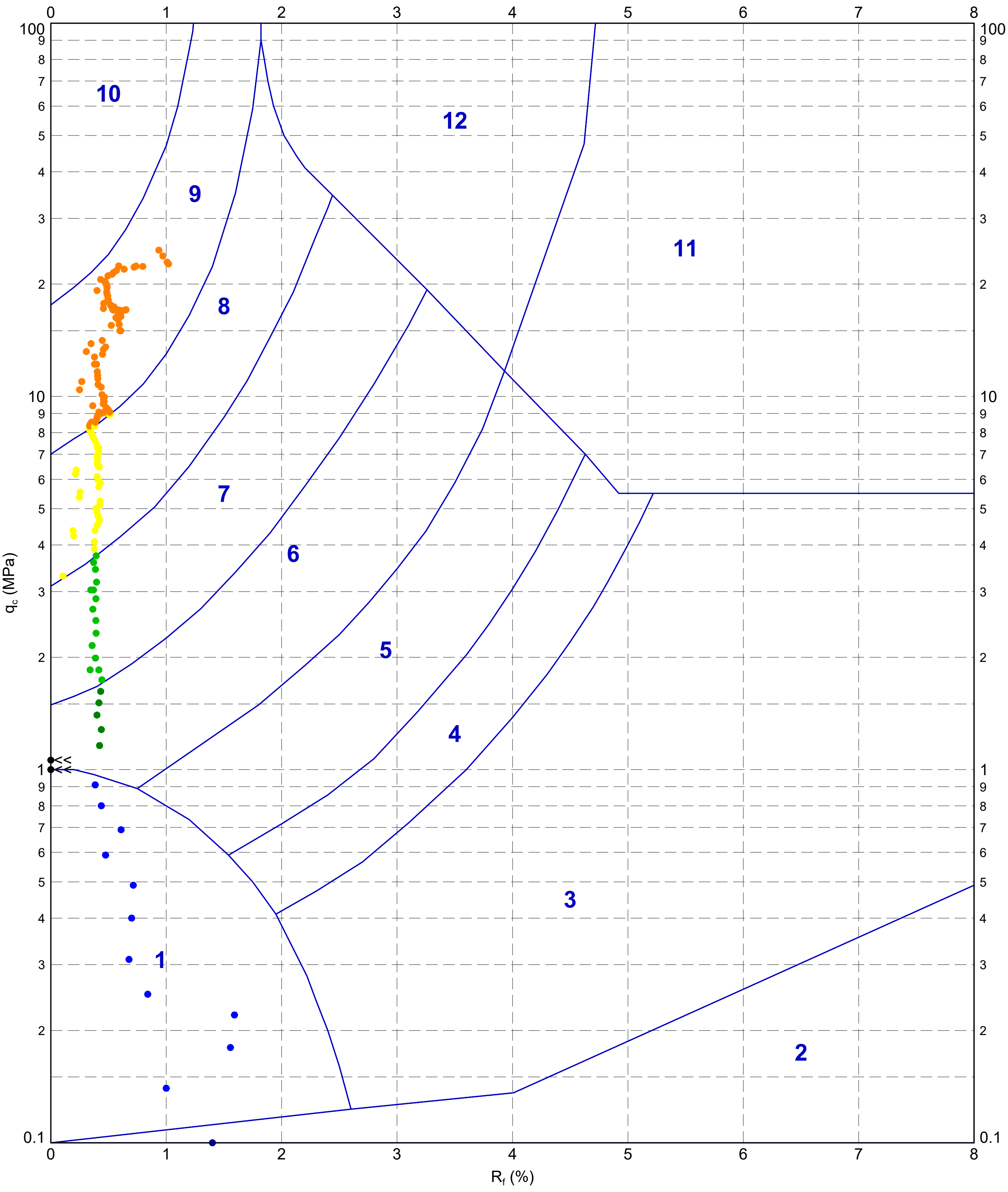
Transducer	Pre	Post	Difference
Tip	209 mV	203 mV	-0.065 MPa
Sleeve	208 mV	204 mV	-0.003 kPa
Pore Pressure 2	282 mV	242 mV	-0.01 kPa
X-Y Inclinometer	2463 mV	2473 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE

Soiltechnics
Lossiemouth
Lossiemouth
Robertson et al. 1986 q_c vs. R_f - 01

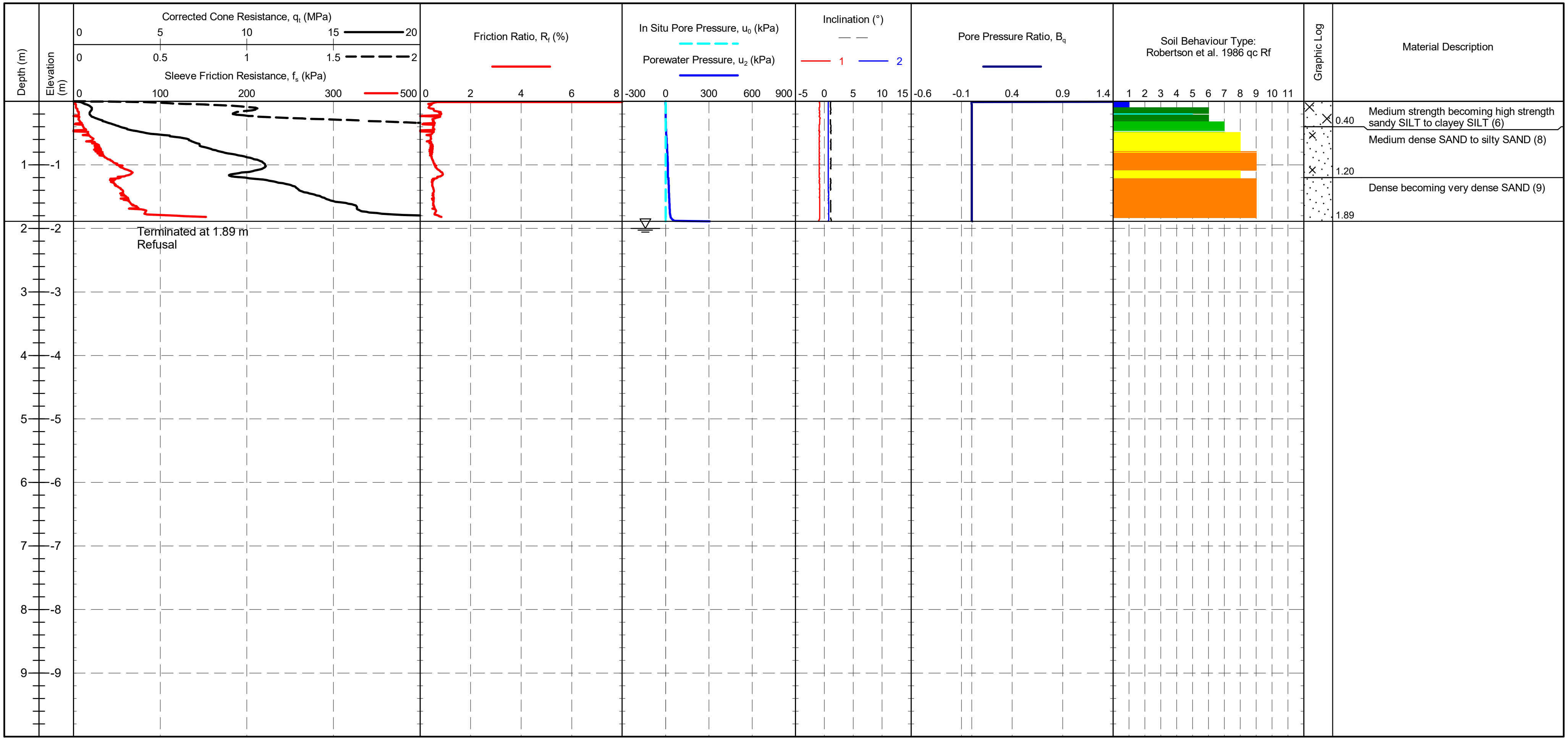
DRAWN		DATE	26/10/2020
CHECKED		DATE	26/10/2020
SCALE	Not To Scale		A4
PROJECT No	1200410	FIGURE No	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **02**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858 CALIBRATION DATE : 26/07/2020 CONE MODEL : Subtraction CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 017 - Griffen OPERATOR : RS FRICTION REDUCER : None WEATHER : Raining & Mild GROUNDWATER DEPTH : Assumed for calculation purposes.		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	205 mV	-0.022 MPa
Sleeve	205 mV	204 mV	-0.001 kPa
Pore Pressure 2	255 mV	243 mV	-0.003 kPa
X-Y Inclinometer	2413 mV	2404 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

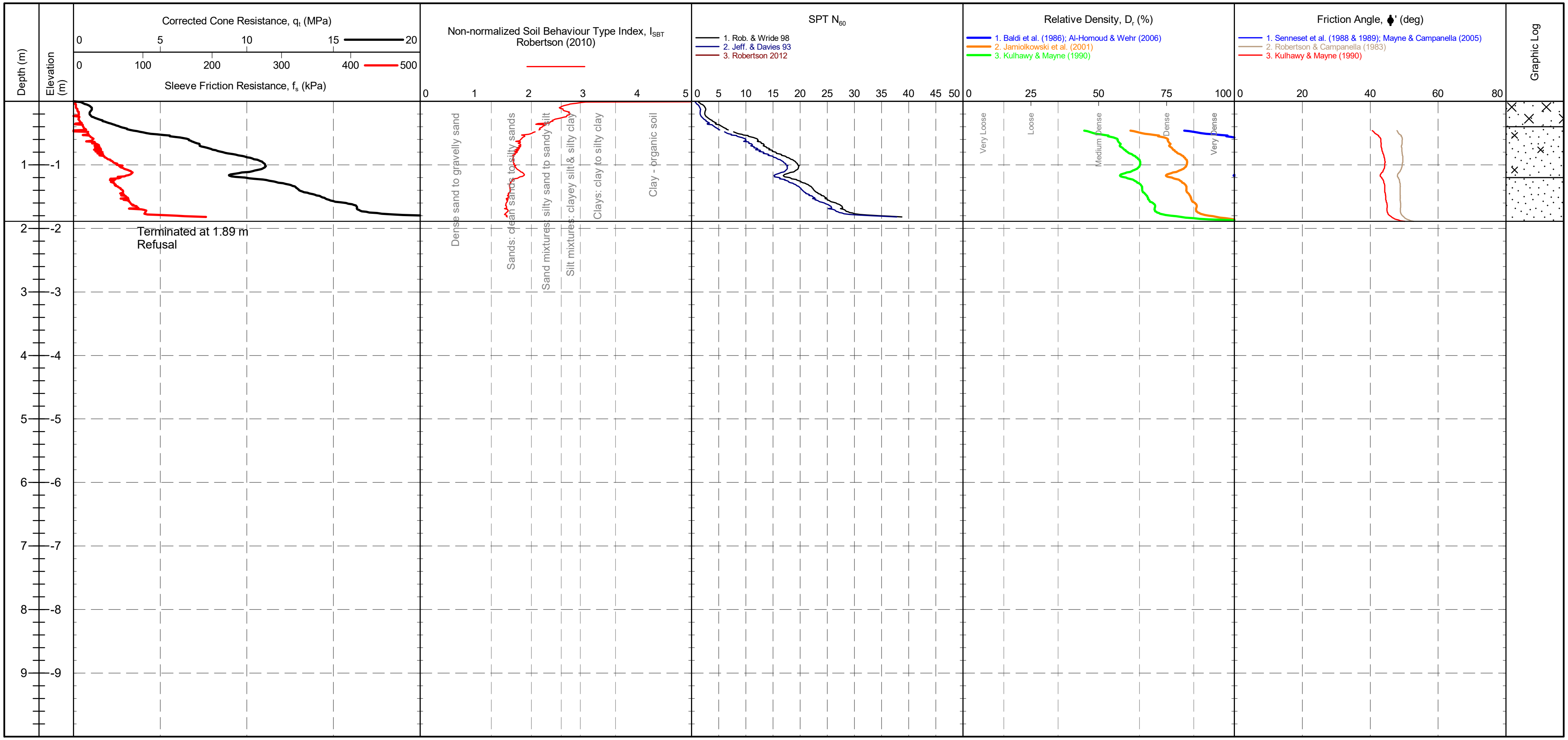
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID **02**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen		
CONE AREA RATIO	: 0.79	OPERATOR	: RS		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	205 mV	-0.022 MPa
Sleeve	205 mV	204 mV	-0.001 kPa
Pore Pressure 2	255 mV	243 mV	-0.003 kPa
X-Y Inclinometer	2413 mV	2404 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

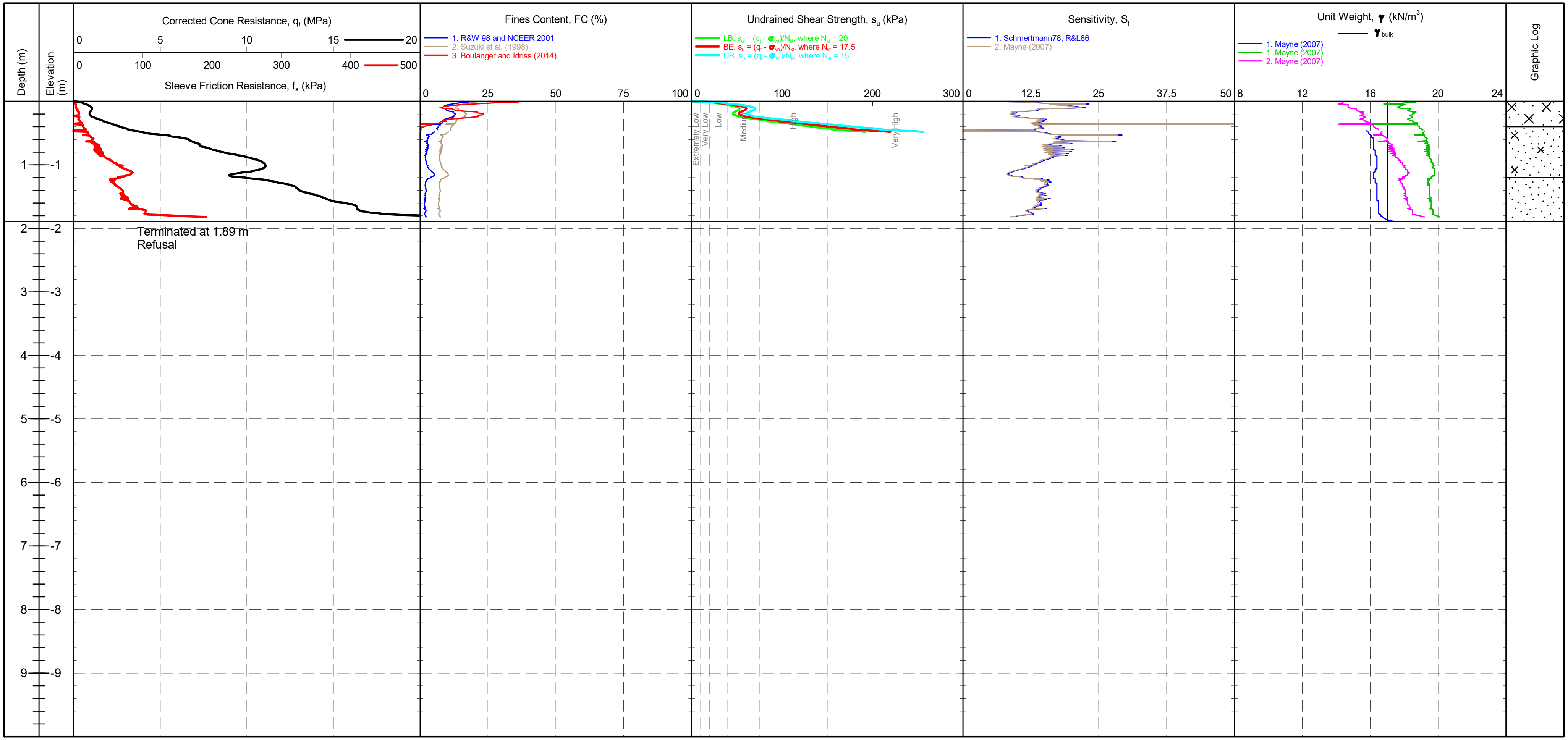
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
02

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

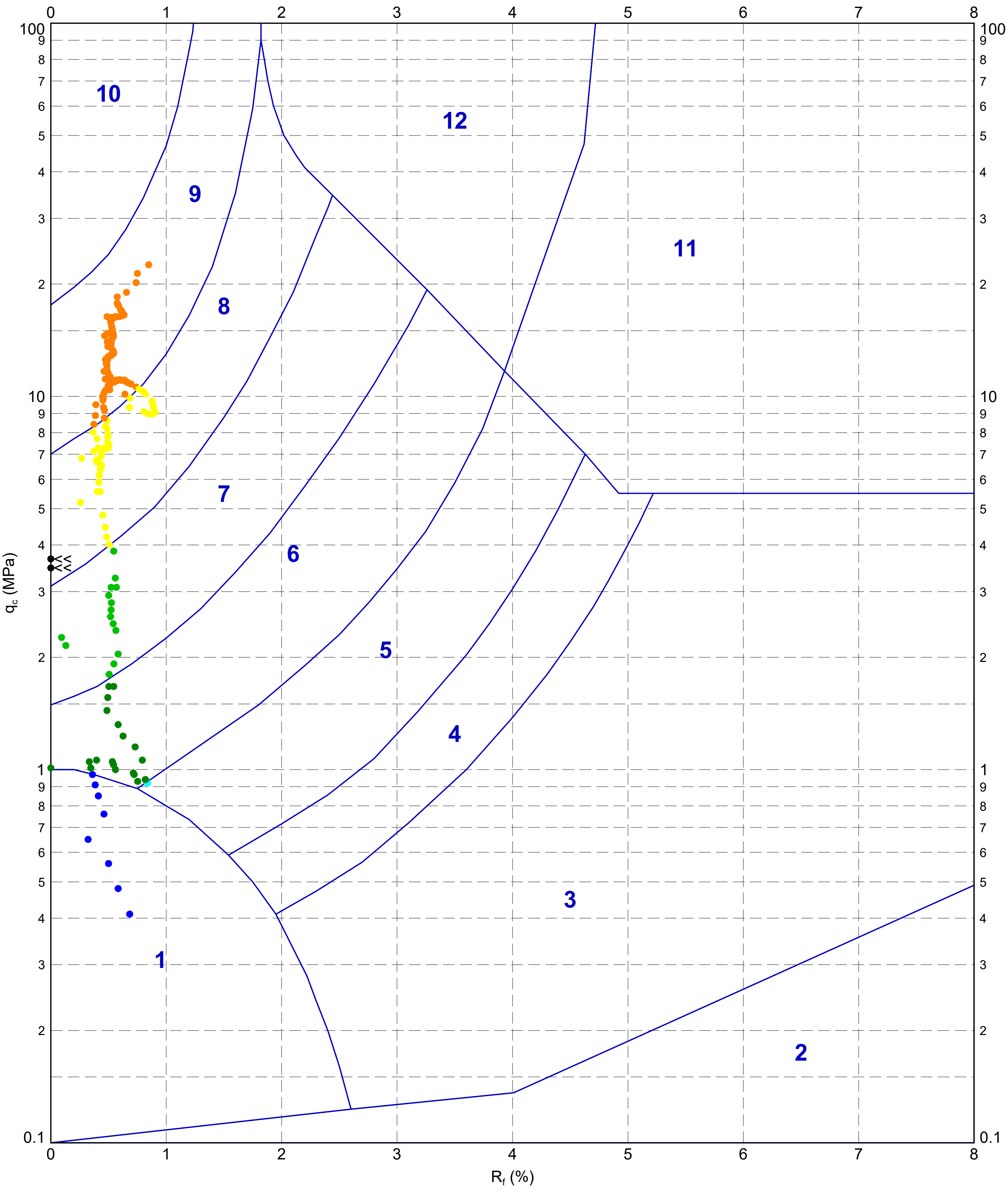
Transducer	Pre	Post	Difference
Tip	207 mV	205 mV	-0.022 MPa
Sleeve	205 mV	204 mV	-0.001 kPa
Pore Pressure 2	255 mV	243 mV	-0.003 kPa
X-Y Inclinometer	2413 mV	2404 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

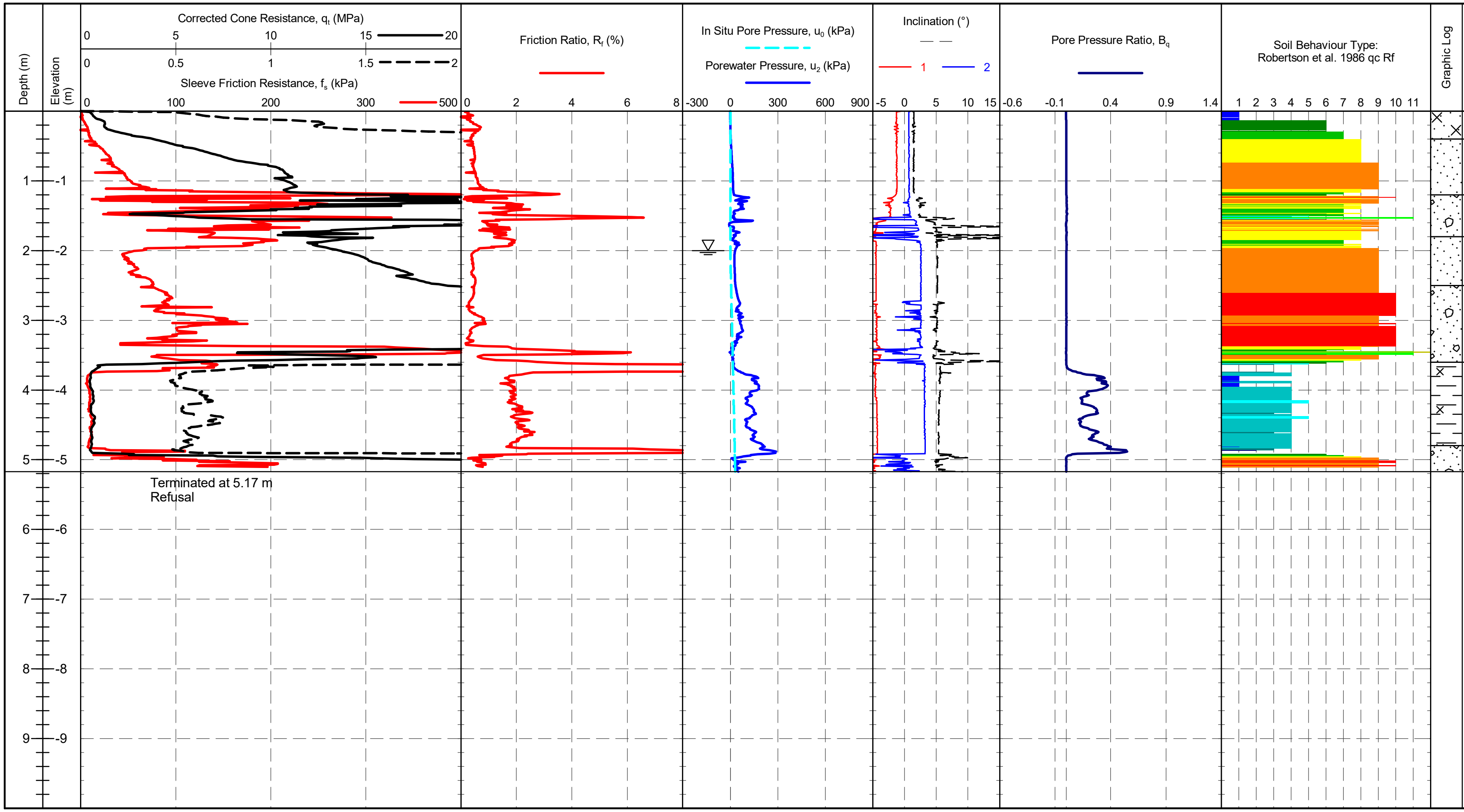
IN SITU SITE INVESTIGATION	TITLE Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 02	DRAWN	DATE 26/10/2020
		CHECKED	DATE 26/10/2020
		SCALE Not To Scale	A4
		PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION   Working with: soiltechnics (environmental and geotechnical consultants)

CPT LOG 01

PointID: **03**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



Depth (m)	Material Description
0.40	Low strength becoming medium strength sandy SILT to clayey SILT (6)
1.20	Medium dense to dense SAND to silty SAND (8)
1.80	Dense locally very dense gravelly SAND to SAND (10) with a layer of clay
2.50	Dense SAND (9)
3.60	Very dense gravelly SAND to SAND (10)
4.80	Low strength silty CLAY to CLAY (4)
5.17	Very dense gravelly SAND to SAND (10)

CONE ID	S15-CFIP.1858	TEST TYPE	TE2
CALIBRATION DATE	26/07/2020	APPLICATION CLASS	2
CONE MODEL	Subtraction	RIG	CPT 017 - Griffen
CONE AREA	15cm^2	OPERATOR	RS
CONE AREA RATIO	0.79	FRICTION REDUCER	None
FILTER POSITION	u2	WEATHER	Raining & Mild
FILTER TYPE	HDPE	GROUNDWATER DEPTH	Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	204 mV	-0.022 MPa
Sleeve	205 mV	204 mV	-0.001 kPa
Pore Pressure 2	249 mV	249 mV	0 kPa
X-Y Inclinometer	2341 mV	2324 mV	

METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

Groundwater Level

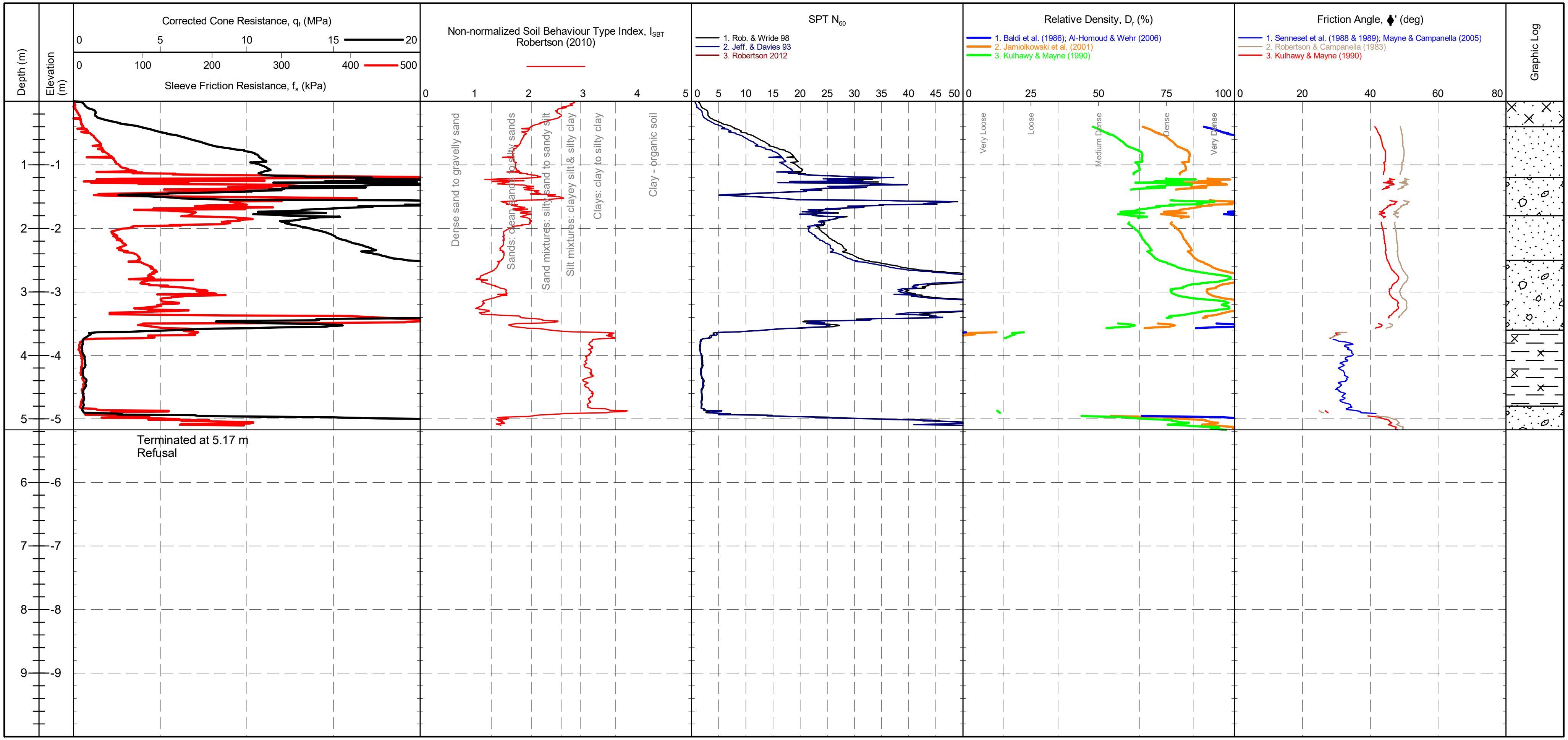
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID **03**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	15cm^2
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	204 mV	-0.022 MPa
Sleeve	205 mV	204 mV	-0.001 kPa
Pore Pressure 2	249 mV	249 mV	0 kPa
X-Y Inclinometer	2341 mV	2324 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

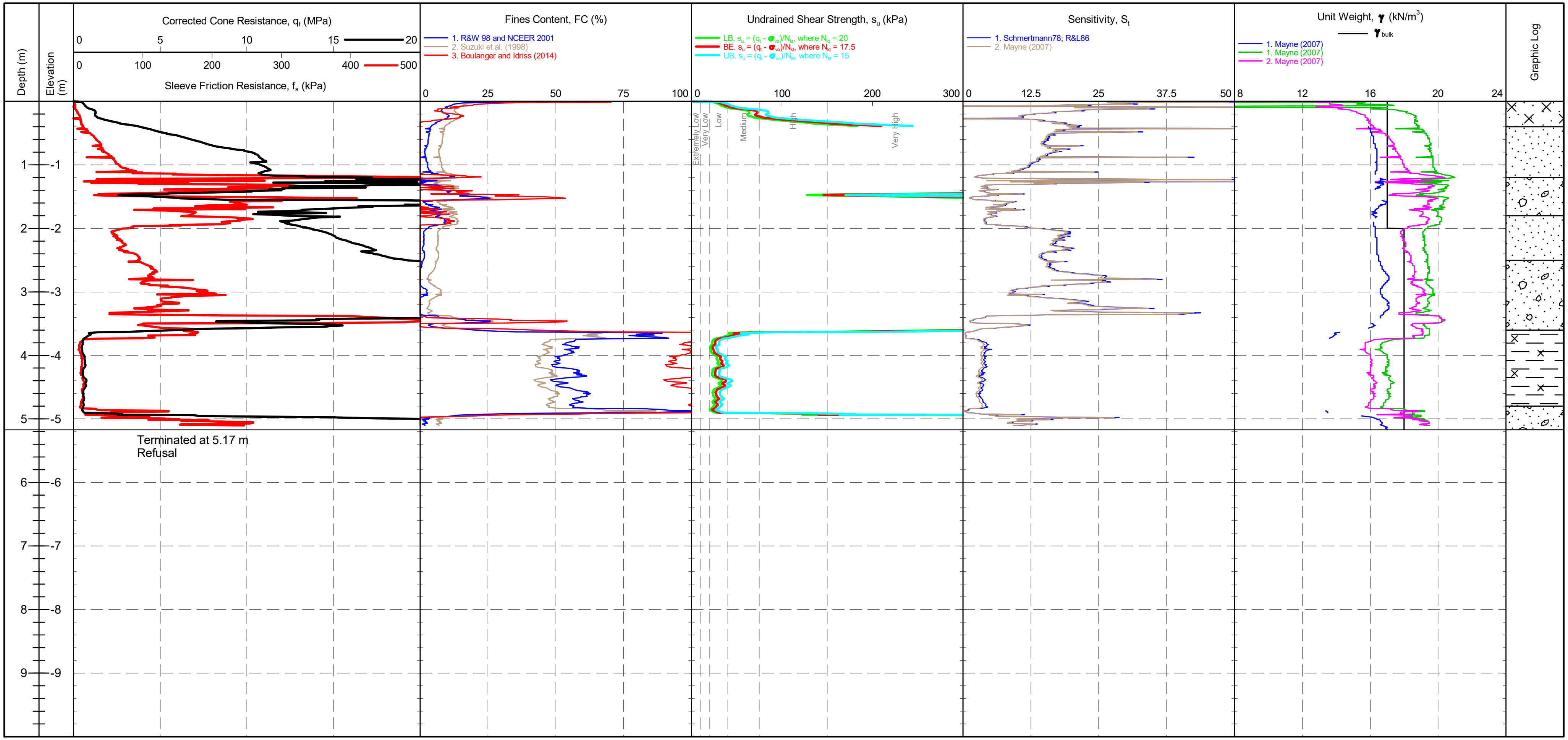
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID **03**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

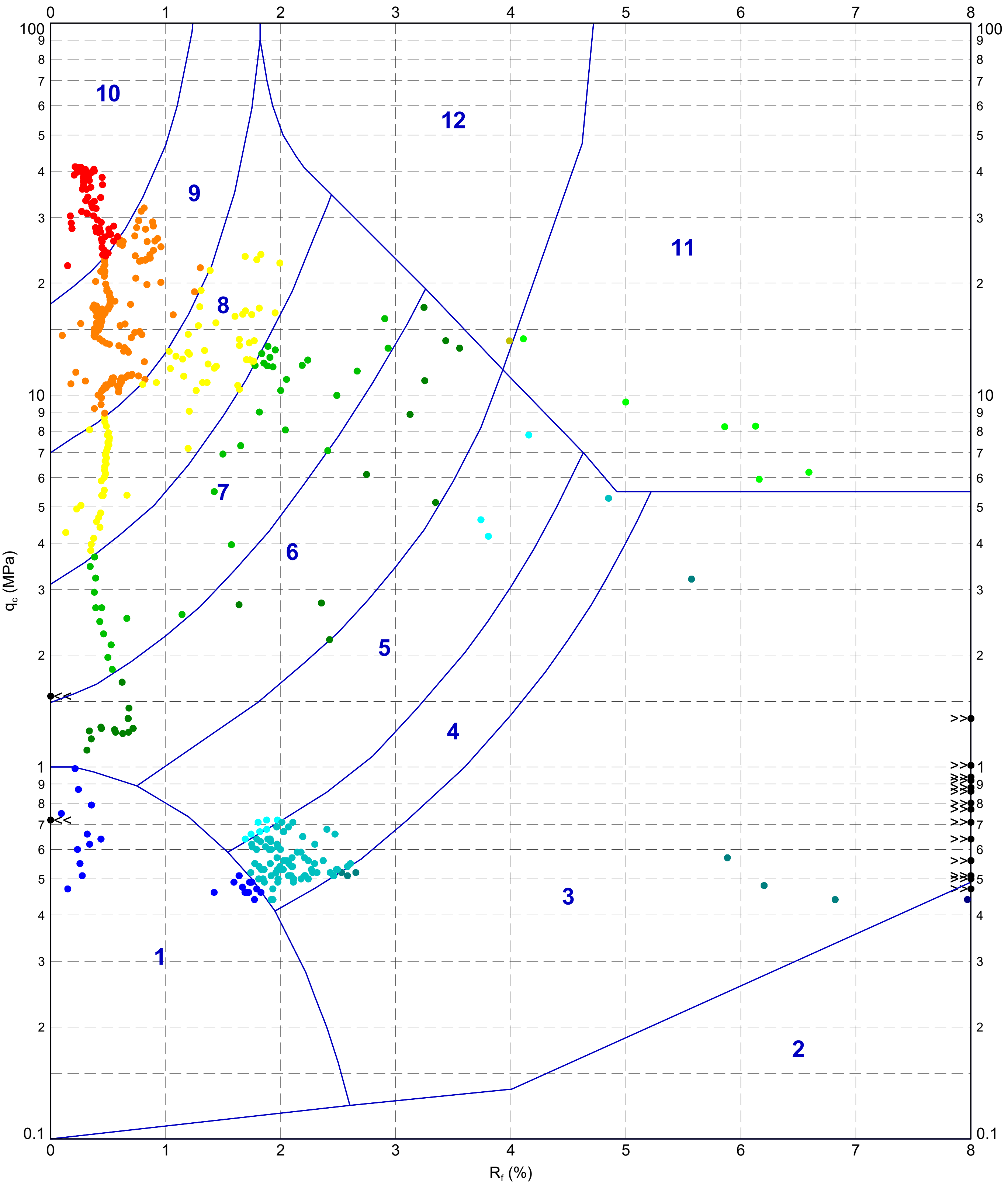
Transducer	Pre	Post	Difference
Tip	206 mV	204 mV	-0.022 MPa
Sleeve	205 mV	204 mV	-0.001 kPa
Pore Pressure 2	249 mV	249 mV	0 kPa
X-Y Inclinometer	2341 mV	2324 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE
Soiltechnics
Lossiemouth
Lossiemouth
Robertson et al. 1986 q_c vs. R_f - 03

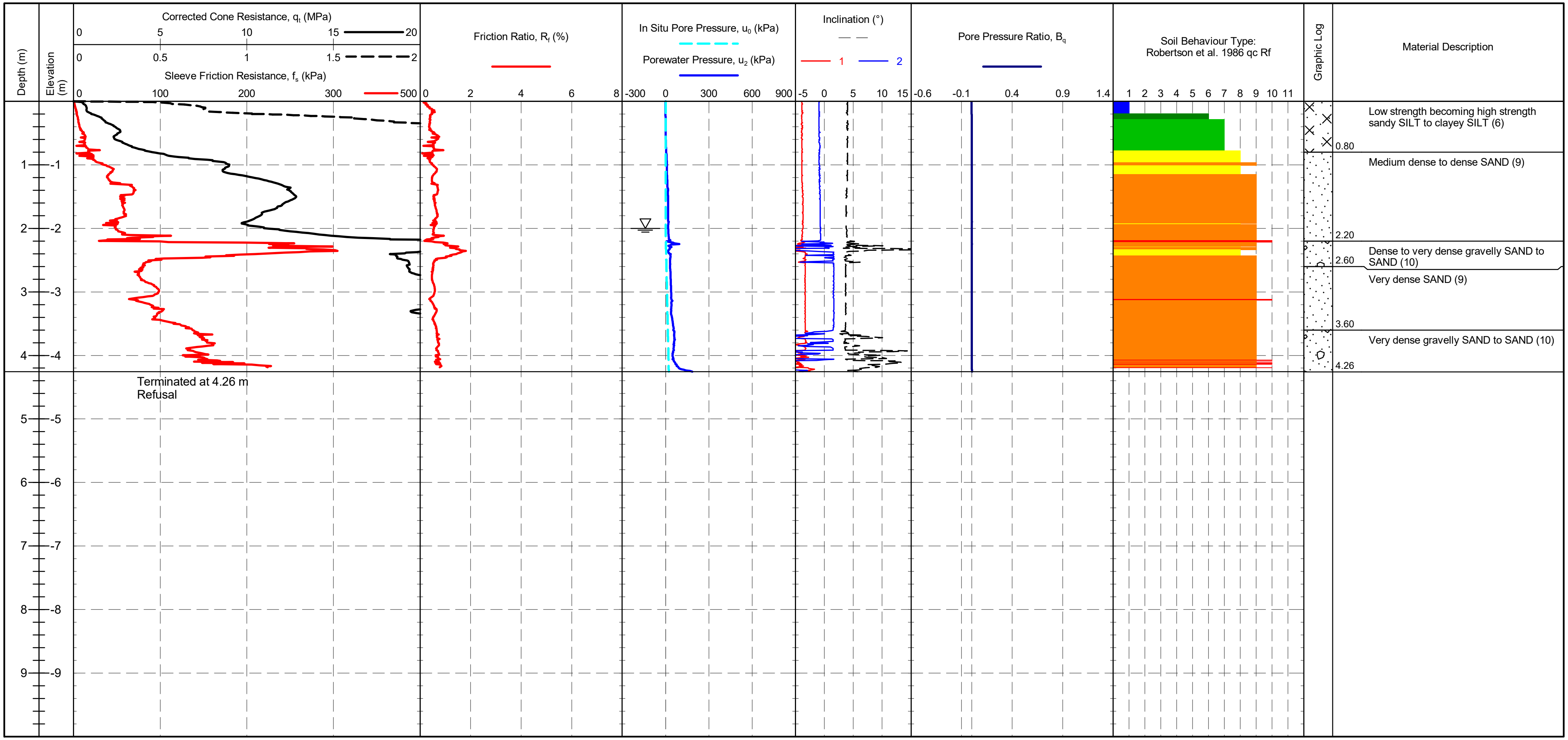
DRAWN		DATE	26/10/2020
CHECKED		DATE	26/10/2020
SCALE	Not To Scale		A4
PROJECT No	1200410	FIGURE No	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **04**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	198 mV	-0.098 MPa
Sleeve	205 mV	201 mV	-0.003 kPa
Pore Pressure 2	262 mV	226 mV	-0.009 kPa
X-Y Inclinometer	2049 mV	2081 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

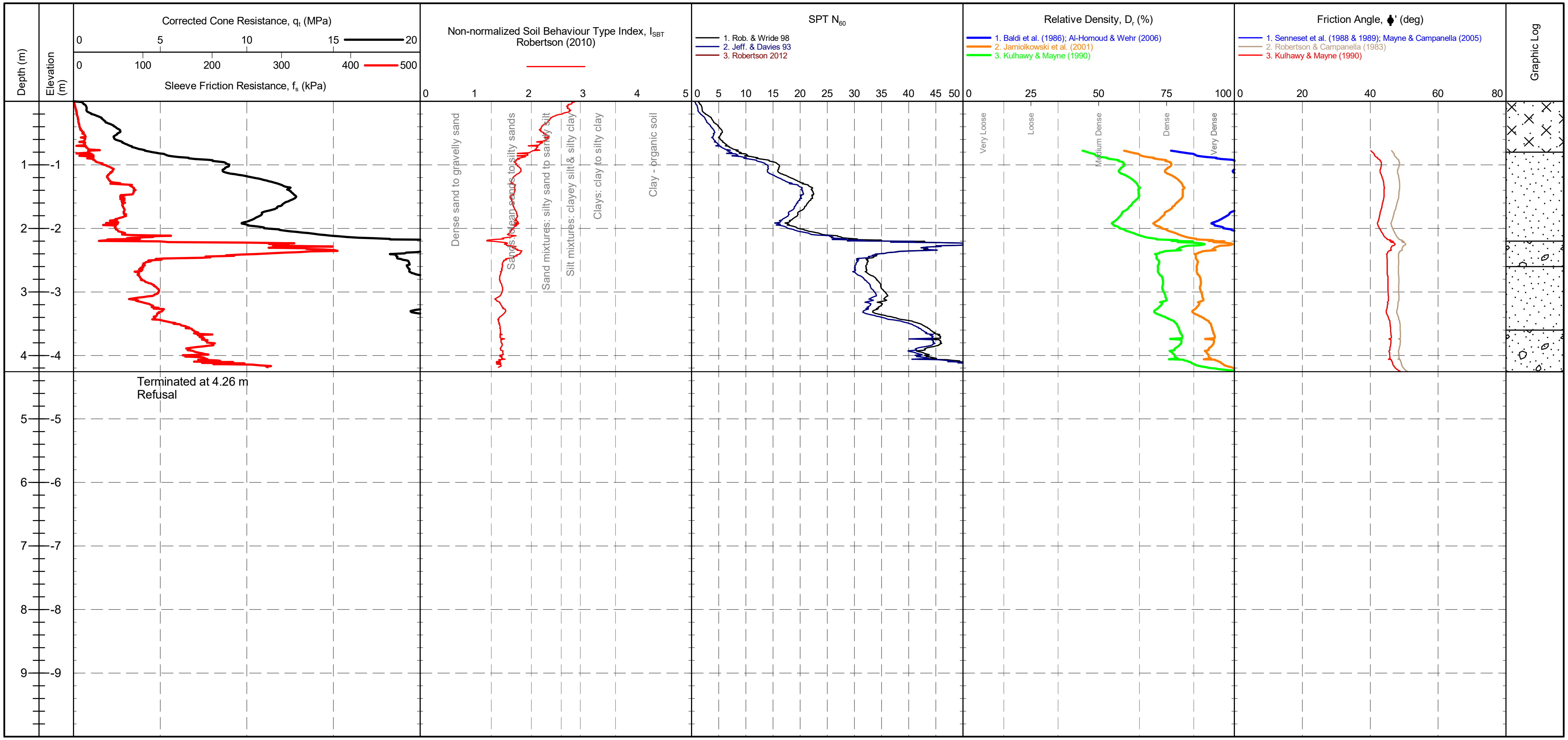
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
04

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	198 mV	-0.098 MPa
Sleeve	205 mV	201 mV	-0.003 kPa
Pore Pressure 2	262 mV	226 mV	-0.009 kPa
X-Y Inclinometer	2049 mV	2081 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

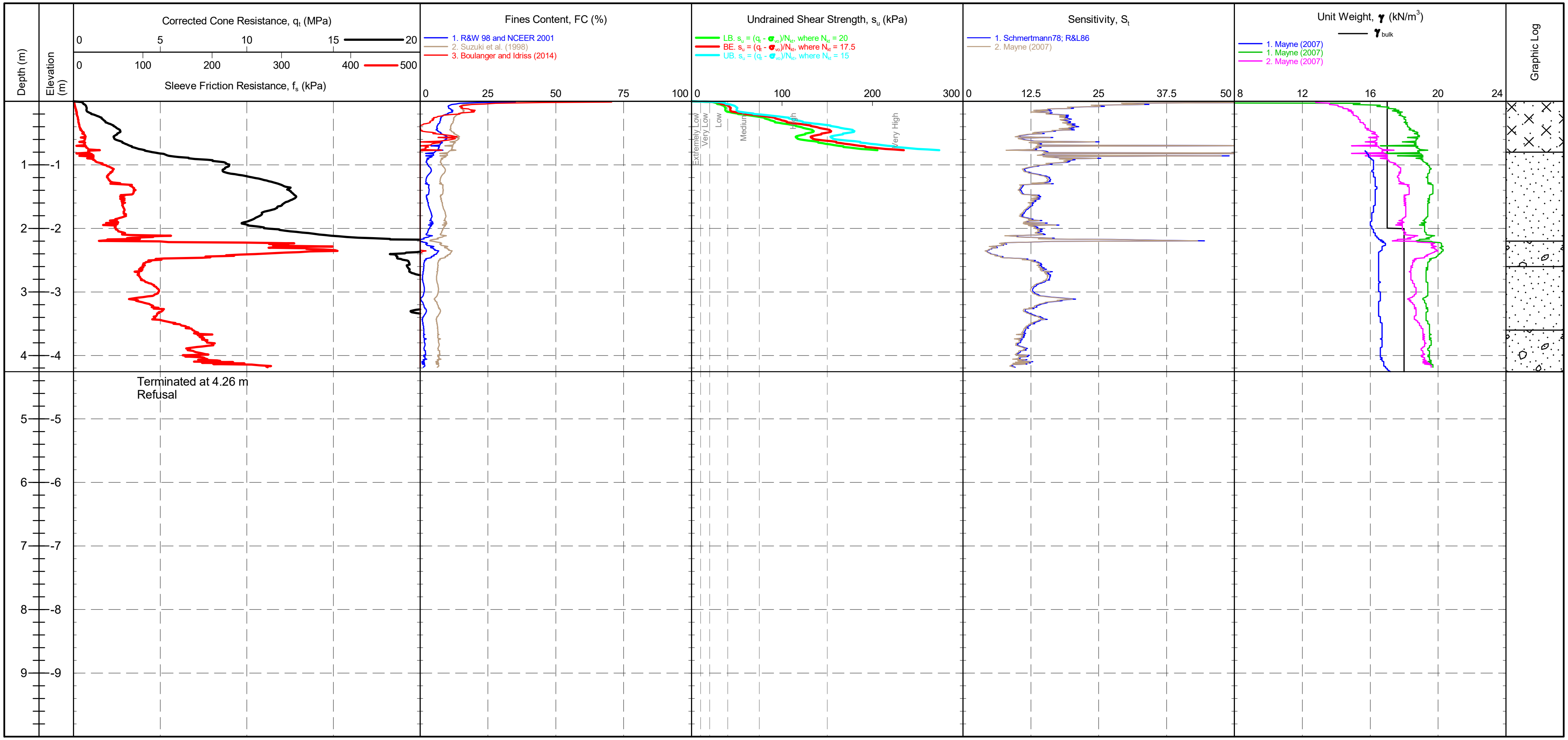
Dissipation Test

IN SITU
SITE INVESTIGATION Working with: soiltechnics
environmental and geotechnical consultants

CPT LOG 03

PointID
04

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

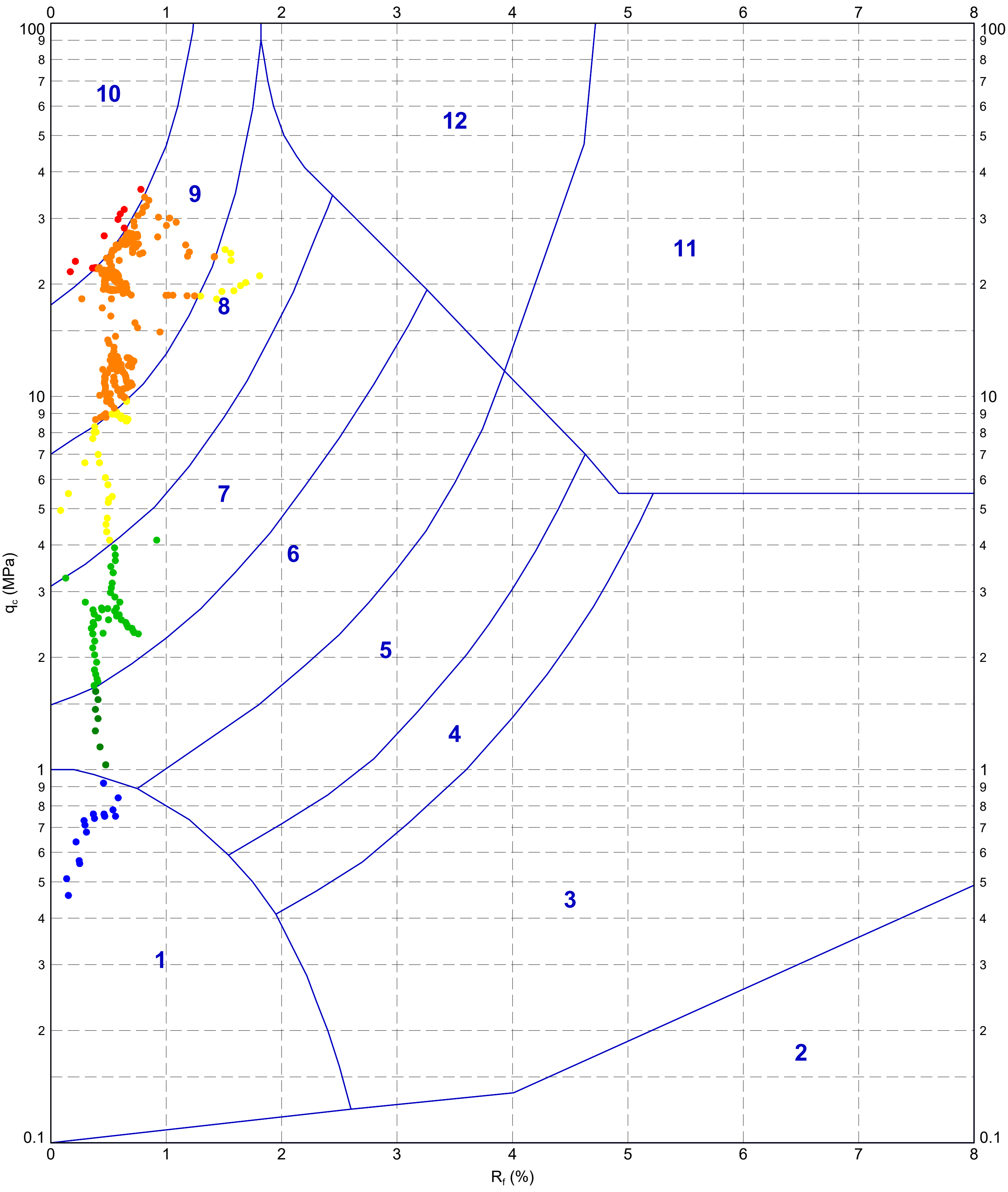
Transducer	Pre	Post	Difference
Tip	207 mV	198 mV	-0.098 MPa
Sleeve	205 mV	201 mV	-0.003 kPa
Pore Pressure 2	262 mV	226 mV	-0.009 kPa
X-Y Inclinometer	2049 mV	2081 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE	DRAWN	DATE
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 04		26/10/2020
	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

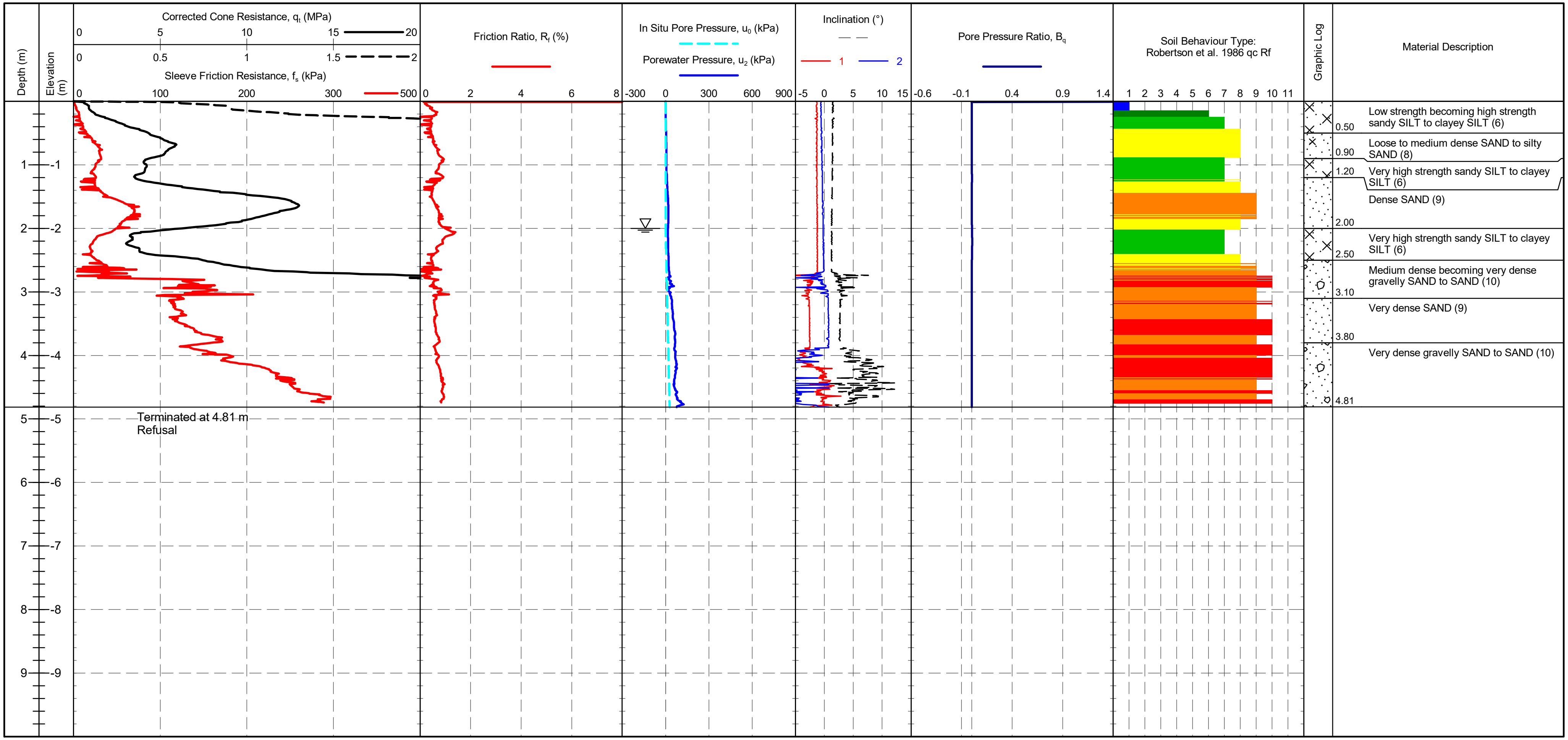
PointID **05**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 19/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CALIBRATION DATE	: 26/07/2020
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild
GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	197 mV	-0.108 MPa
Sleeve	205 mV	199 mV	-0.004 kPa
Pore Pressure 2	247 mV	214 mV	-0.008 kPa
X-Y Inclinometer	2313 mV	2320 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

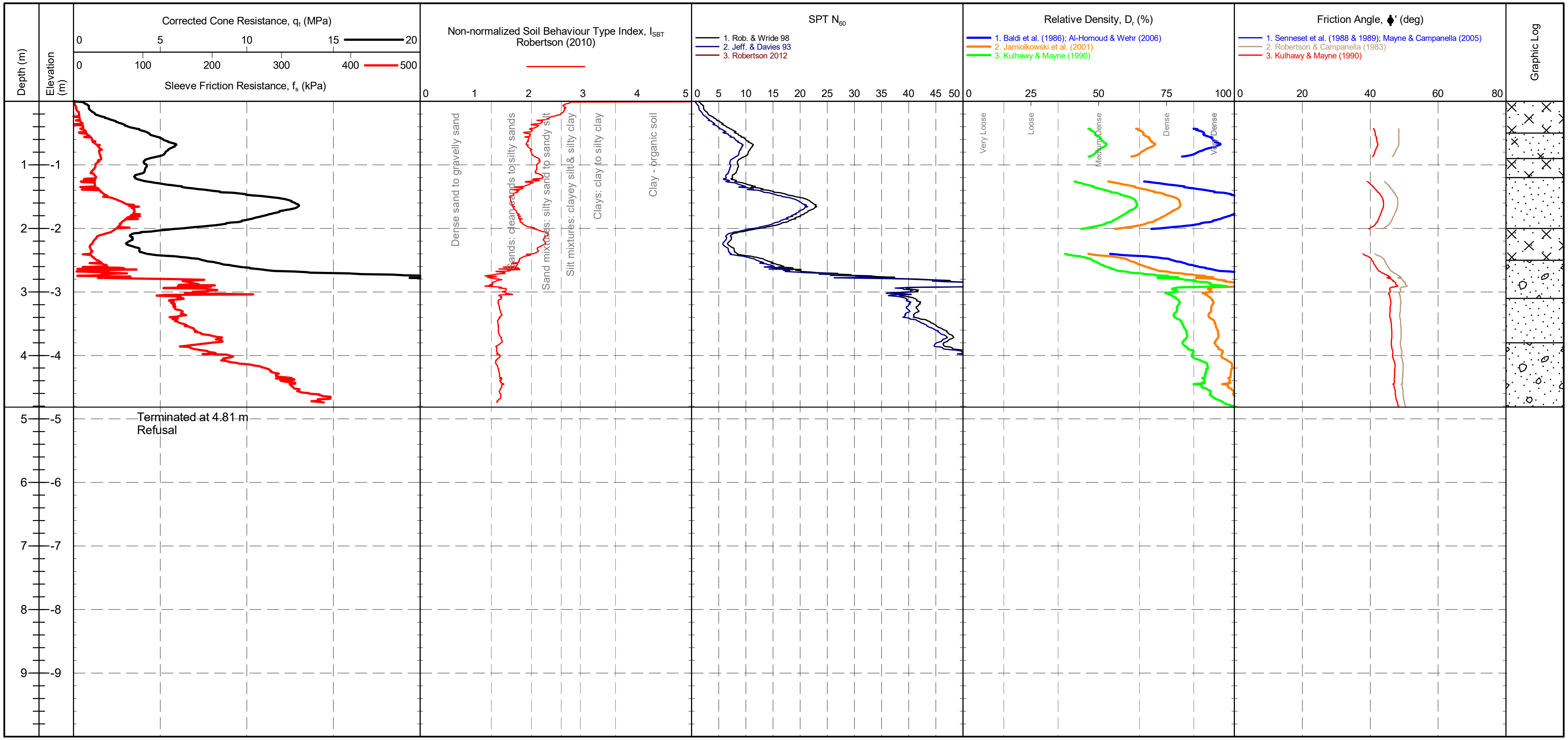
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID **05**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858	TEST TYPE : TE2		
CONE MODEL : Subtraction	APPLICATION CLASS : 2		
CONE AREA : 15cm²	RIG : CPT 017 - Griffen		
CONE AREA RATIO : 0.79	OPERATOR : RS		
FILTER POSITION : u2	FRICTION REDUCER : None		
FILTER TYPE : HDPE	WEATHER : Raining & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	197 mV	-0.108 MPa
Sleeve	205 mV	199 mV	-0.004 kPa
Pore Pressure 2	247 mV	214 mV	-0.008 kPa
X-Y Inclinometer	2313 mV	2320 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

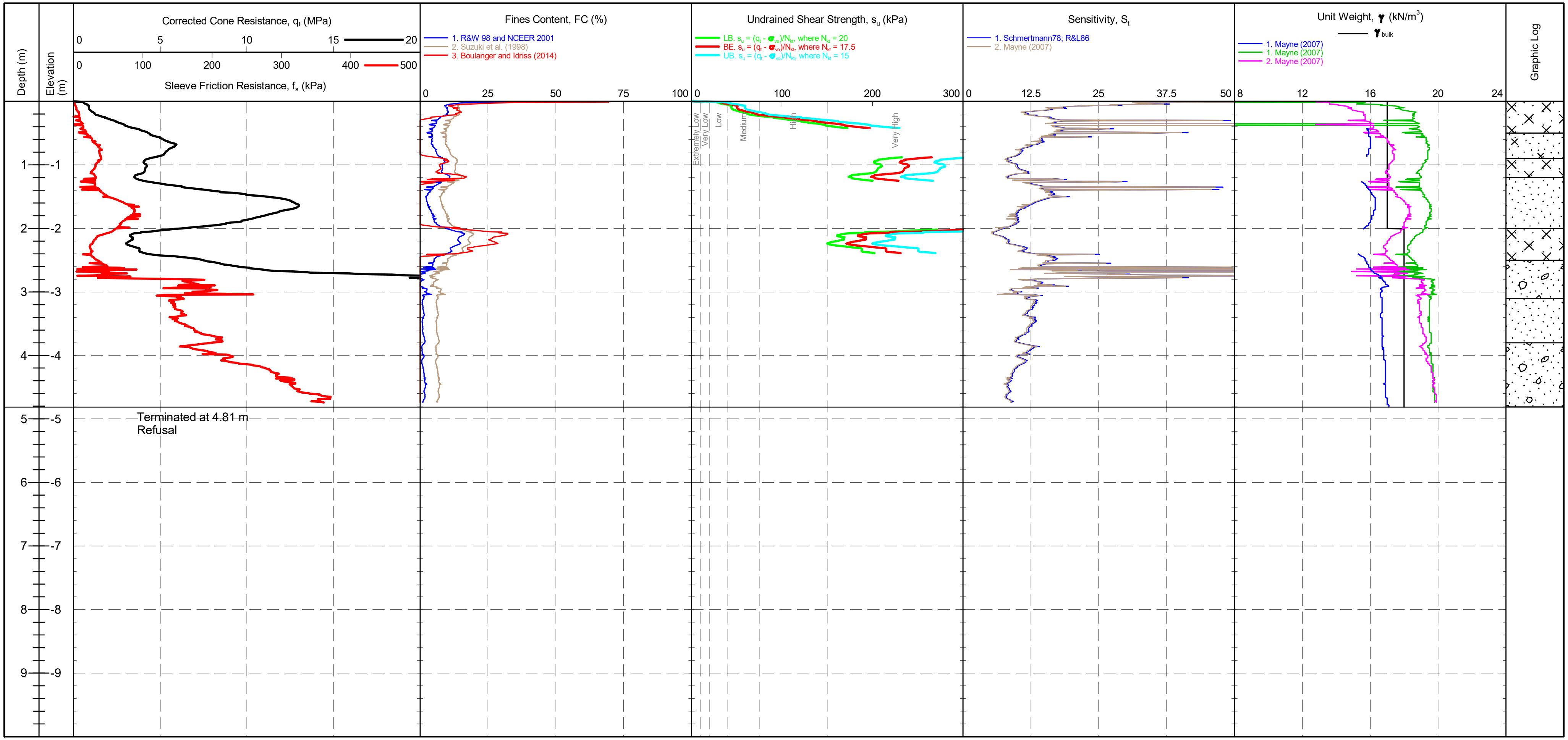
PointID: **05**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 19/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

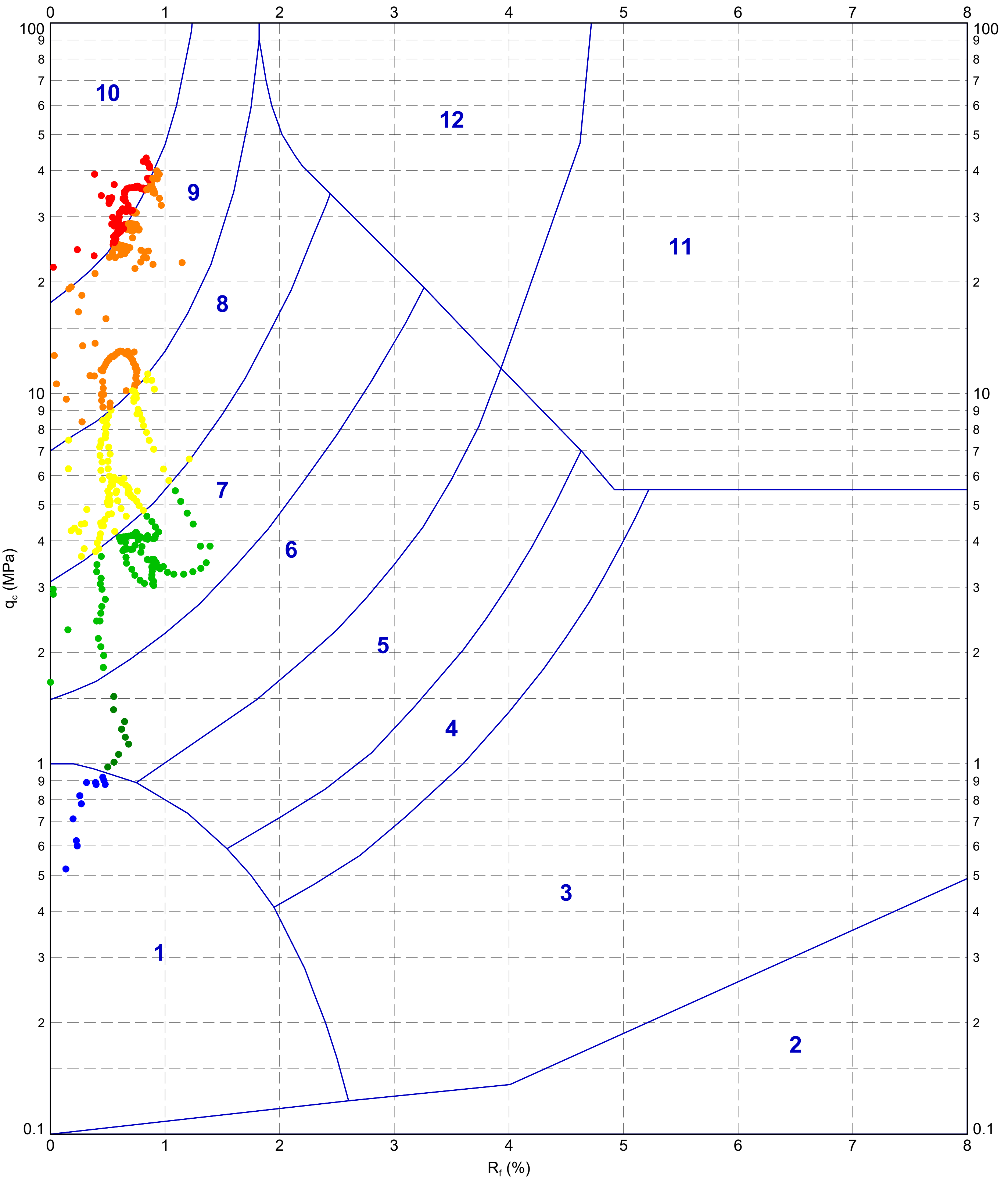
Transducer	Pre	Post	Difference
Tip	207 mV	197 mV	-0.108 MPa
Sleeve	205 mV	199 mV	-0.004 kPa
Pore Pressure 2	247 mV	214 mV	-0.008 kPa
X-Y Inclinometer	2313 mV	2320 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE: Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 05	DRAWN	DATE 26/10/2020	
	CHECKED	DATE 26/10/2020	
	SCALE Not To Scale		A4
	PROJECT No 1200410	FIGURE No	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

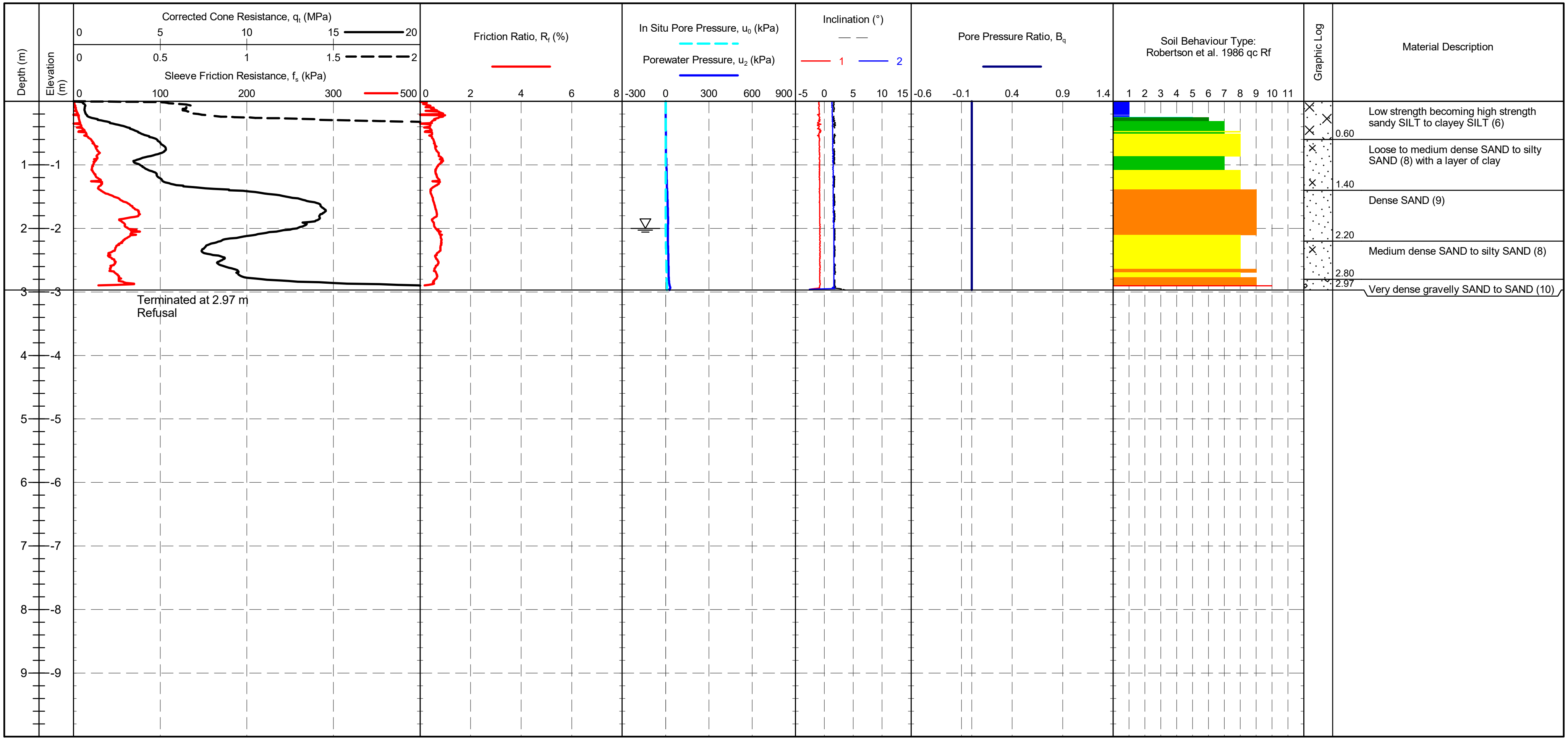
CPT LOG 01

PointID **06**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark: Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 19/10/2020
PLOT DATE : 26/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm²	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	208 mV	204 mV	-0.043 MPa
Sleeve	206 mV	204 mV	-0.001 kPa
Pore Pressure 2	245 mV	254 mV	0.002 kPa
X-Y Inclinometer	2358 mV	2354 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

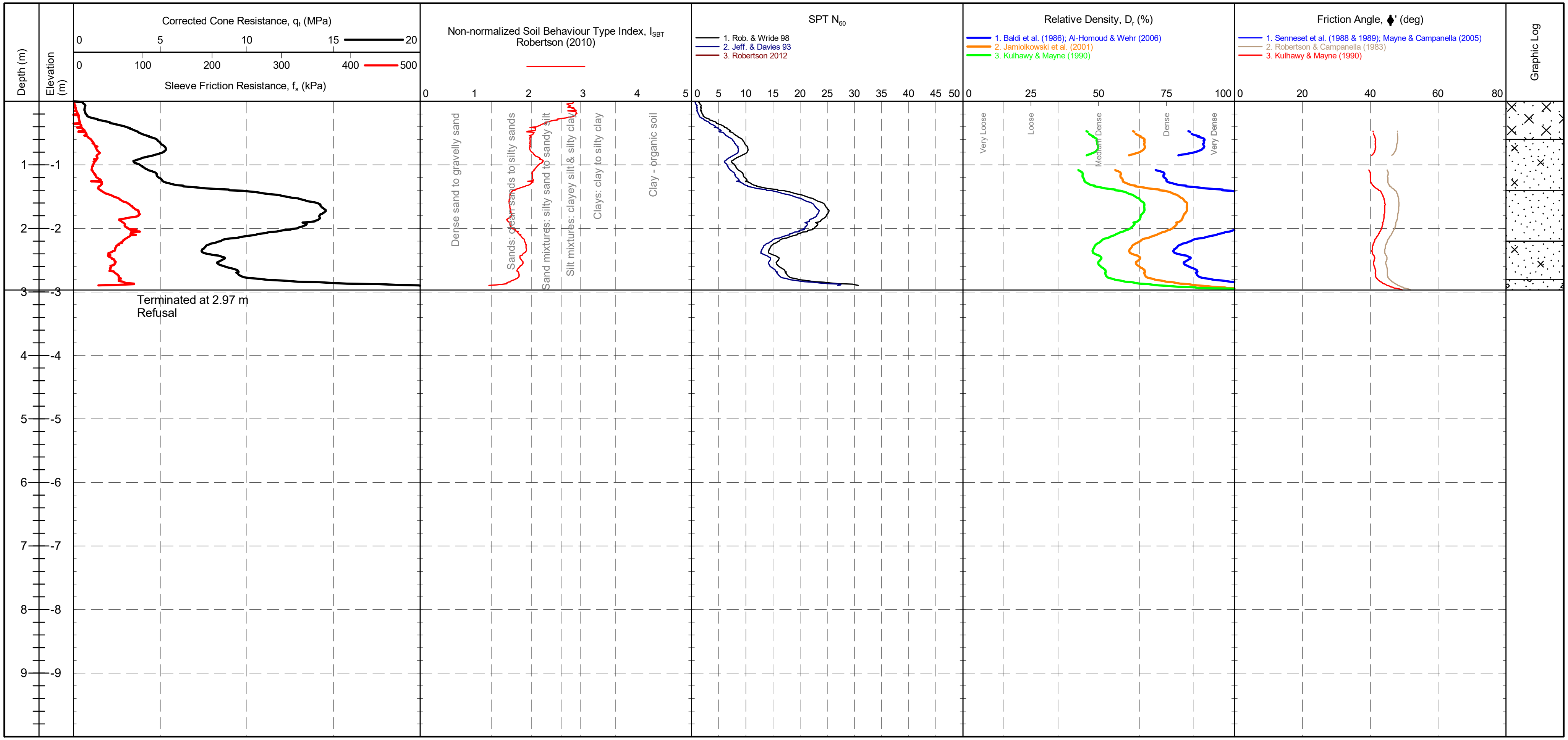
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID **06**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	208 mV	204 mV	-0.043 MPa
Sleeve	206 mV	204 mV	-0.001 kPa
Pore Pressure 2	245 mV	254 mV	0.002 kPa
X-Y Inclinometer	2358 mV	2354 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

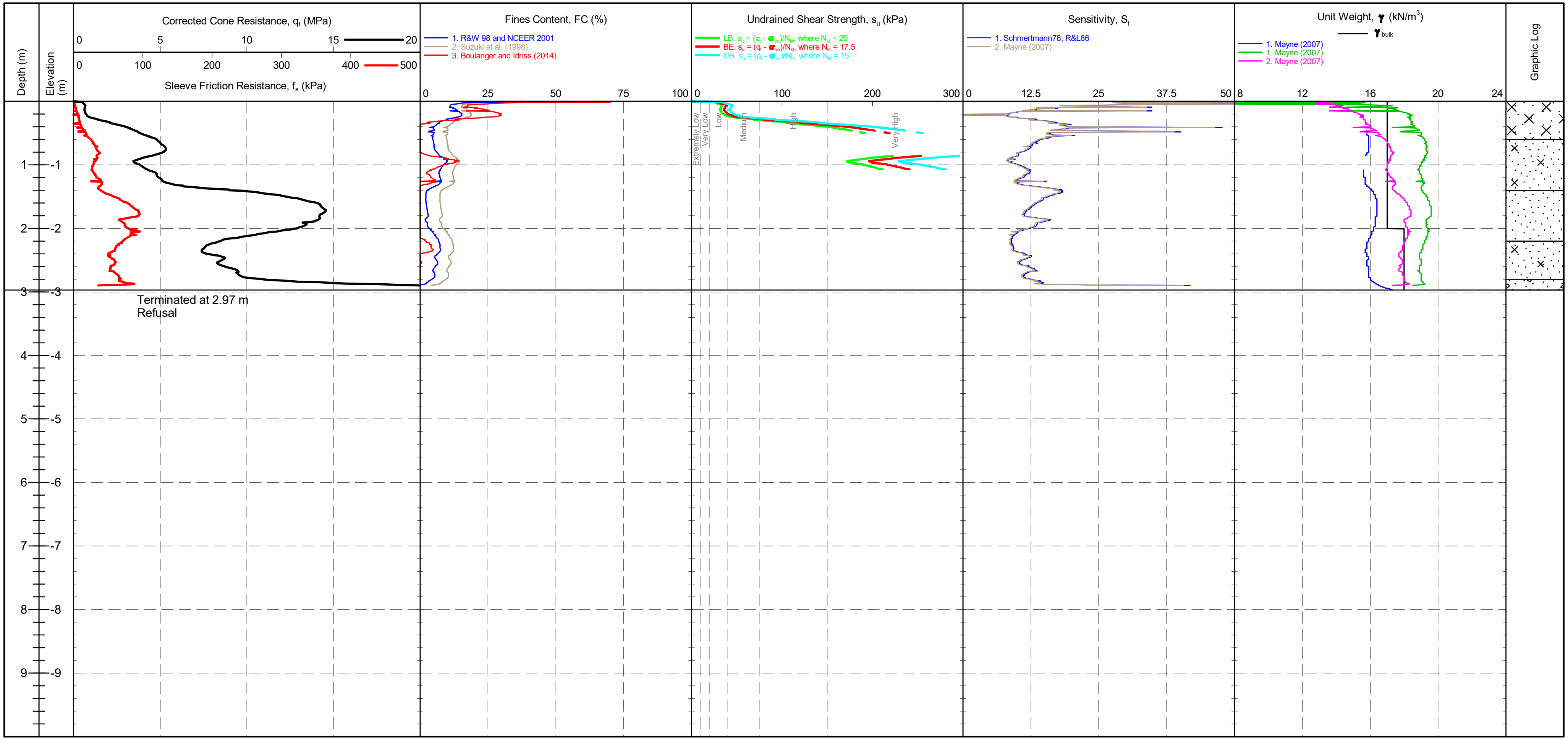
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID **06**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

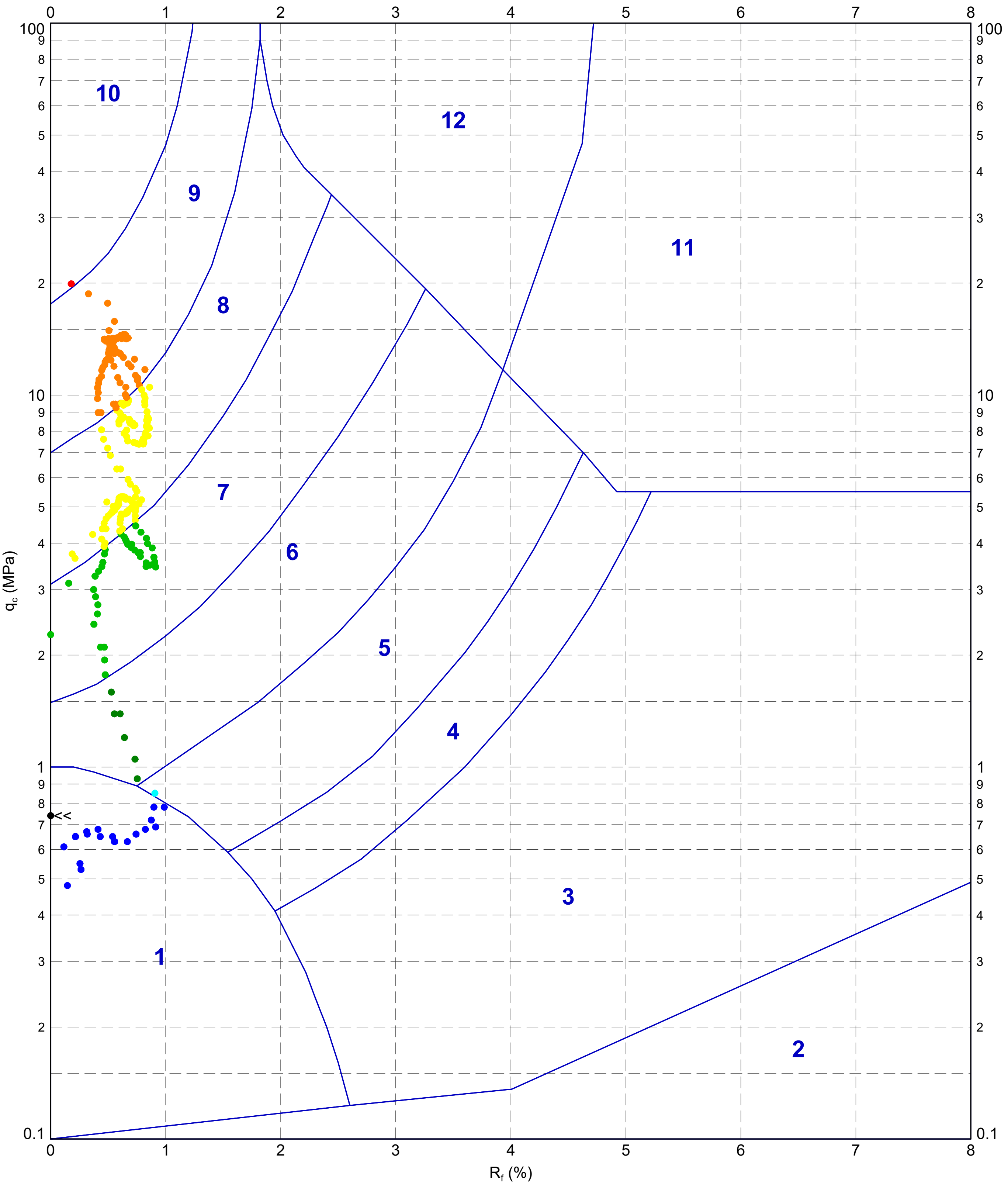
Transducer	Pre	Post	Difference
Tip	208 mV	204 mV	-0.043 MPa
Sleeve	206 mV	204 mV	-0.001 kPa
Pore Pressure 2	245 mV	254 mV	0.002 kPa
X-Y Inclinometer	2358 mV	2354 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

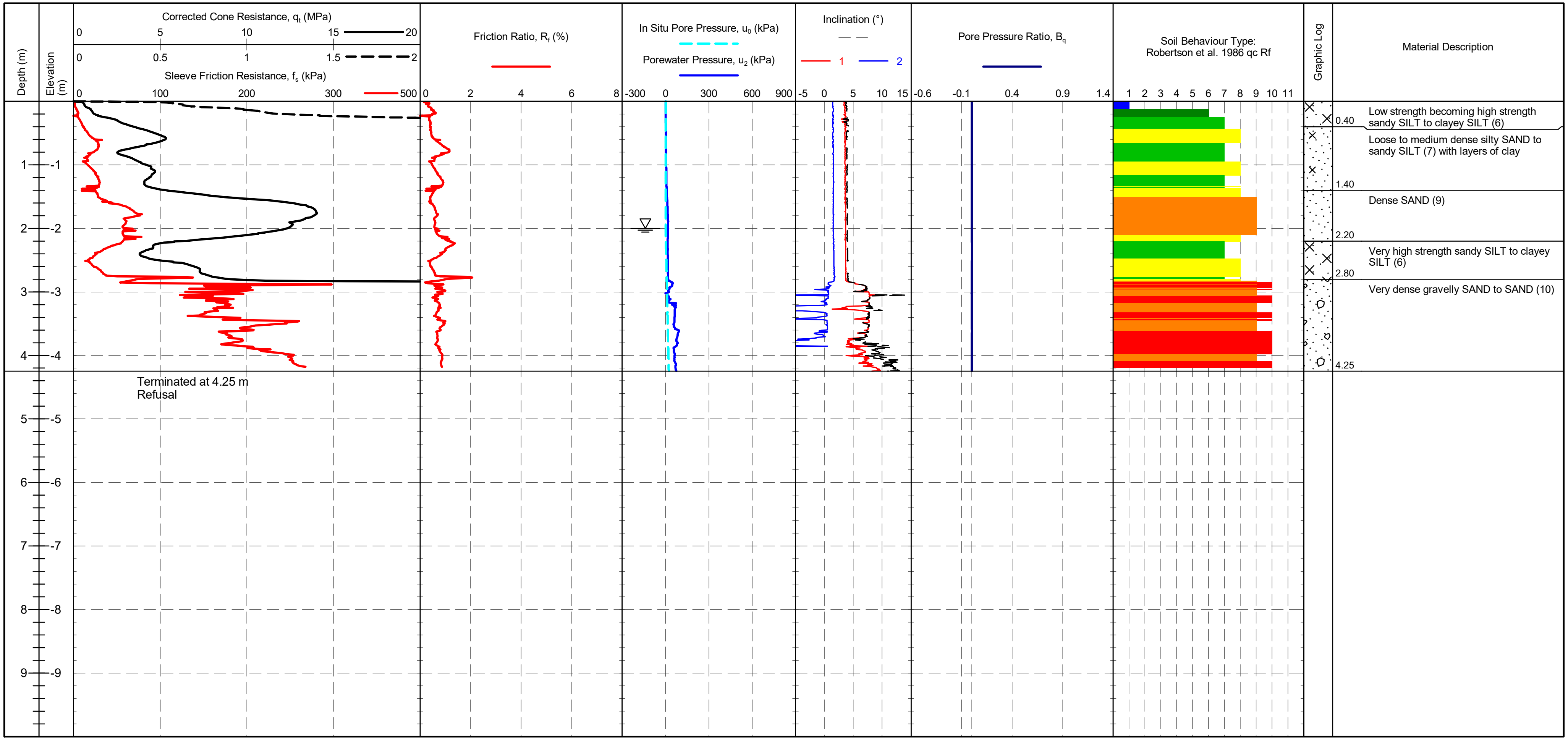
IN SITU SITE INVESTIGATION	TITLE Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 06	DRAWN	DATE 26/10/2020
		CHECKED	DATE 26/10/2020
		SCALE Not To Scale	A4
		PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **07**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	196 mV	-0.108 MPa
Sleeve	204 mV	198 mV	-0.004 kPa
Pore Pressure 2	259 mV	215 mV	-0.011 kPa
X-Y Inclinometer	2771 mV	2820 mV	

METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

Groundwater Level

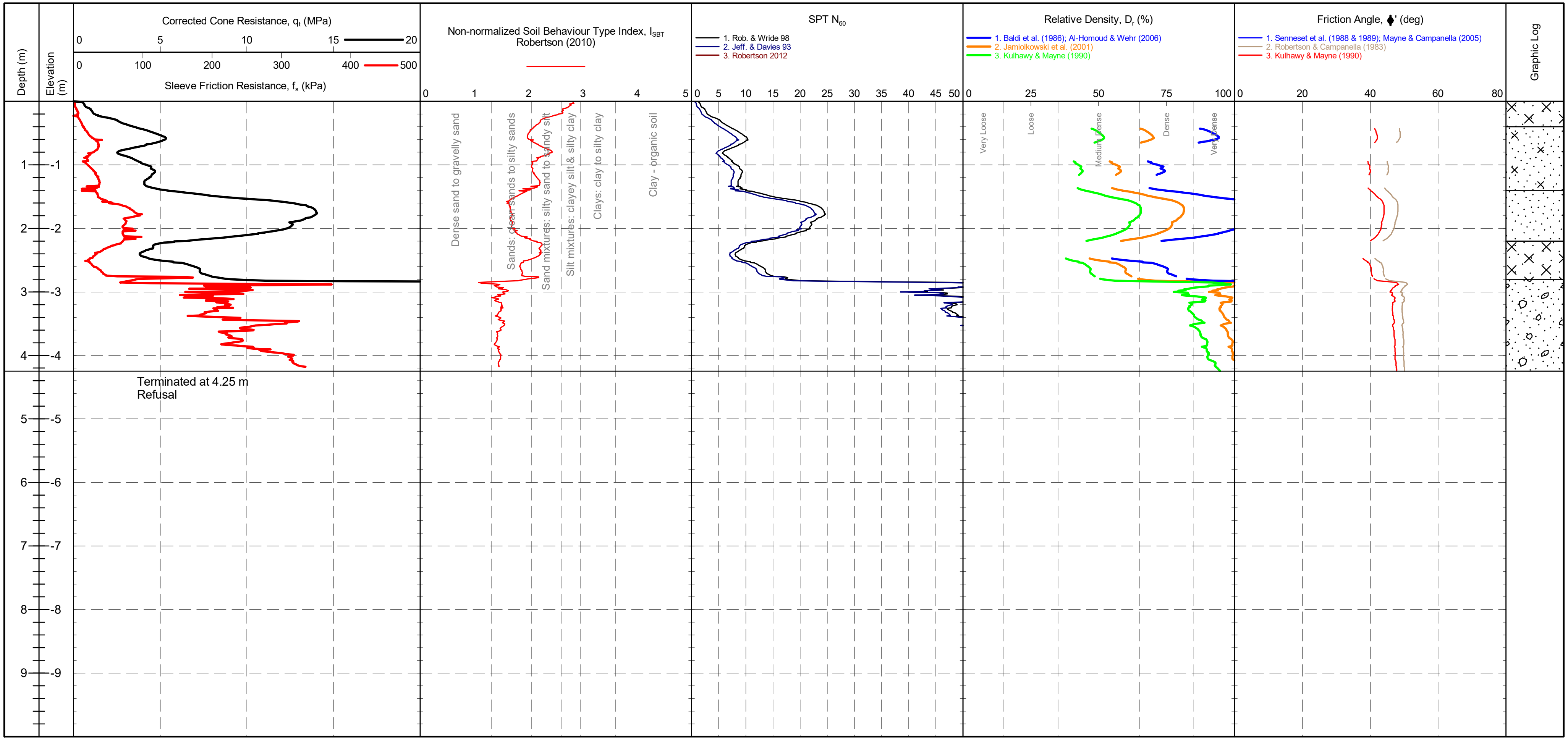
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID	
	07

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858	TEST TYPE : TE2		
CONE MODEL : Subtraction	APPLICATION CLASS : 2		
CONE AREA : 15cm^2	RIG : CPT 017 - Griffen		
CONE AREA RATIO : 0.79	OPERATOR : RS		
FILTER POSITION : u2	FRICTION REDUCER : None		
FILTER TYPE : HDPE	WEATHER : Raining & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	196 mV	-0.108 MPa
Sleeve	204 mV	198 mV	-0.004 kPa
Pore Pressure 2	259 mV	215 mV	-0.011 kPa
X-Y Inclinometer	2771 mV	2820 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

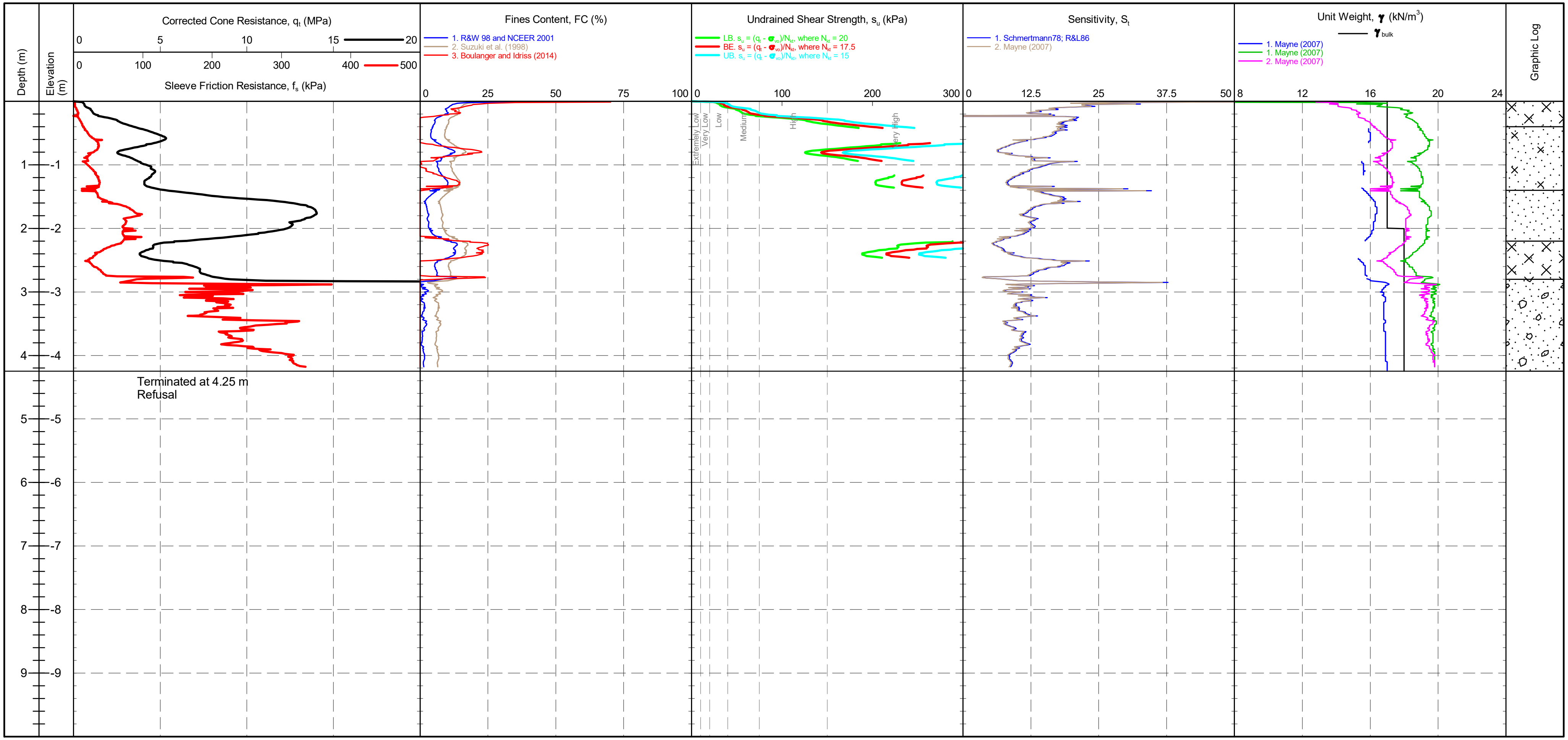
CPT LOG 03

PointID **07**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 19/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

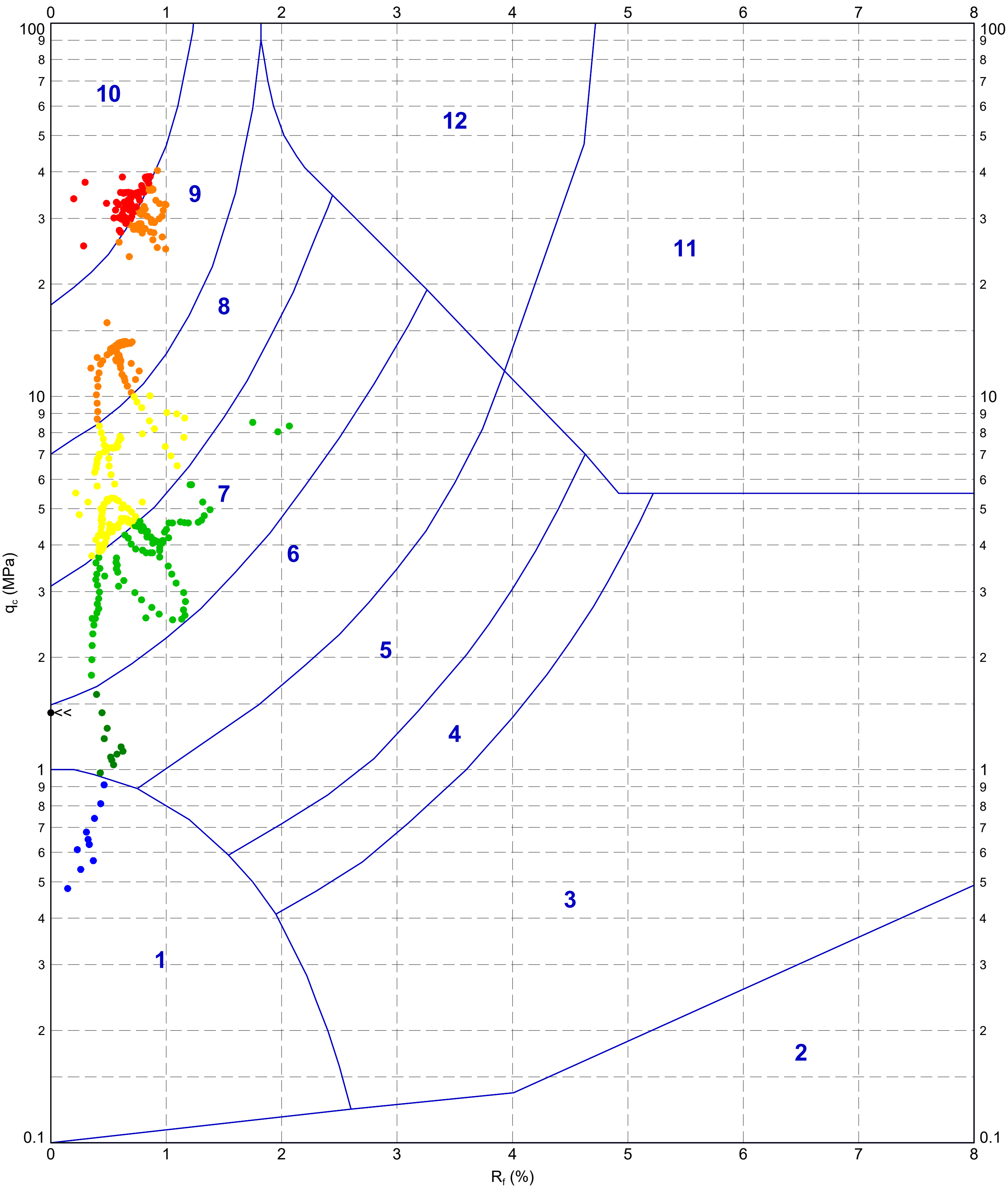
Transducer	Pre	Post	Difference
Tip	206 mV	196 mV	-0.108 MPa
Sleeve	204 mV	198 mV	-0.004 kPa
Pore Pressure 2	259 mV	215 mV	-0.011 kPa
X-Y Inclinometer	2771 mV	2820 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

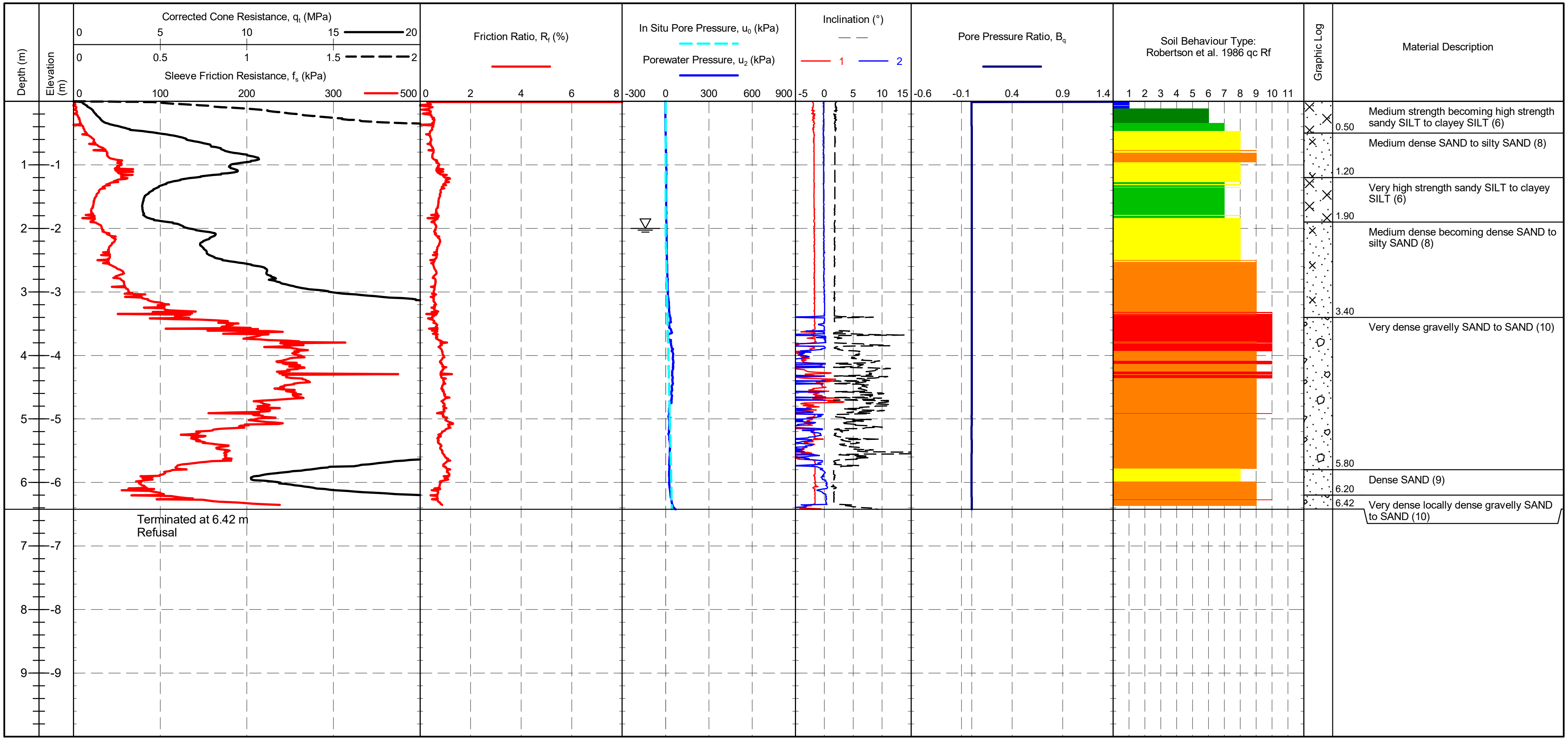
IN SITU SITE INVESTIGATION	TITLE Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 07	DRAWN	DATE 26/10/2020
		CHECKED	DATE 26/10/2020
		SCALE Not To Scale	A4
		PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **08**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm²	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	208 mV	199 mV	-0.098 MPa
Sleeve	204 mV	201 mV	-0.002 kPa
Pore Pressure 2	265 mV	229 mV	-0.009 kPa
X-Y Inclinometer	2231 mV	2235 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

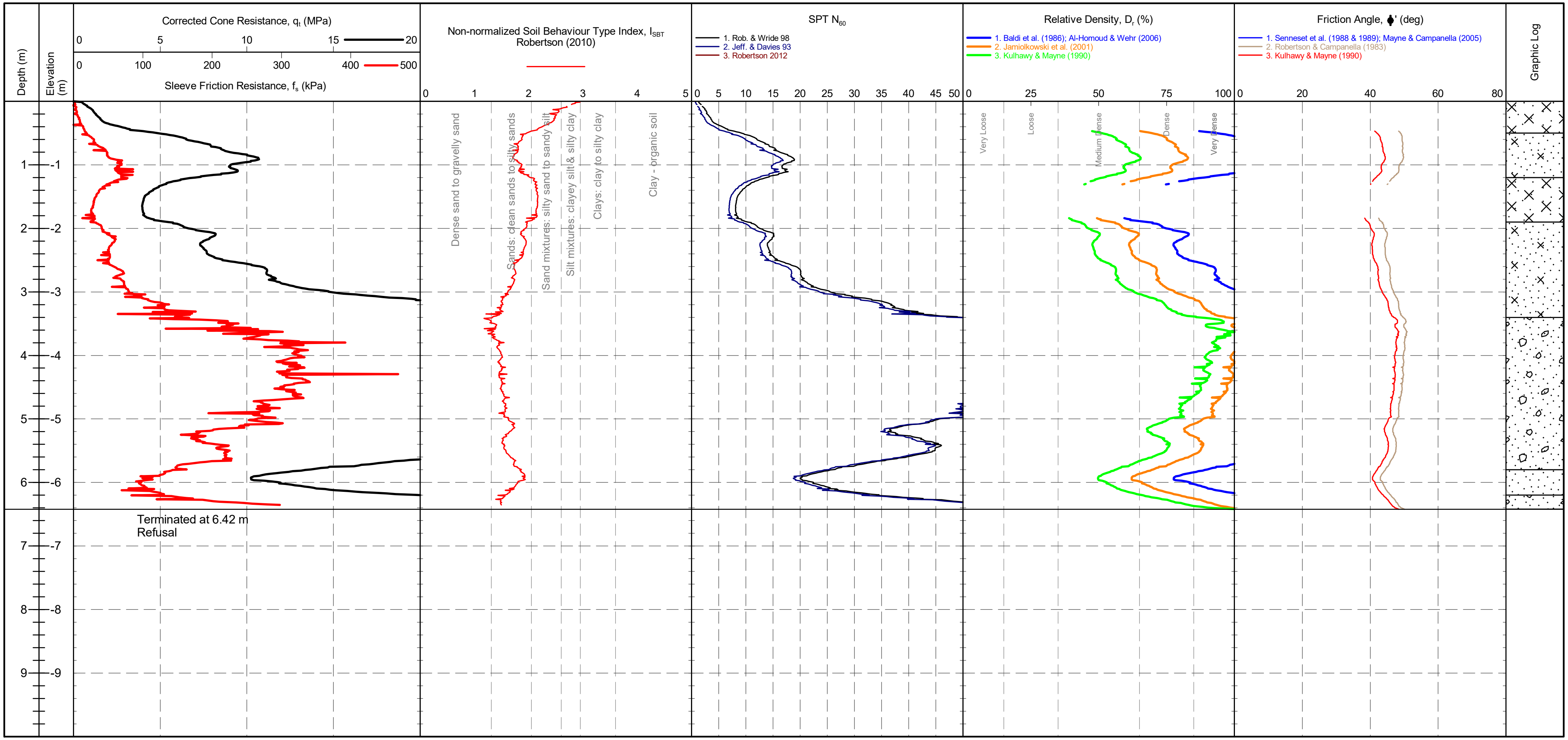
IN SITU
SITE INVESTIGATION

Working with: soiltechnics
environmental and geotechnical consultants

CPT LOG 02

PointID
08

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: $15cm^2$	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	208 mV	199 mV	-0.098 MPa
Sleeve	204 mV	201 mV	-0.002 kPa
Pore Pressure 2	265 mV	229 mV	-0.009 kPa
X-Y Inclinometer	2231 mV	2235 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

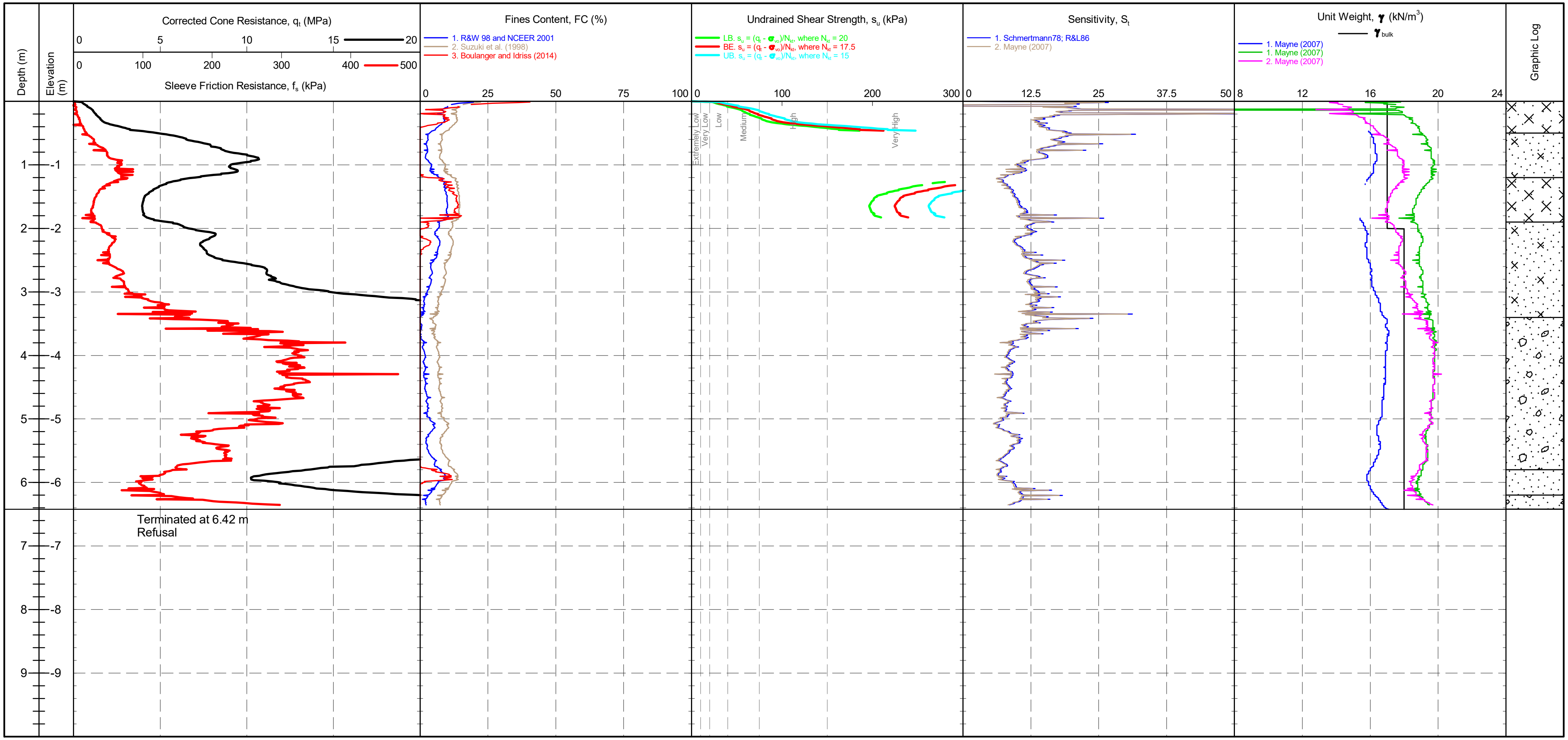
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID **08**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

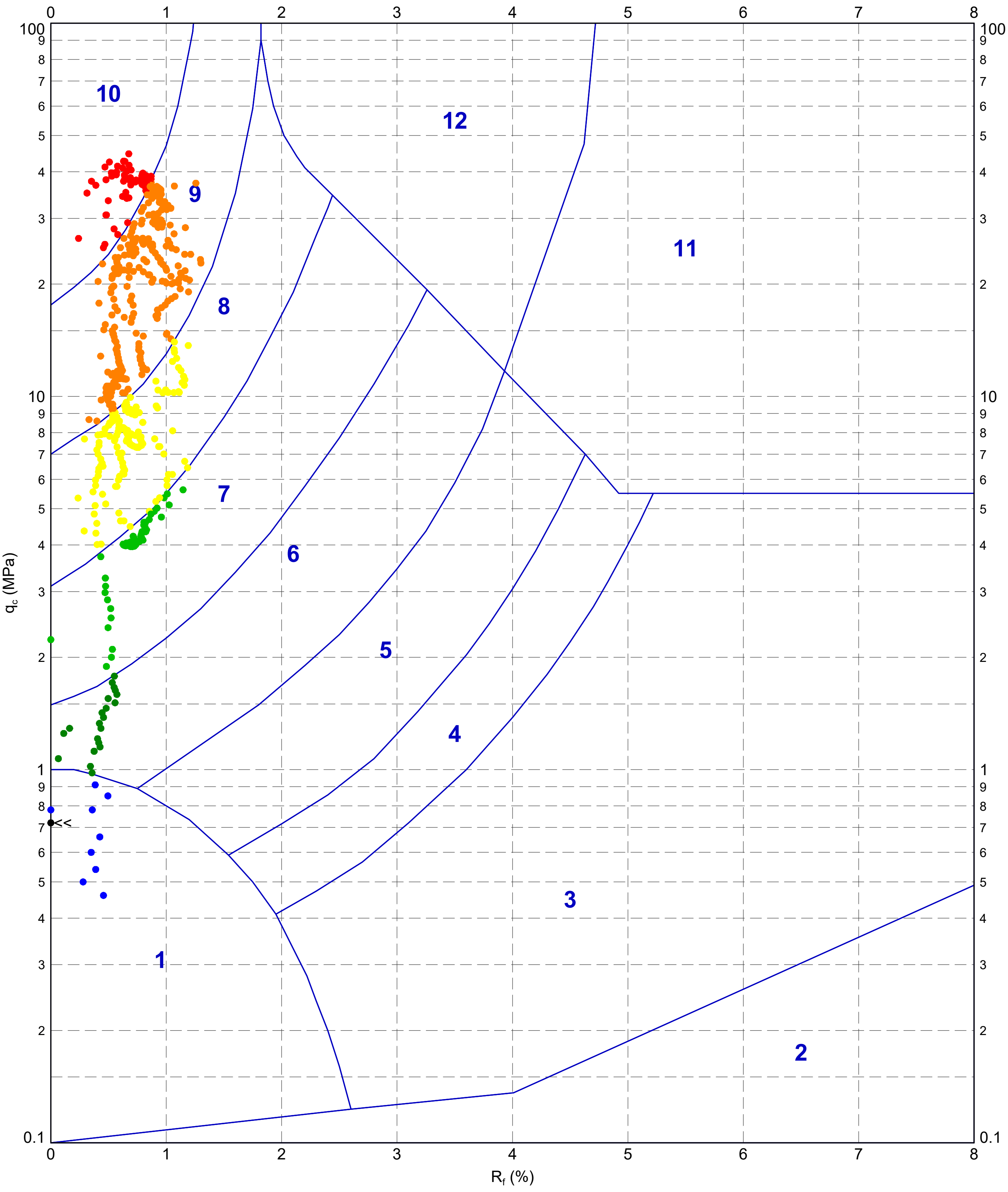
Transducer	Pre	Post	Difference
Tip	208 mV	199 mV	-0.098 MPa
Sleeve	204 mV	201 mV	-0.002 kPa
Pore Pressure 2	265 mV	229 mV	-0.009 kPa
X-Y Inclinometer	2231 mV	2235 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

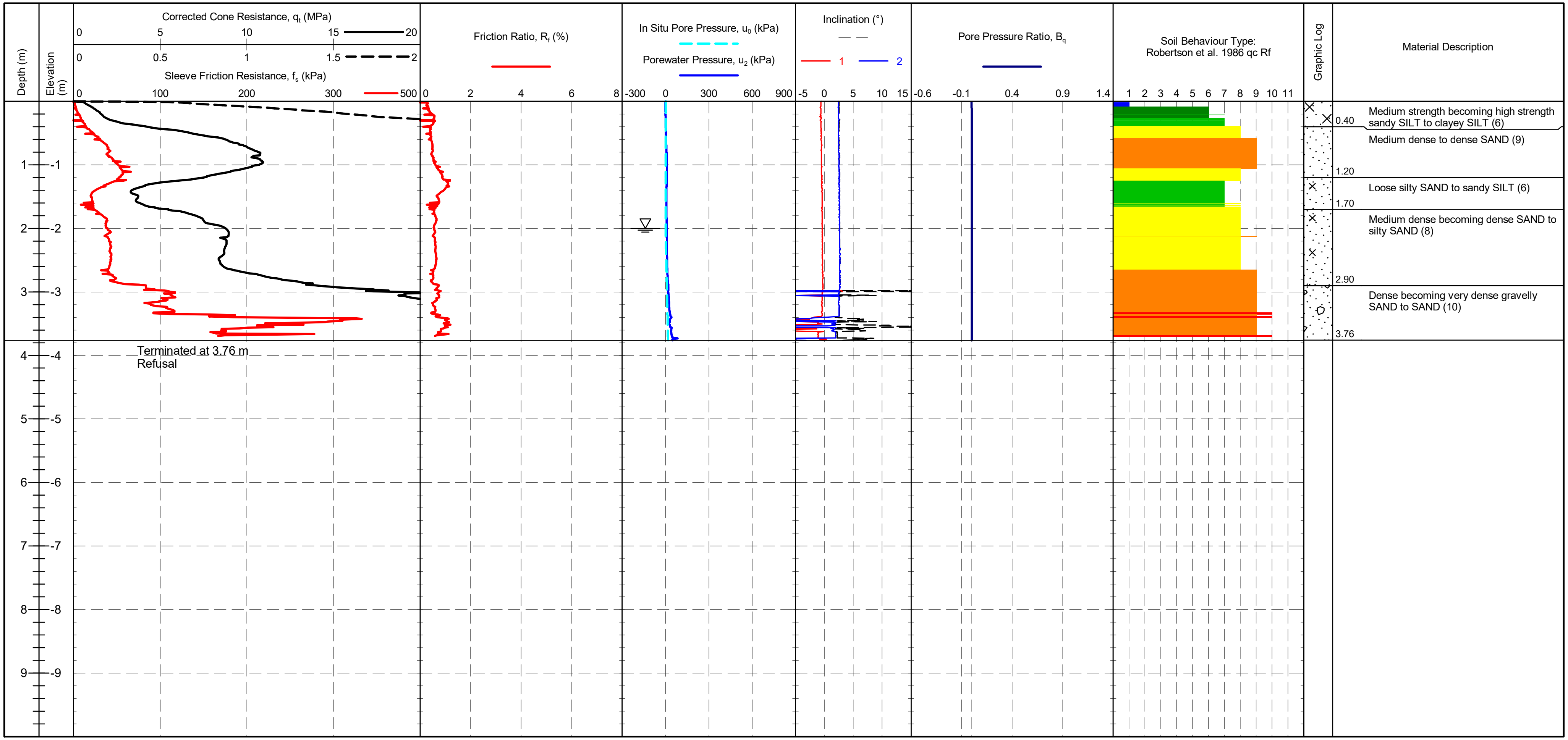
TITLE: Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 08	DRAWN	DATE 26/10/2020	
	CHECKED	DATE 26/10/2020	
	SCALE Not To Scale		A4
	PROJECT No 1200410	FIGURE No	

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
09

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	208 mV	199 mV	-0.098 MPa
Sleeve	206 mV	200 mV	-0.004 kPa
Pore Pressure 2	244 mV	225 mV	-0.005 kPa
X-Y Inclinometer	2404 mV	2394 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

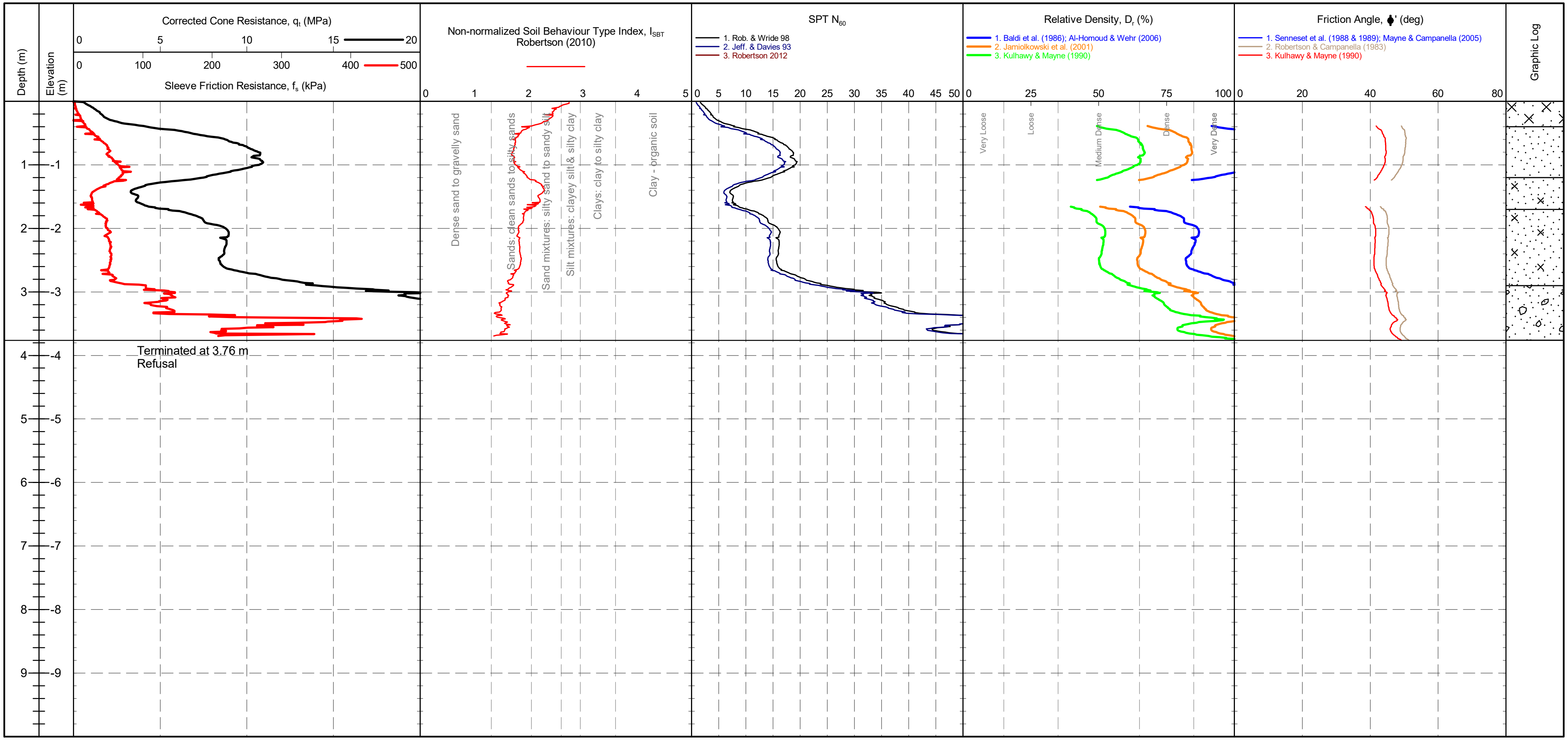
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
09

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2				
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2				
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen				
CONE AREA RATIO	: 0.79	OPERATOR	: RS				
FILTER POSITION	: u2	FRICTION REDUCER	: None				
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild				

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	208 mV	199 mV	-0.098 MPa
Sleeve	206 mV	200 mV	-0.004 kPa
Pore Pressure 2	244 mV	225 mV	-0.005 kPa
X-Y Inclinometer	2404 mV	2394 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

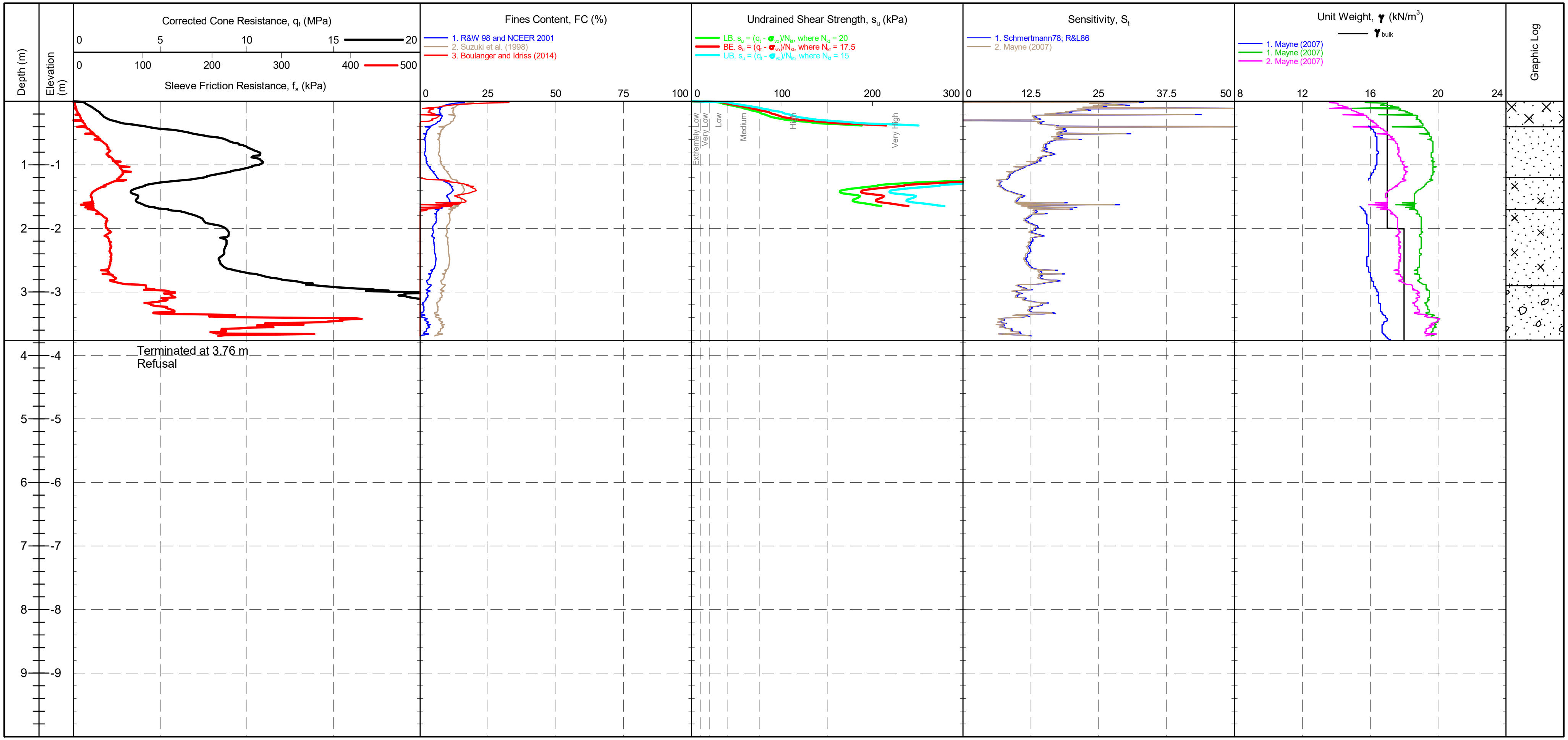
Dissipation Test

CPT LOG 03

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID **09**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858	TEST TYPE : TE2		
CONE MODEL : Subtraction	APPLICATION CLASS : 2		
CONE AREA : 15cm²	RIG : CPT 017 - Griffen		
CONE AREA RATIO : 0.79	OPERATOR : RS		
FILTER POSITION : u2	FRICTION REDUCER : None		
FILTER TYPE : HDPE	WEATHER : Raining & Mild		

CPTU ZERO VALUES

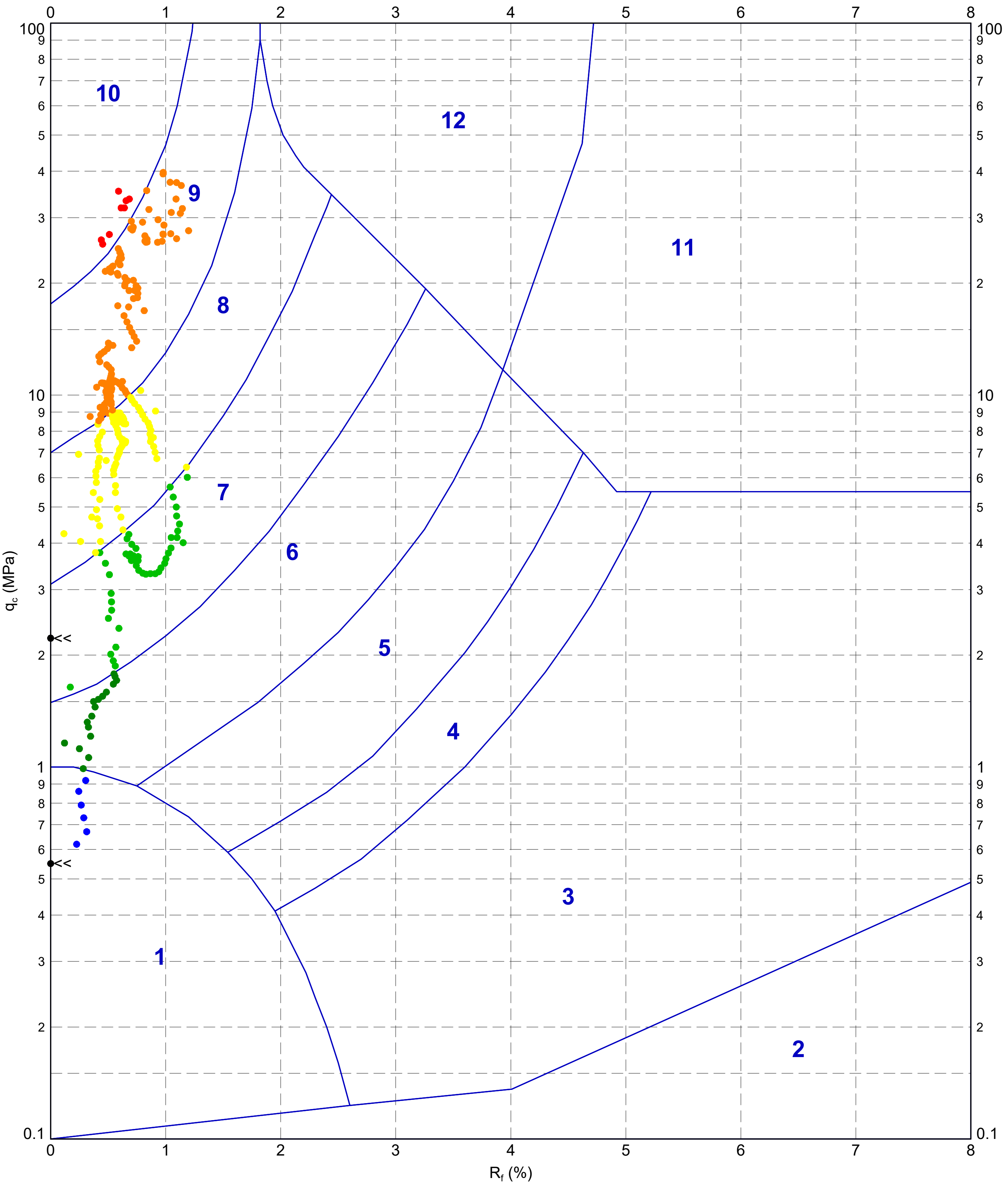
Transducer	Pre	Post	Difference
Tip	208 mV	199 mV	-0.098 MPa
Sleeve	206 mV	200 mV	-0.004 kPa
Pore Pressure 2	244 mV	225 mV	-0.005 kPa
X-Y Inclinometer	2404 mV	2394 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

200907-ADVANCED REPORT INSITUSI 2.02.1 LIB - ZOE.GLB Graph CPT ROBERTSON ET AL 86 QC VS. RF A4P 1200410 - LOSSIEMOUTH - SOILTECHNICS.GPJ <<DrawingFile>> 26/10/2020 14:05 10.01.00.11 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Prj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION

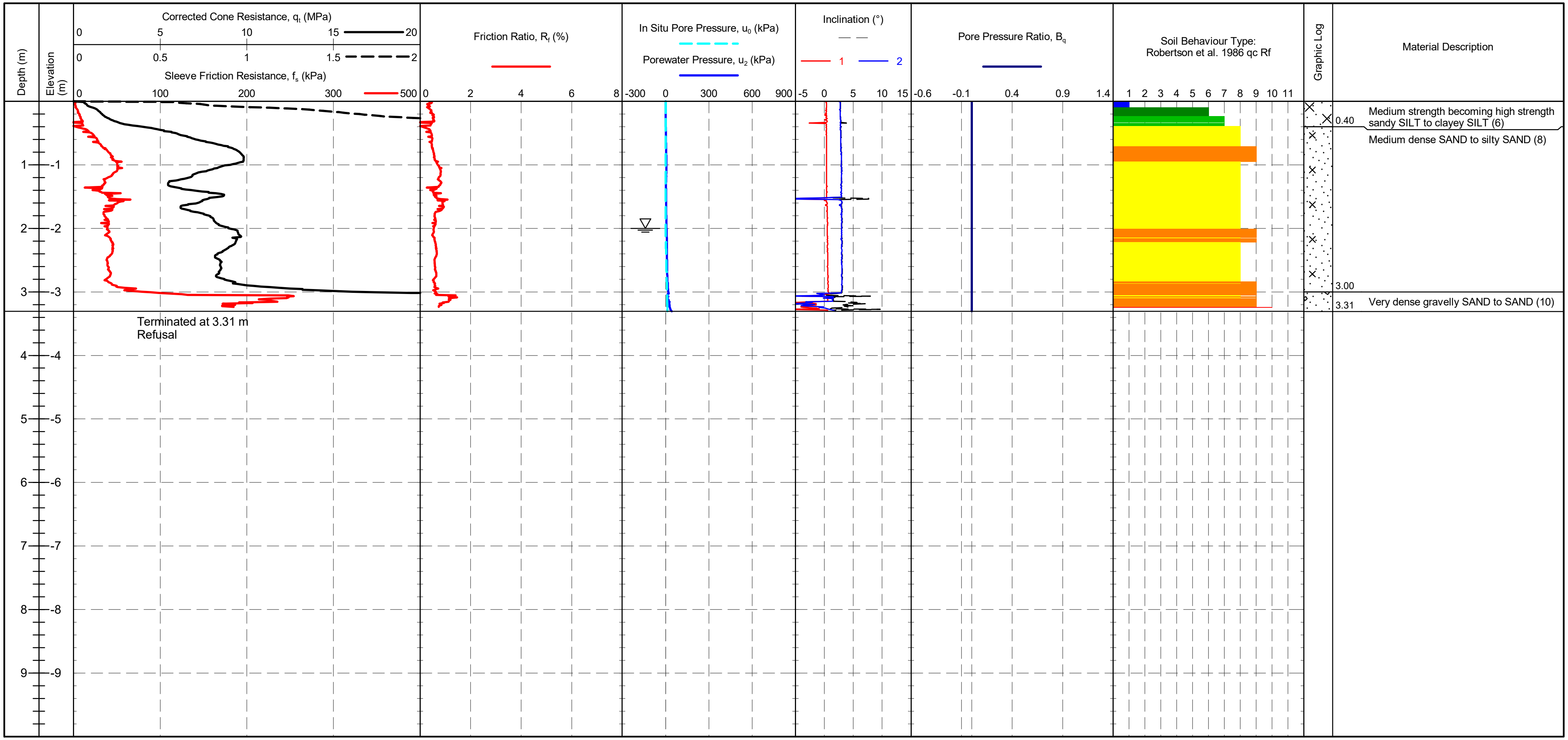
TITLE	DRAWN	DATE
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 09		26/10/2020
	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **10**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858 CALIBRATION DATE : 26/07/2020 CONE MODEL : Subtraction CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 017 - Griffen OPERATOR : RS FRICTION REDUCER : None WEATHER : Raining & Mild GROUNDWATER DEPTH : Assumed for calculation purposes.		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	202 mV	-0.043 MPa
Sleeve	203 mV	202 mV	-0.001 kPa
Pore Pressure 2	250 mV	244 mV	-0.001 kPa
X-Y Inclinometer	2483 mV	2473 mV	

METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

Groundwater Level

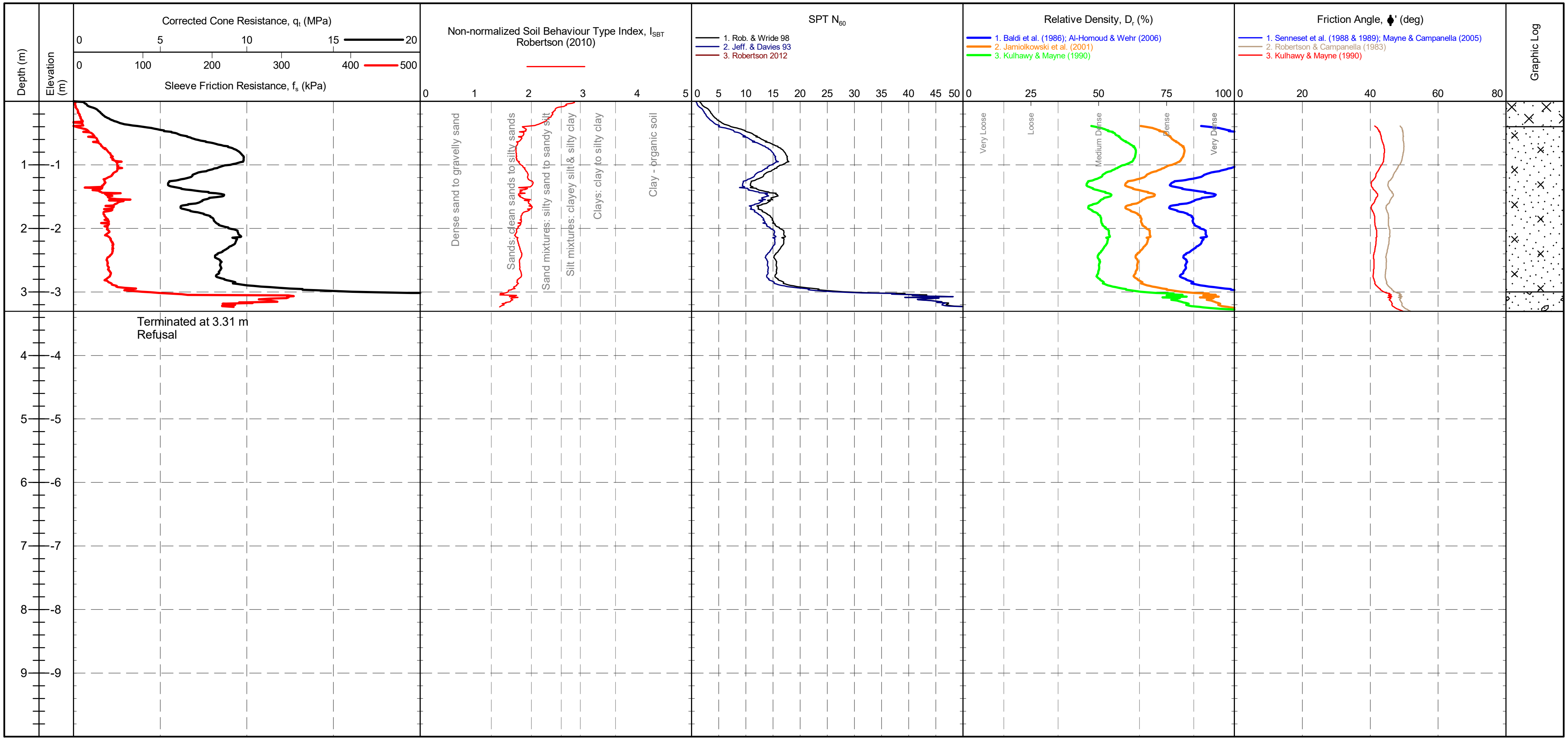
Dissipation Test

SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
10

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	202 mV	-0.043 MPa
Sleeve	203 mV	202 mV	-0.001 kPa
Pore Pressure 2	250 mV	244 mV	-0.001 kPa
X-Y Inclinometer	2483 mV	2473 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

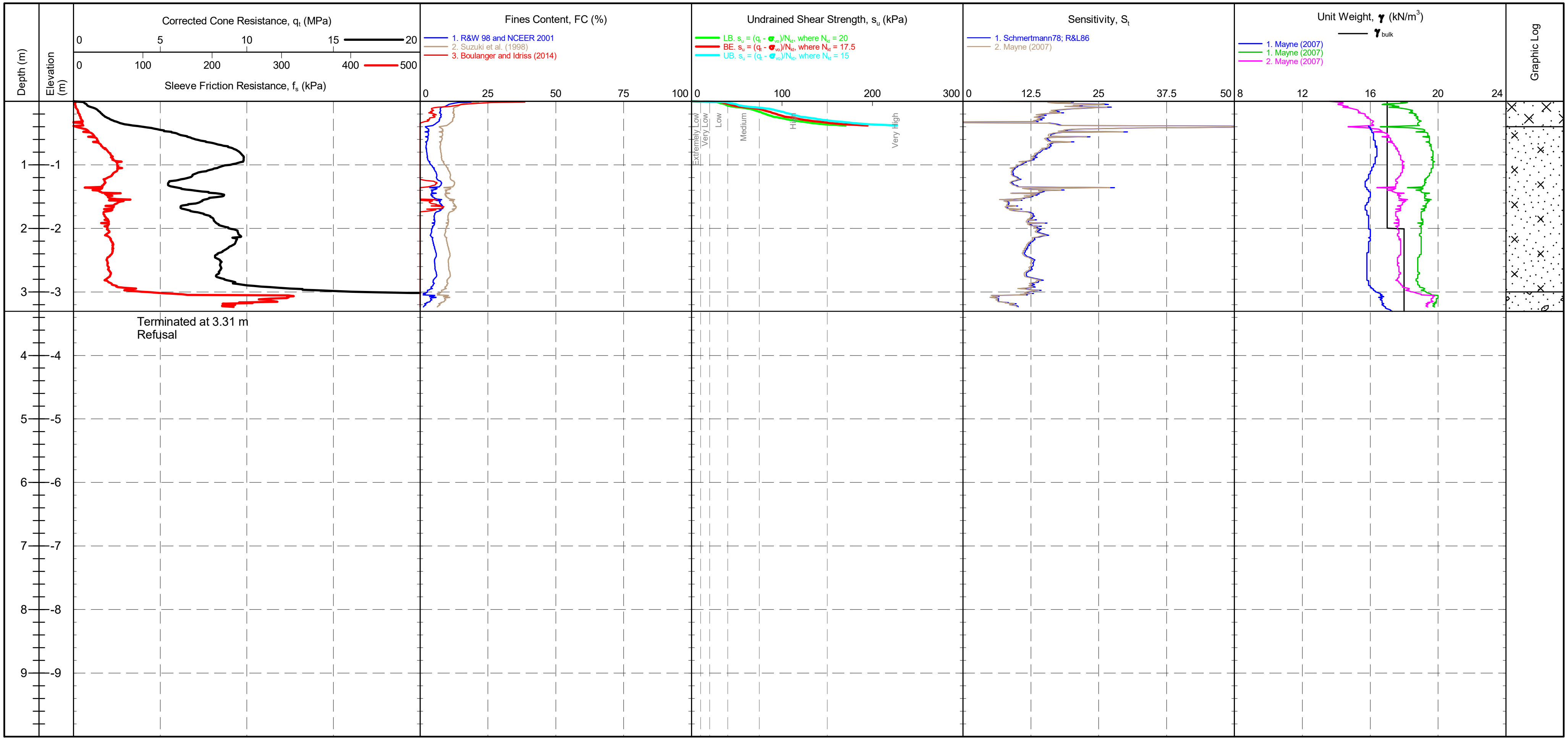
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID **10**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

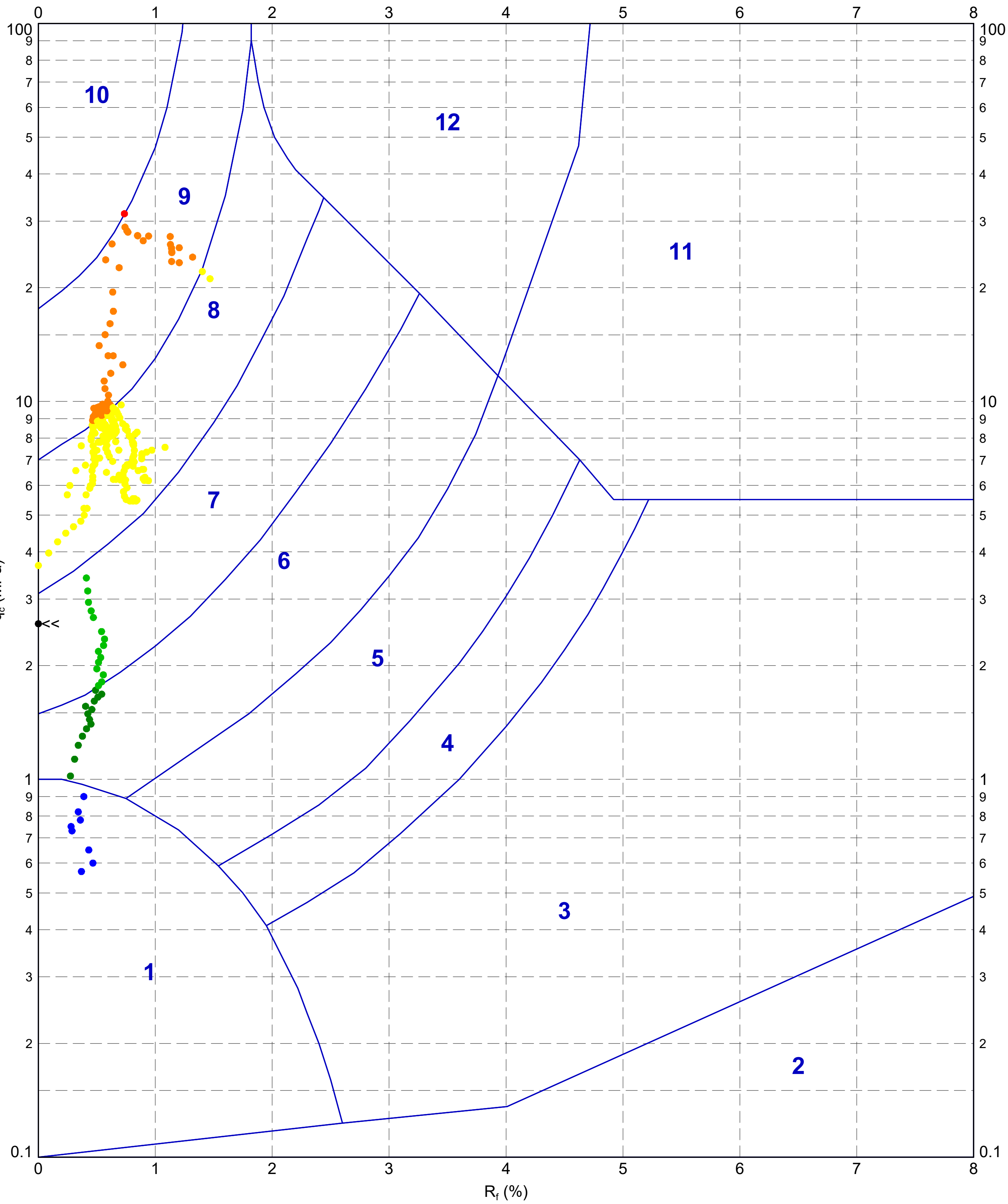
Transducer	Pre	Post	Difference
Tip	206 mV	202 mV	-0.043 MPa
Sleeve	203 mV	202 mV	-0.001 kPa
Pore Pressure 2	250 mV	244 mV	-0.001 kPa
X-Y Inclinometer	2483 mV	2473 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

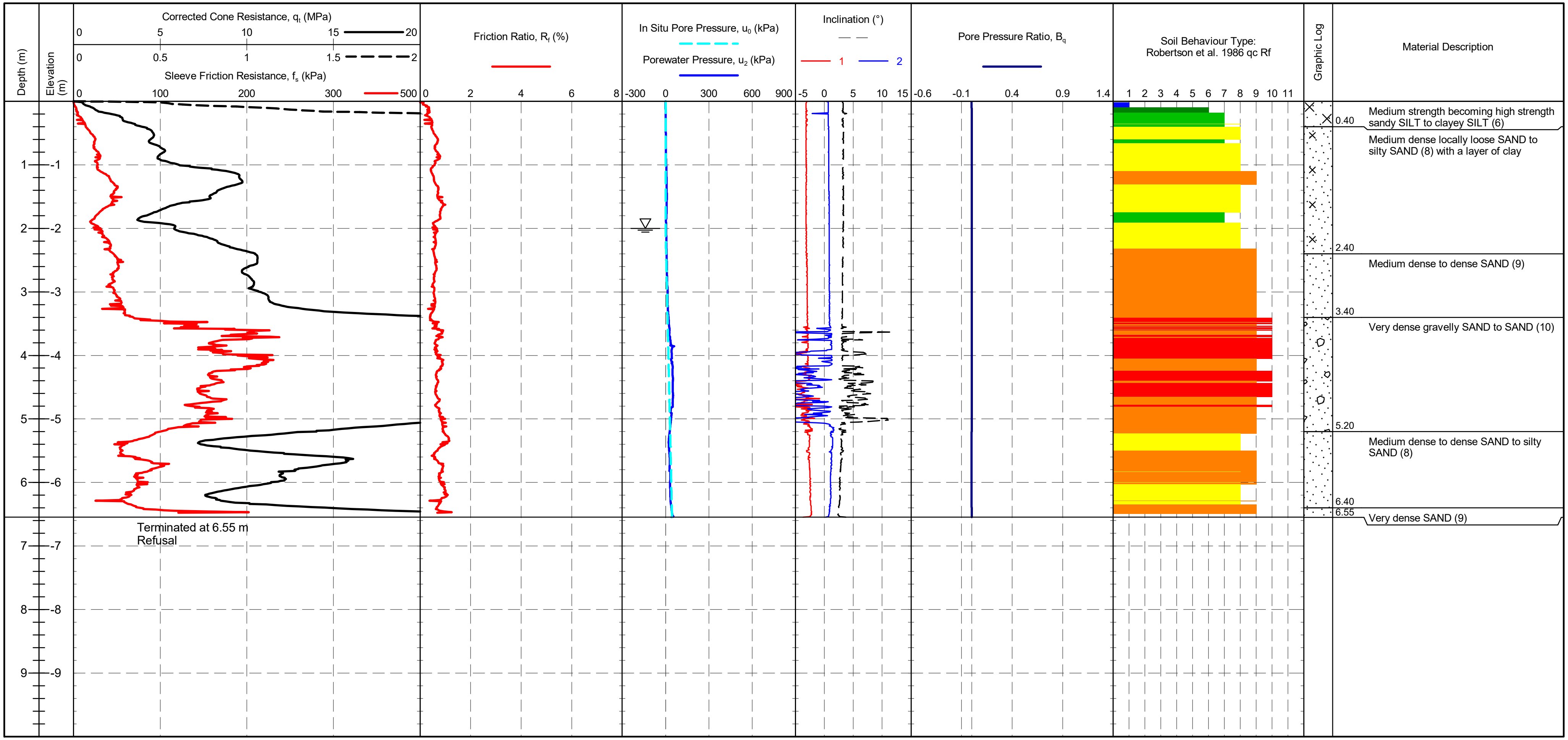
IN SITU SITE INVESTIGATION	TITLE	DRAWN	DATE 26/10/2020
	Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 10	CHECKED	DATE 26/10/2020
		SCALE Not To Scale	A4
		PROJECT No 1200410	FIGURE No

![IN SITU SITE INVESTIGATION] Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **11**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CALIBRATION DATE	: 26/07/2020
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild
GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	200 mV	-0.065 MPa
Sleeve	204 mV	198 mV	-0.004 kPa
Pore Pressure 2	247 mV	253 mV	0.001 kPa
X-Y Inclinometer	2163 mV	2165 mV	

METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

Groundwater Level

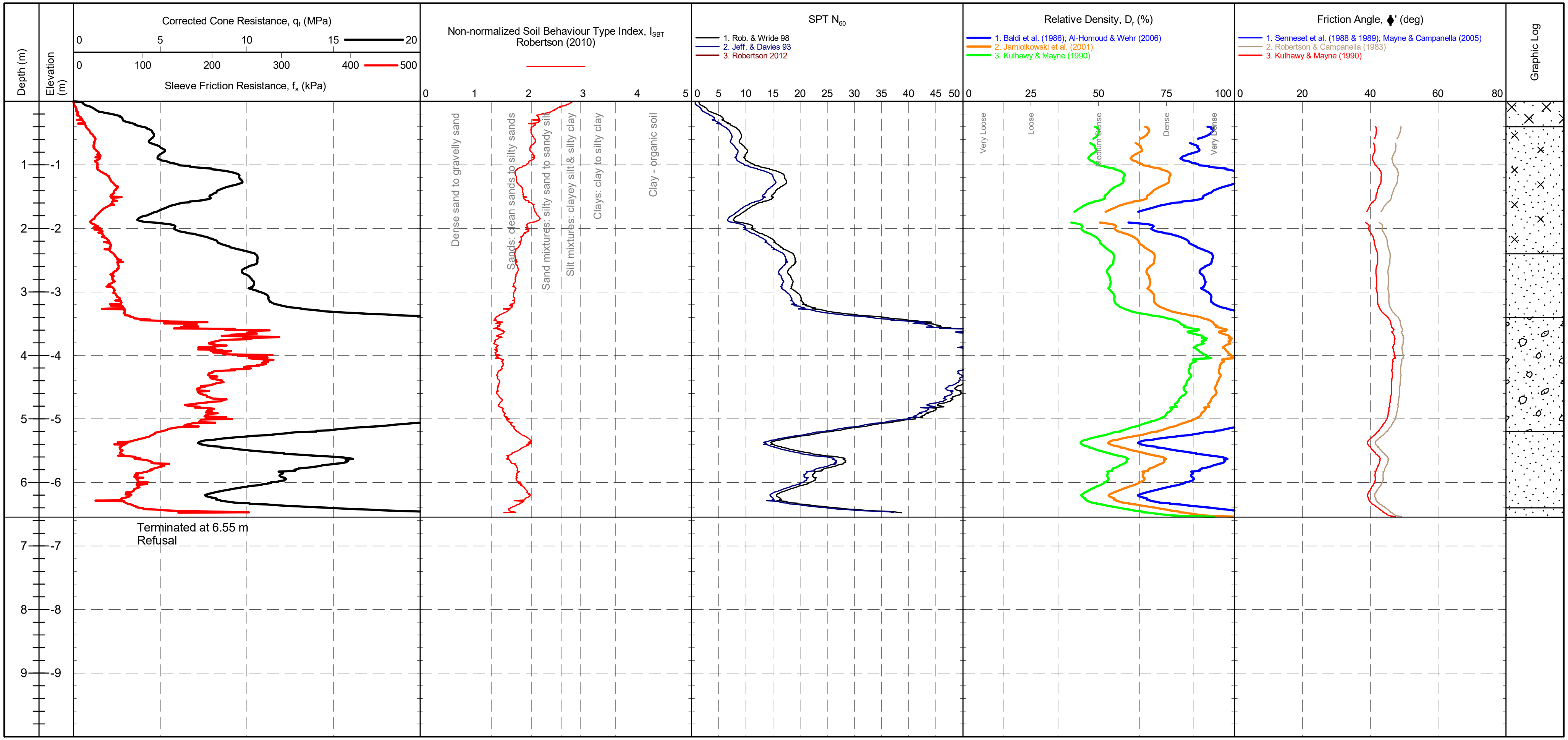
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
11

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	200 mV	-0.065 MPa
Sleeve	204 mV	198 mV	-0.004 kPa
Pore Pressure 2	247 mV	253 mV	0.001 kPa
X-Y Inclinometer	2163 mV	2165 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

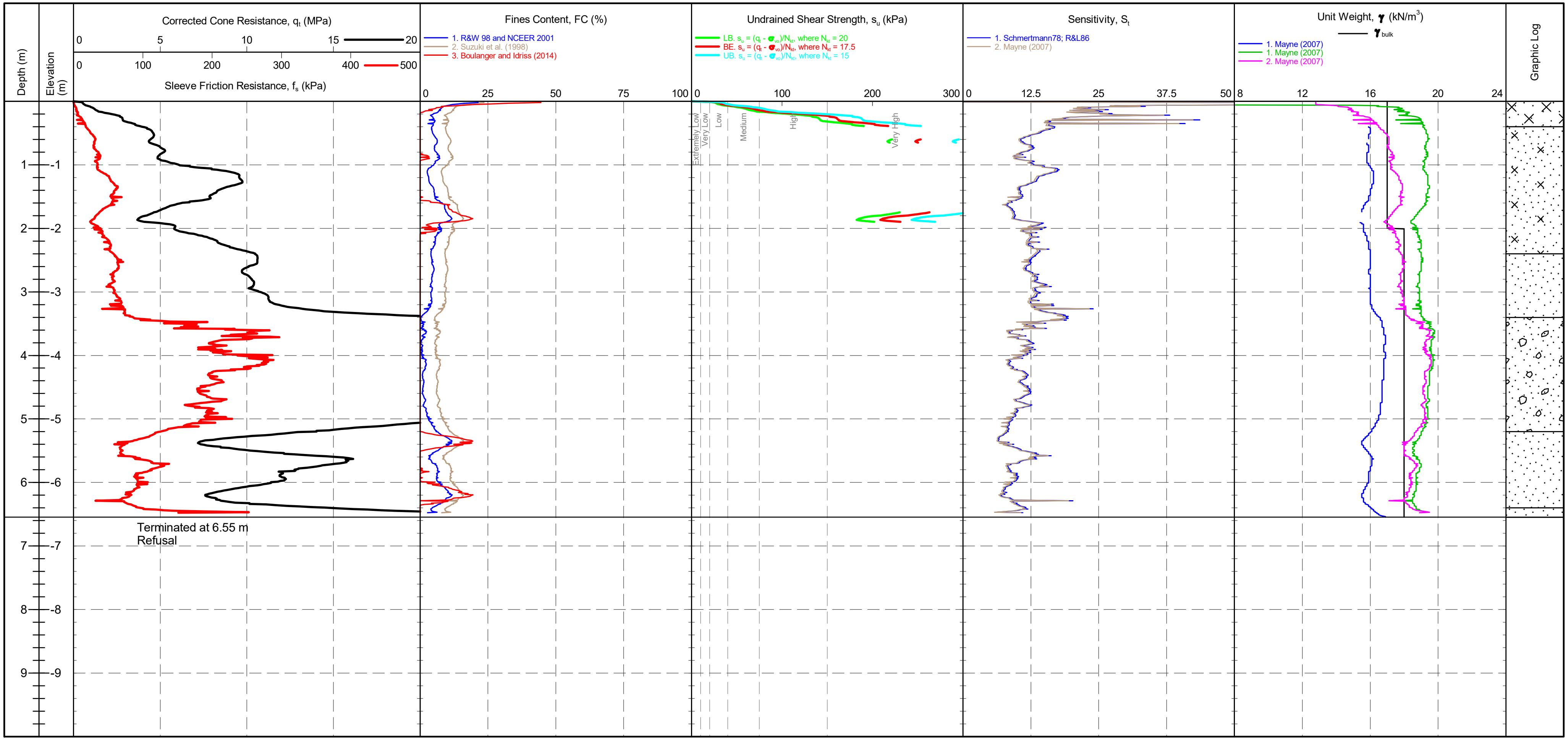
CPT LOG 03

PointID **11**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 19/10/2020
PLOT DATE : 26/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

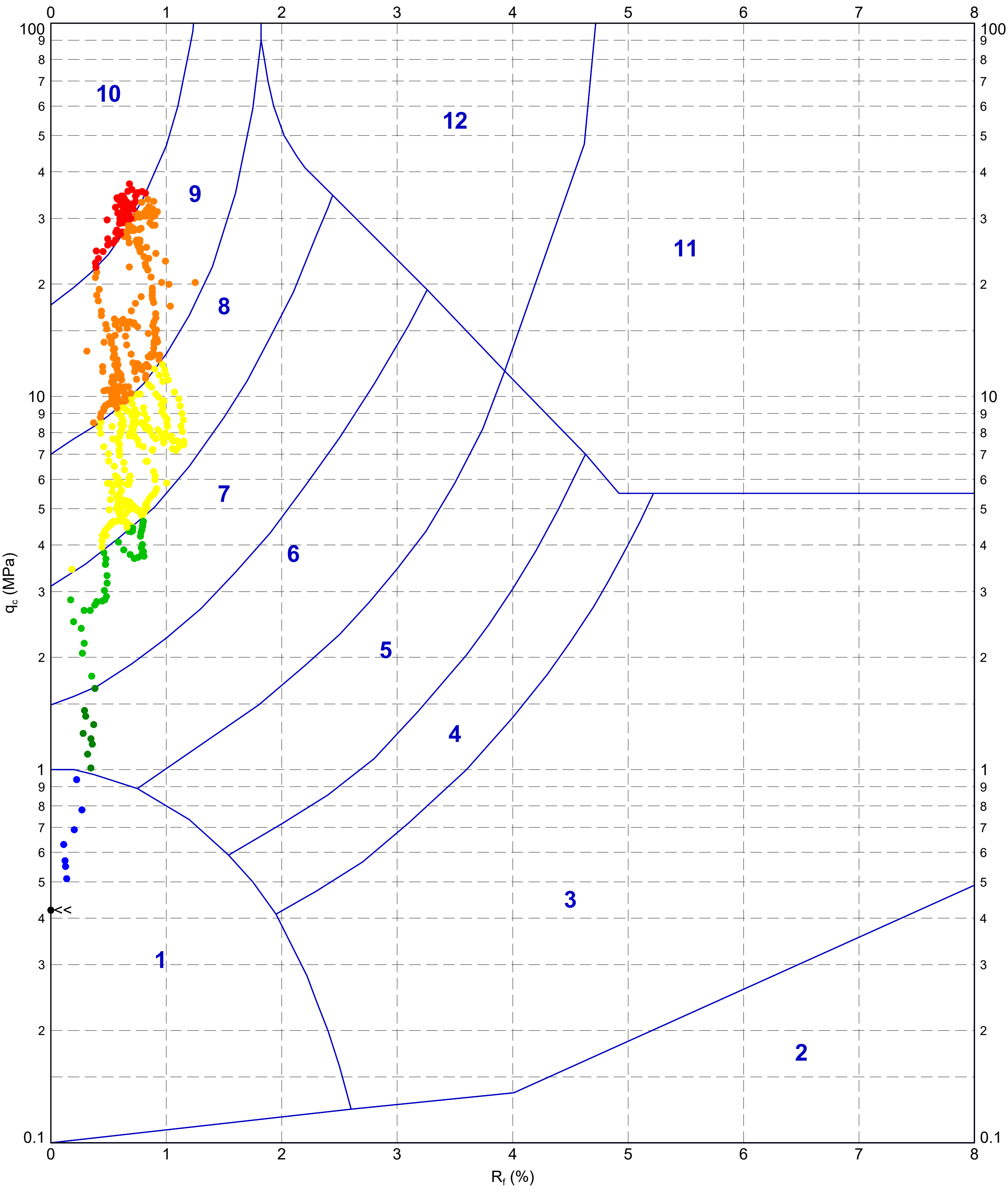
Transducer	Pre	Post	Difference
Tip	206 mV	200 mV	-0.065 MPa
Sleeve	204 mV	198 mV	-0.004 kPa
Pore Pressure 2	247 mV	253 mV	0.001 kPa
X-Y Inclinometer	2163 mV	2165 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE		DRAWN	DATE 26/10/2020
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 11		CHECKED	DATE 26/10/2020
		SCALE Not To Scale	A4
		PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

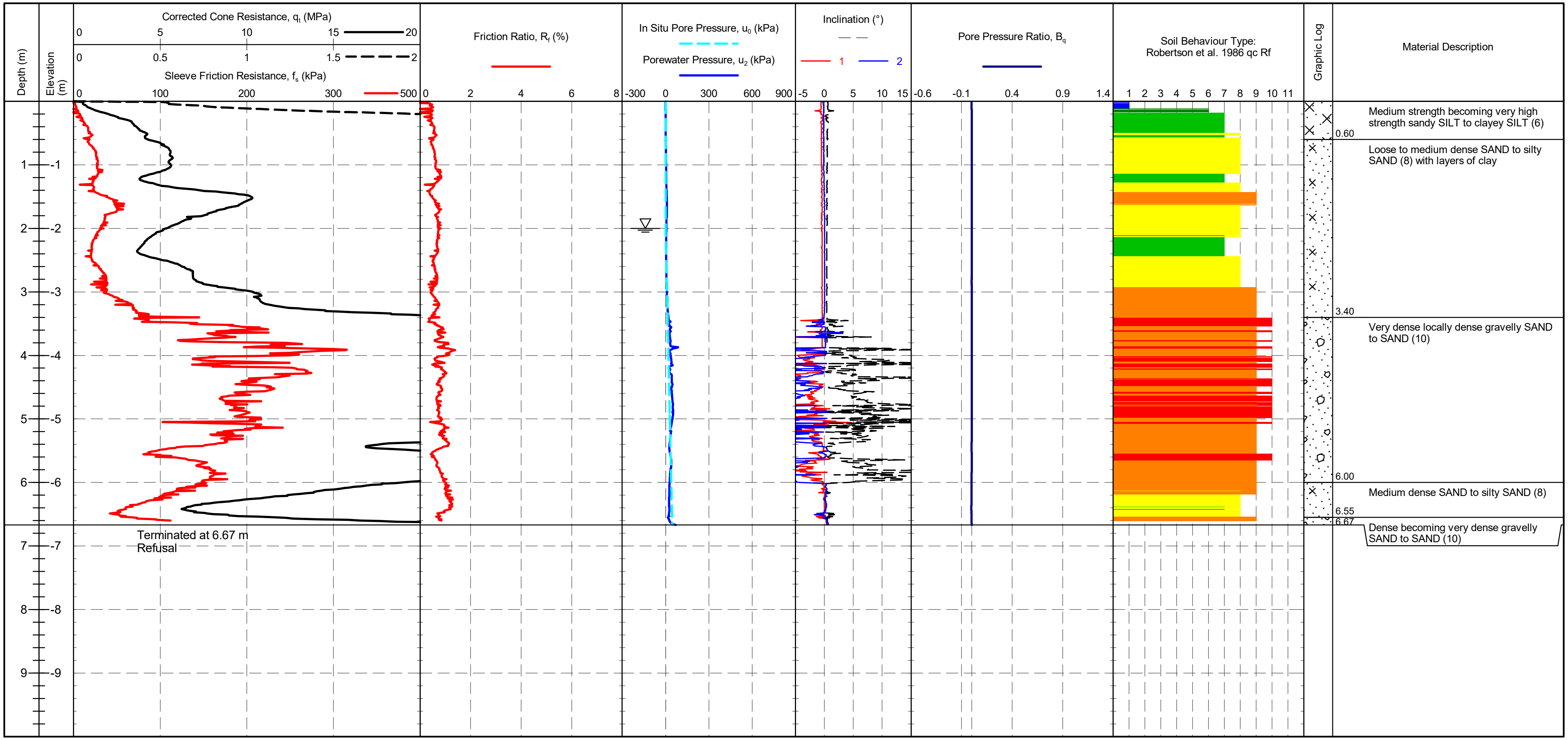
PointID **12**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 19/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CALIBRATION DATE	: 26/07/2020
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild
GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	199 mV	-0.054 MPa
Sleeve	200 mV	198 mV	-0.001 kPa
Pore Pressure 2	257 mV	236 mV	-0.005 kPa
X-Y Inclinometer	2455 mV	2413 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

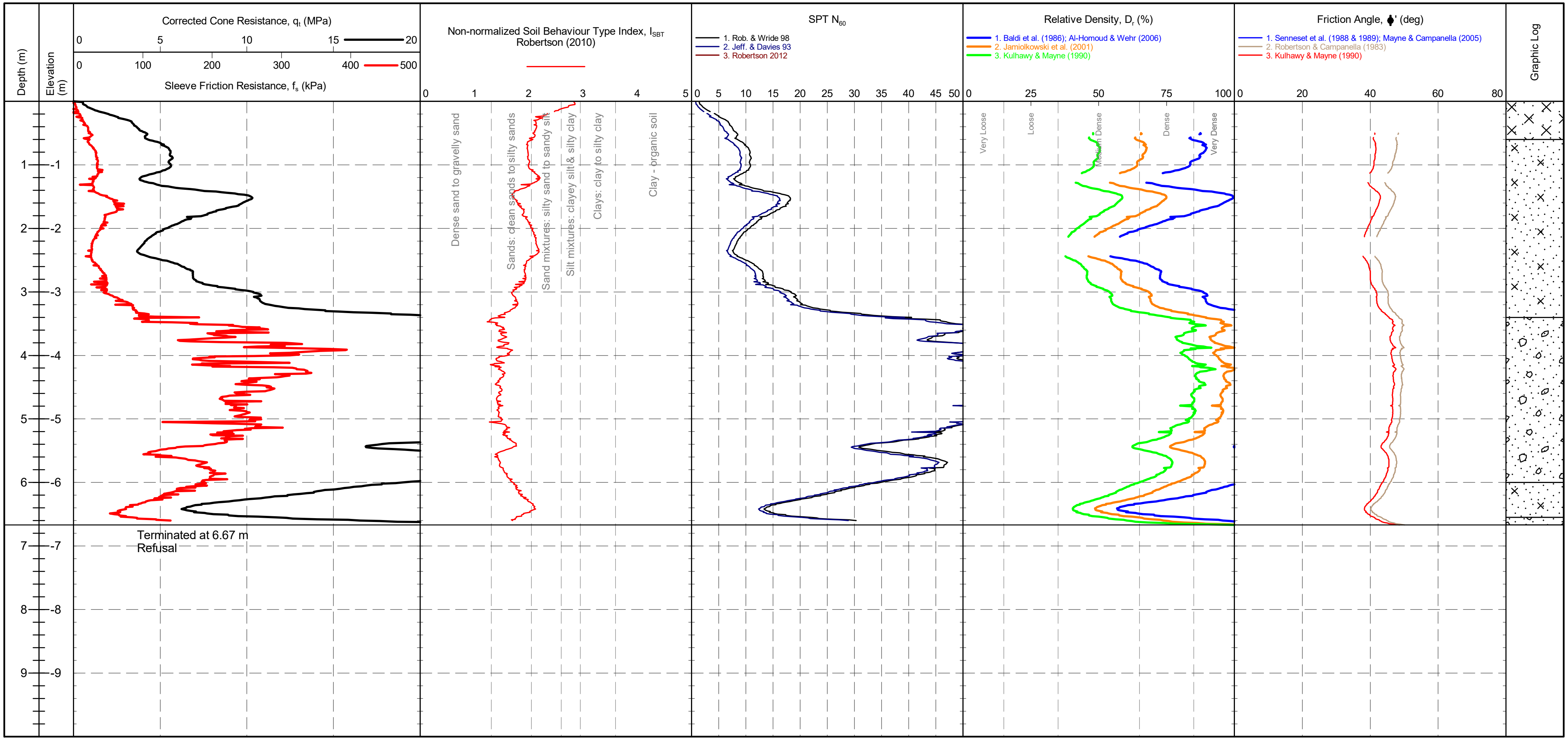
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID	12

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	199 mV	-0.054 MPa
Sleeve	200 mV	198 mV	-0.001 kPa
Pore Pressure 2	257 mV	236 mV	-0.005 kPa
X-Y Inclinometer	2455 mV	2413 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

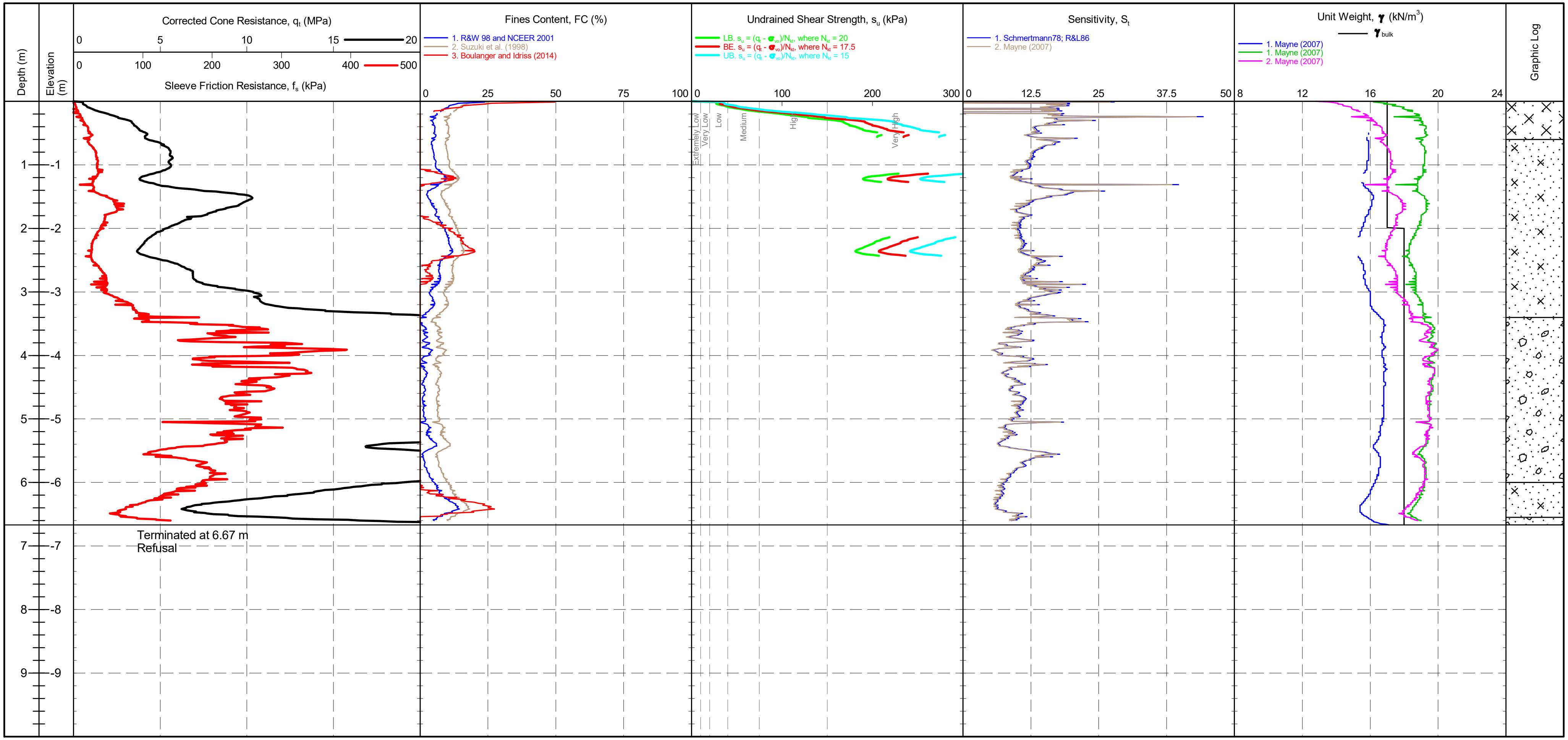
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
12

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

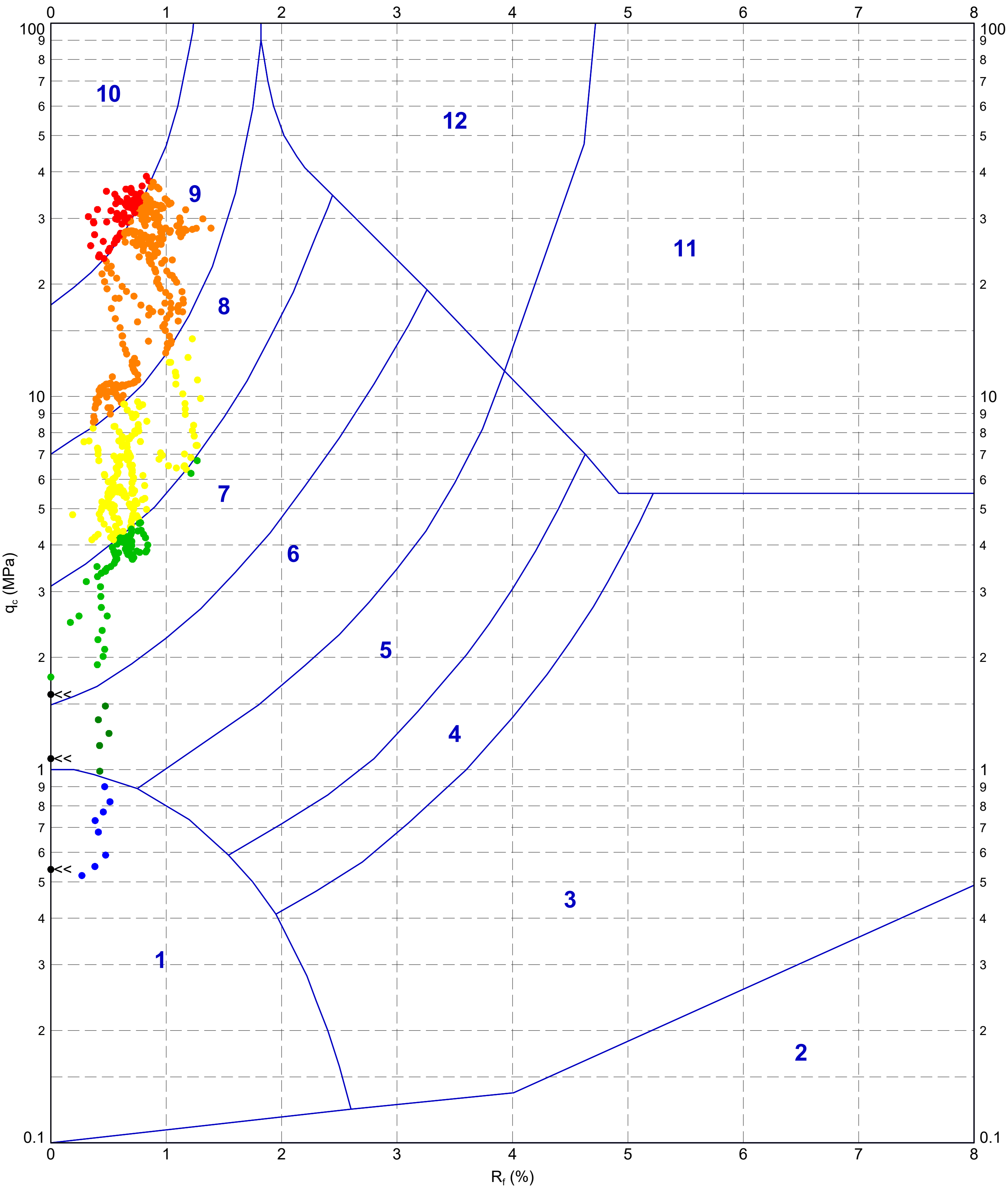
Transducer	Pre	Post	Difference
Tip	204 mV	199 mV	-0.054 MPa
Sleeve	200 mV	198 mV	-0.001 kPa
Pore Pressure 2	257 mV	236 mV	-0.005 kPa
X-Y Inclinometer	2455 mV	2413 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

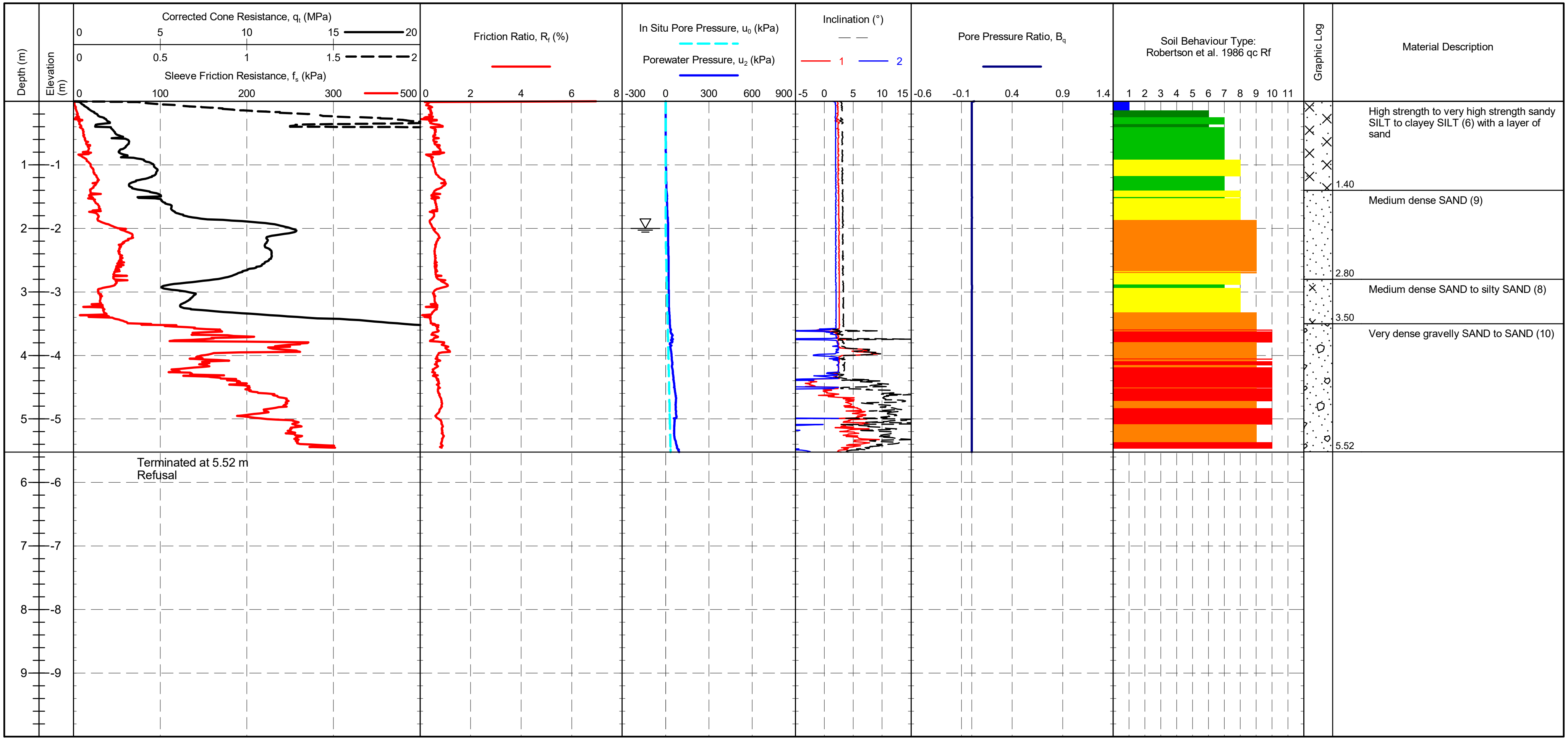
TITLE Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 12	DRAWN	DATE 26/10/2020	
	CHECKED	DATE 26/10/2020	
	SCALE Not To Scale		A4
	PROJECT No 1200410	FIGURE No	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **13**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CALIBRATION DATE	: 26/07/2020
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild
GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	193 mV	-0.141 MPa
Sleeve	203 mV	196 mV	-0.005 kPa
Pore Pressure 2	245 mV	208 mV	-0.009 kPa
X-Y Inclinometer	2675 mV	2681 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

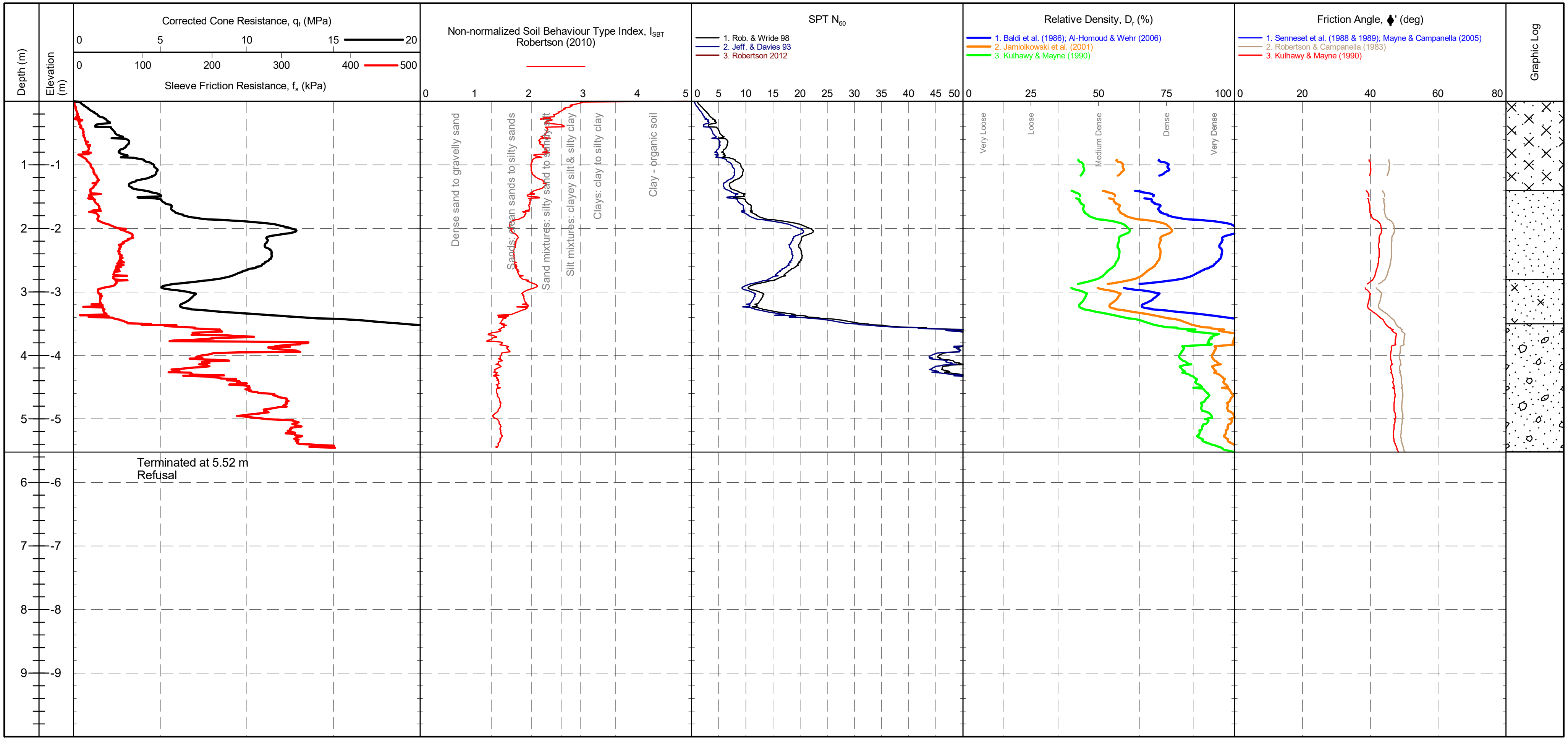
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
13

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	193 mV	-0.141 MPa
Sleeve	203 mV	196 mV	-0.005 kPa
Pore Pressure 2	245 mV	208 mV	-0.009 kPa
X-Y Inclinometer	2675 mV	2681 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

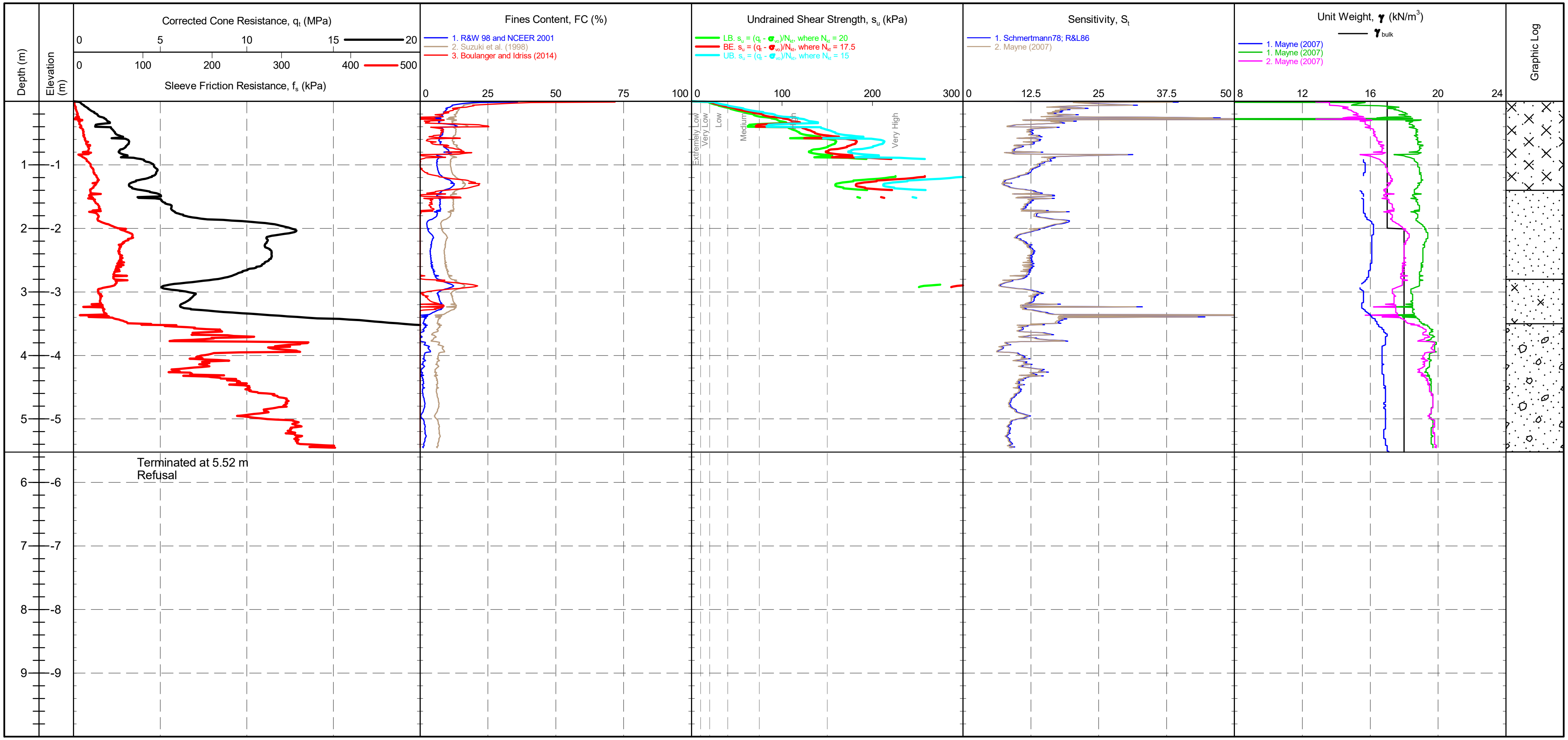
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
13

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	15cm^2
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

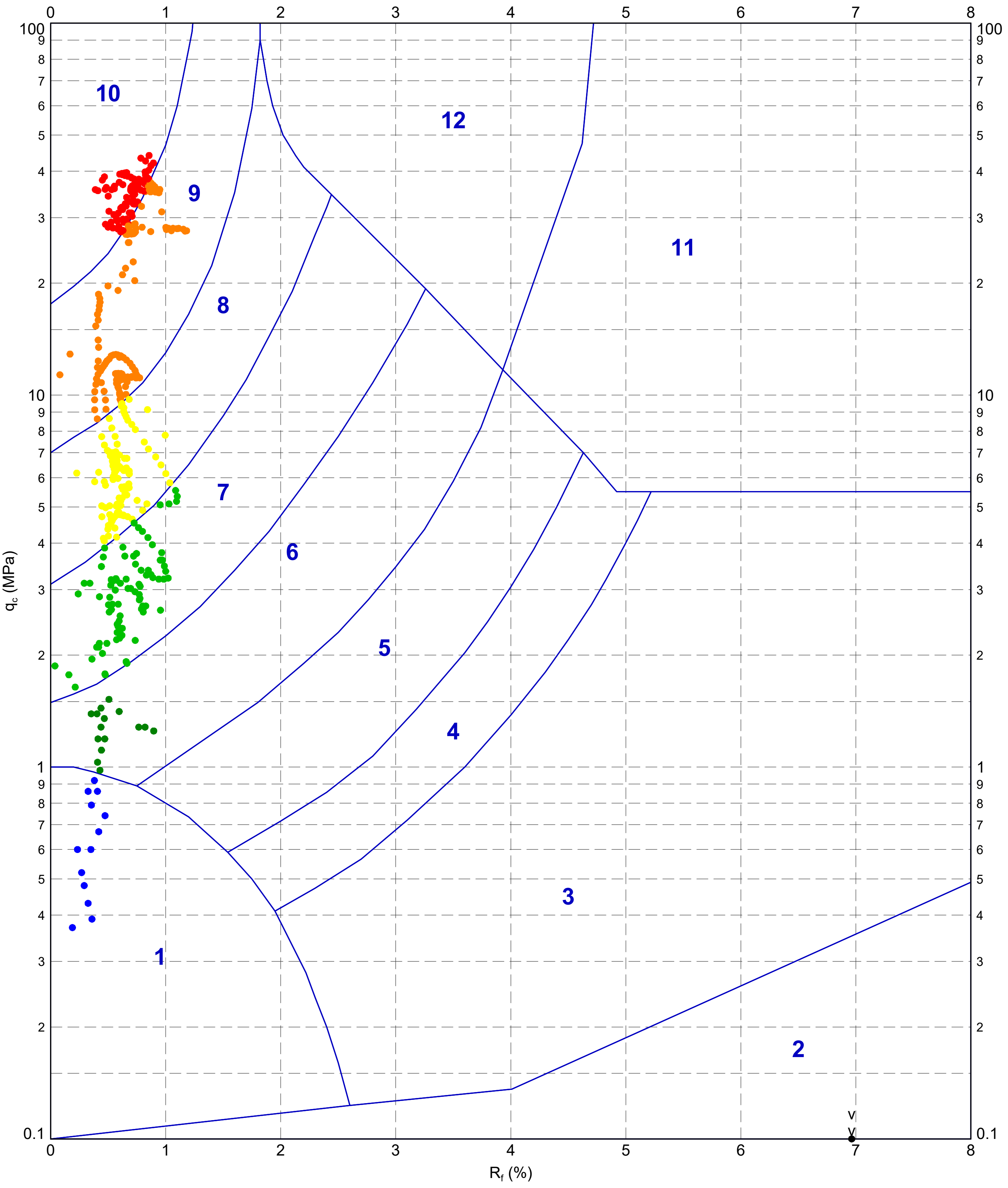
Transducer	Pre	Post	Difference
Tip	206 mV	193 mV	-0.141 MPa
Sleeve	203 mV	196 mV	-0.005 kPa
Pore Pressure 2	245 mV	208 mV	-0.009 kPa
X-Y Inclinometer	2675 mV	2681 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

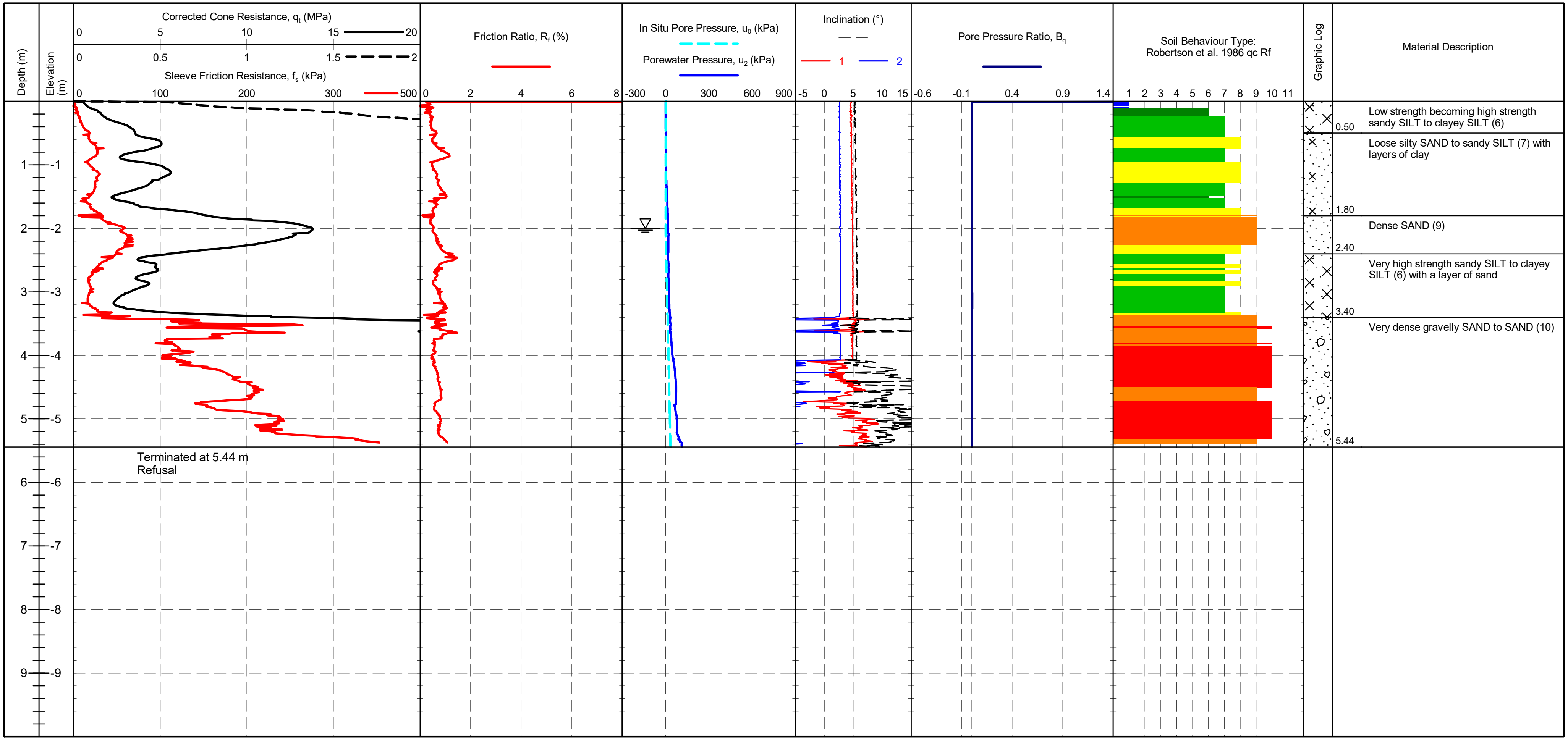
TITLE	DRAWN	DATE
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 13		26/10/2020
	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION   Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **14**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CALIBRATION DATE	:	26/07/2020
CONE MODEL	:	Subtraction
CONE AREA	:	15cm²
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild
GROUNDWATER DEPTH	:	Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	202 mV	193 mV	-0.098 MPa
Sleeve	201 mV	196 mV	-0.004 kPa
Pore Pressure 2	226 mV	214 mV	-0.003 kPa
X-Y Inclinometer	2889 mV	2908 mV	

METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

Groundwater Level

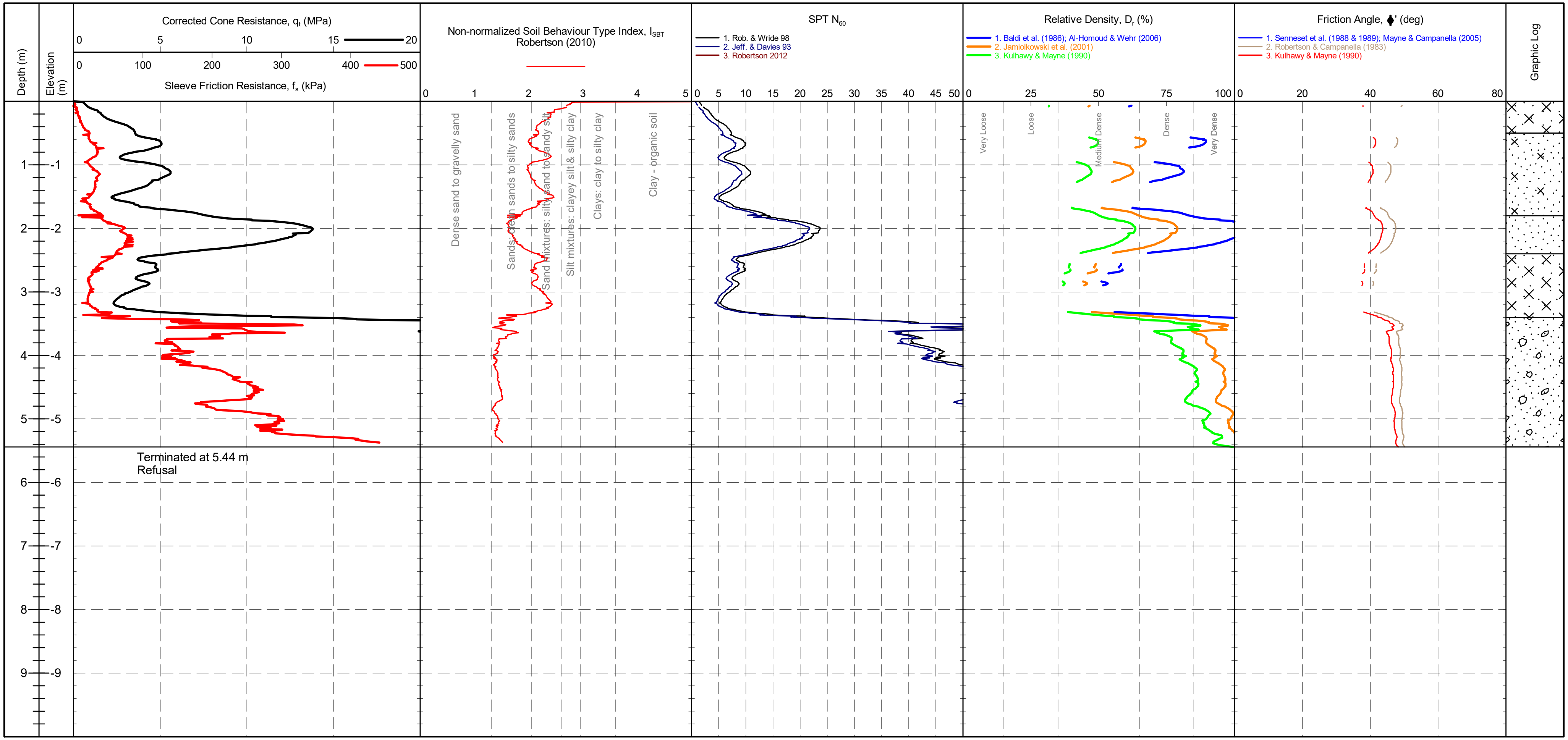
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
14

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858 CONE MODEL : Subtraction CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 017 - Griffen OPERATOR : RS FRICTION REDUCER : None WEATHER : Raining & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	202 mV	193 mV	-0.098 MPa
Sleeve	201 mV	196 mV	-0.004 kPa
Pore Pressure 2	226 mV	214 mV	-0.003 kPa
X-Y Inclinometer	2889 mV	2908 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

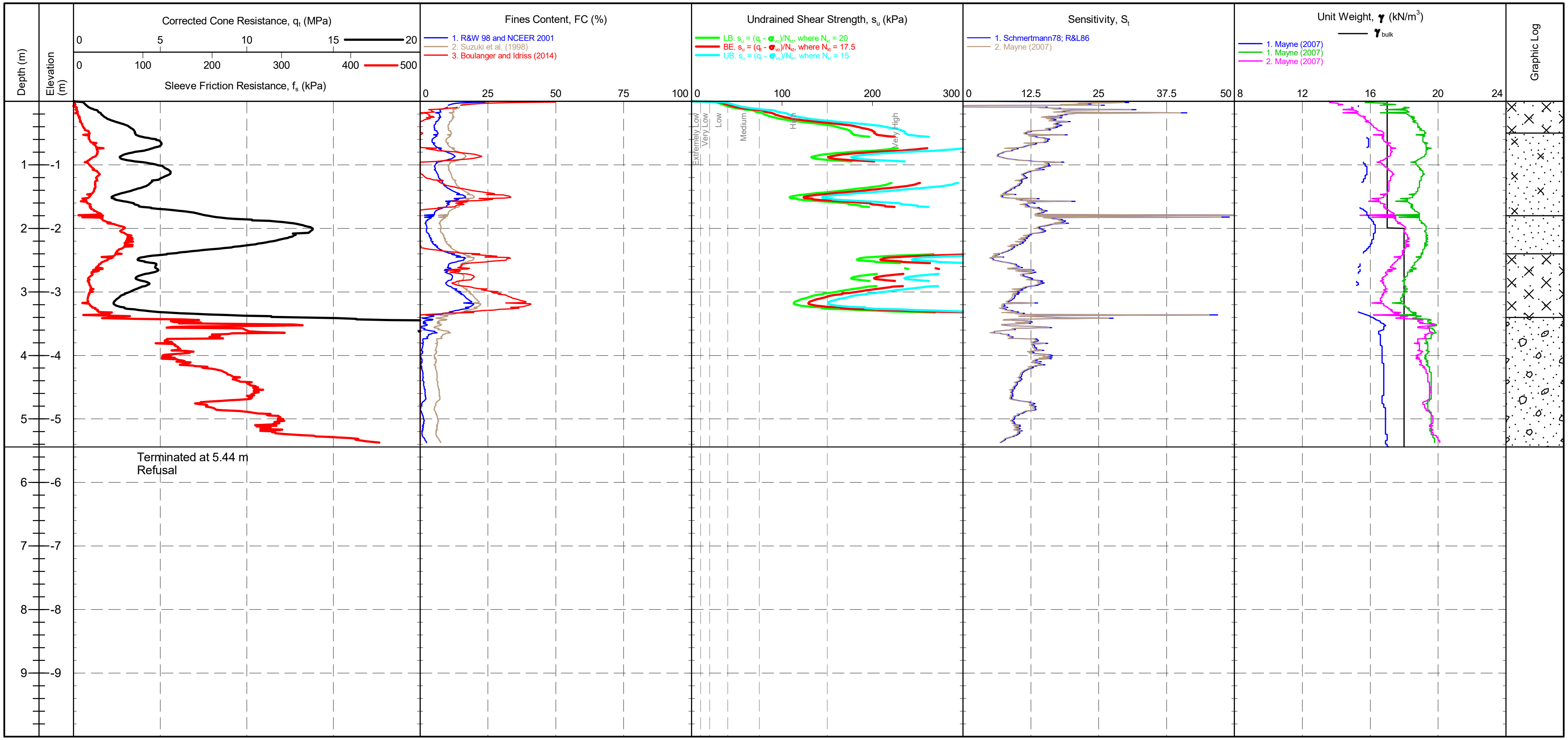
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
14

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2						
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2						
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen						
CONE AREA RATIO	: 0.79	OPERATOR	: RS						
FILTER POSITION	: u2	FRICTION REDUCER	: None						
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild						

CPTU ZERO VALUES

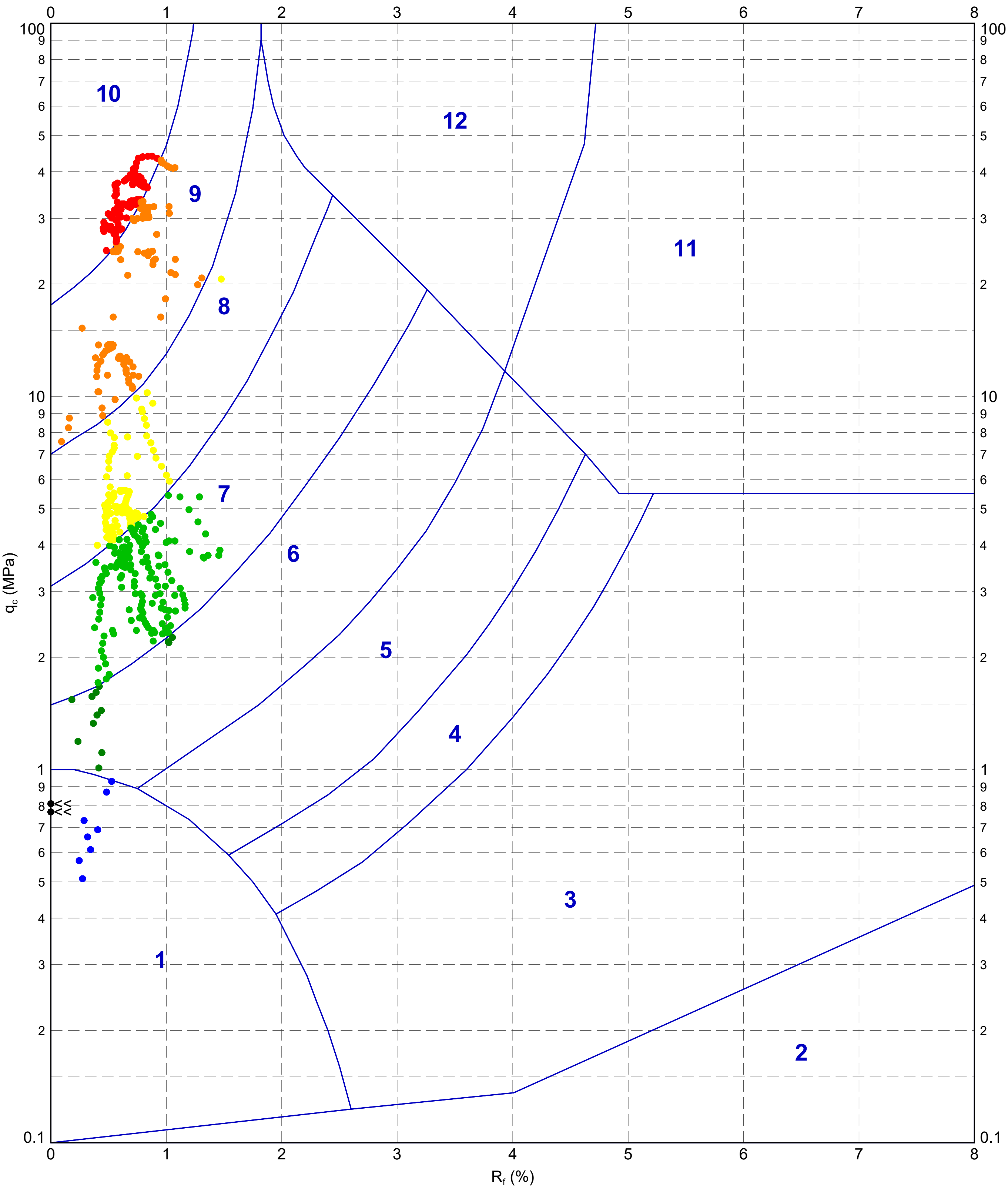
Transducer	Pre	Post	Difference
Tip	202 mV	193 mV	-0.098 MPa
Sleeve	201 mV	196 mV	-0.004 kPa
Pore Pressure 2	226 mV	214 mV	-0.003 kPa
X-Y Inclinometer	2889 mV	2908 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

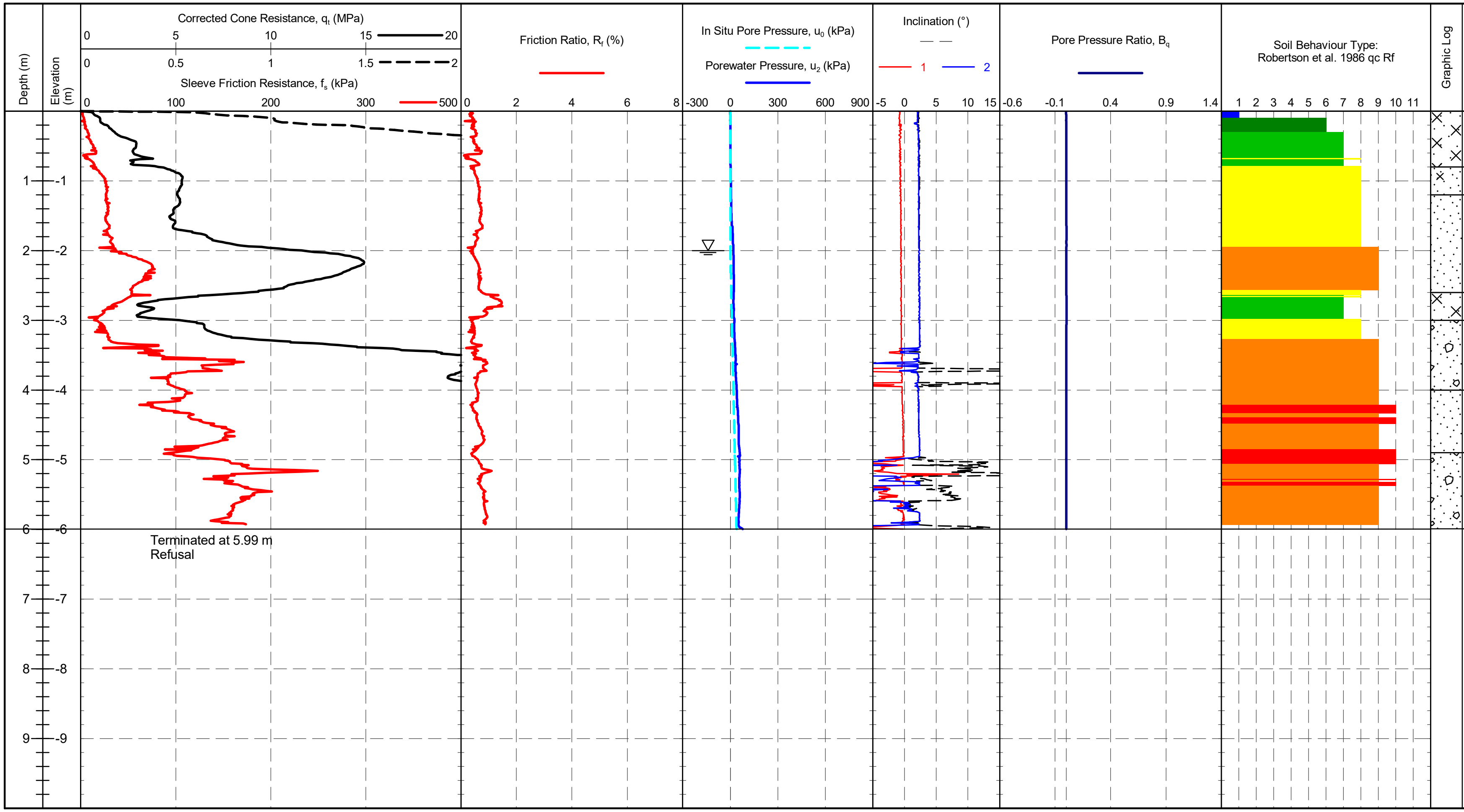
TITLE Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 14	DRAWN	DATE 26/10/2020	
	CHECKED	DATE 26/10/2020	
	SCALE Not To Scale		A4
	PROJECT No 1200410	FIGURE No	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID: **15**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



Material Description

Depth (m)	Description
0.80	Low strength becoming high strength sandy SILT to clayey SILT (6)
1.20	Loose locally medium dense SAND to silty SAND (8)
2.60	Dense SAND (9)
3.00	Very high strength sandy SILT to clayey SILT (6)
4.00	Medium dense becoming very dense gravelly SAND to SAND (10)
4.90	Very dense SAND (9)
5.99	Very dense gravelly SAND to SAND (10)

CONE ID	S15-CFIP.1858
CALIBRATION DATE	26/07/2020
CONE MODEL	Subtraction
CONE AREA	15cm^2
CONE AREA RATIO	0.79
FILTER POSITION	u2
FILTER TYPE	HDPE

TEST TYPE	TE2
APPLICATION CLASS	2
RIG	CPT 017 - Griffen
OPERATOR	RS
FRICTION REDUCER	None
WEATHER	Raining & Mild
GROUNDWATER DEPTH	Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	202 mV	196 mV	-0.065 MPa
Sleeve	201 mV	196 mV	-0.004 kPa
Pore Pressure 2	232 mV	240 mV	0.002 kPa
X-Y Inclinometer	2373 mV	2378 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

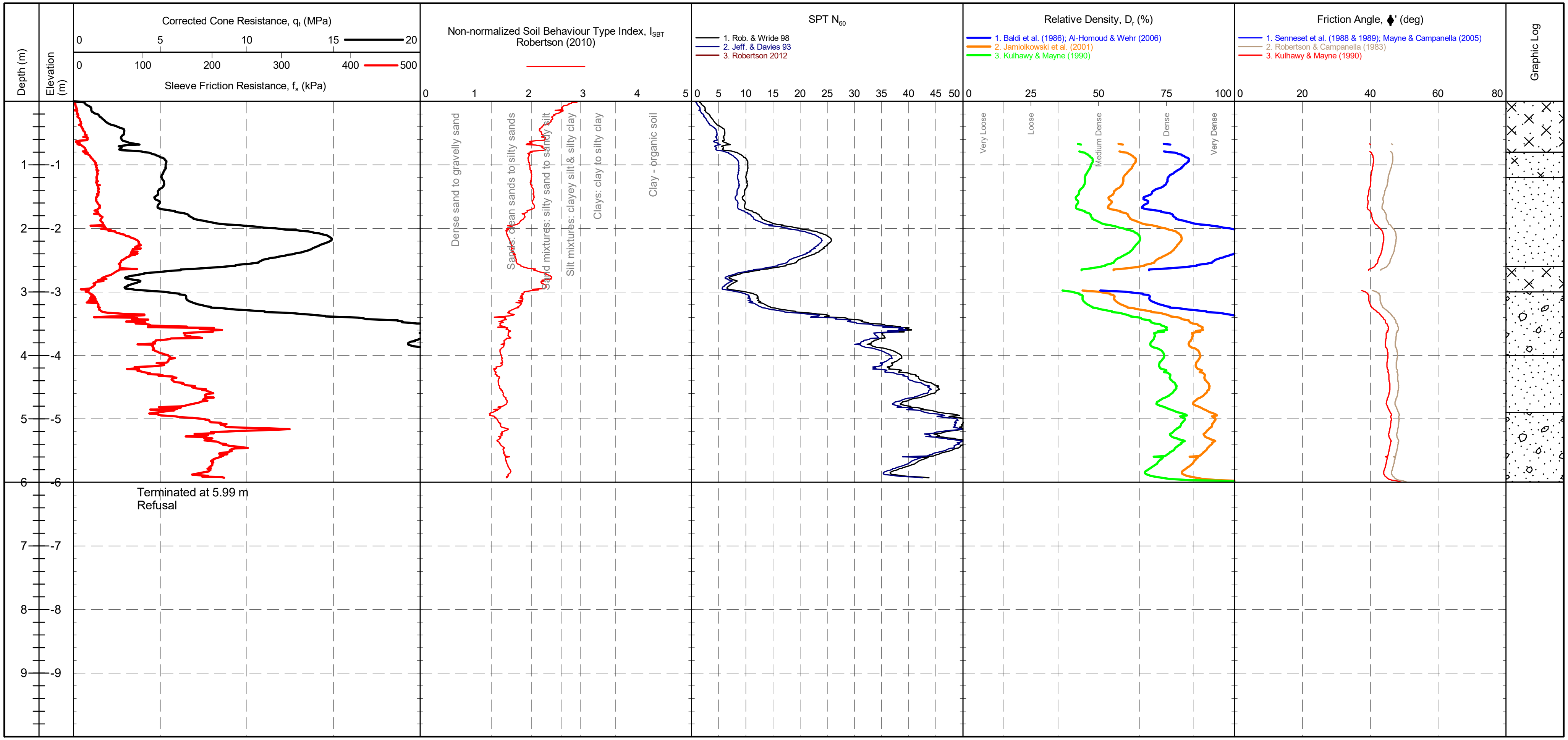
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
15

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	202 mV	196 mV	-0.065 MPa
Sleeve	201 mV	196 mV	-0.004 kPa
Pore Pressure 2	232 mV	240 mV	0.002 kPa
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GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

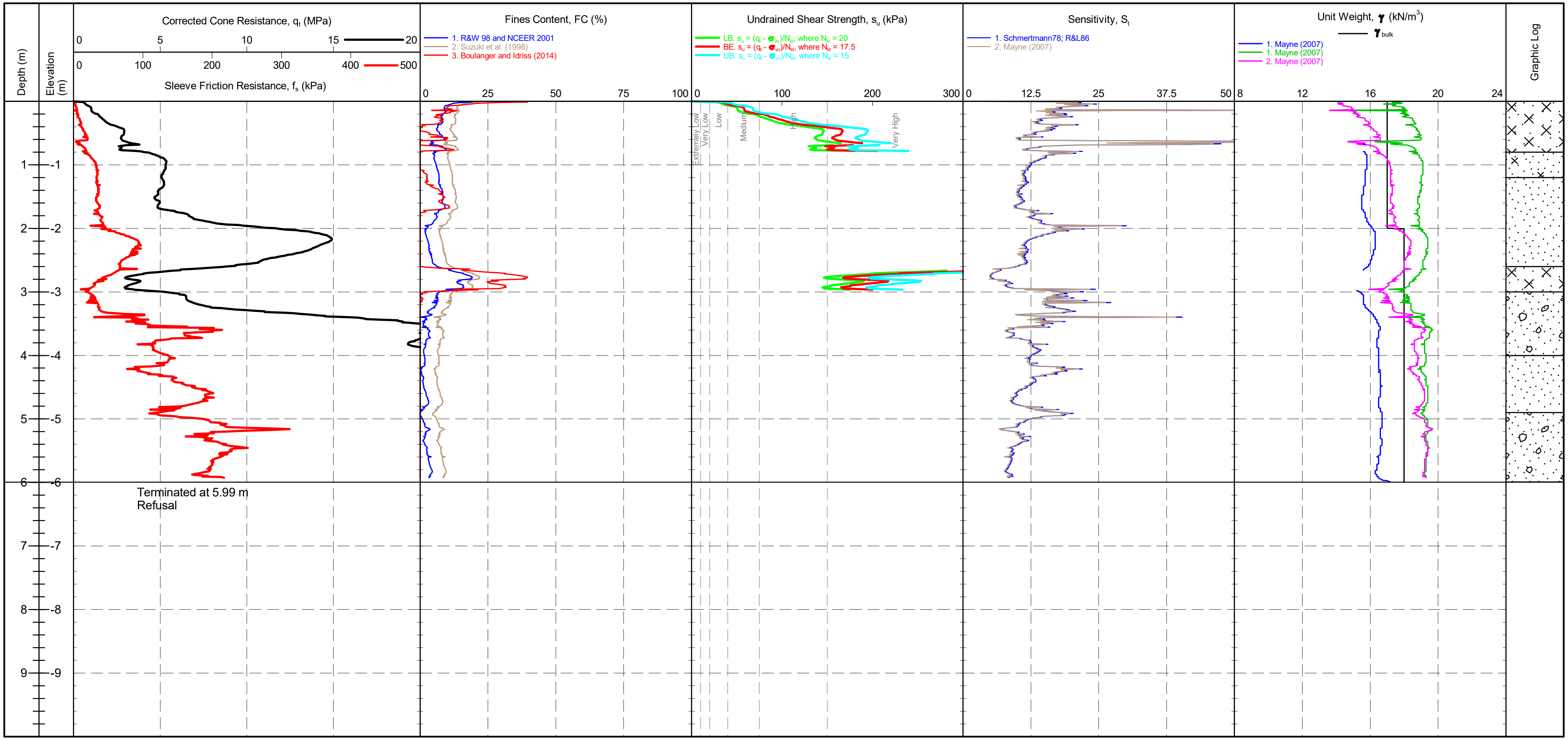
PointID **15**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 19/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

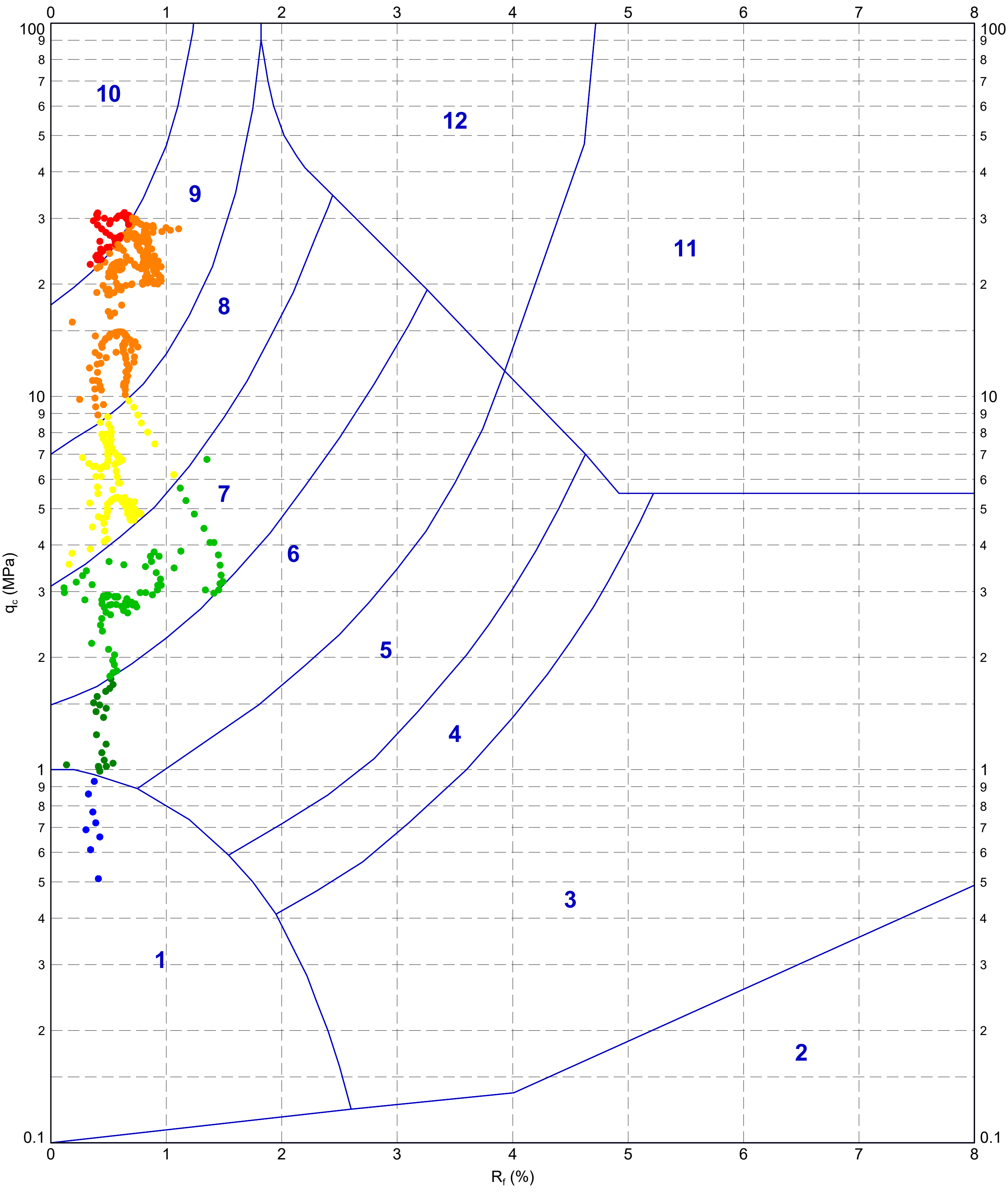
Transducer	Pre	Post	Difference
Tip	202 mV	196 mV	-0.065 MPa
Sleeve	201 mV	196 mV	-0.004 kPa
Pore Pressure 2	232 mV	240 mV	0.002 kPa
X-Y Inclinometer	2373 mV	2378 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE	DRAWN	DATE
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 15		26/10/2020
	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

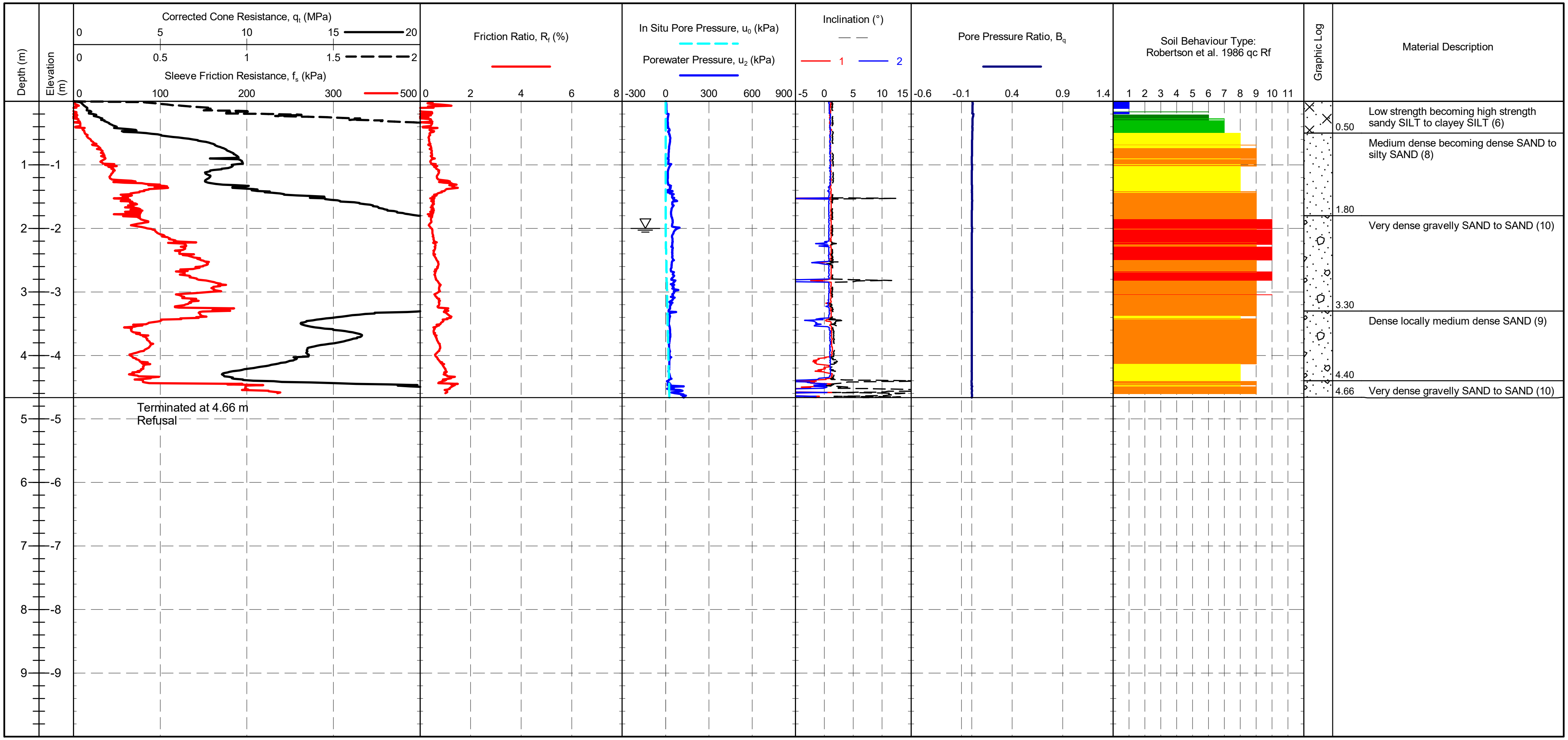
PointID **16**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CALIBRATION DATE	: 26/07/2020
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild
GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	201 mV	-0.054 MPa
Sleeve	203 mV	202 mV	-0.001 kPa
Pore Pressure 2	262 mV	231 mV	-0.008 kPa
X-Y Inclinometer	2554 mV	2535 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

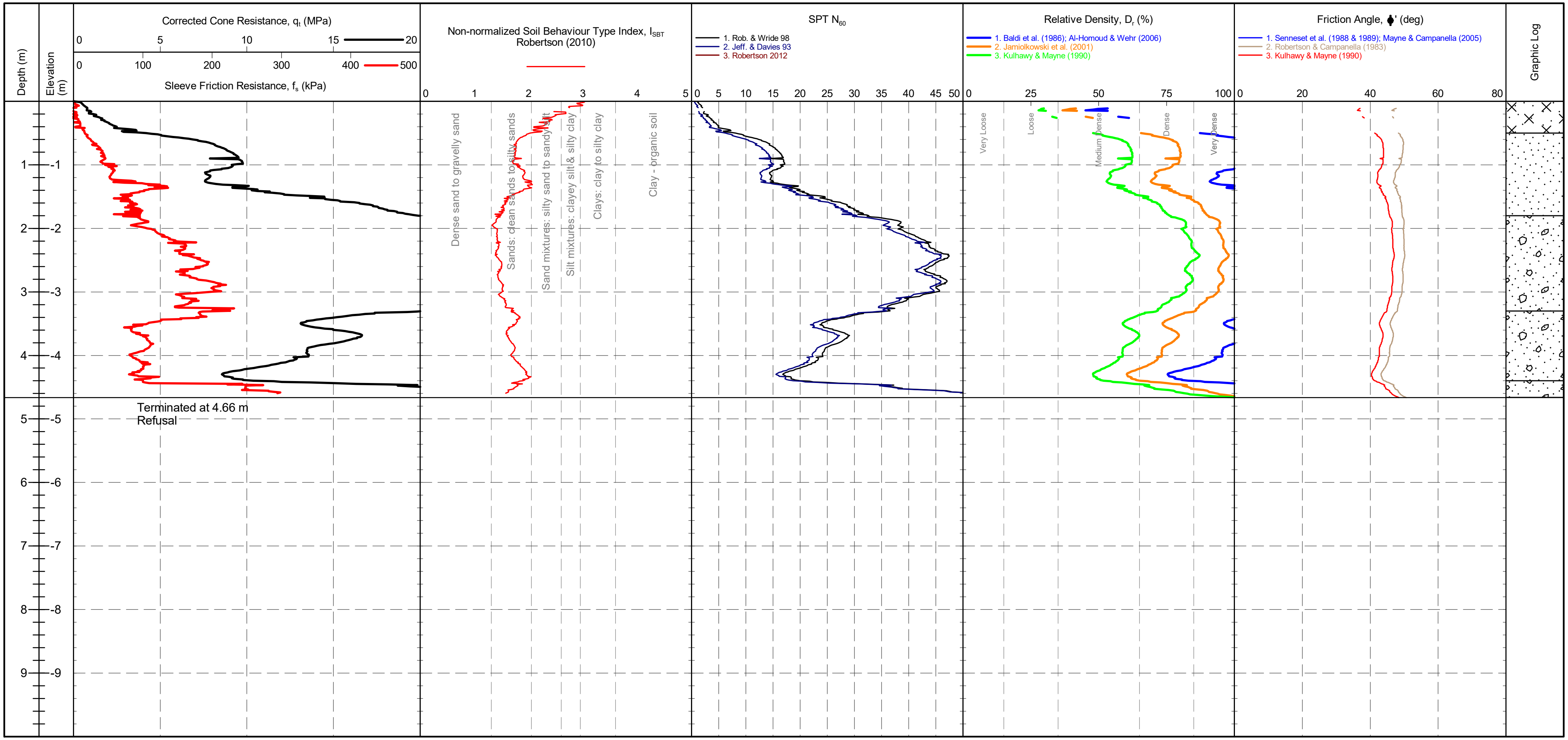
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
16

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	201 mV	-0.054 MPa
Sleeve	203 mV	202 mV	-0.001 kPa
Pore Pressure 2	262 mV	231 mV	-0.008 kPa
X-Y Inclinometer	2554 mV	2535 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

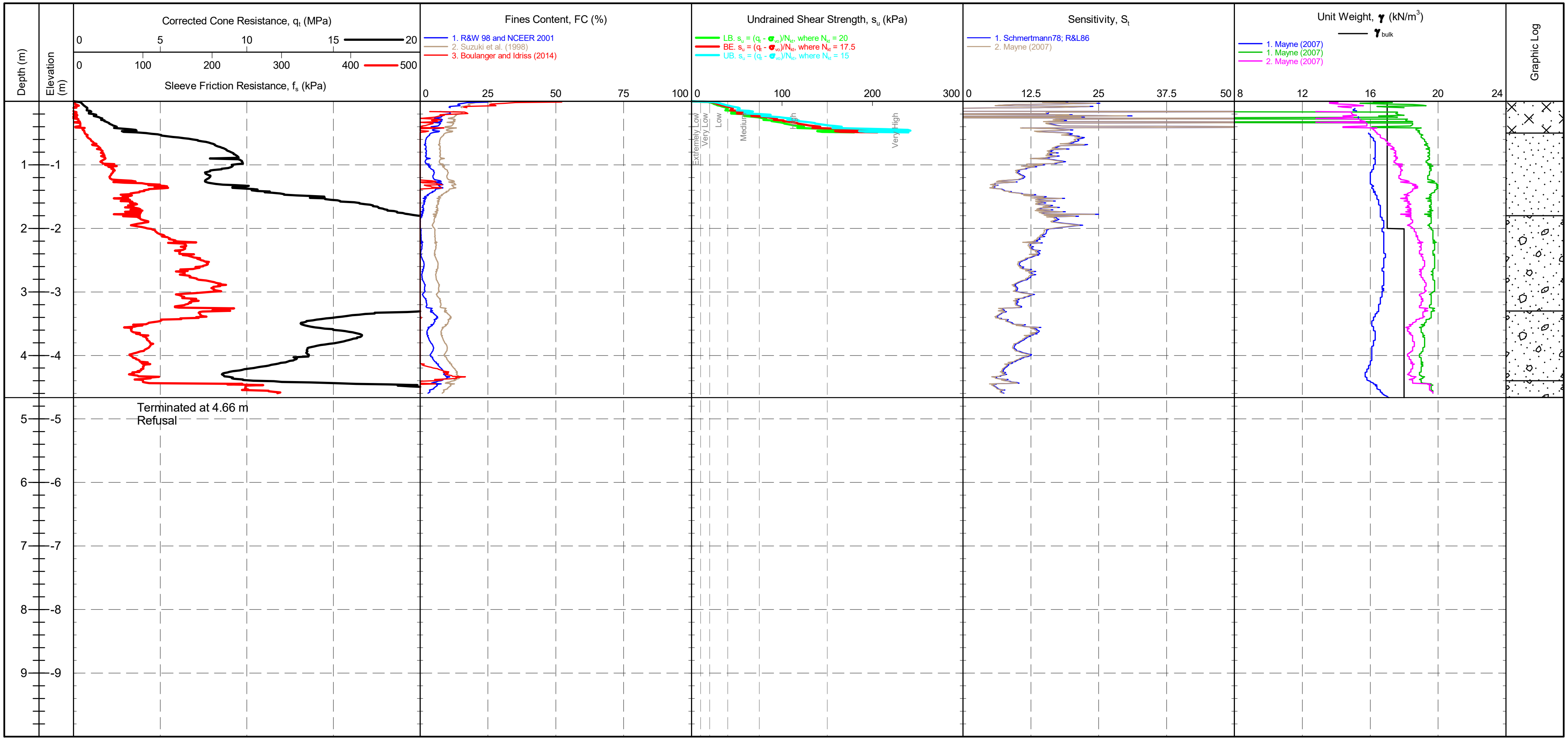
CPT LOG 03

PointID **16**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark: Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen		
CONE AREA RATIO	: 0.79	OPERATOR	: RS		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild		

CPTU ZERO VALUES

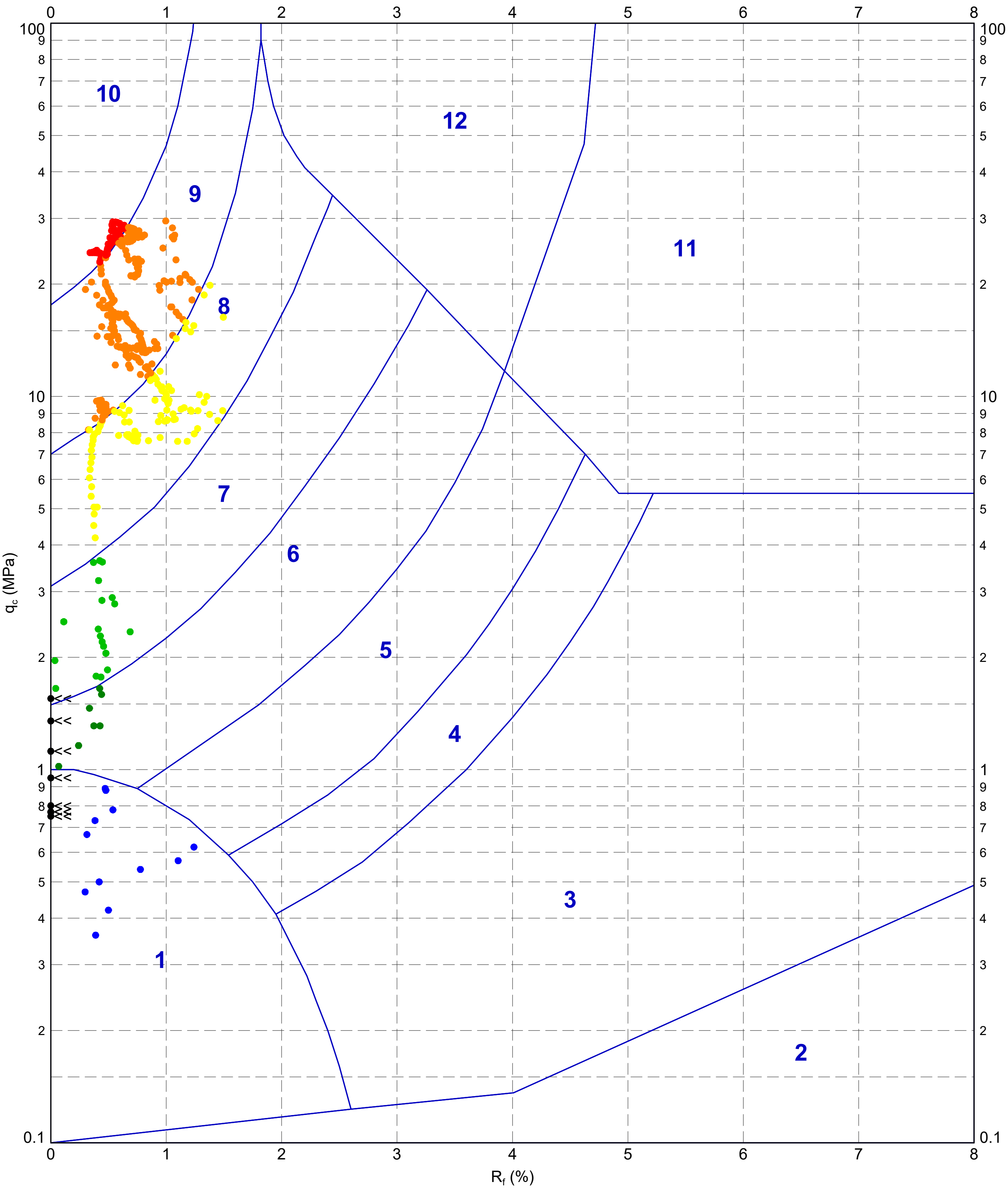
Transducer	Pre	Post	Difference
Tip	206 mV	201 mV	-0.054 MPa
Sleeve	203 mV	202 mV	-0.001 kPa
Pore Pressure 2	262 mV	231 mV	-0.008 kPa
X-Y Inclinometer	2554 mV	2535 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

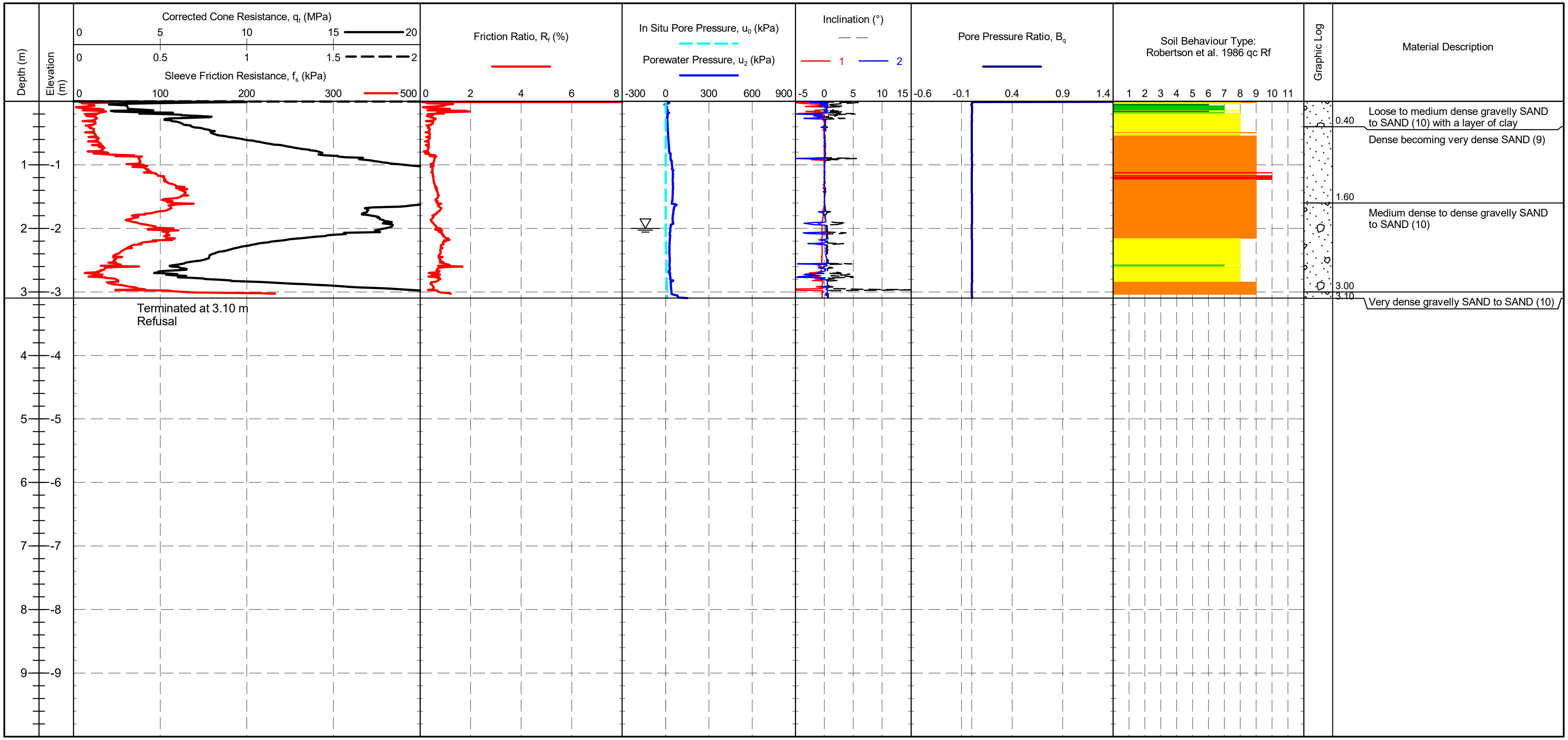
TITLE	DRAWN	DATE
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 16		26/10/2020
	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **17**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CALIBRATION DATE	: 26/07/2020
CONE MODEL	: Subtraction
CONE AREA	: 15cm²
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild
GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	205 mV	-0.022 MPa
Sleeve	205 mV	207 mV	0.001 kPa
Pore Pressure 2	252 mV	241 mV	-0.003 kPa
X-Y Inclinometer	2422 mV	2496 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

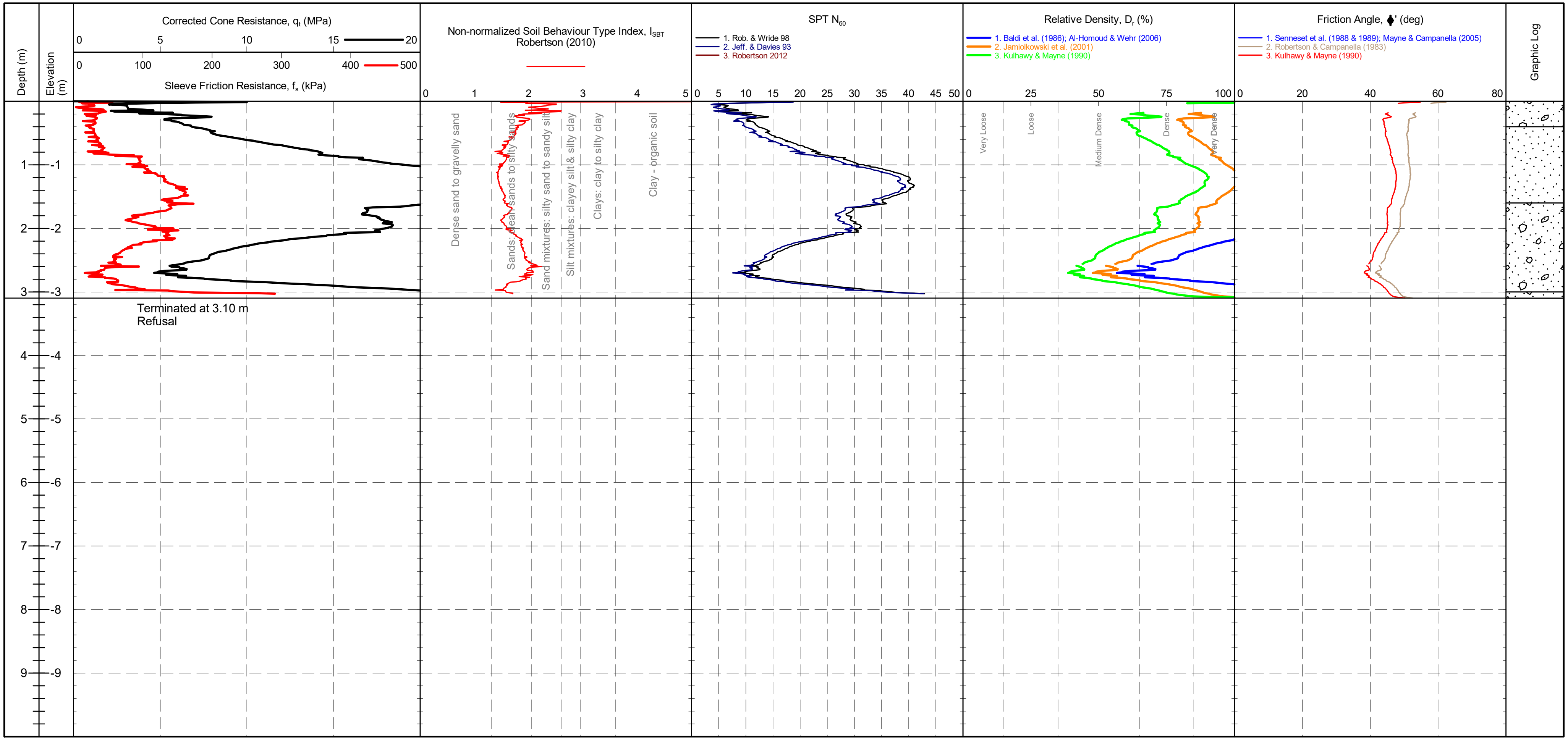
Dissipation Test

IN SITU
SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
17

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	205 mV	-0.022 MPa
Sleeve	205 mV	207 mV	0.001 kPa
Pore Pressure 2	252 mV	241 mV	-0.003 kPa
X-Y Inclinometer	2422 mV	2496 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

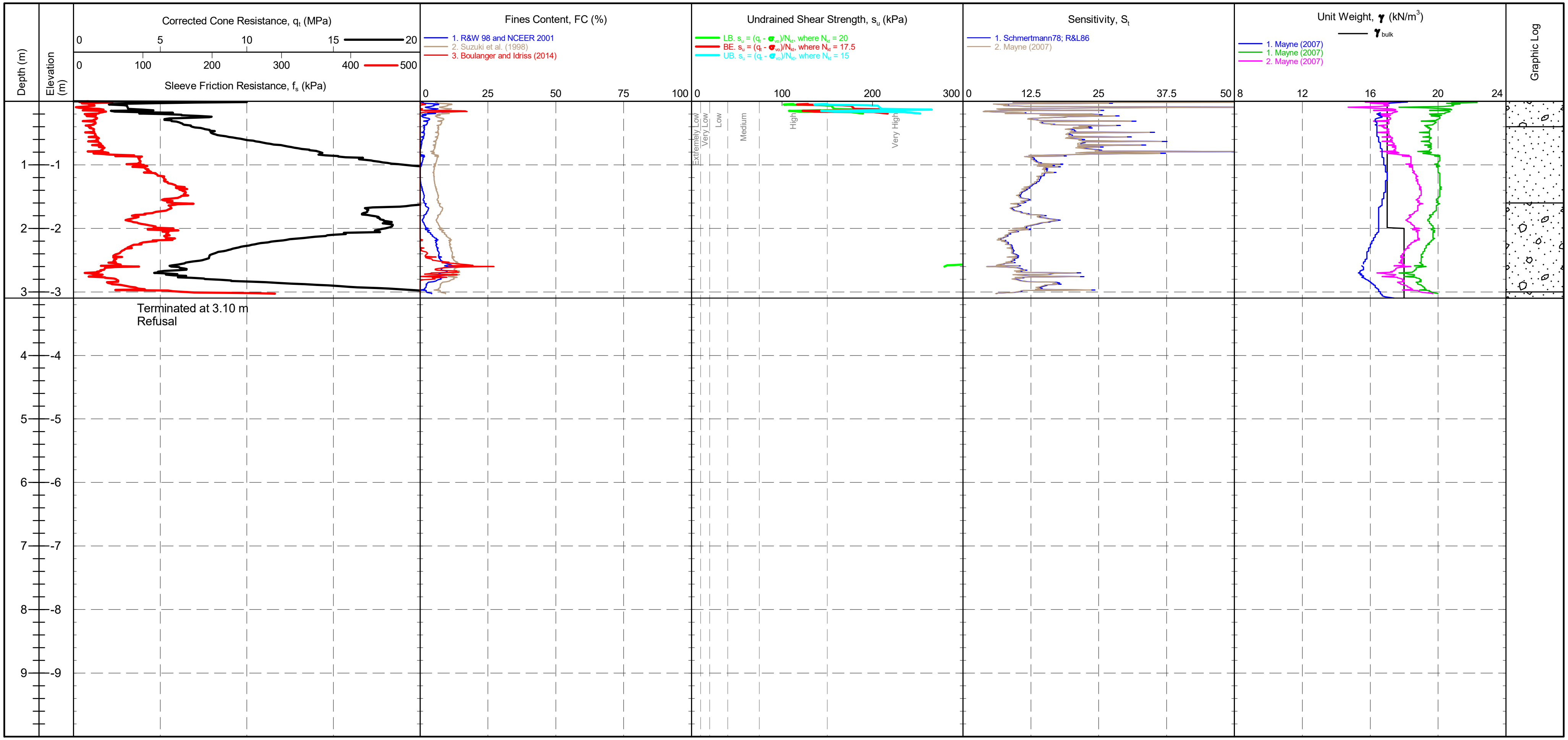
IN SITU
SITE INVESTIGATION

Working with: soiltechnics
environmental and geotechnical consultants

CPT LOG 03

PointID
17

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

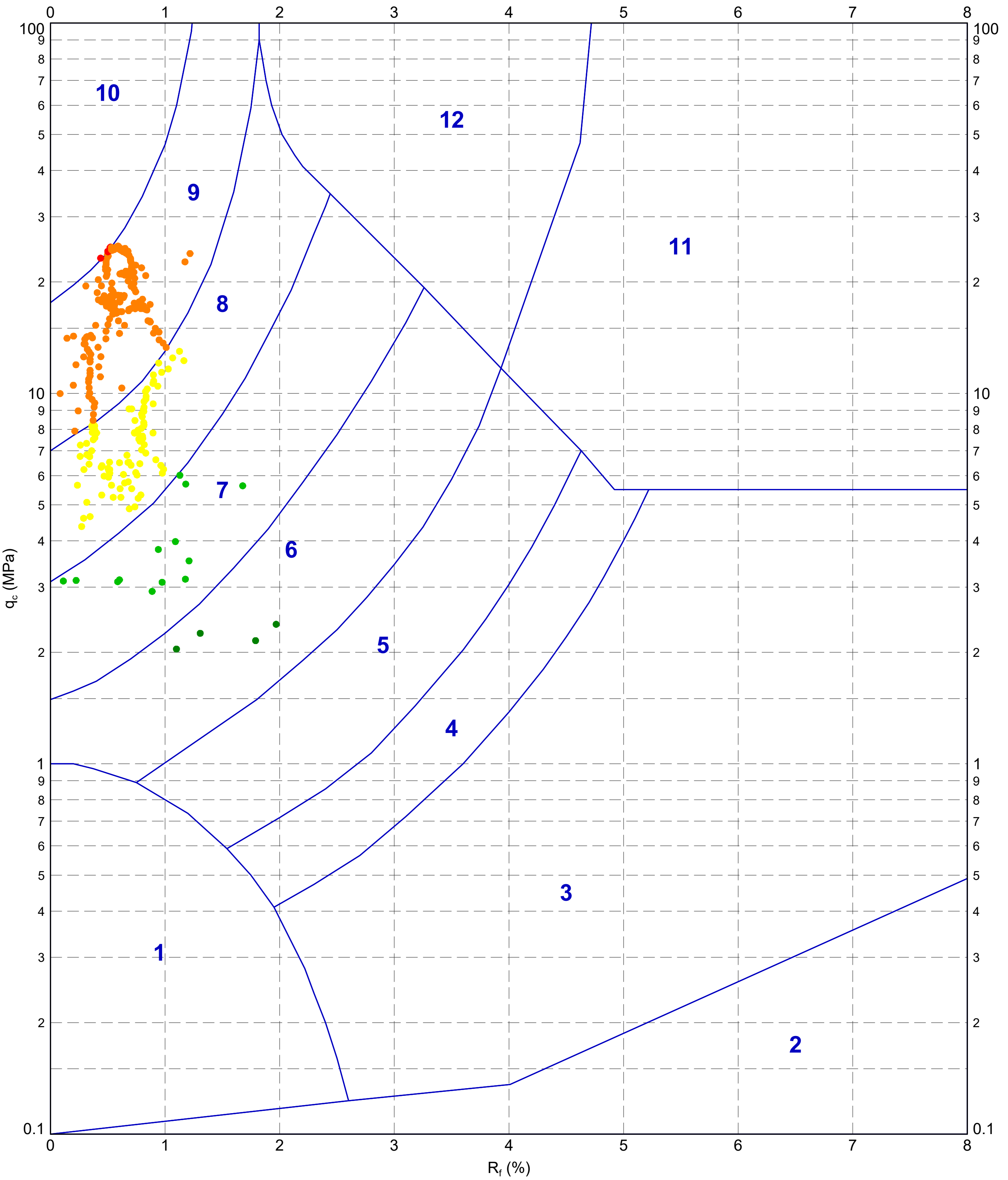
Transducer	Pre	Post	Difference
Tip	207 mV	205 mV	-0.022 MPa
Sleeve	205 mV	207 mV	0.001 kPa
Pore Pressure 2	252 mV	241 mV	-0.003 kPa
X-Y Inclinometer	2422 mV	2496 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

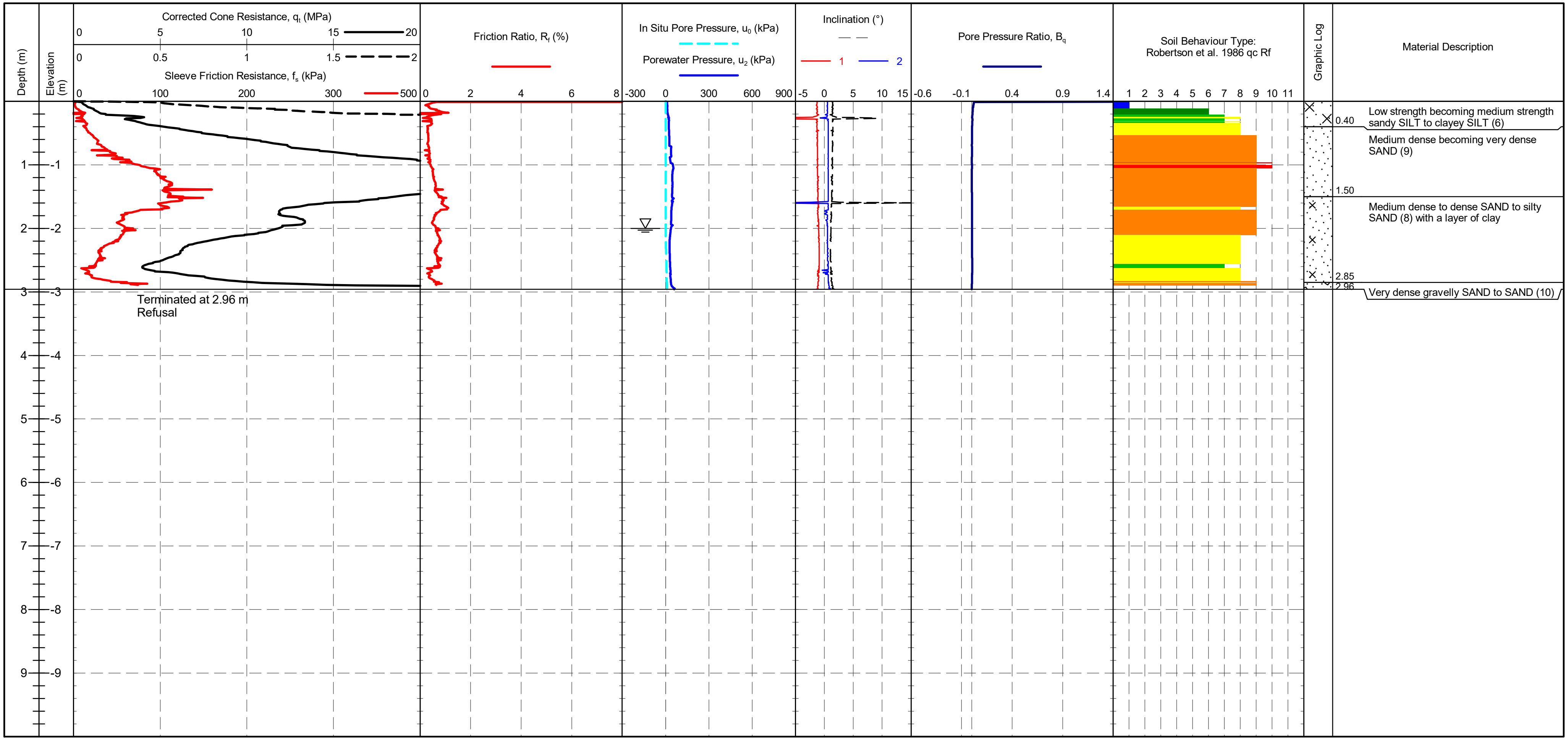
IN SITU SITE INVESTIGATION	TITLE Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 17	DRAWN	DATE 26/10/2020
		CHECKED	DATE 26/10/2020
		SCALE Not To Scale	A4
		PROJECT No 1200410	FIGURE No

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
18

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858 CALIBRATION DATE : 26/07/2020 CONE MODEL : Subtraction CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 017 - Griffen OPERATOR : RS FRICTION REDUCER : None WEATHER : Raining & Mild GROUNDWATER DEPTH : Assumed for calculation purposes.		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	201 mV	206 mV	0.054 MPa
Sleeve	202 mV	205 mV	0.002 kPa
Pore Pressure 2	237 mV	240 mV	0.001 kPa
X-Y Inclinometer	2333 mV	2338 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

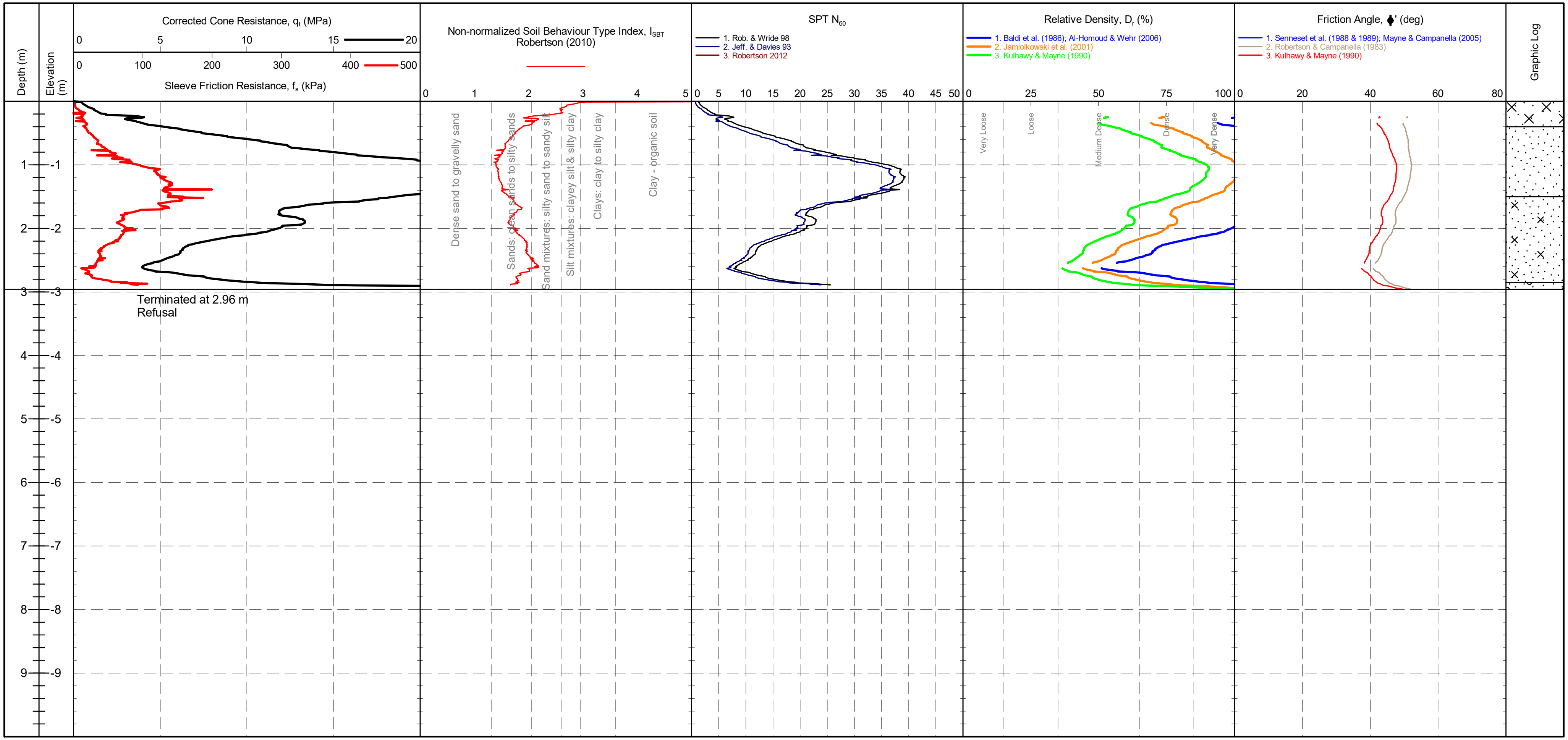
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID **18**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	201 mV	206 mV	0.054 MPa
Sleeve	202 mV	205 mV	0.002 kPa
Pore Pressure 2	237 mV	240 mV	0.001 kPa
X-Y Inclinometer	2333 mV	2338 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

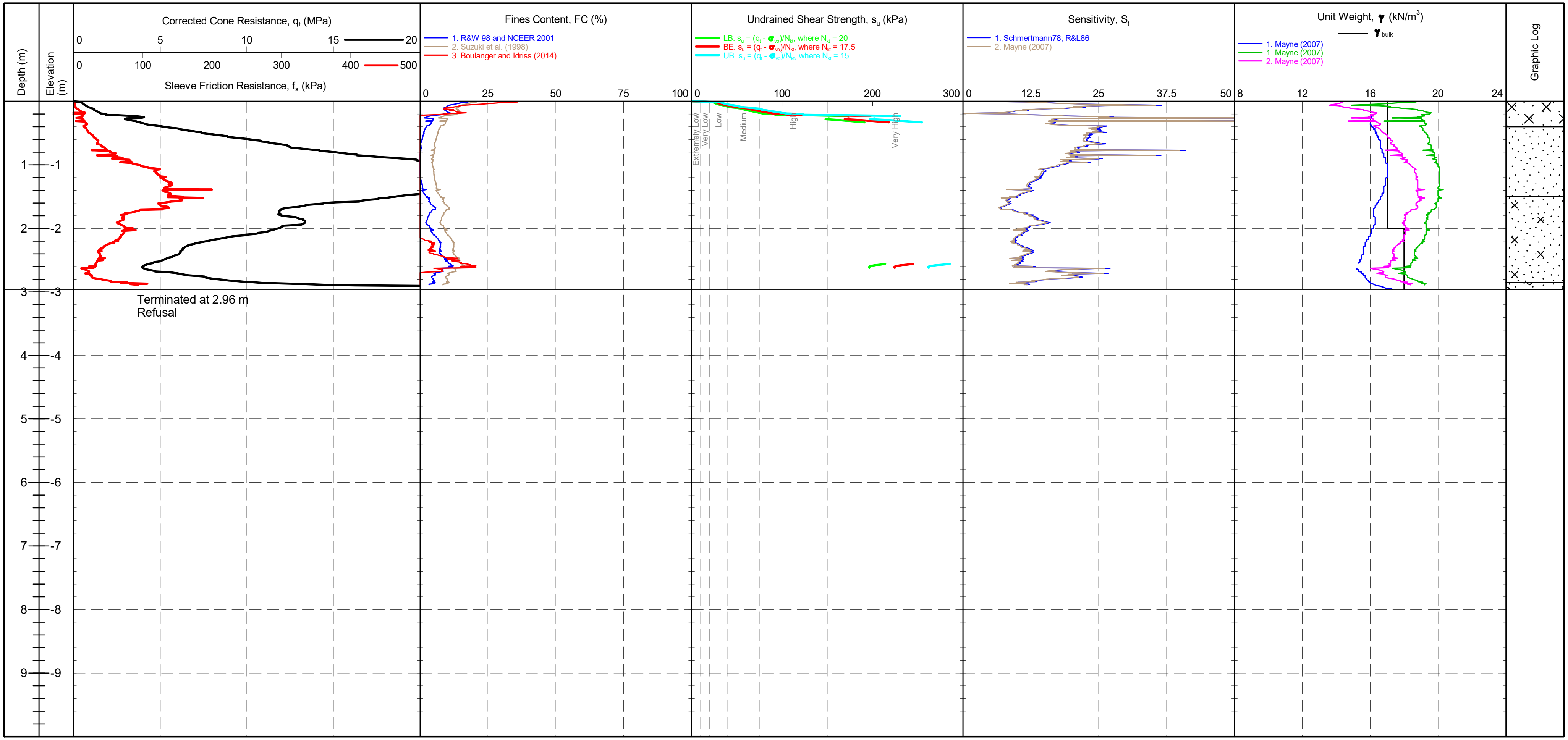
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
18

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

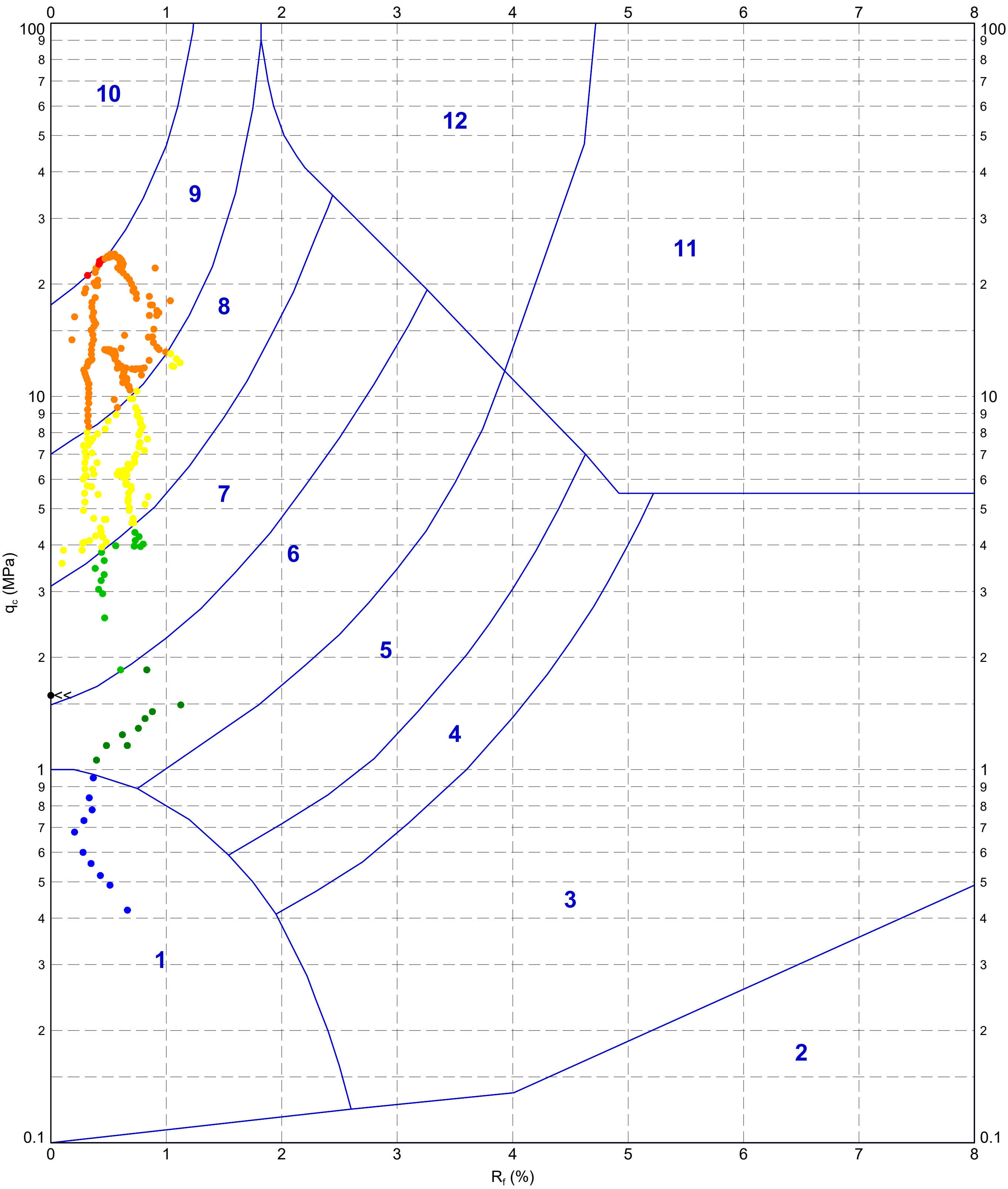
Transducer	Pre	Post	Difference
Tip	201 mV	206 mV	0.054 MPa
Sleeve	202 mV	205 mV	0.002 kPa
Pore Pressure 2	237 mV	240 mV	0.001 kPa
X-Y Inclinometer	2333 mV	2338 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

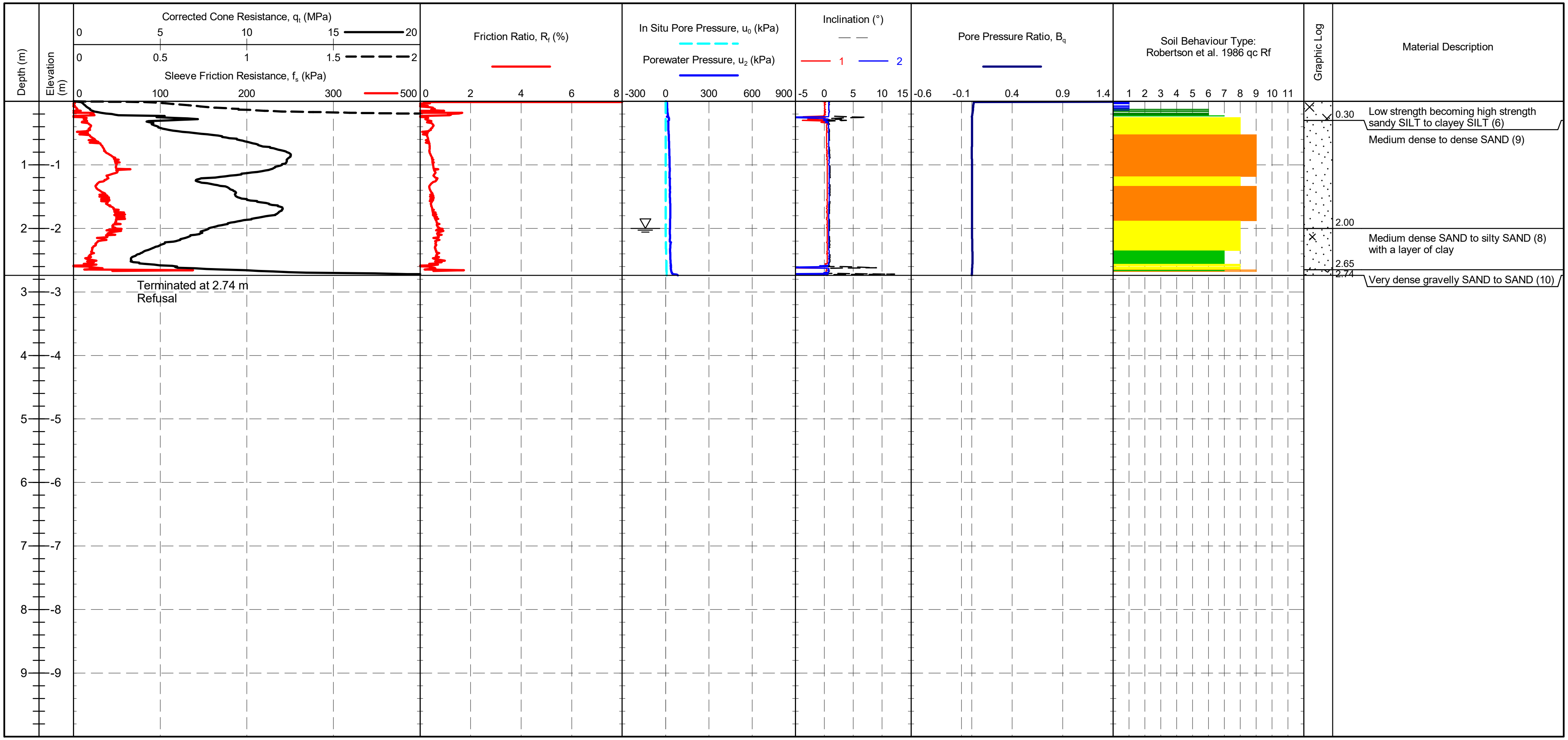
TITLE	Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 18	DRAWN	DATE 26/10/2020
		CHECKED	DATE 26/10/2020
		SCALE Not To Scale	A4
		PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID
19

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	198 mV	204 mV	0.065 MPa
Sleeve	200 mV	204 mV	0.003 kPa
Pore Pressure 2	249 mV	249 mV	0 kPa
X-Y Inclinometer	2469 mV	2475 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

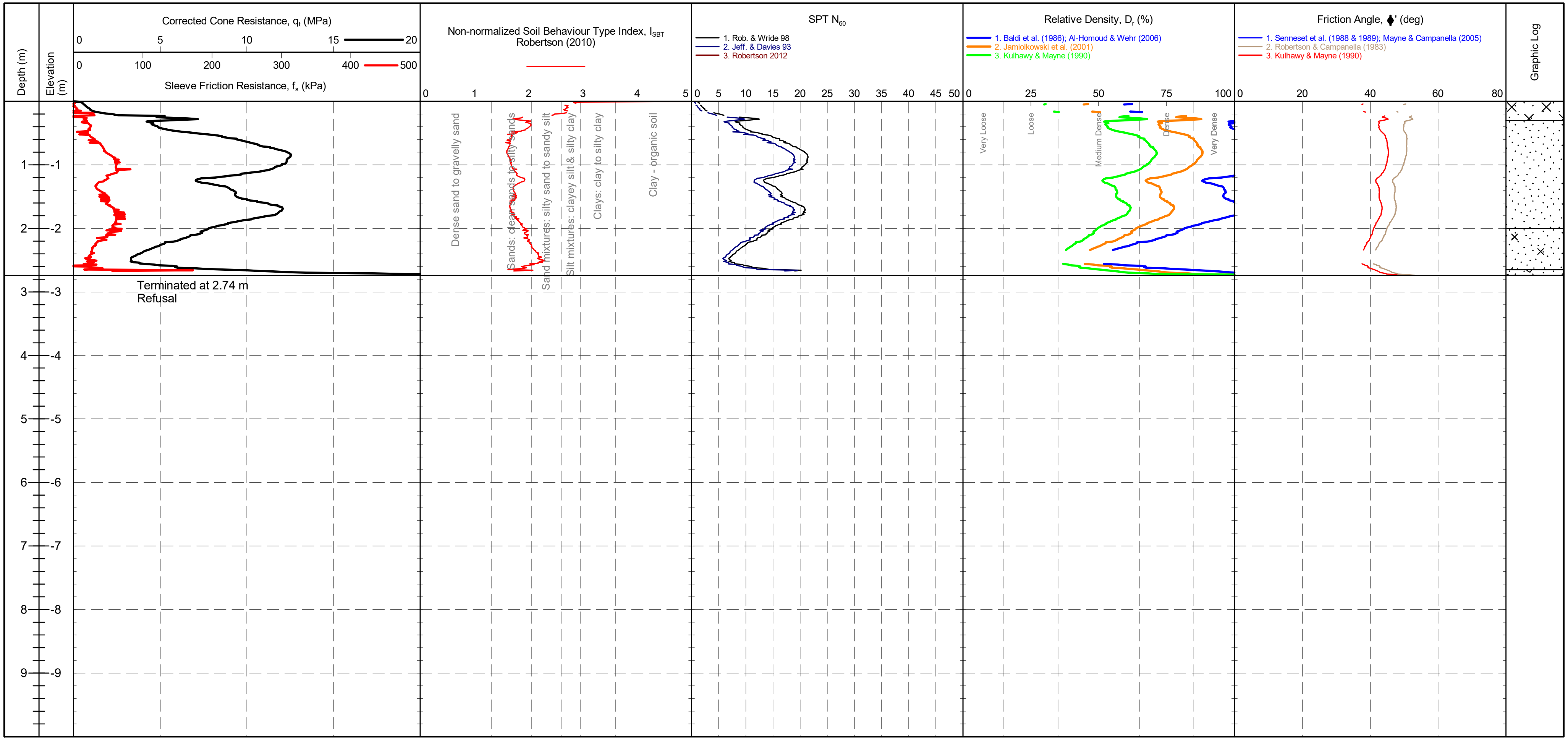
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
19

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	198 mV	204 mV	0.065 MPa
Sleeve	200 mV	204 mV	0.003 kPa
Pore Pressure 2	249 mV	249 mV	0 kPa
X-Y Inclinometer	2469 mV	2475 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

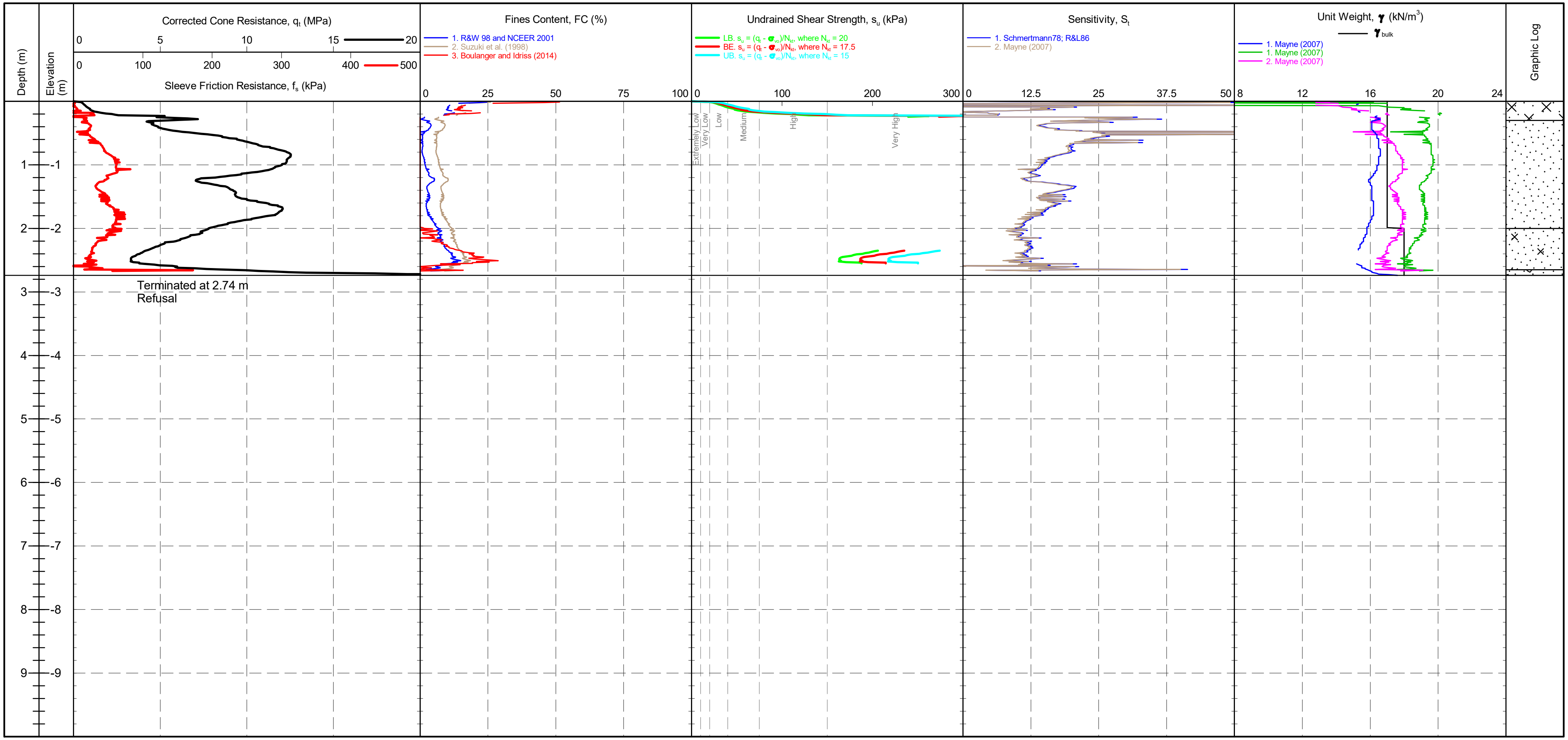
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID **19**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

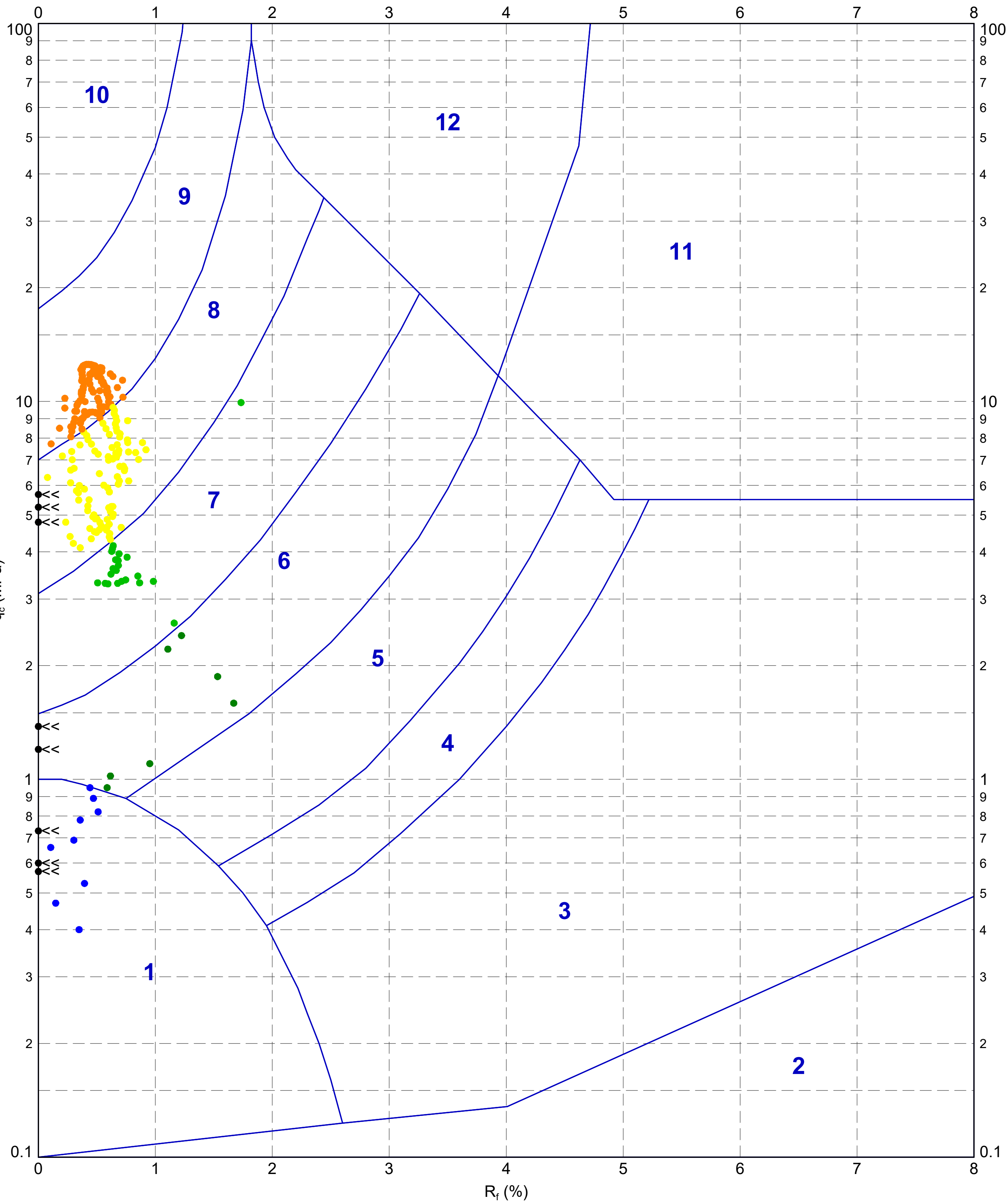
Transducer	Pre	Post	Difference
Tip	198 mV	204 mV	0.065 MPa
Sleeve	200 mV	204 mV	0.003 kPa
Pore Pressure 2	249 mV	249 mV	0 kPa
X-Y Inclinometer	2469 mV	2475 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

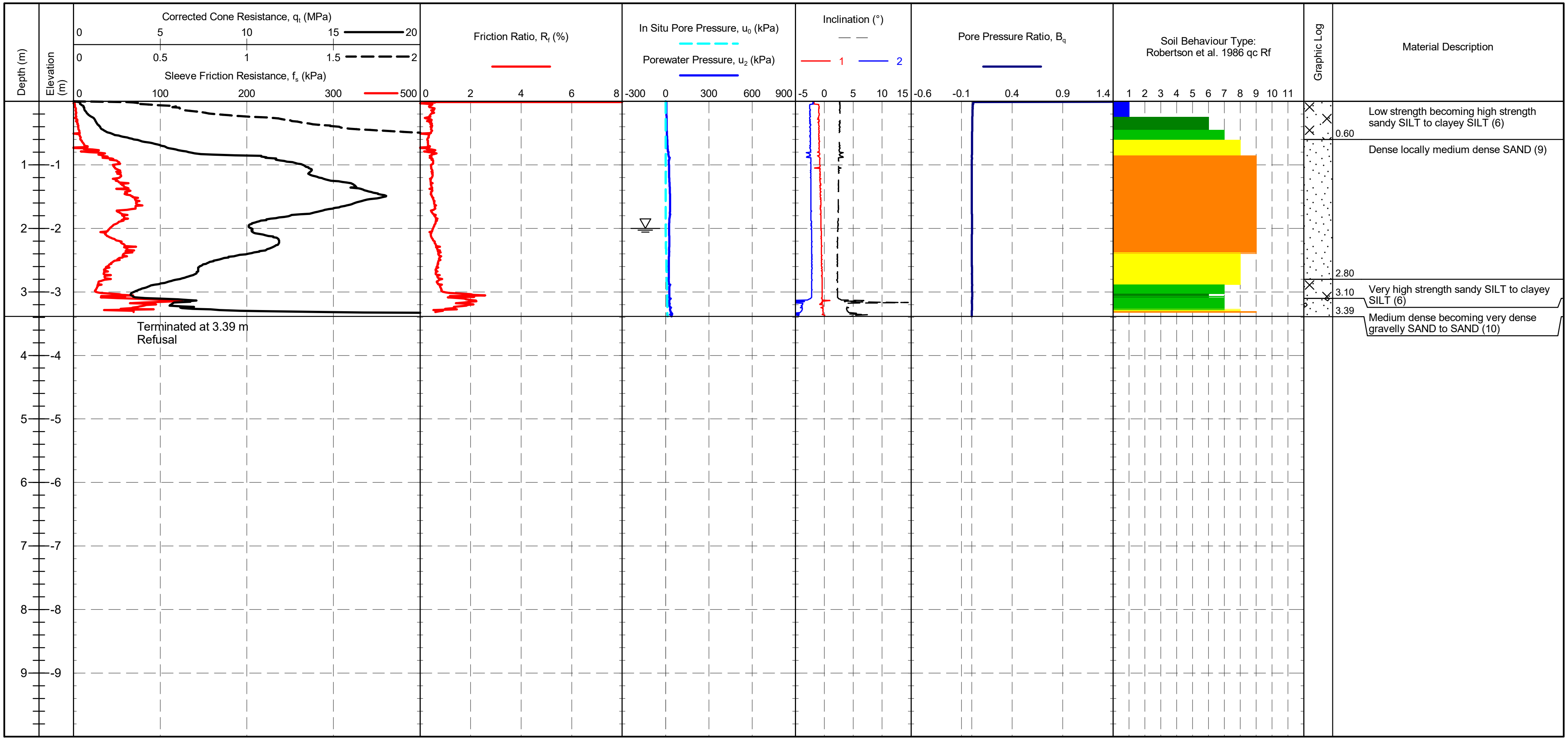
TITLE	DRAWN	DATE
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 19		26/10/2020
	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **20**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	S15-CFIP.1858	TEST TYPE	TE2
CALIBRATION DATE	26/07/2020	APPLICATION CLASS	2
CONE MODEL	Subtraction	RIG	CPT 017 - Griffen
CONE AREA	15cm^2	OPERATOR	RS
CONE AREA RATIO	0.79	FRICTION REDUCER	None
FILTER POSITION	u2	WEATHER	Raining & Mild
FILTER TYPE	HDPE	GROUNDWATER DEPTH	Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	203 mV	-0.043 MPa
Sleeve	205 mV	203 mV	-0.001 kPa
Pore Pressure 2	260 mV	240 mV	-0.005 kPa
X-Y Inclinometer	2274 mV	2415 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

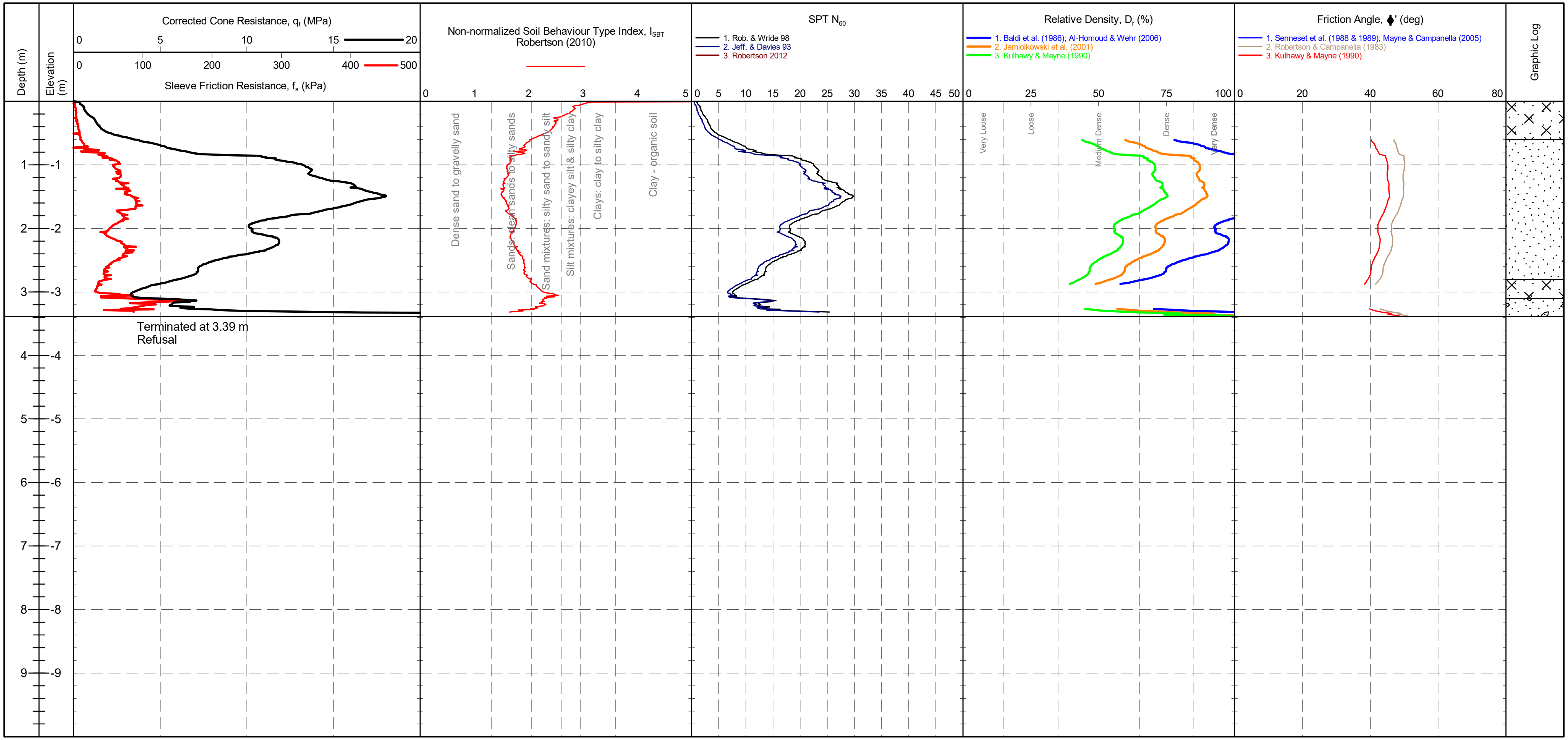
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
20

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen		
CONE AREA RATIO	: 0.79	OPERATOR	: RS		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	203 mV	-0.043 MPa
Sleeve	205 mV	203 mV	-0.001 kPa
Pore Pressure 2	260 mV	240 mV	-0.005 kPa
X-Y Inclinometer	2274 mV	2415 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

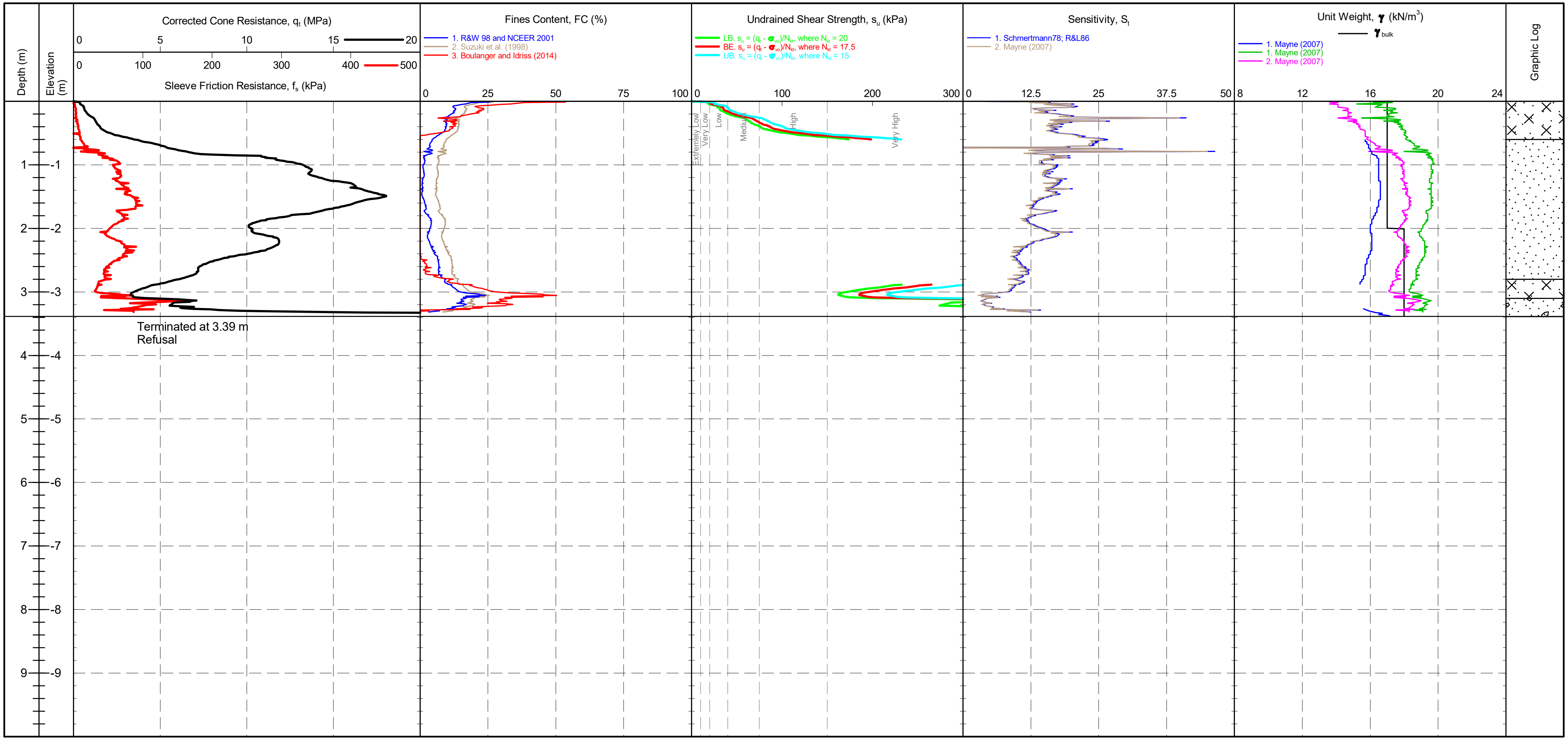
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
20

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

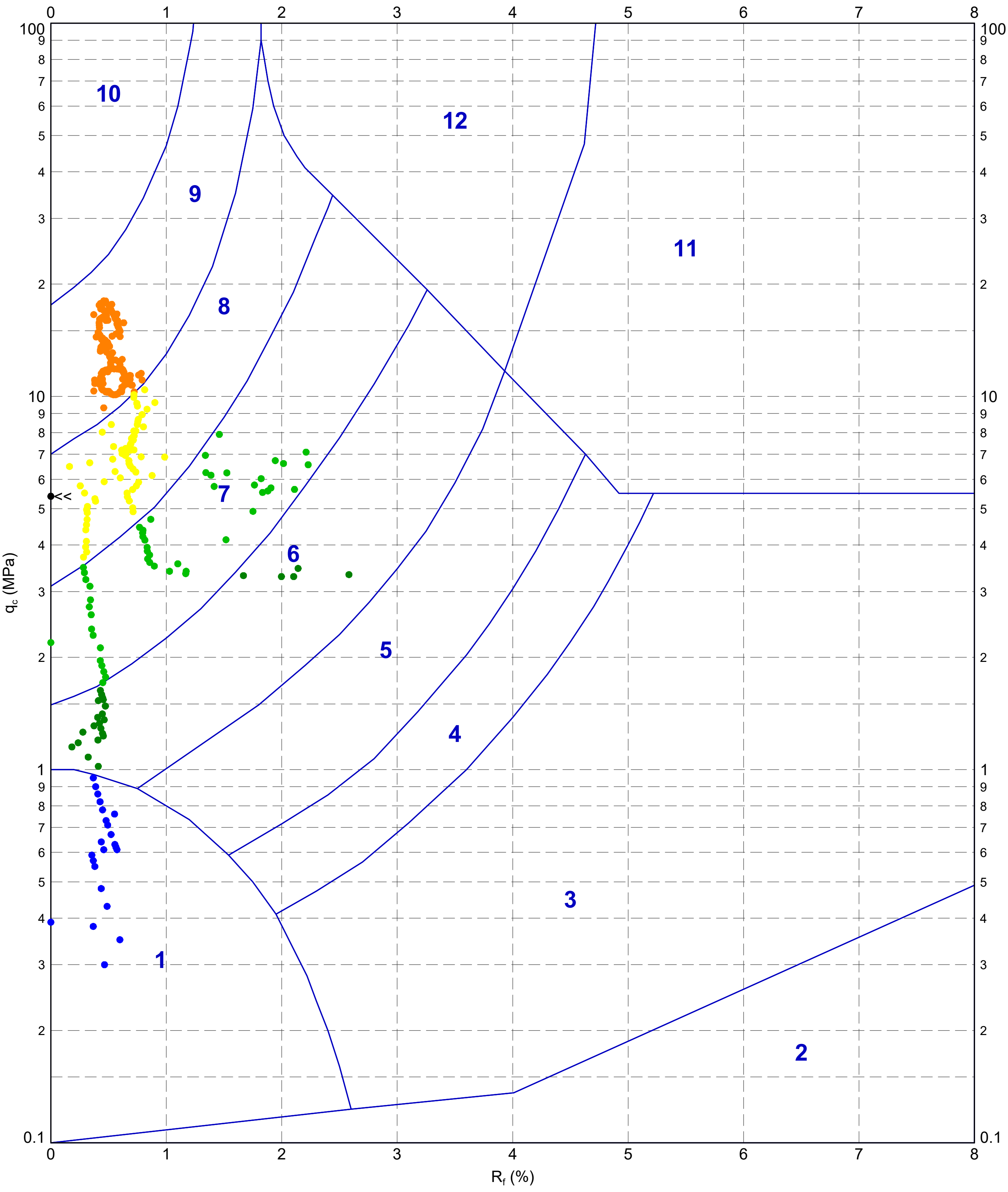
Transducer	Pre	Post	Difference
Tip	207 mV	203 mV	-0.043 MPa
Sleeve	205 mV	203 mV	-0.001 kPa
Pore Pressure 2	260 mV	240 mV	-0.005 kPa
X-Y Inclinometer	2274 mV	2415 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE
Soiltechnics
Lossiemouth
Lossiemouth
Robertson et al. 1986 q_c vs. R_f - 20

DRAWN		DATE	26/10/2020
CHECKED		DATE	26/10/2020
SCALE	Not To Scale		A4
PROJECT No	1200410	FIGURE No	

IN SITU SITE INVESTIGATION

Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

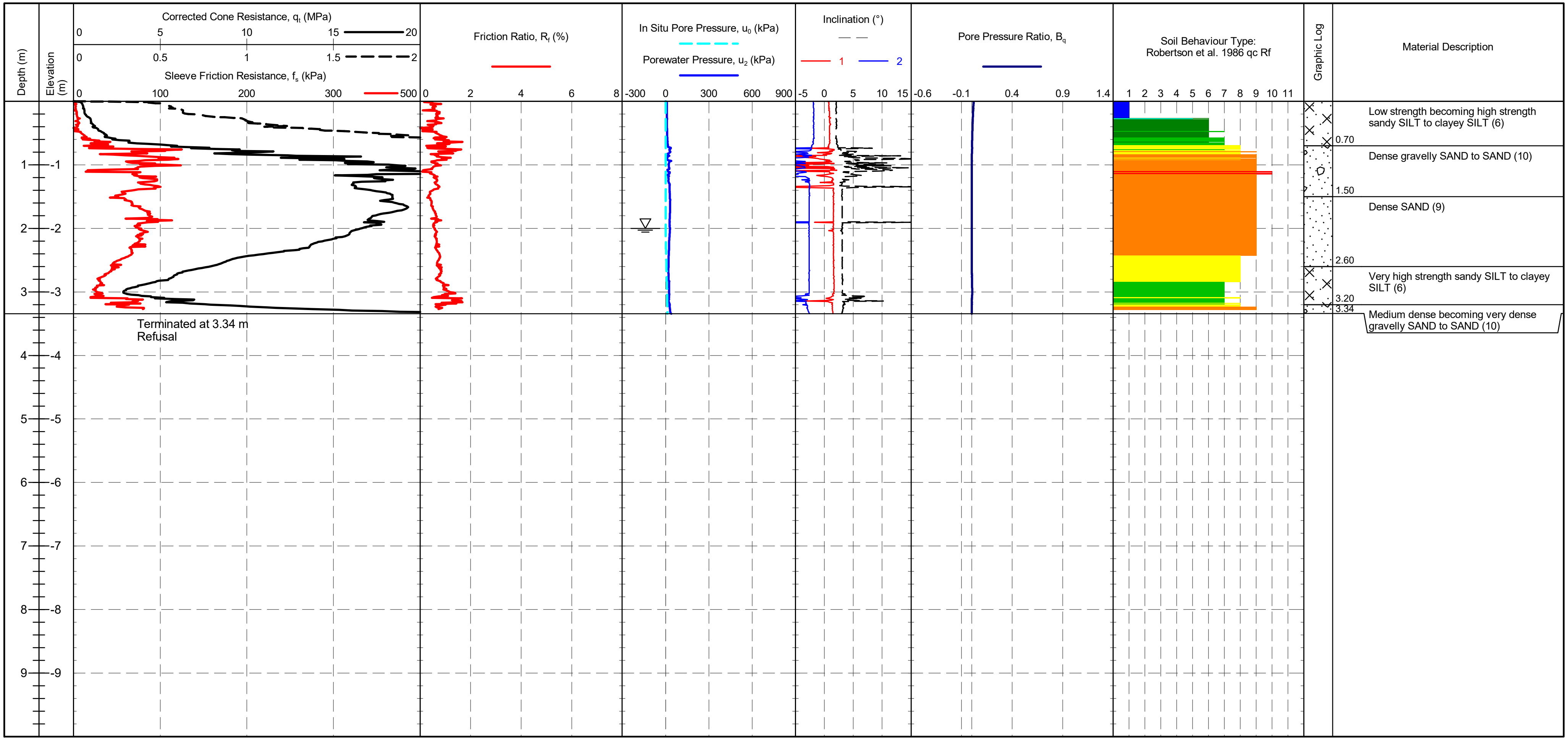
PointID **21**

CLIENT : Soiltechnics
PROJECT : Lossiemouth
LOCATION : Lossiemouth
PROJECT No. : 1200410

EASTING : 0.0 m
NORTHING : 0.0 m
ELEVATION : 0.00 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 26/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	205 mV	-0.022 MPa
Sleeve	204 mV	205 mV	0.001 kPa
Pore Pressure 2	255 mV	236 mV	-0.005 kPa
X-Y Inclinometer	2500 mV	2541 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

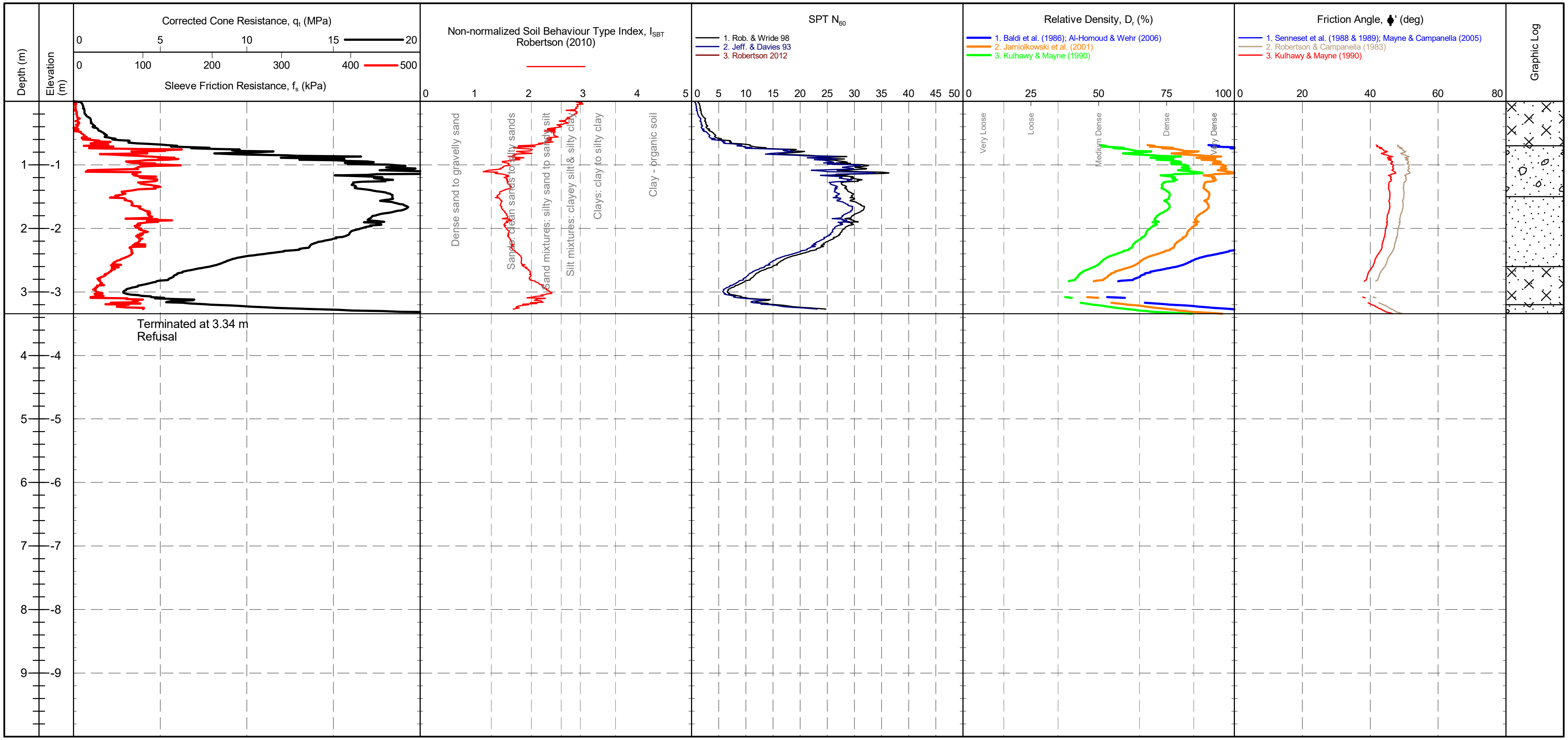
Groundwater Level
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
21

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		CPTU ZERO VALUES		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen	Tip	207 mV	205 mV	-0.022 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: RS	Sleeve	204 mV	205 mV	0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	255 mV	236 mV	-0.005 kPa
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild	X-Y Inclinometer	2500 mV	2541 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

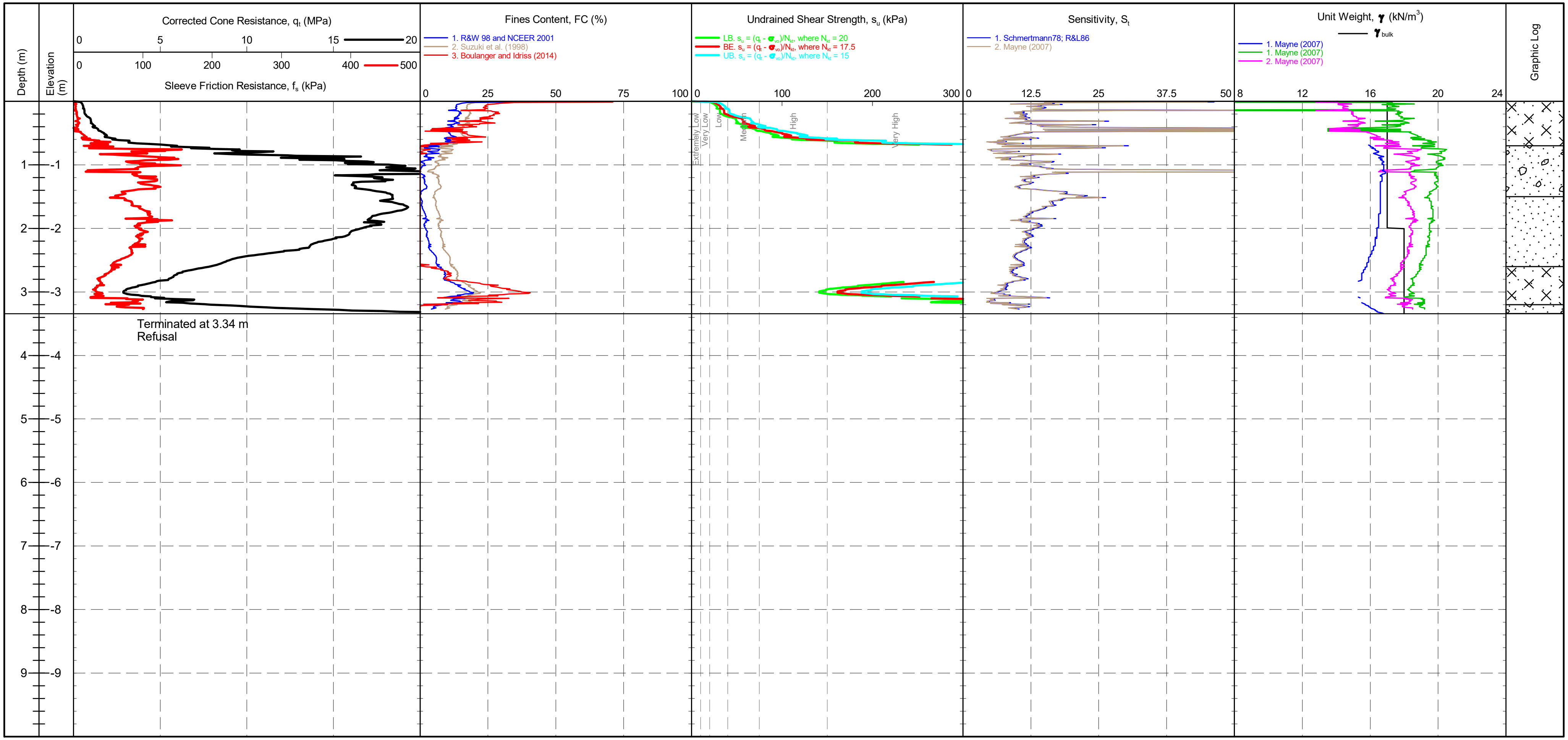
PointID **21**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

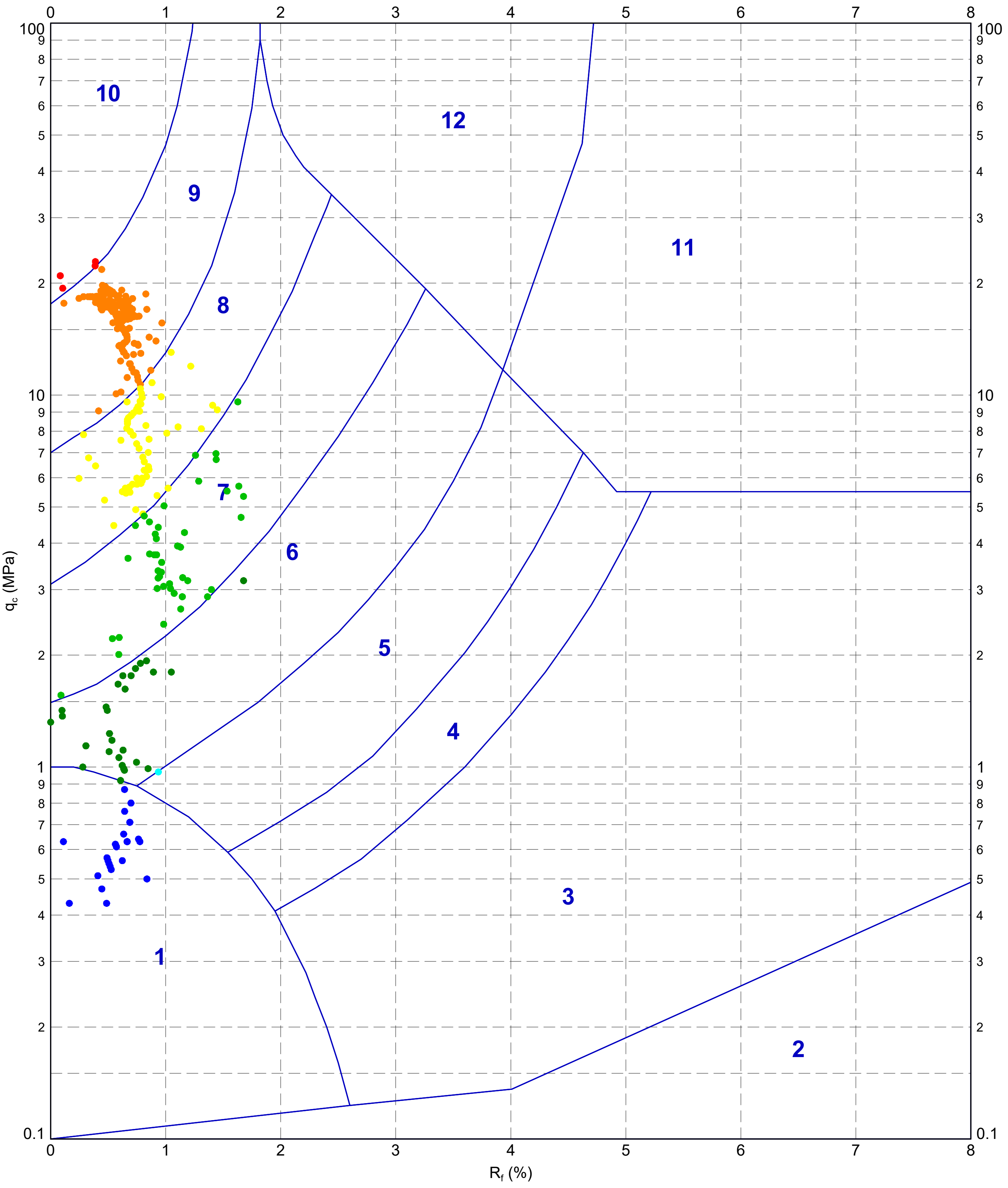
Transducer	Pre	Post	Difference
Tip	207 mV	205 mV	-0.022 MPa
Sleeve	204 mV	205 mV	0.001 kPa
Pore Pressure 2	255 mV	236 mV	-0.005 kPa
X-Y Inclinometer	2500 mV	2541 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

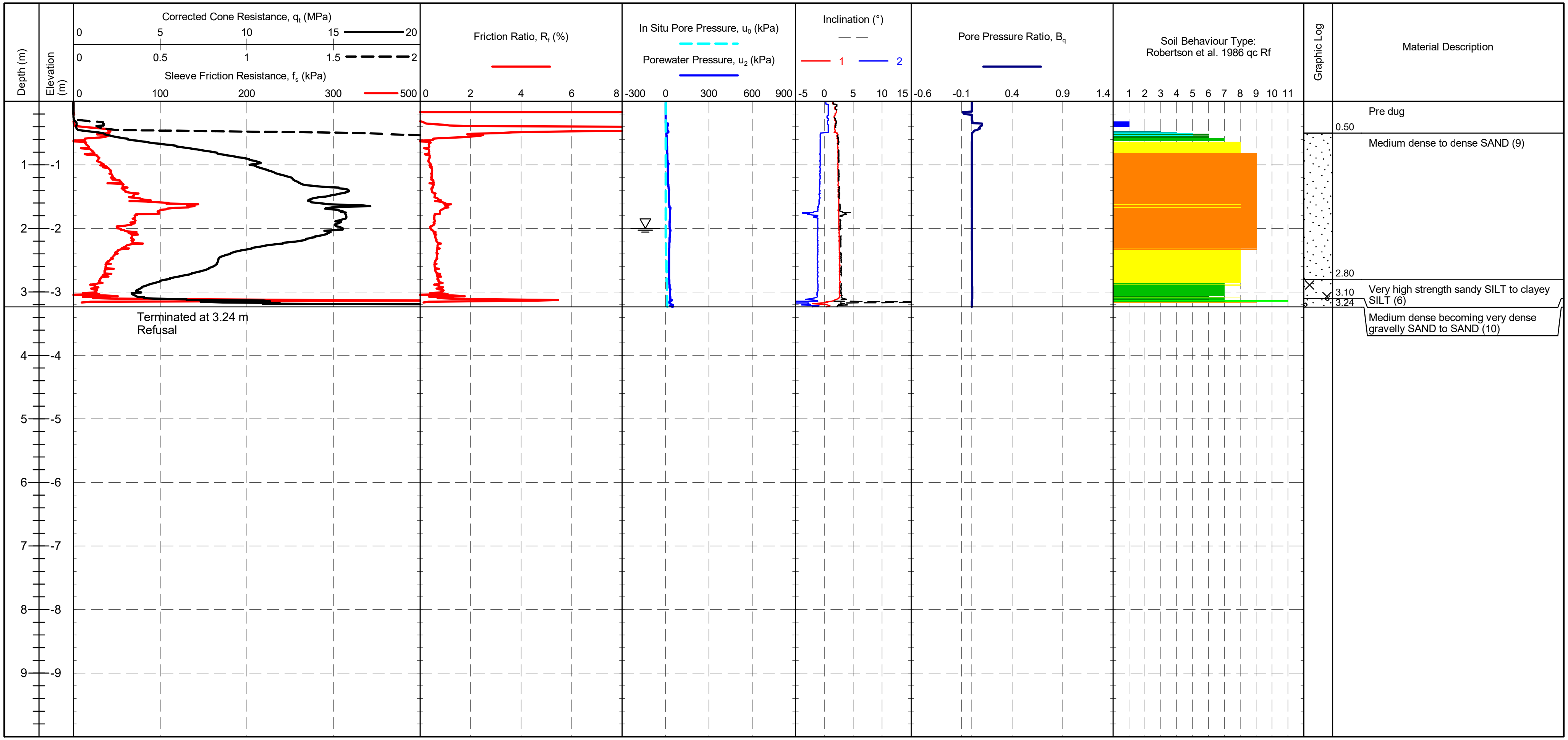
TITLE	DRAWN	DATE 26/10/2020
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 21	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID	22

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	205 mV	203 mV	-0.022 MPa
Sleeve	204 mV	203 mV	-0.001 kPa
Pore Pressure 2	245 mV	236 mV	-0.002 kPa
X-Y Inclinometer	2633 mV	2656 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

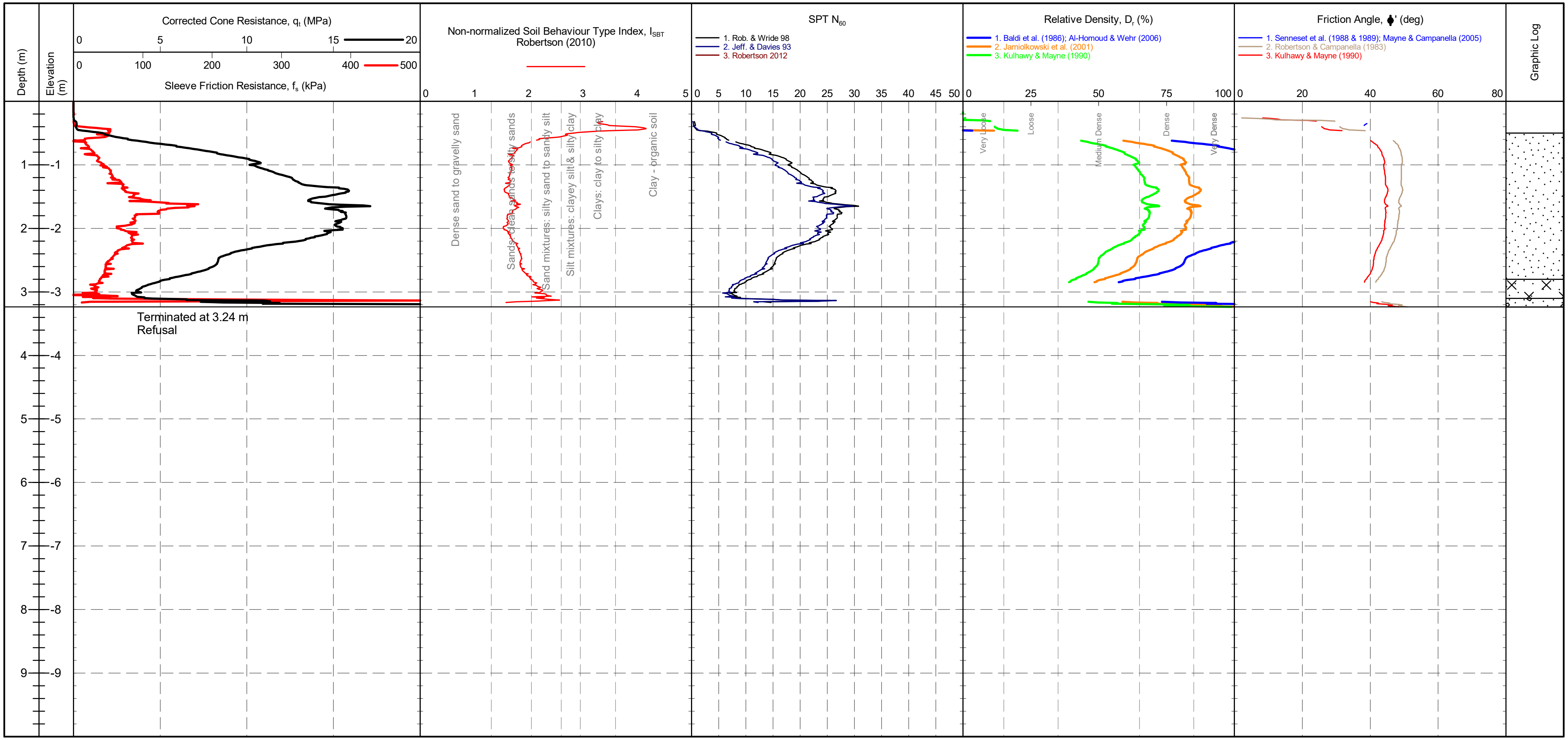
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
22

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	15cm^2
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	205 mV	203 mV	-0.022 MPa
Sleeve	204 mV	203 mV	-0.001 kPa
Pore Pressure 2	245 mV	236 mV	-0.002 kPa
X-Y Inclinometer	2633 mV	2656 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

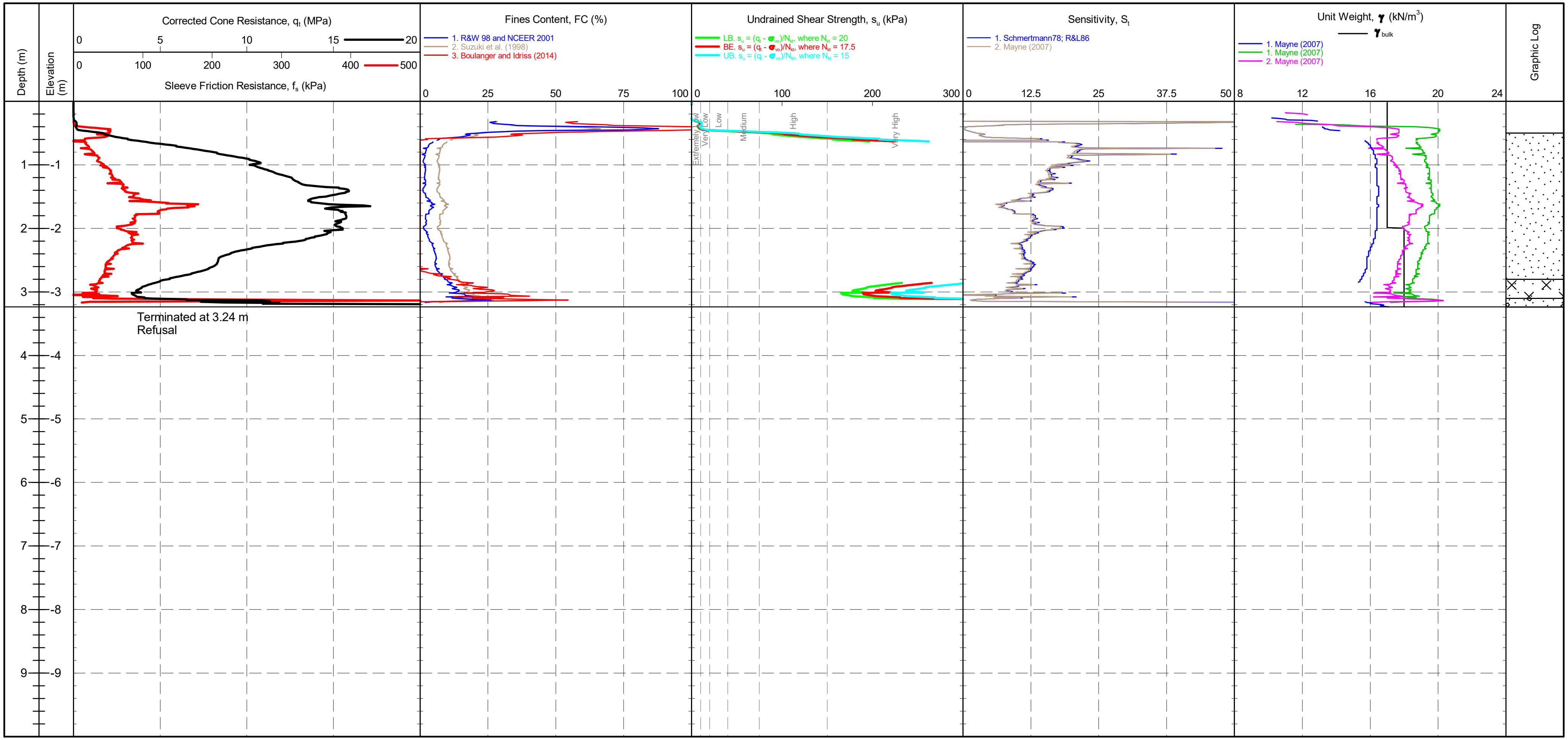
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
22

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm²
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

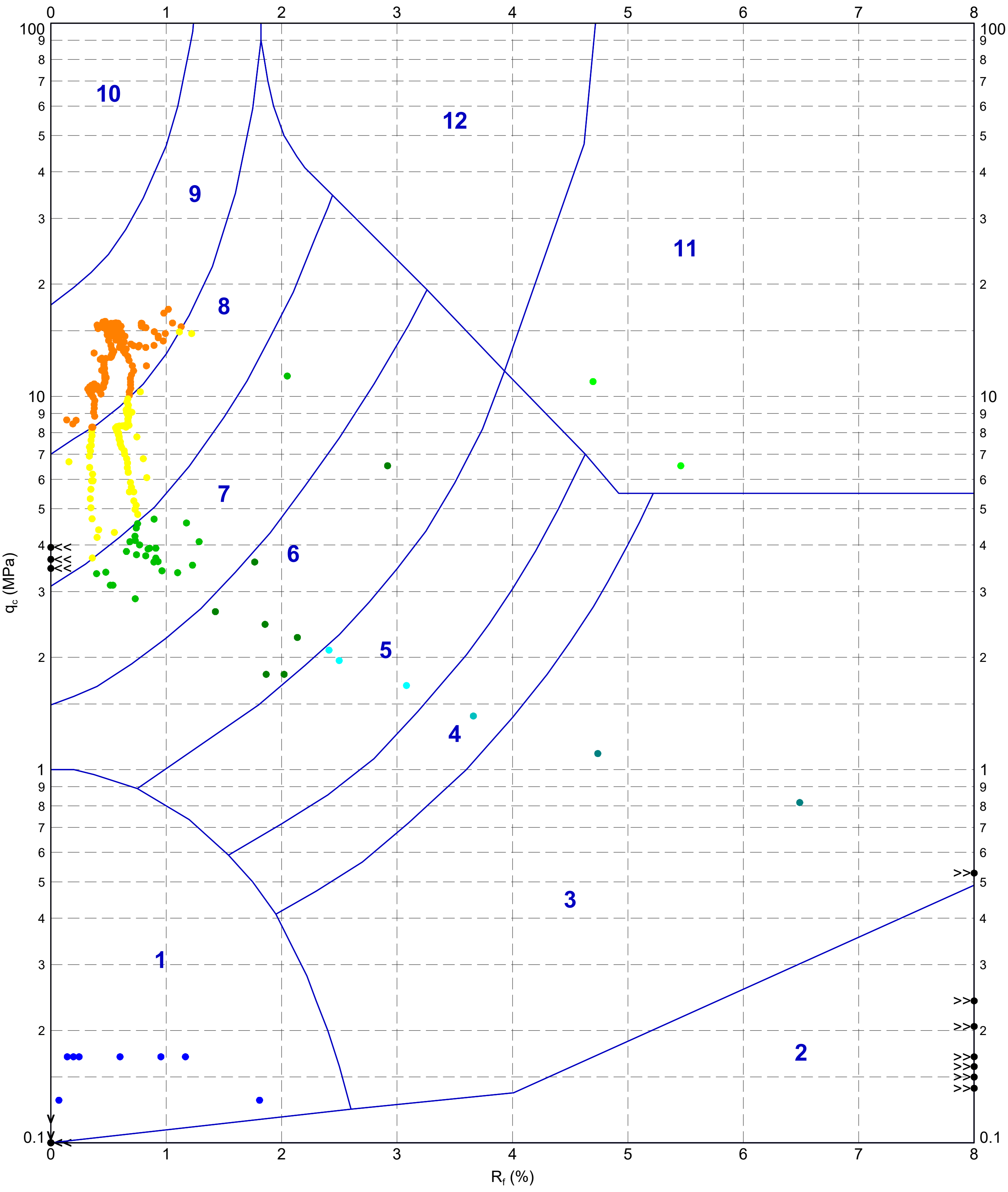
Transducer	Pre	Post	Difference
Tip	205 mV	203 mV	-0.022 MPa
Sleeve	204 mV	203 mV	-0.001 kPa
Pore Pressure 2	245 mV	236 mV	-0.002 kPa
X-Y Inclinometer	2633 mV	2656 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

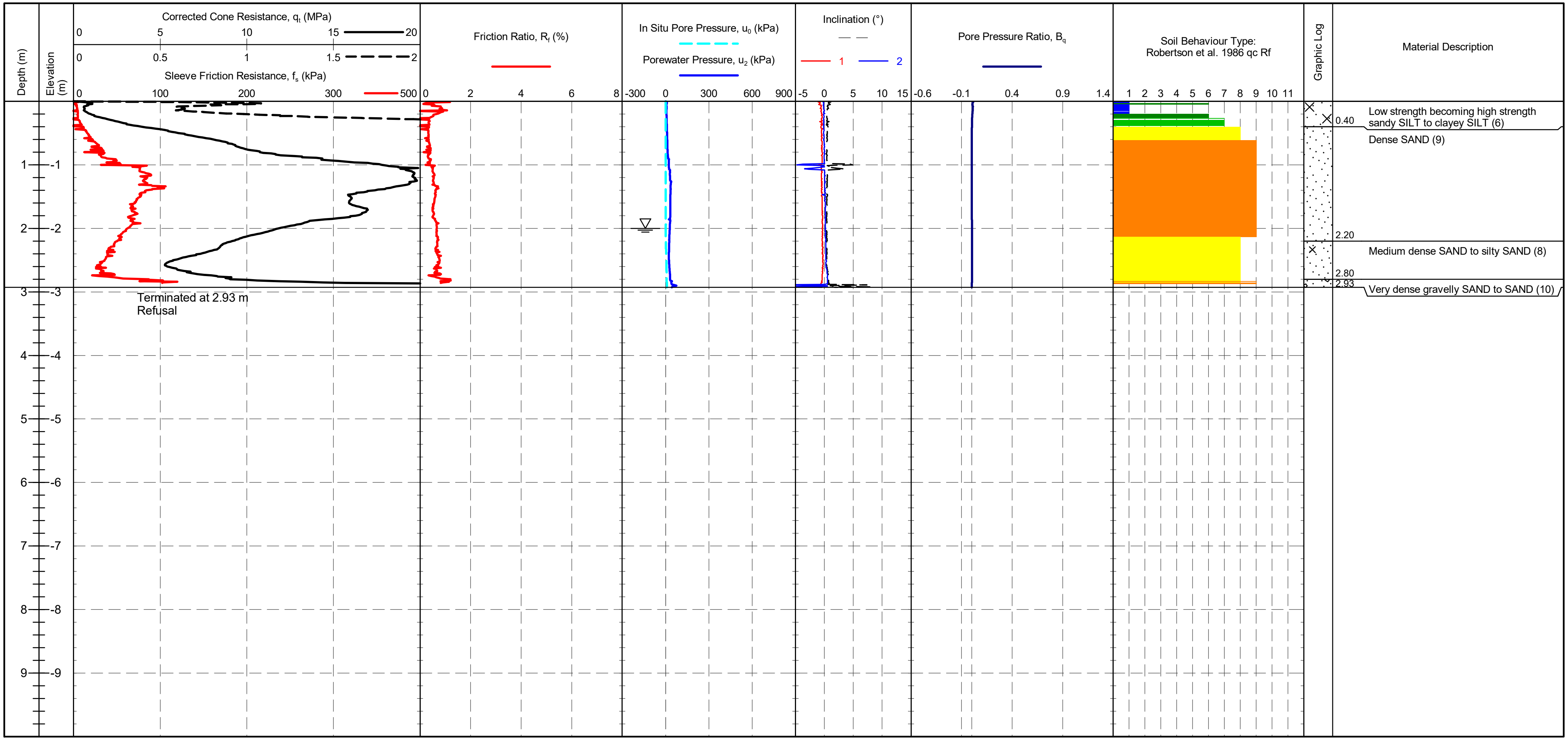
TITLE	DRAWN	DATE 26/10/2020
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 22	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **23**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	203 mV	-0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	242 mV	234 mV	-0.002 kPa
X-Y Inclinometer	2346 mV	2362 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

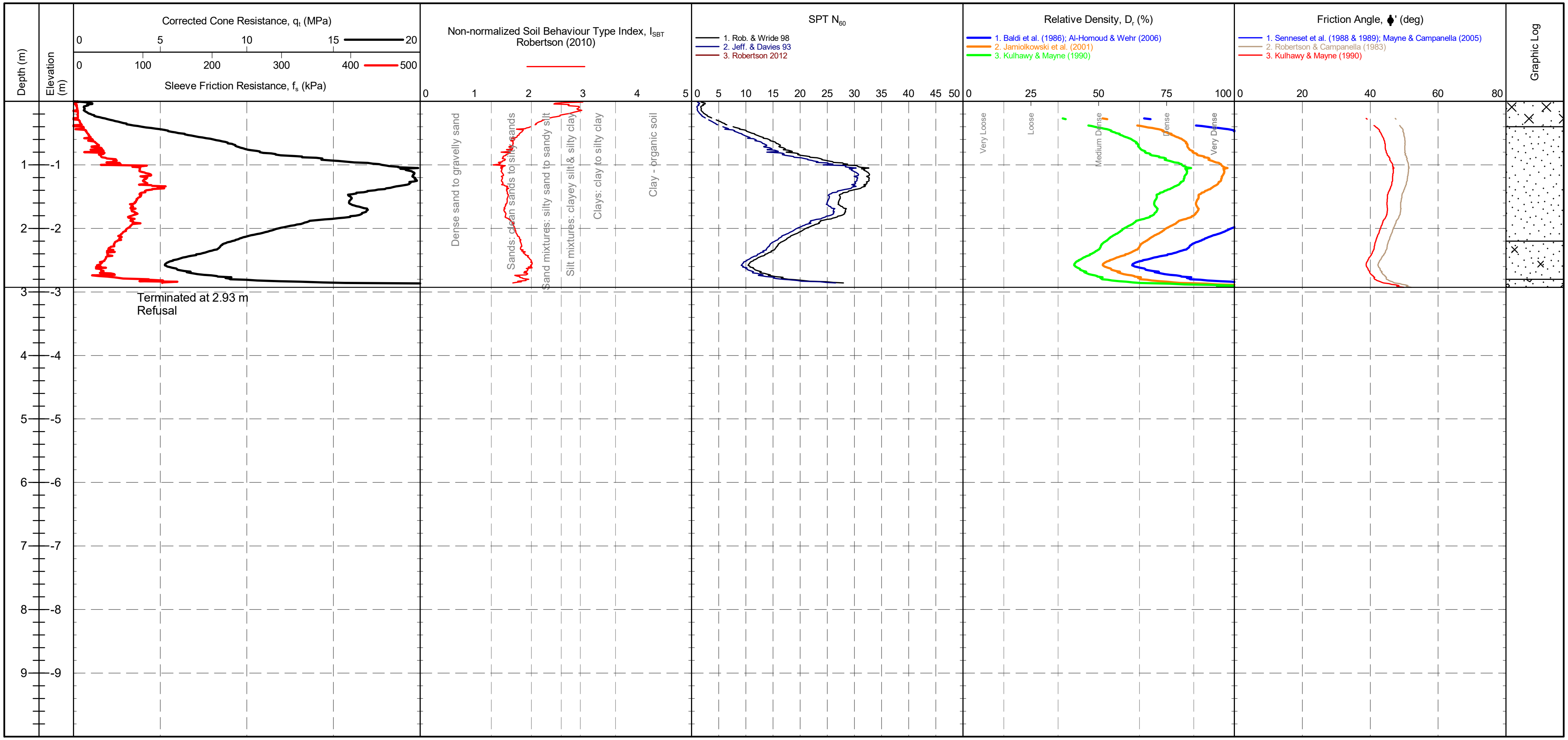
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID **23**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	203 mV	-0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	242 mV	234 mV	-0.002 kPa
X-Y Inclinometer	2346 mV	2362 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

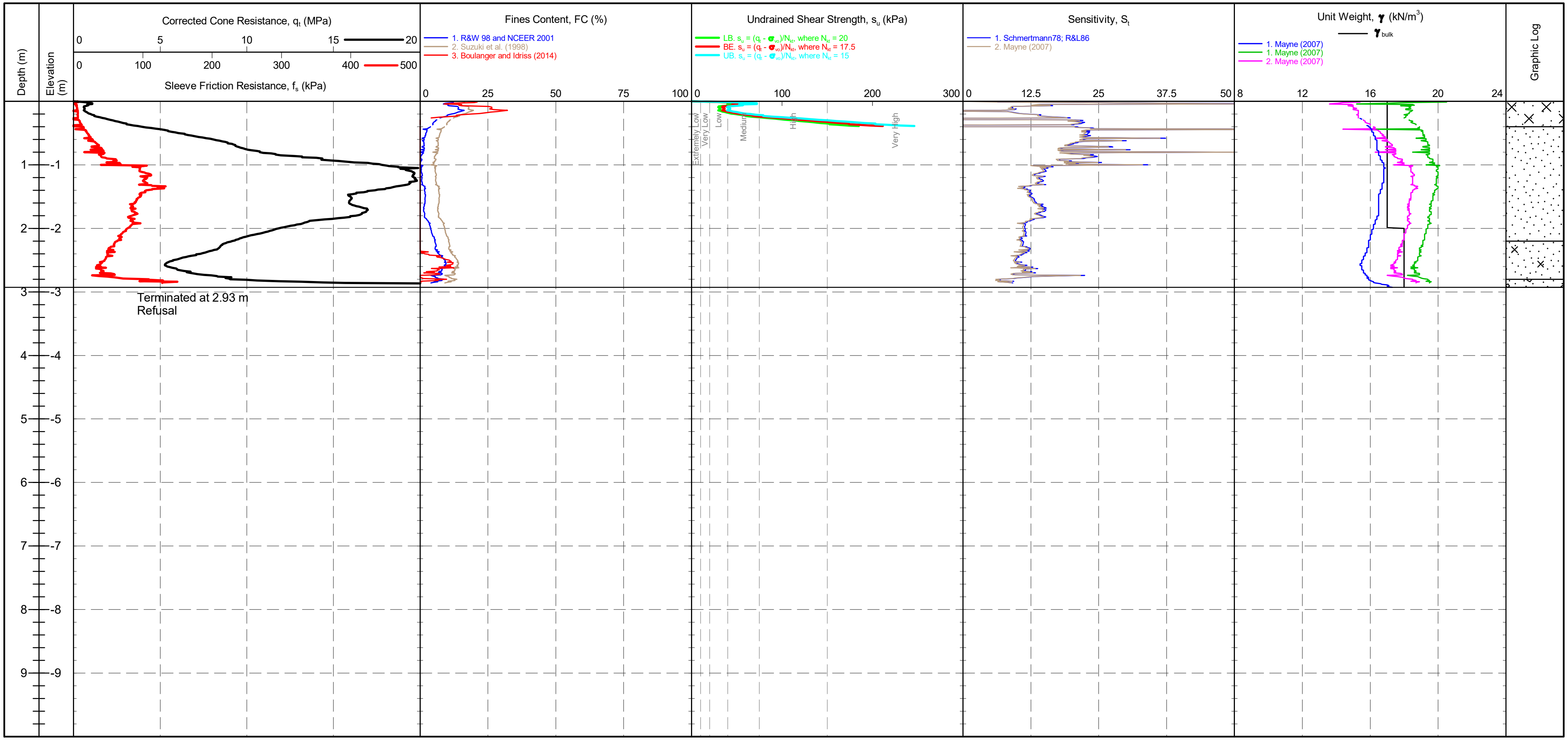
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
23

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

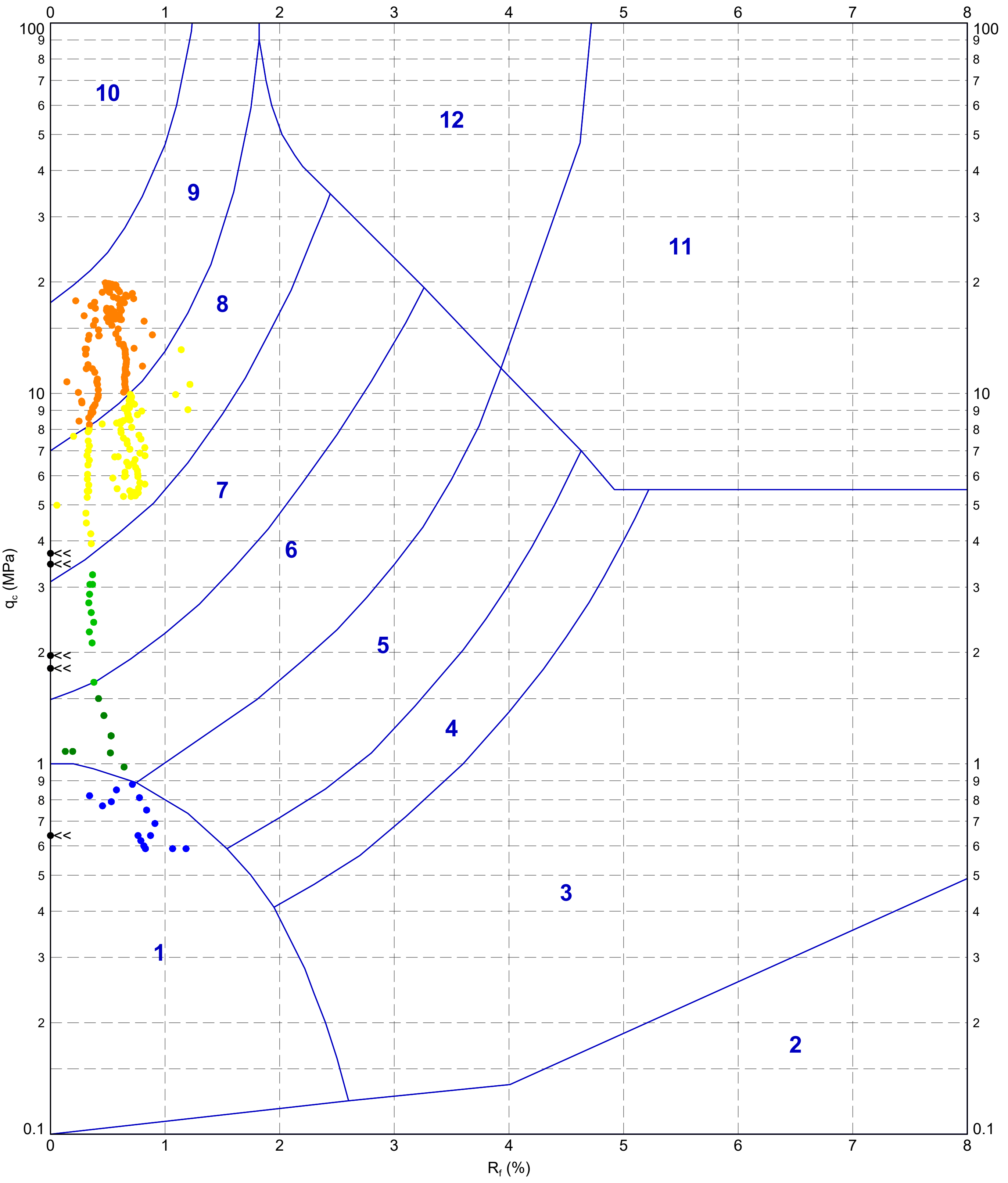
Transducer	Pre	Post	Difference
Tip	204 mV	203 mV	-0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	242 mV	234 mV	-0.002 kPa
X-Y Inclinometer	2346 mV	2362 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE	DRAWN	DATE 26/10/2020	
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 23	CHECKED	DATE 26/10/2020	
	SCALE Not To Scale		A4
	PROJECT No 1200410	FIGURE No	

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

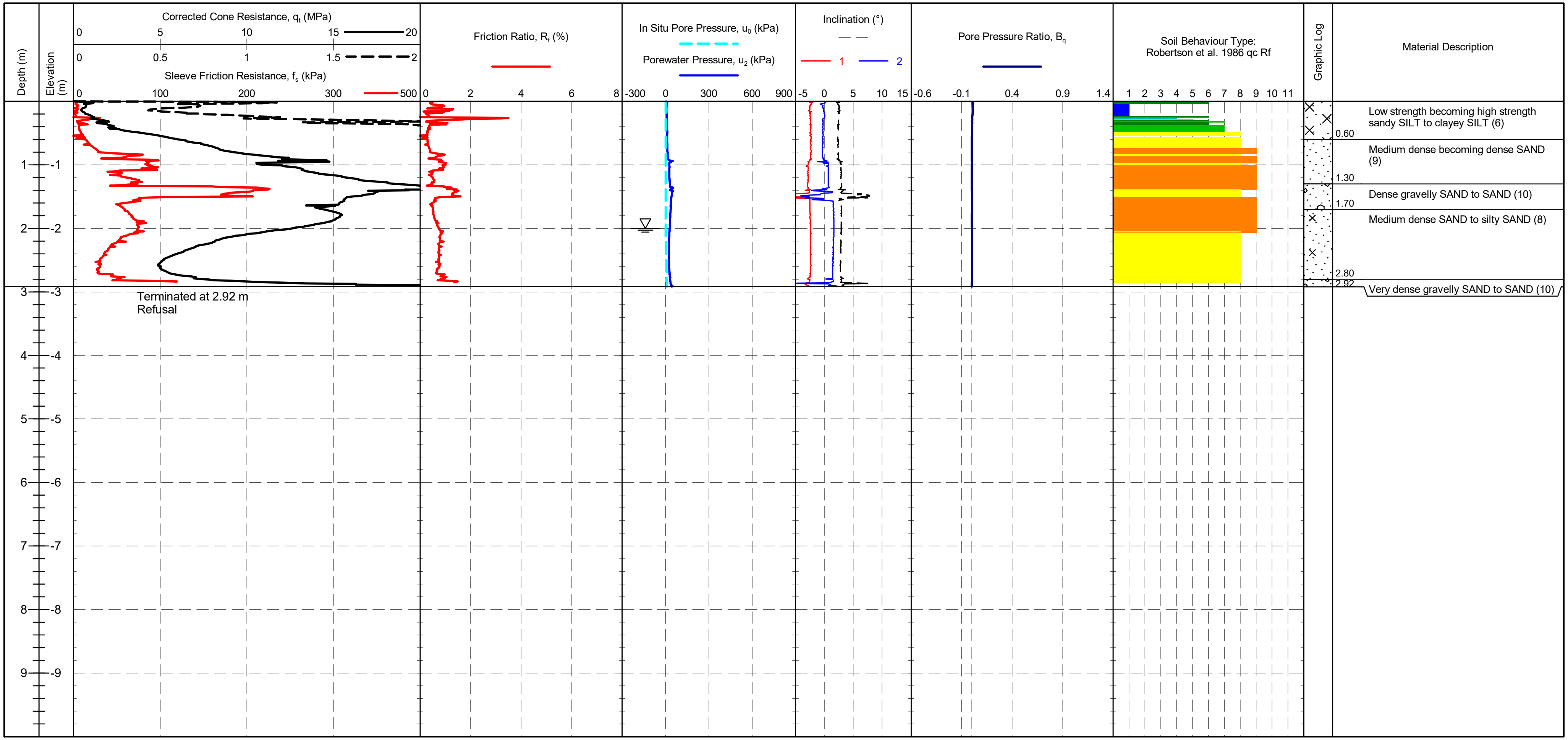
PointID
24

CLIENT : Soiltechnics
PROJECT : Lossiemouth
LOCATION : Lossiemouth
PROJECT No. : 1200410

EASTING : 0.0 m
NORTHING : 0.0 m
ELEVATION : 0.00 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 26/10/2020
METHOD : ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CALIBRATION DATE	:	26/07/2020
CONE MODEL	:	Subtraction
CONE AREA	:	15cm²
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild
GROUNDWATER DEPTH	:	Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	204 mV	0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	239 mV	231 mV	-0.002 kPa
X-Y Inclinometer	2246 mV	2208 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

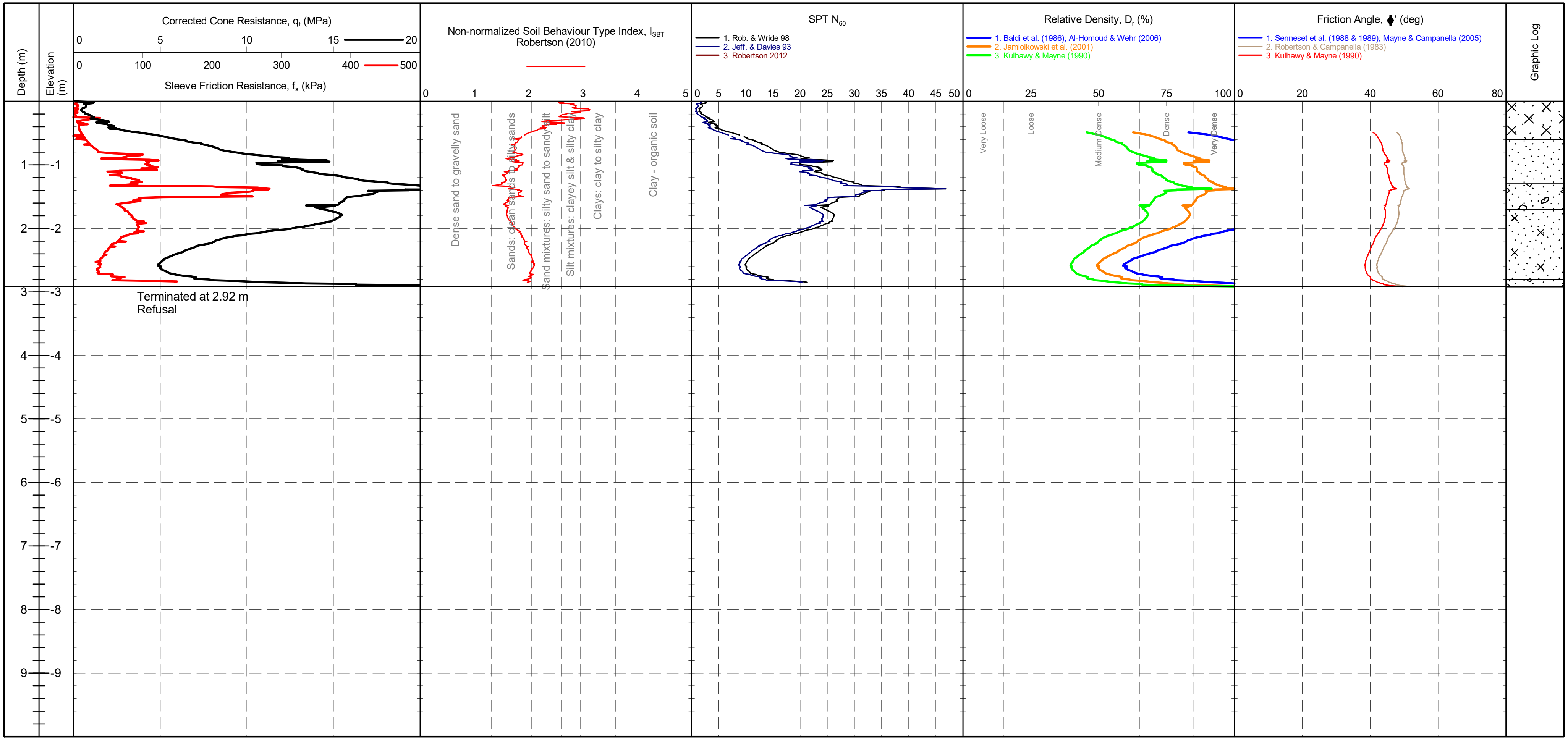
Groundwater Level
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION — Working with: soiltechnics environmental and geotechnical consultants

PointID
24

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	204 mV	0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	239 mV	231 mV	-0.002 kPa
X-Y Inclinometer	2246 mV	2208 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

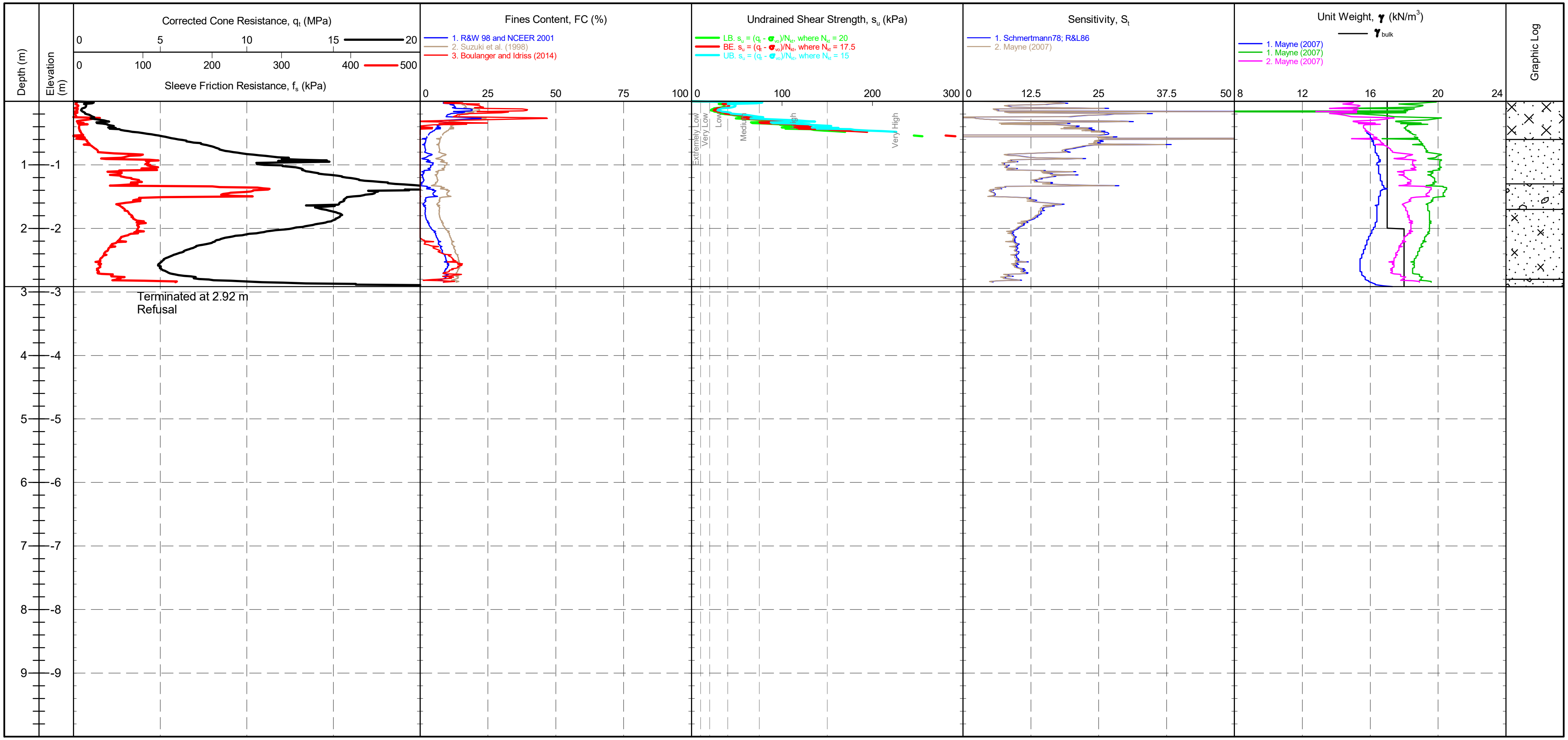
Dissipation Test

CPT LOG 03

SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID **24**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

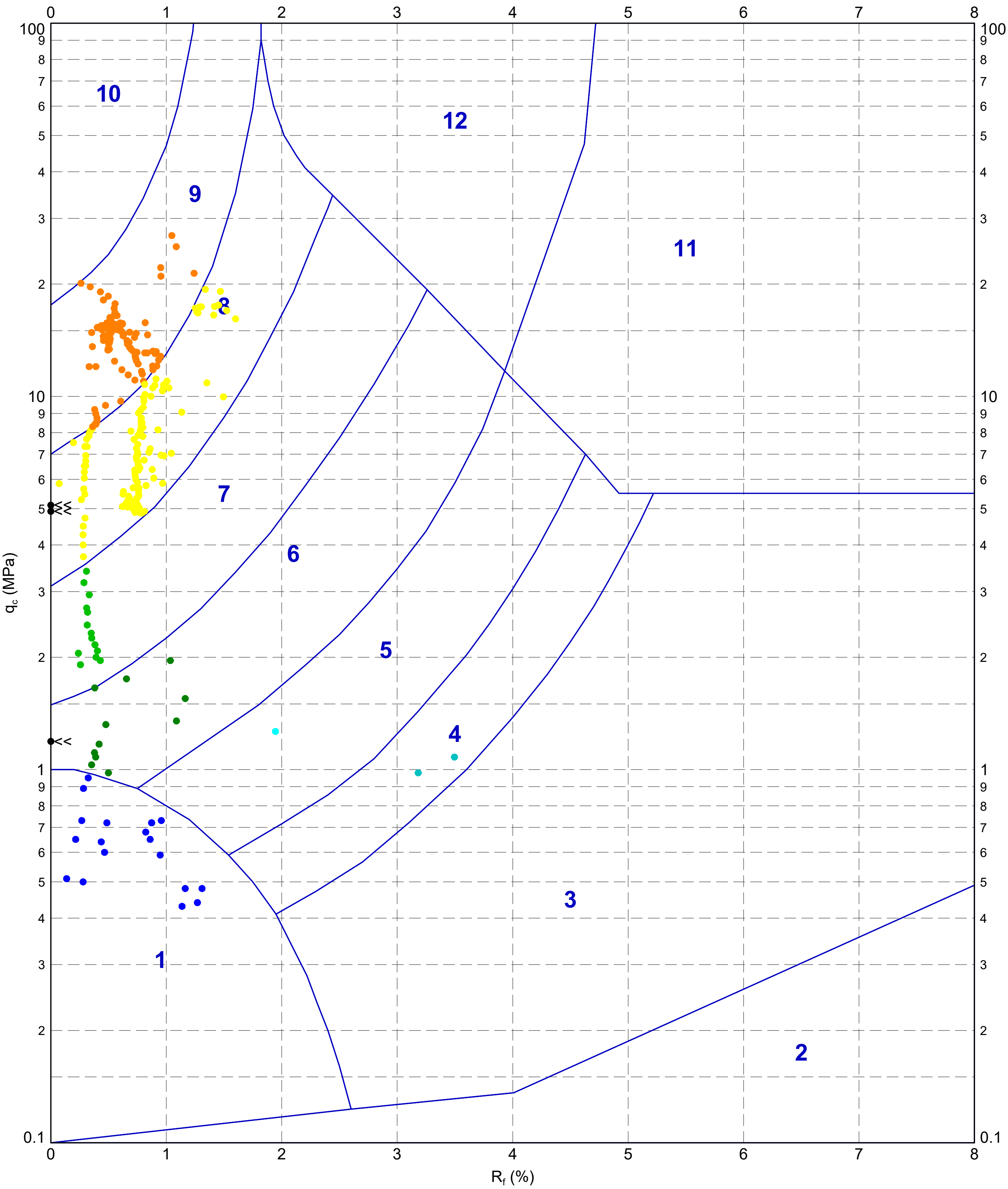
Transducer	Pre	Post	Difference
Tip	203 mV	204 mV	0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	239 mV	231 mV	-0.002 kPa
X-Y Inclinometer	2246 mV	2208 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

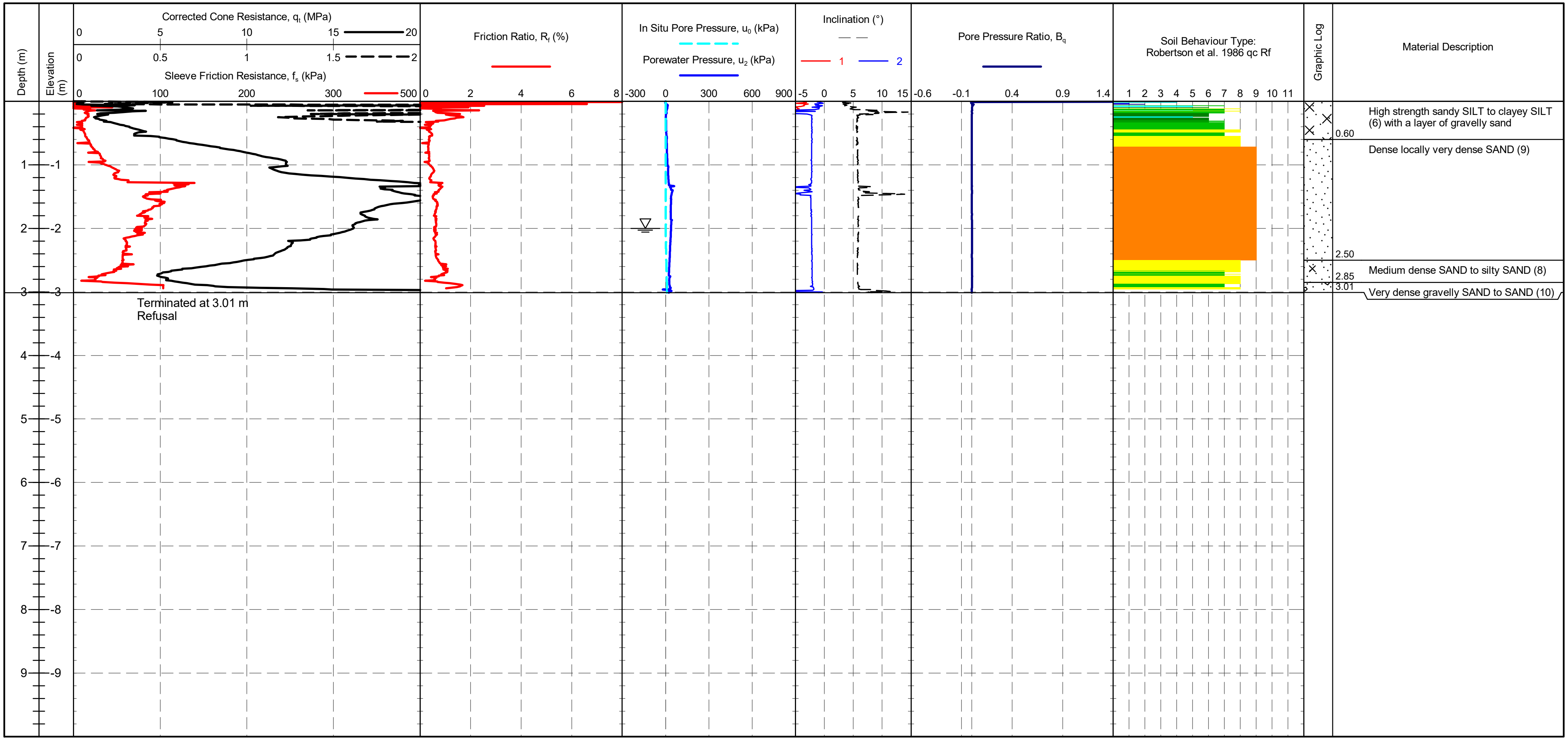
TITLE: Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 24	DRAWN	DATE 26/10/2020	
	CHECKED	DATE 26/10/2020	
	SCALE Not To Scale		A4
	PROJECT No 1200410	FIGURE No	

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
25

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	203 mV	-0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	239 mV	231 mV	-0.002 kPa
X-Y Inclinometer	2075 mV	2097 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

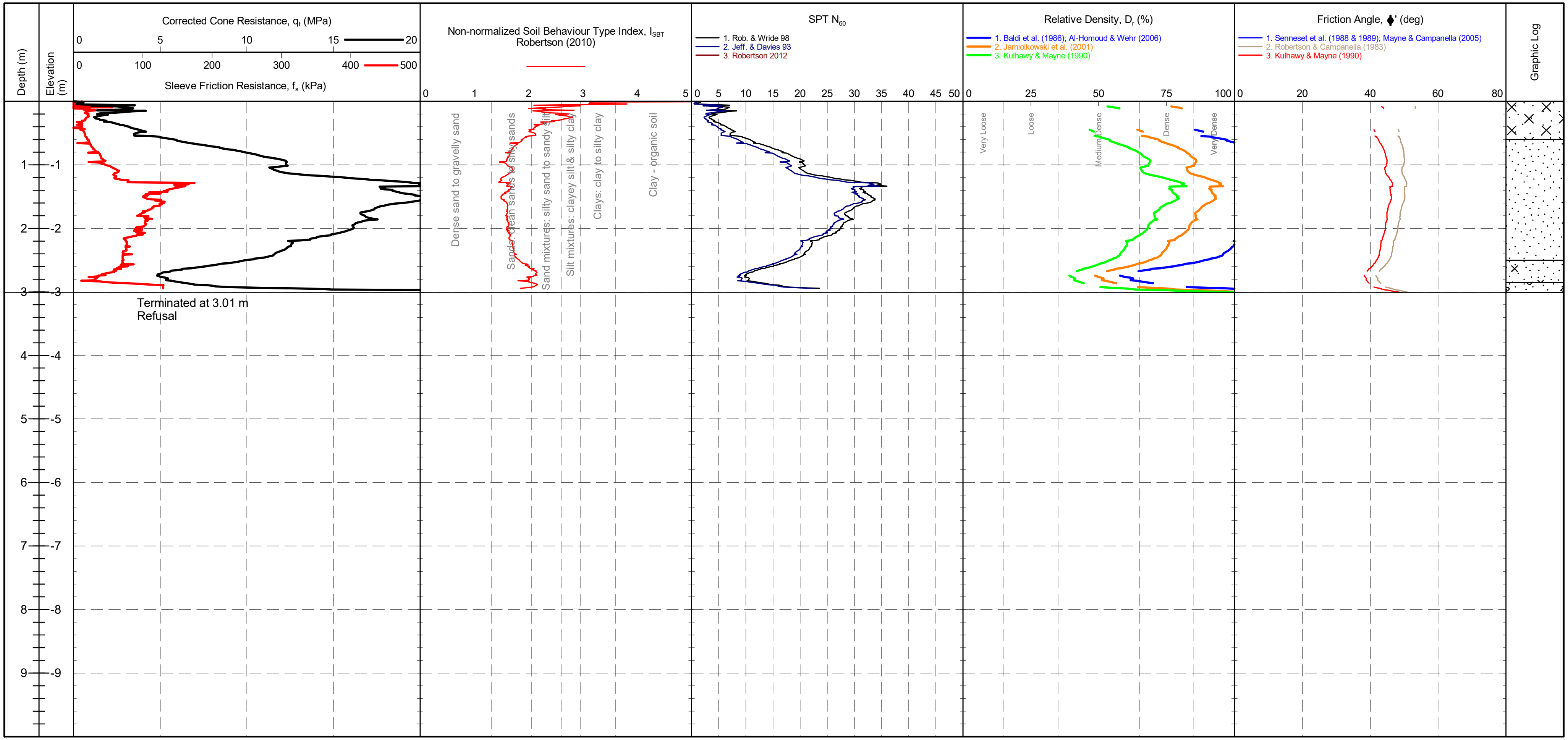
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
25

CLIENT : Soiltechnics	EASTING	: 0.0 m	Remark:	SHEET	: 1 OF 1
PROJECT : Lossiemouth	NORTHING	: 0.0 m	Test refused on tip resistance.	STATUS	: Final
LOCATION : Lossiemouth	ELEVATION	: 0.00 m OD		TEST DATE	: 20/10/2020
PROJECT No. : 1200410	CHECKED BY	: LD		PLOT DATE	: 26/10/2020
	TERMINATION REASON	: Refusal		METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	203 mV	-0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	239 mV	231 mV	-0.002 kPa
X-Y Inclinometer	2075 mV	2097 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

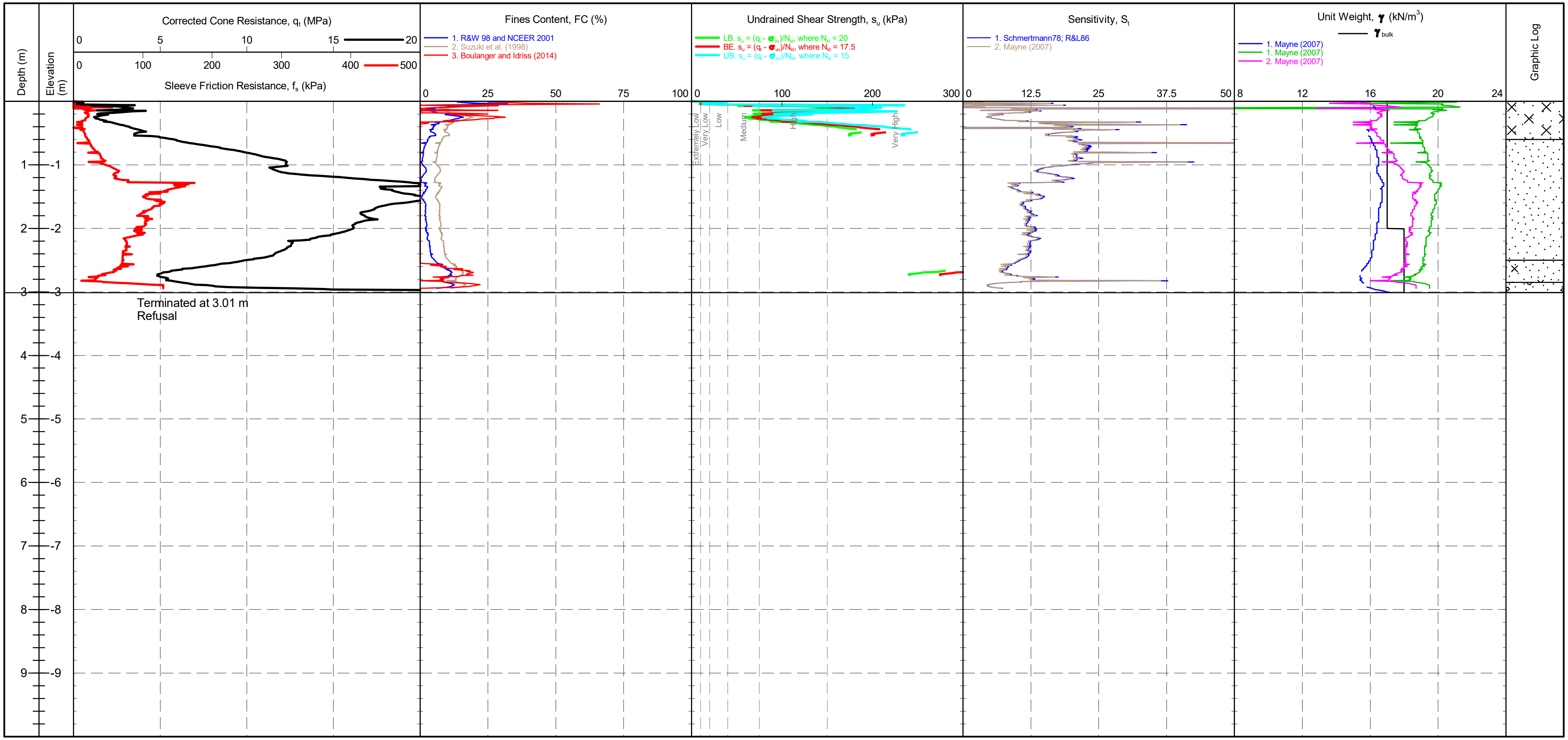
Dissipation Test

CPT LOG 03

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
25

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2				
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2				
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen				
CONE AREA RATIO	: 0.79	OPERATOR	: RS				
FILTER POSITION	: u2	FRICTION REDUCER	: None				
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild				

CPTU ZERO VALUES

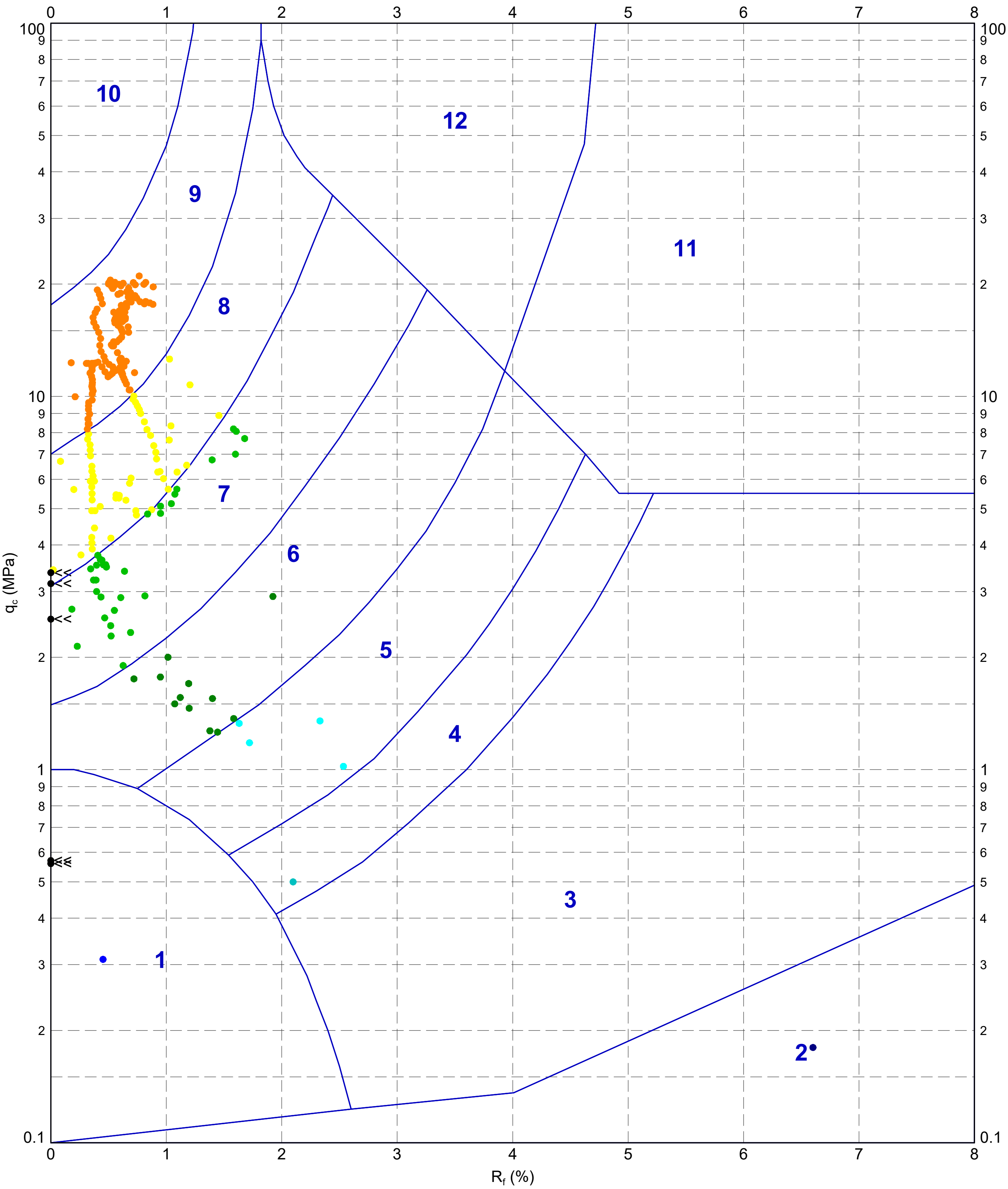
Transducer	Pre	Post	Difference
Tip	204 mV	203 mV	-0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	239 mV	231 mV	-0.002 kPa
X-Y Inclinometer	2075 mV	2097 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE	DRAWN	DATE 26/10/2020
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 25	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

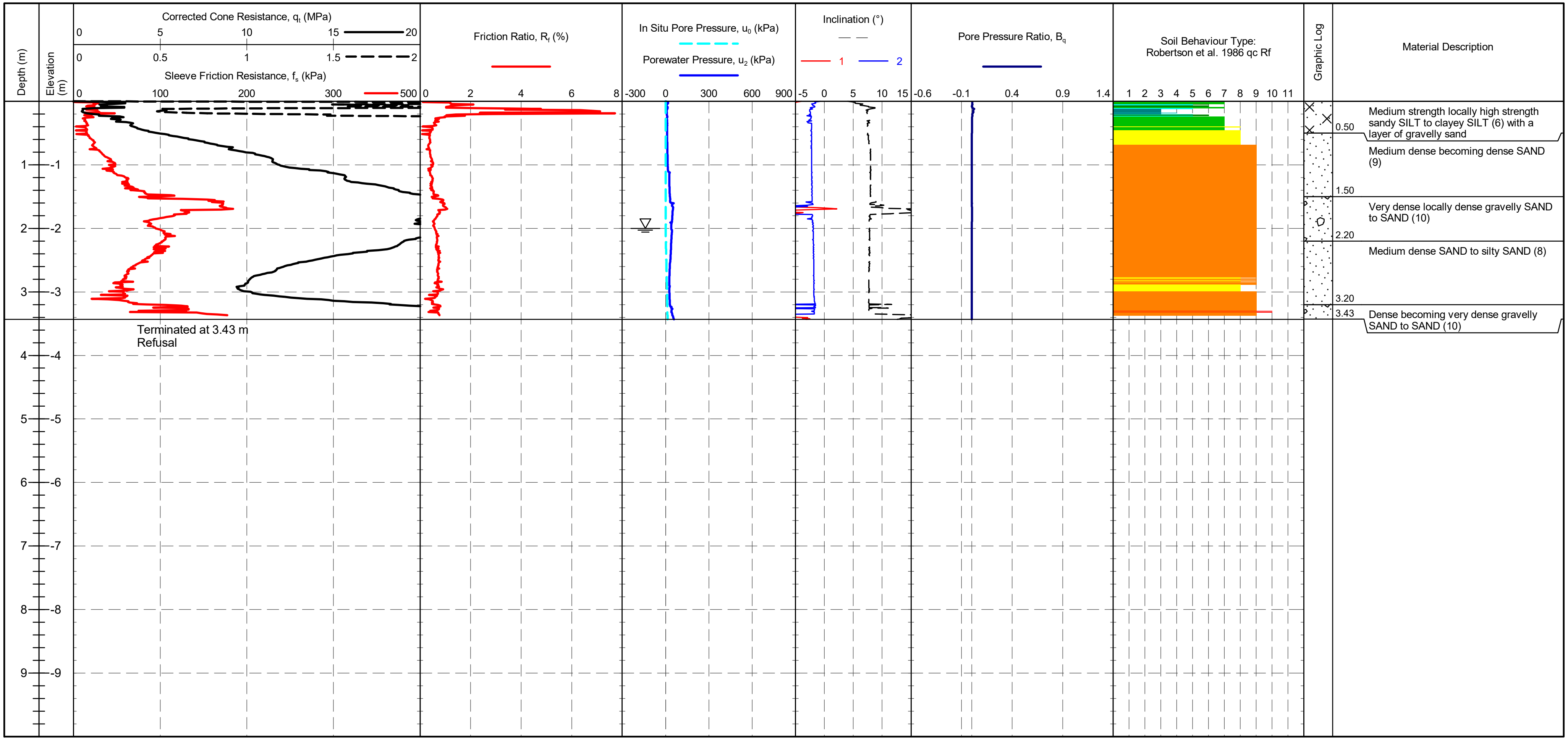
CPT LOG 01

PointID **26**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 26/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	202 mV	-0.022 MPa
Sleeve	202 mV	205 mV	0.002 kPa
Pore Pressure 2	238 mV	223 mV	-0.004 kPa
X-Y Inclinometer	1980 mV	1993 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

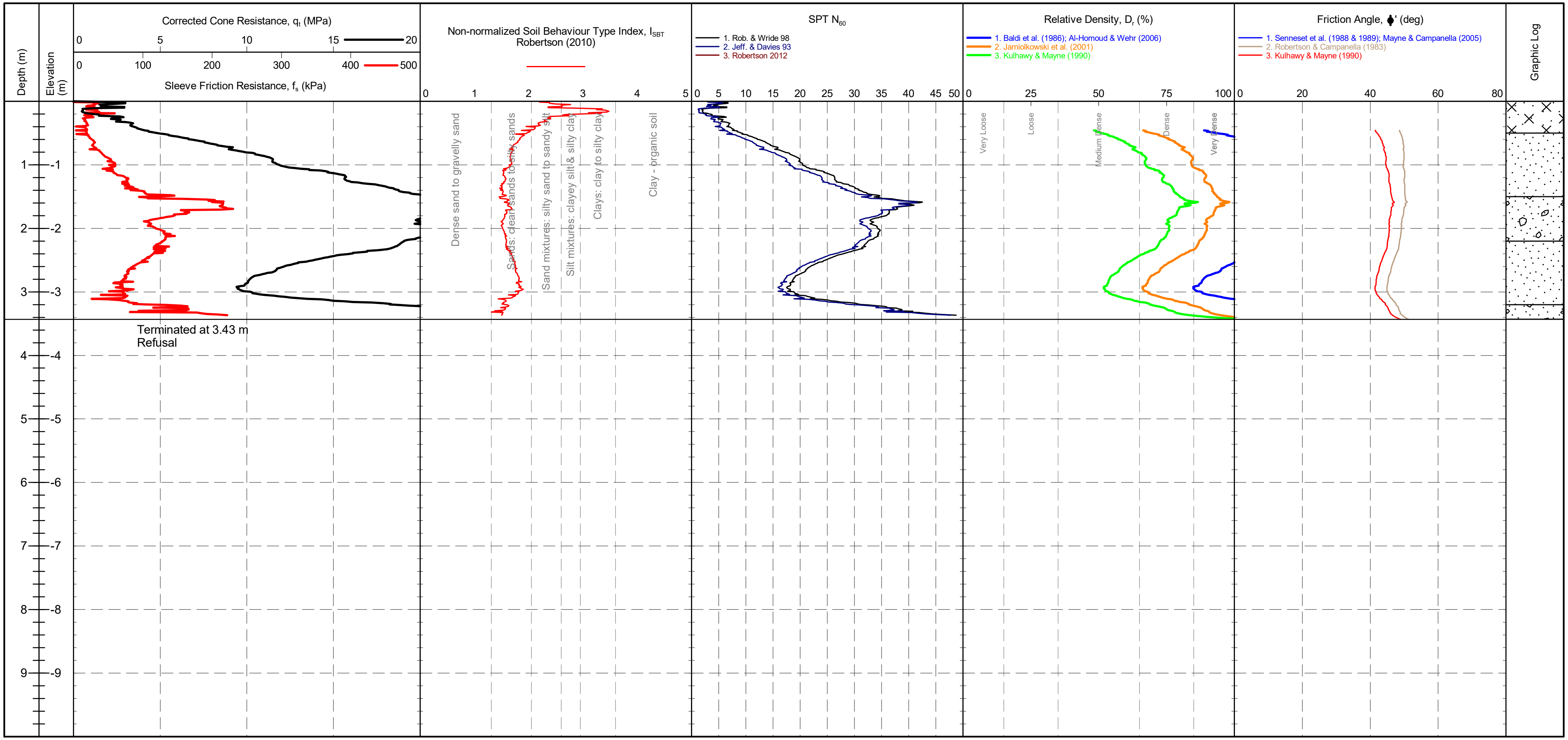
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID **26**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	202 mV	-0.022 MPa
Sleeve	202 mV	205 mV	0.002 kPa
Pore Pressure 2	238 mV	223 mV	-0.004 kPa
X-Y Inclinometer	1980 mV	1993 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

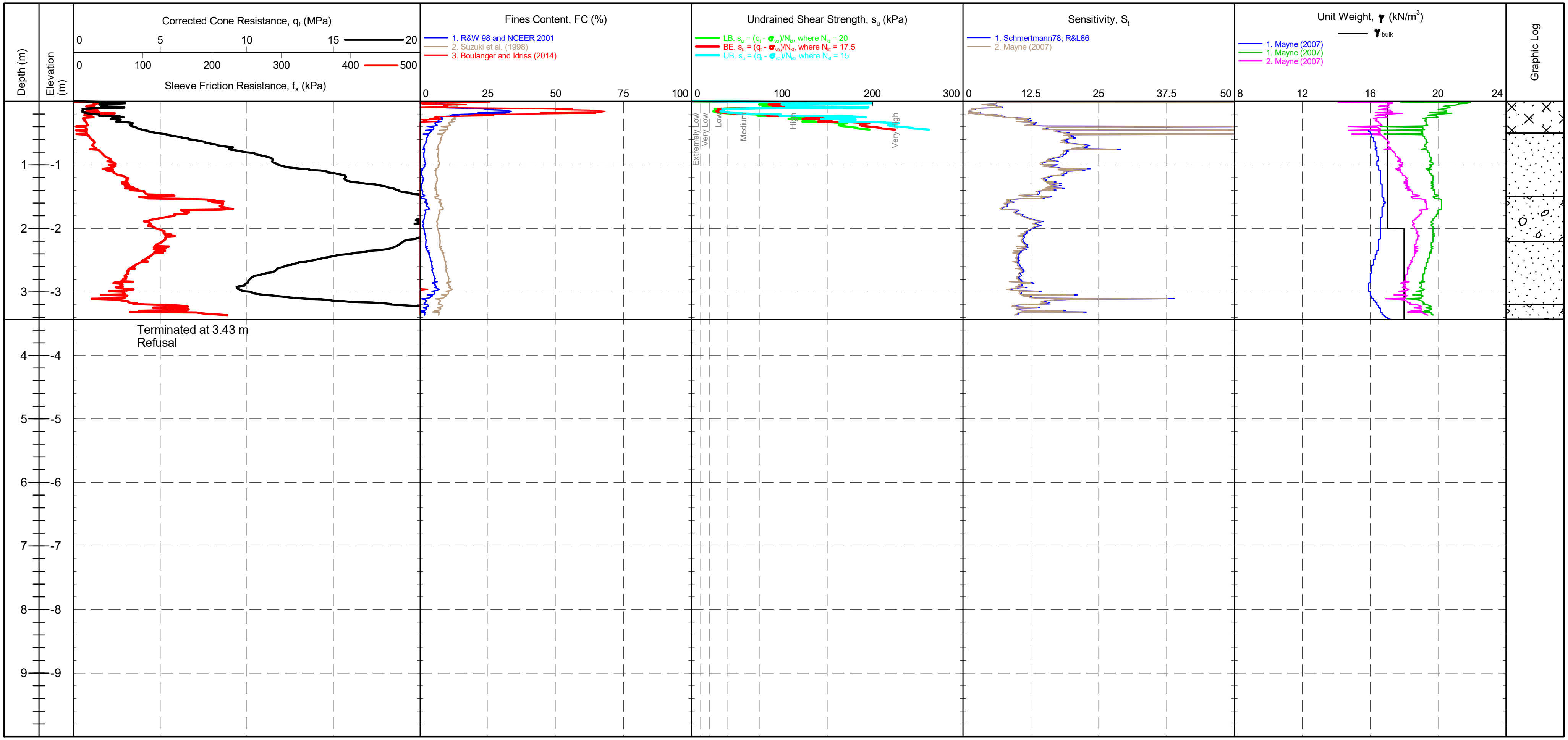
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
26

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	15cm^2
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

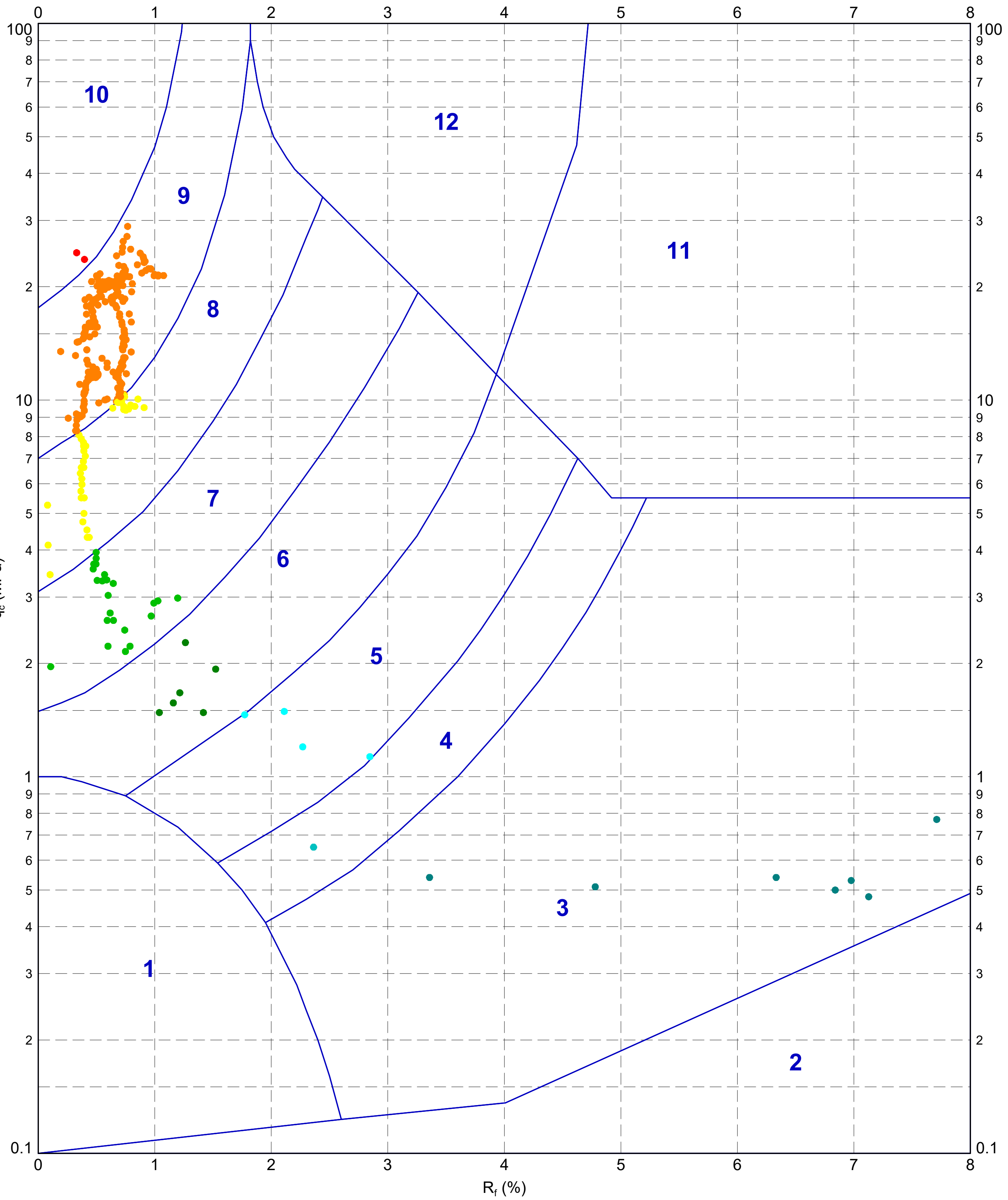
Transducer	Pre	Post	Difference
Tip	204 mV	202 mV	-0.022 MPa
Sleeve	202 mV	205 mV	0.002 kPa
Pore Pressure 2	238 mV	223 mV	-0.004 kPa
X-Y Inclinometer	1980 mV	1993 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

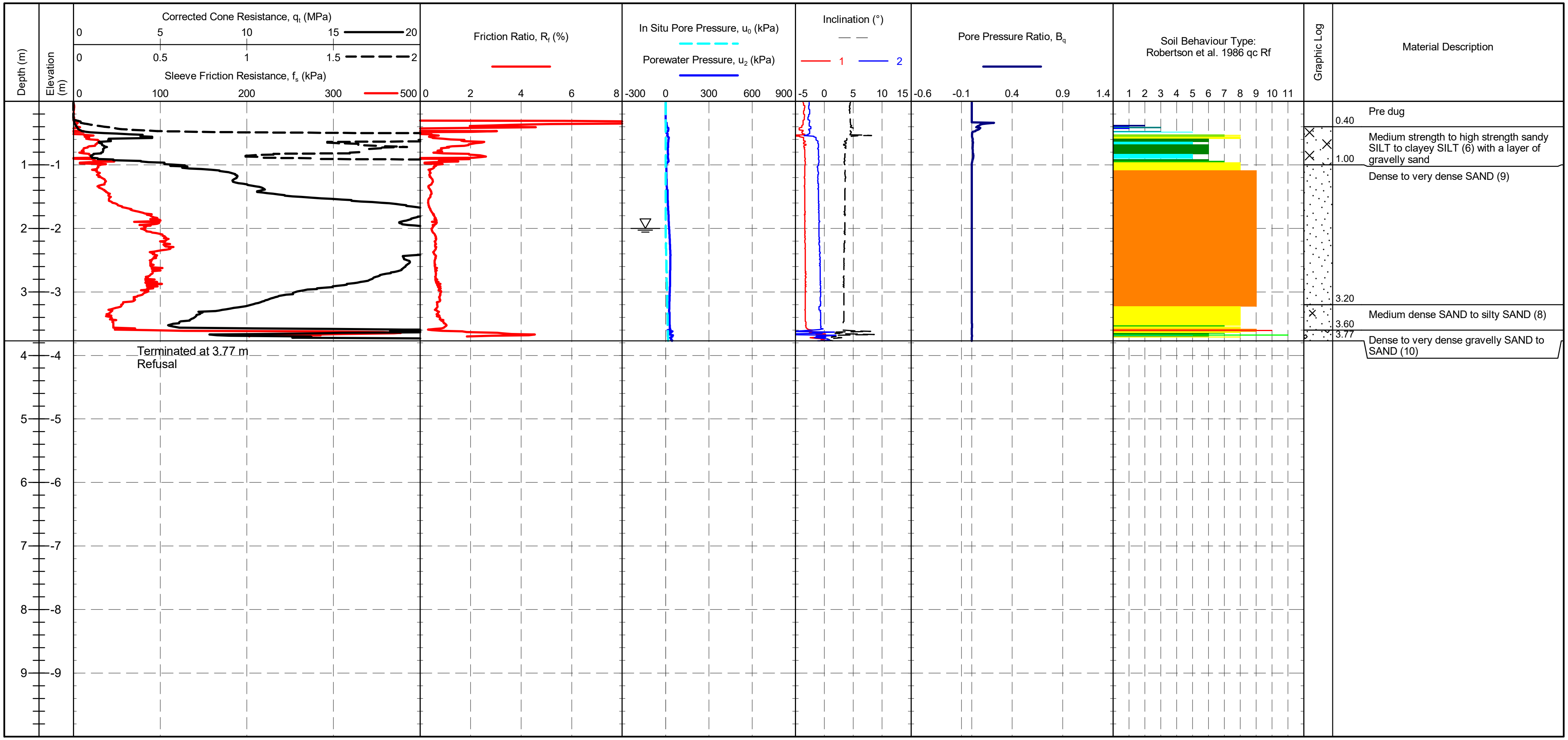
TITLE	DRAWN	DATE 26/10/2020
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 26	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID
27

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858 CALIBRATION DATE : 26/07/2020 CONE MODEL : Subtraction CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 017 - Griffen OPERATOR : RS FRICTION REDUCER : None WEATHER : Raining & Mild GROUNDWATER DEPTH : Assumed for calculation purposes.		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	202 mV	-0.043 MPa
Sleeve	205 mV	202 mV	-0.002 kPa
Pore Pressure 2	238 mV	225 mV	-0.003 kPa
X-Y Inclinometer	2061 mV	2111 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

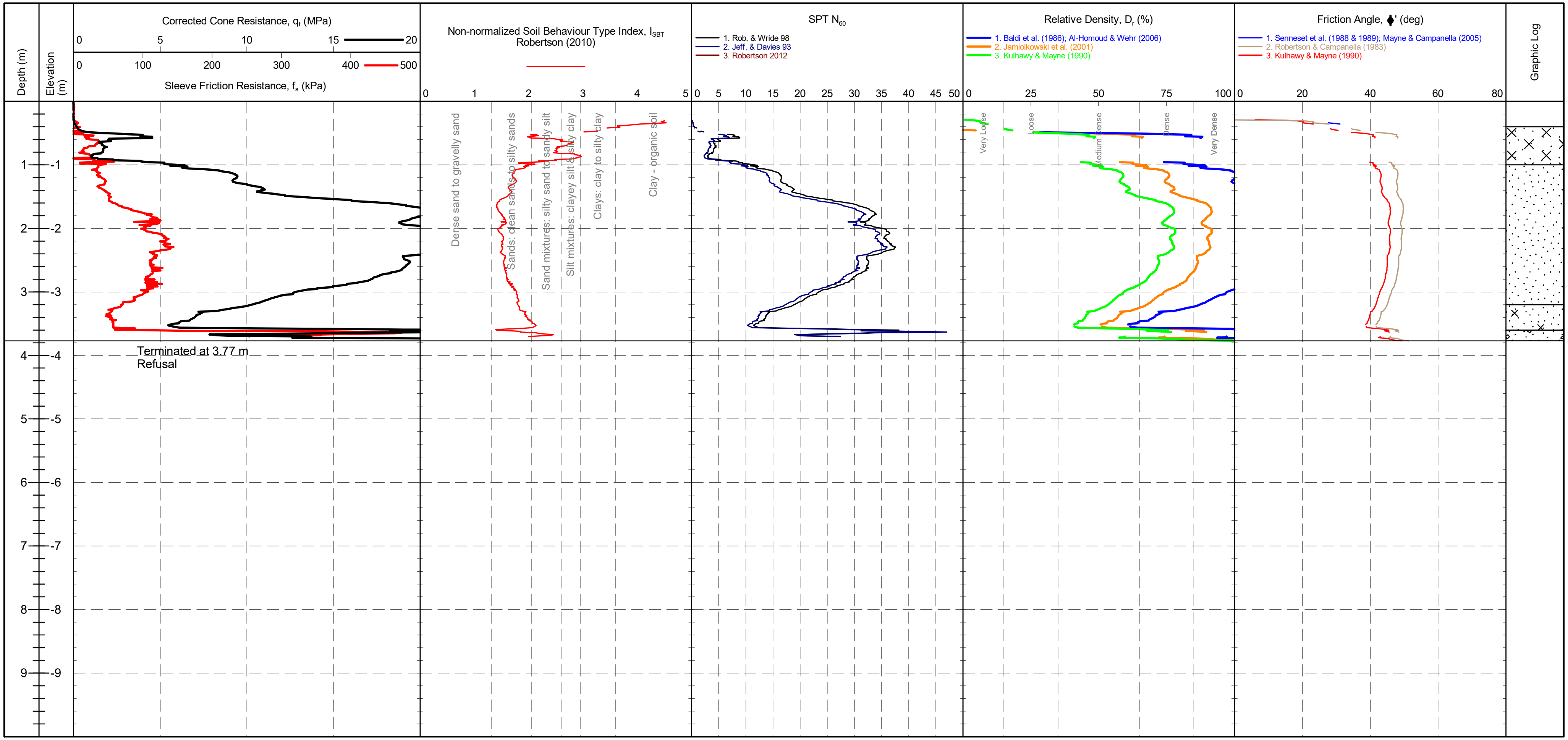
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
27

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2	CPTU ZERO VALUES						
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference			
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen	Tip	206 mV	202 mV	-0.043 MPa			
CONE AREA RATIO	: 0.79	OPERATOR	: RS	Sleeve	205 mV	202 mV	-0.002 kPa			
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	238 mV	225 mV	-0.003 kPa			
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild	X-Y Inclinometer	2061 mV	2111 mV				

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

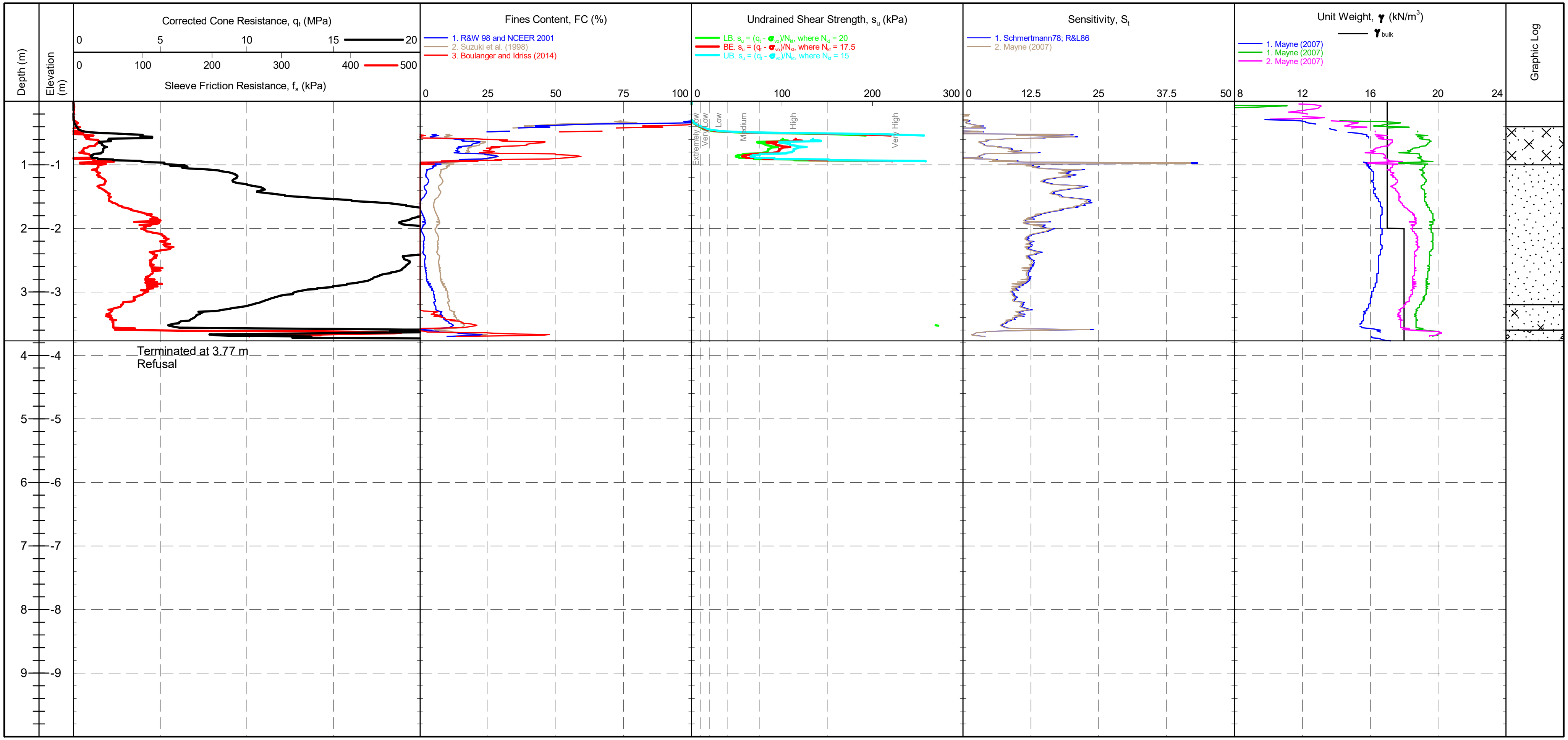
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID **27**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

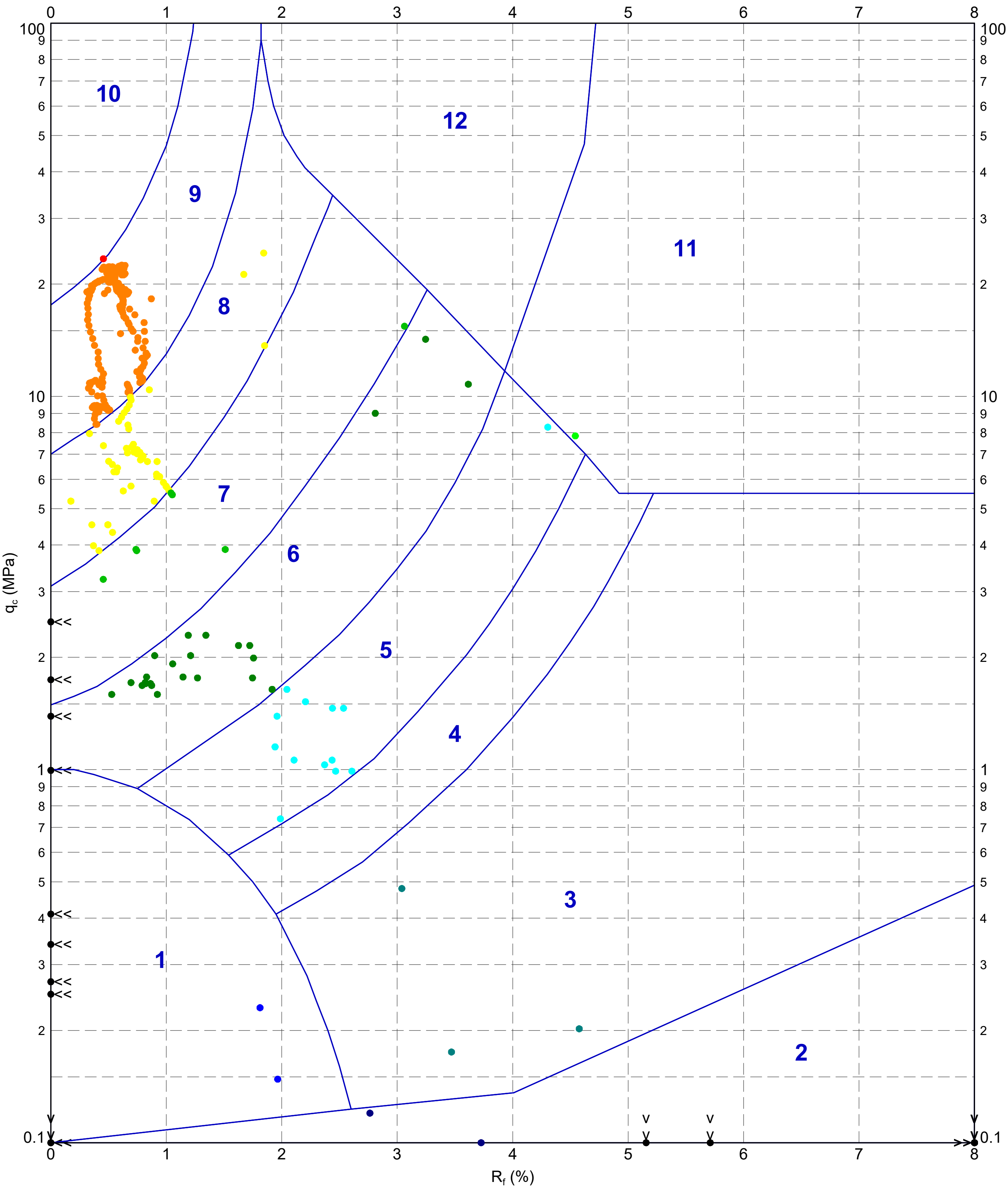
Transducer	Pre	Post	Difference
Tip	206 mV	202 mV	-0.043 MPa
Sleeve	205 mV	202 mV	-0.002 kPa
Pore Pressure 2	238 mV	225 mV	-0.003 kPa
X-Y Inclinometer	2061 mV	2111 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE	DRAWN	DATE 26/10/2020
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 27	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

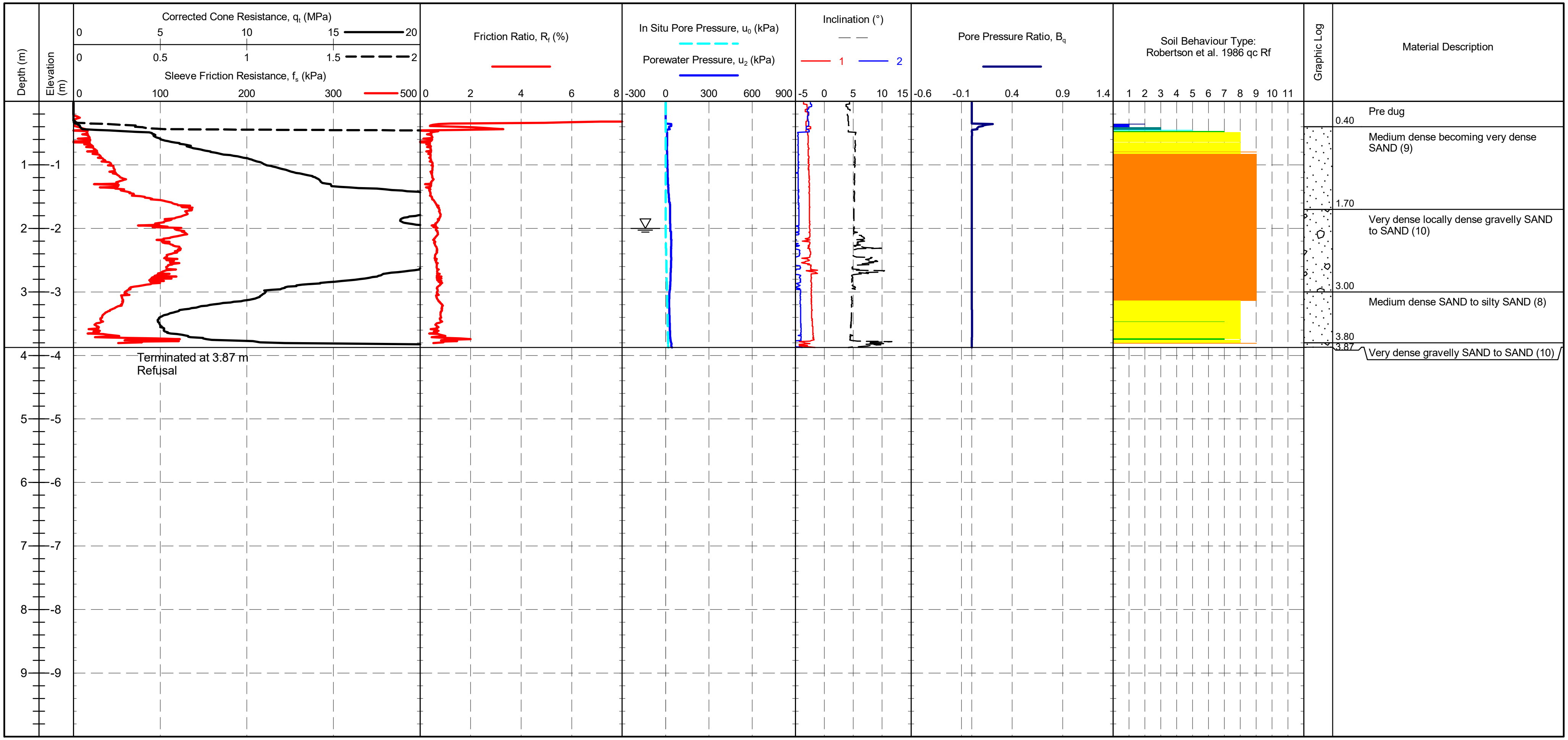
PointID **28**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CALIBRATION DATE	: 26/07/2020
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild
GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	204 mV	0.011 MPa
Sleeve	202 mV	204 mV	0.001 kPa
Pore Pressure 2	230 mV	231 mV	0 kPa
X-Y Inclinometer	2105 mV	2198 mV	

METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

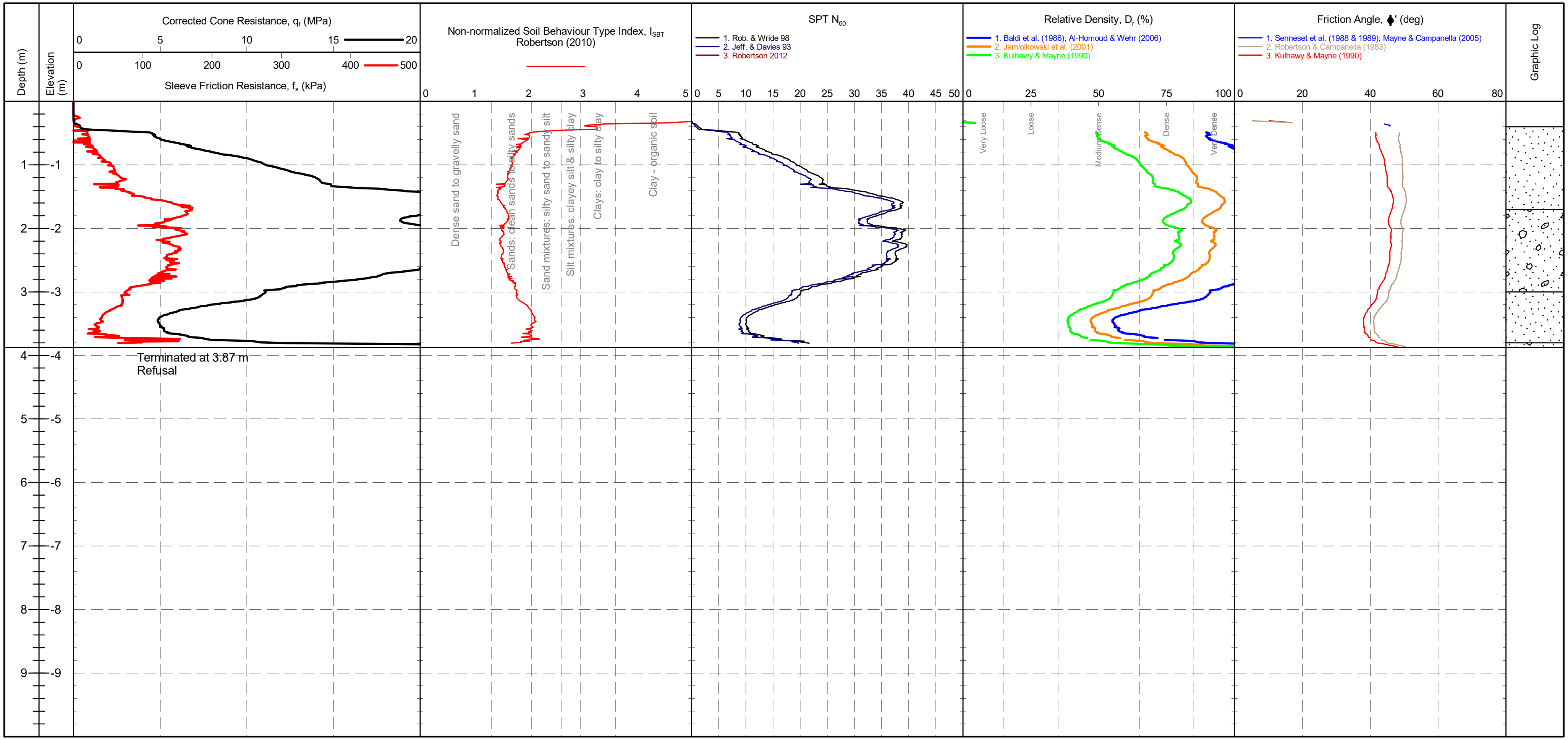
PointID **28**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	204 mV	0.011 MPa
Sleeve	202 mV	204 mV	0.001 kPa
Pore Pressure 2	230 mV	231 mV	0 kPa
X-Y Inclinometer	2105 mV	2198 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID

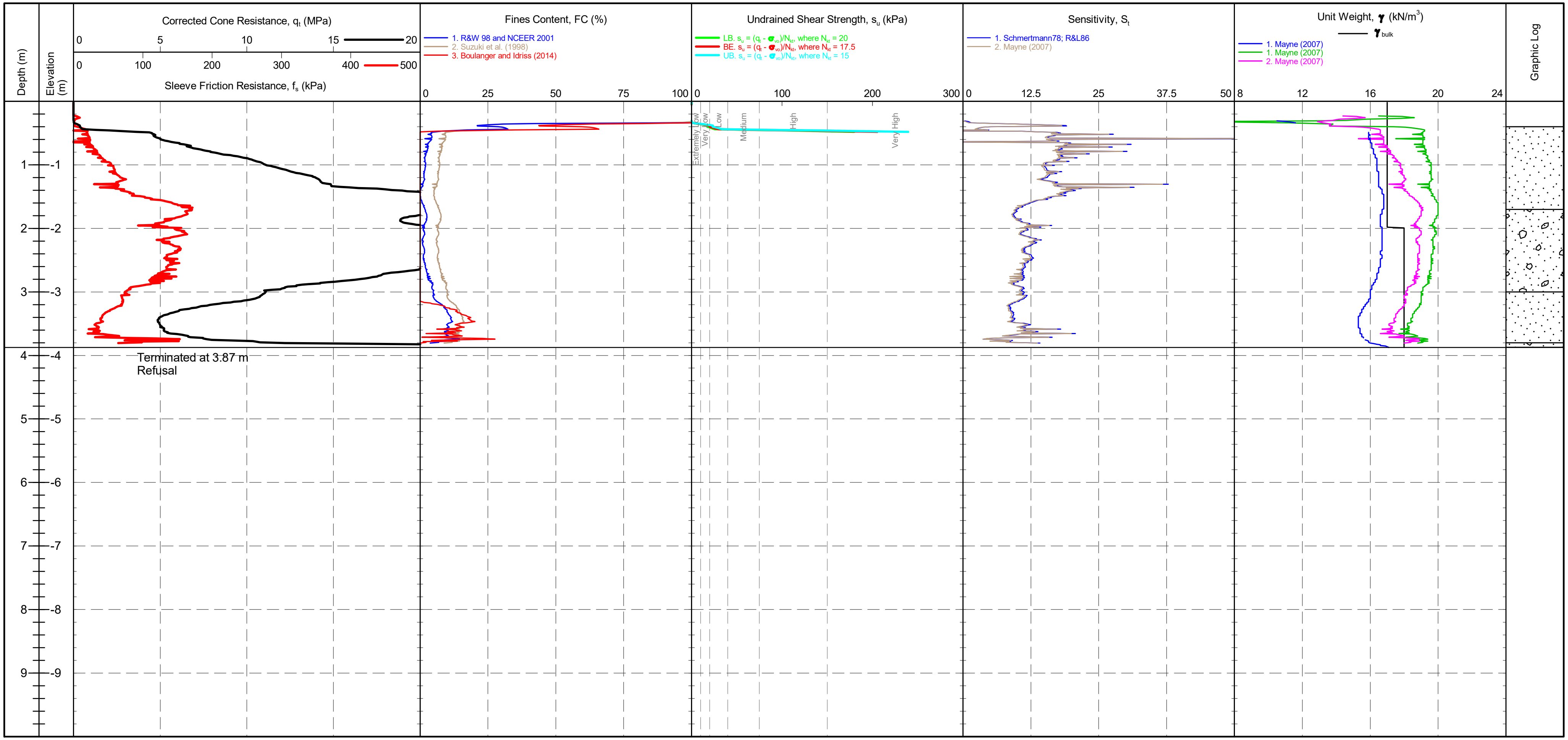
28

CLIENT : Soiltechnics
PROJECT : Lossiemouth
LOCATION : Lossiemouth
PROJECT No. : 1200410

EASTING : 0.0 m
NORTHING : 0.0 m
ELEVATION : 0.00 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 26/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen		
CONE AREA RATIO	: 0.79	OPERATOR	: RS		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild		

CPTU ZERO VALUES

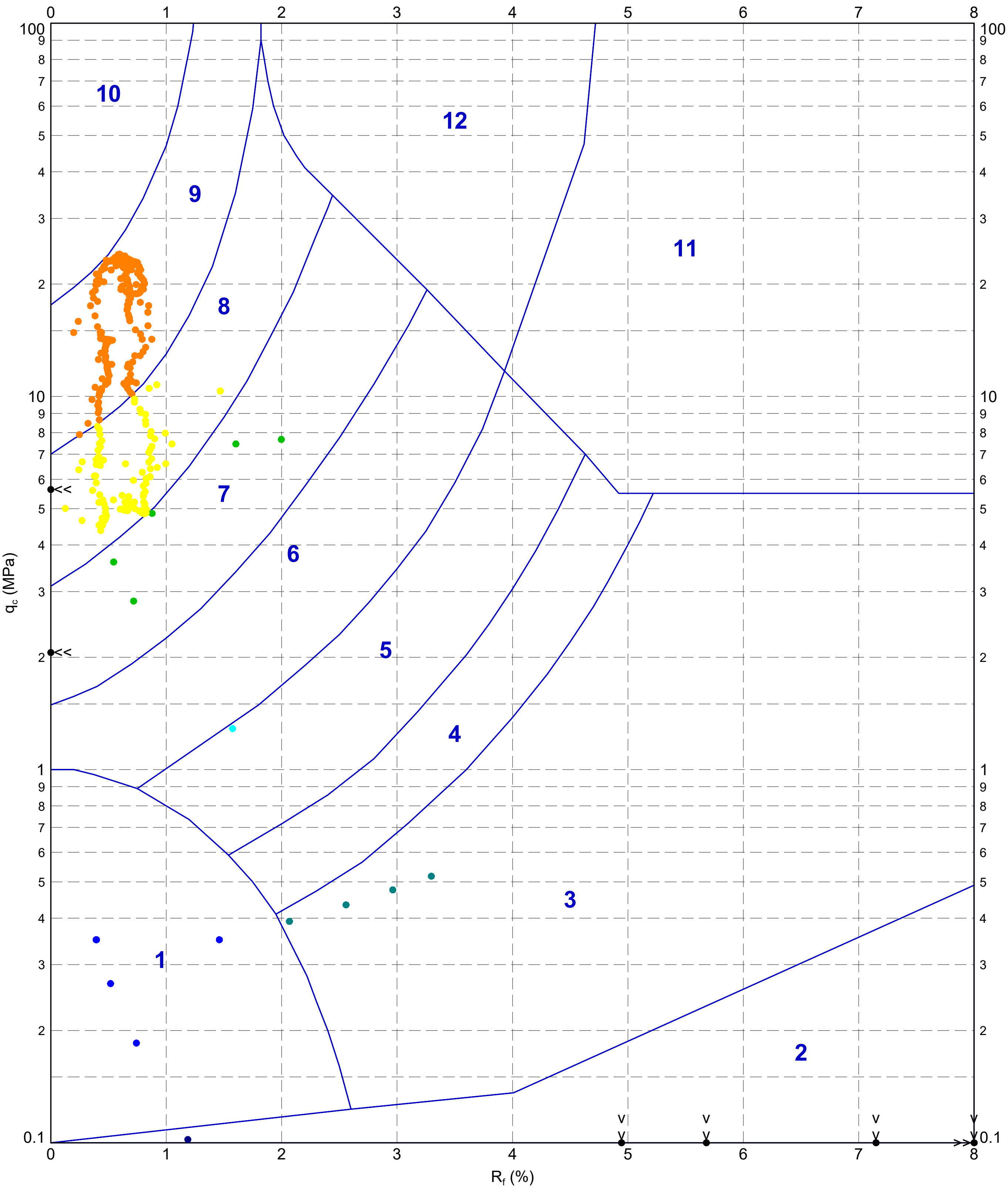
Transducer	Pre	Post	Difference
Tip	203 mV	204 mV	0.011 MPa
Sleeve	202 mV	204 mV	0.001 kPa
Pore Pressure 2	230 mV	231 mV	0 kPa
X-Y Inclinometer	2105 mV	2198 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 28	DRAWN	DATE 26/10/2020	
	CHECKED	DATE 26/10/2020	
	SCALE Not To Scale		A4
	PROJECT No 1200410	FIGURE No	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

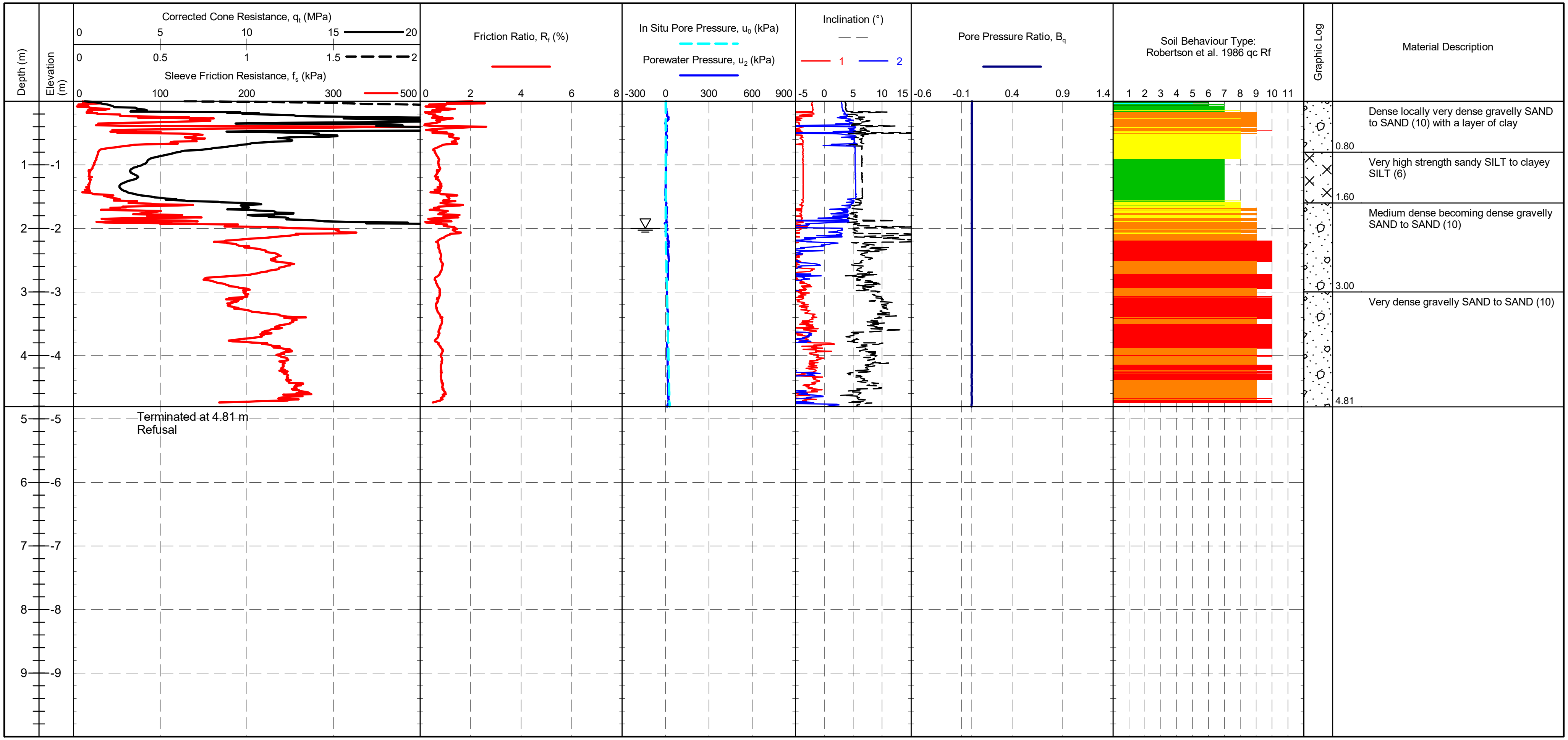
CPT LOG 01

PointID **29**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	198 mV	-0.087 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	254 mV	207 mV	-0.012 kPa
X-Y Inclinometer	2312 mV	2254 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

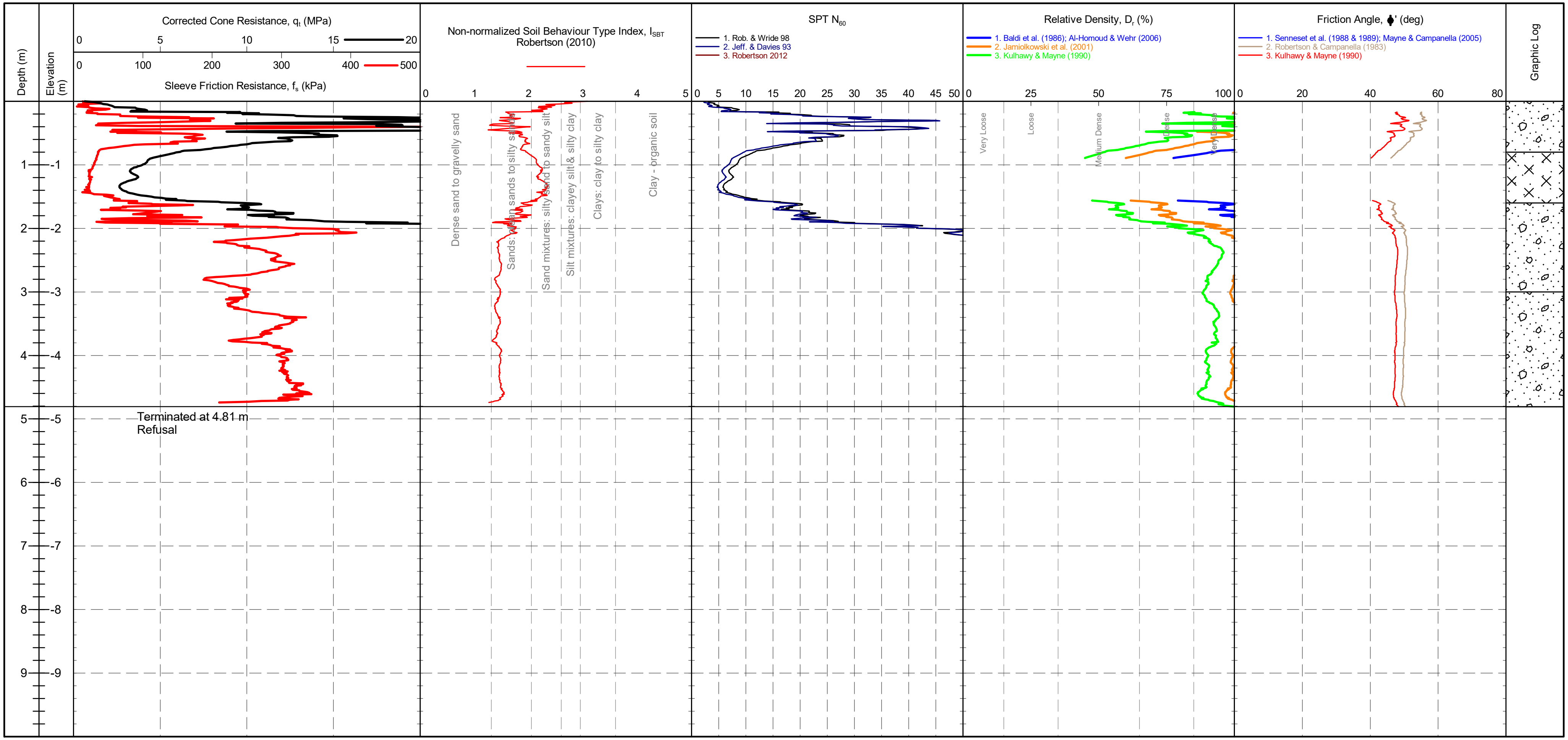
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID **29**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on total pressure.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	198 mV	-0.087 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	254 mV	207 mV	-0.012 kPa
X-Y Inclinometer	2312 mV	2254 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

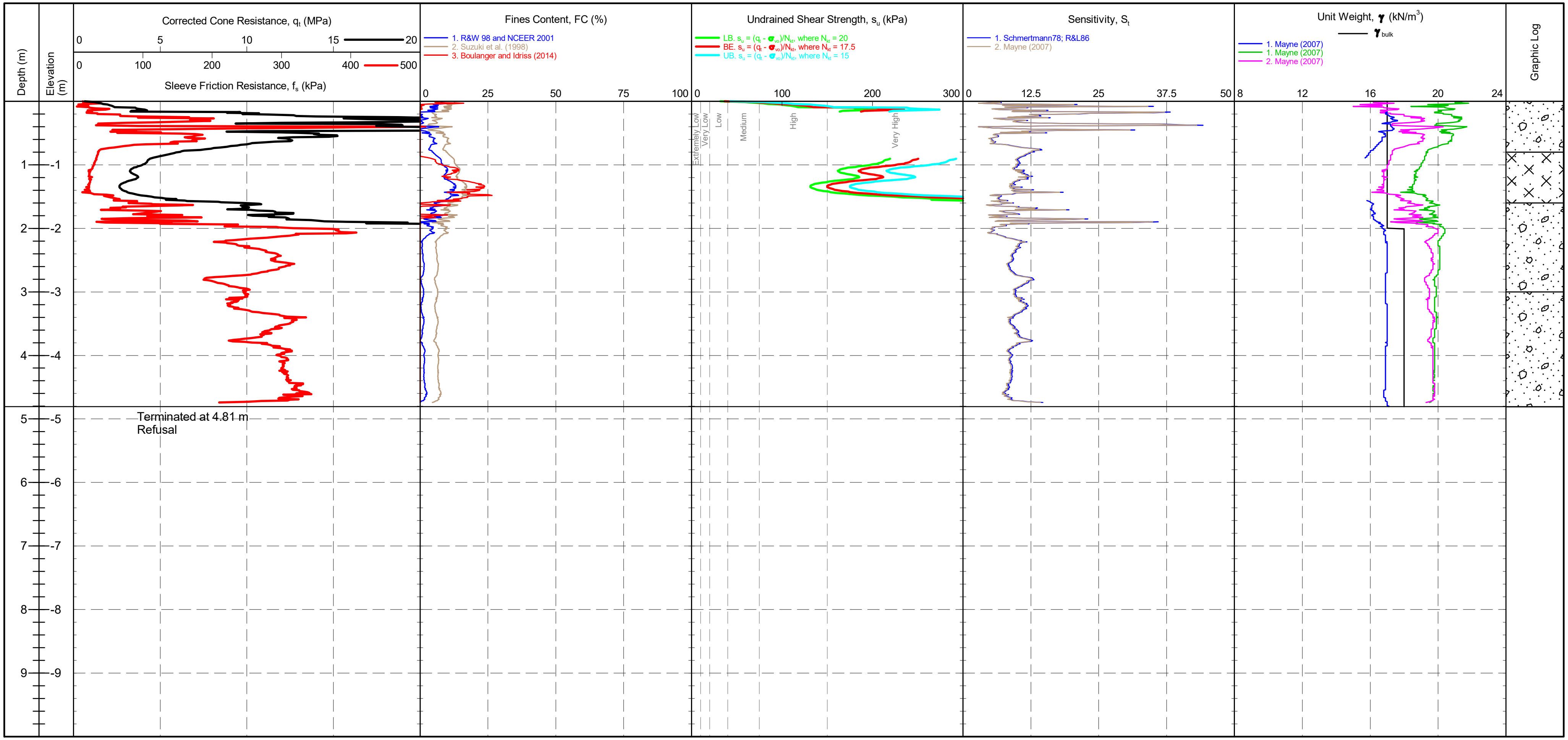
CPT LOG 03

PointID **29**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 26/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

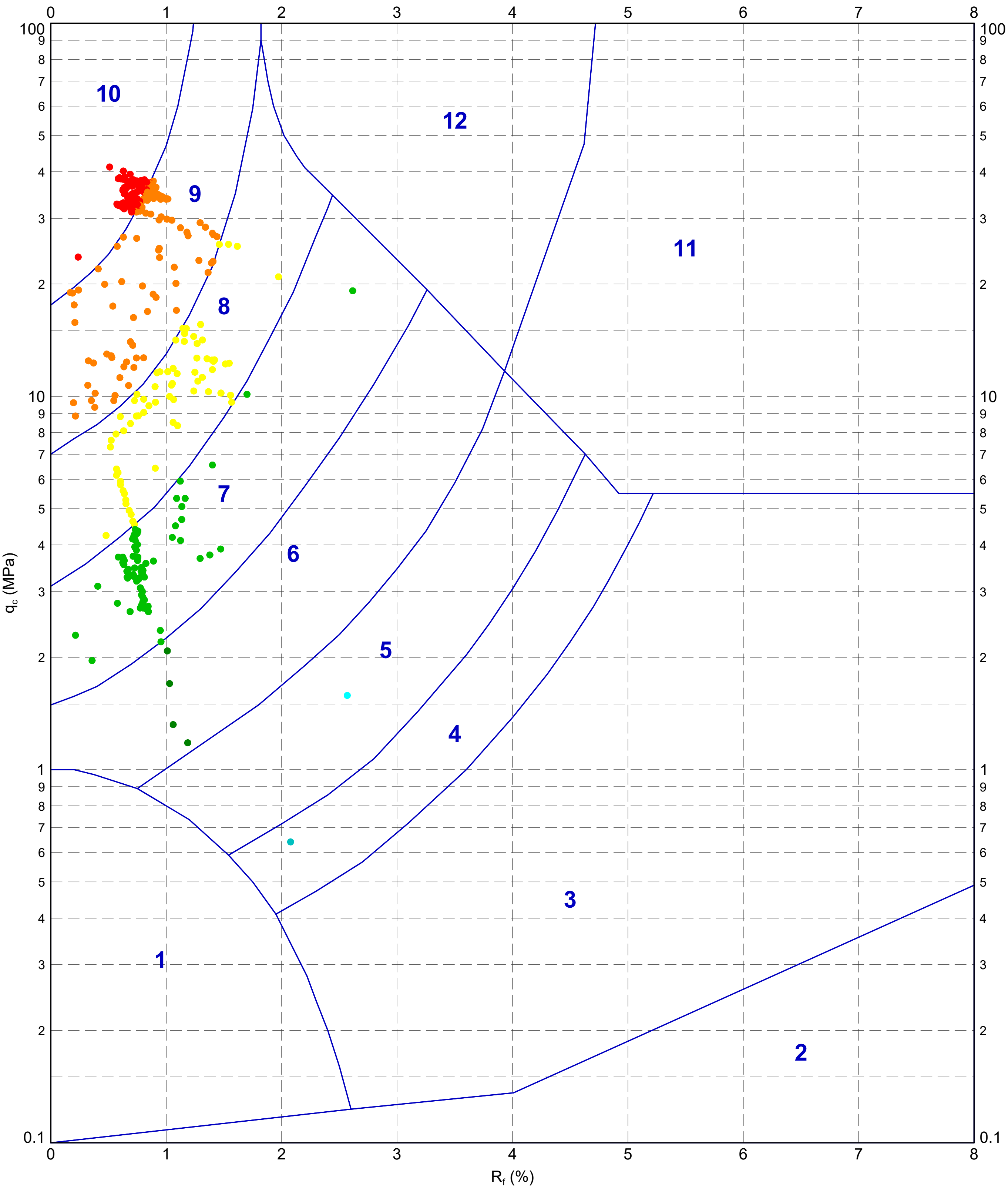
CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	198 mV	-0.087 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	254 mV	207 mV	-0.012 kPa
X-Y Inclinometer	2312 mV	2254 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

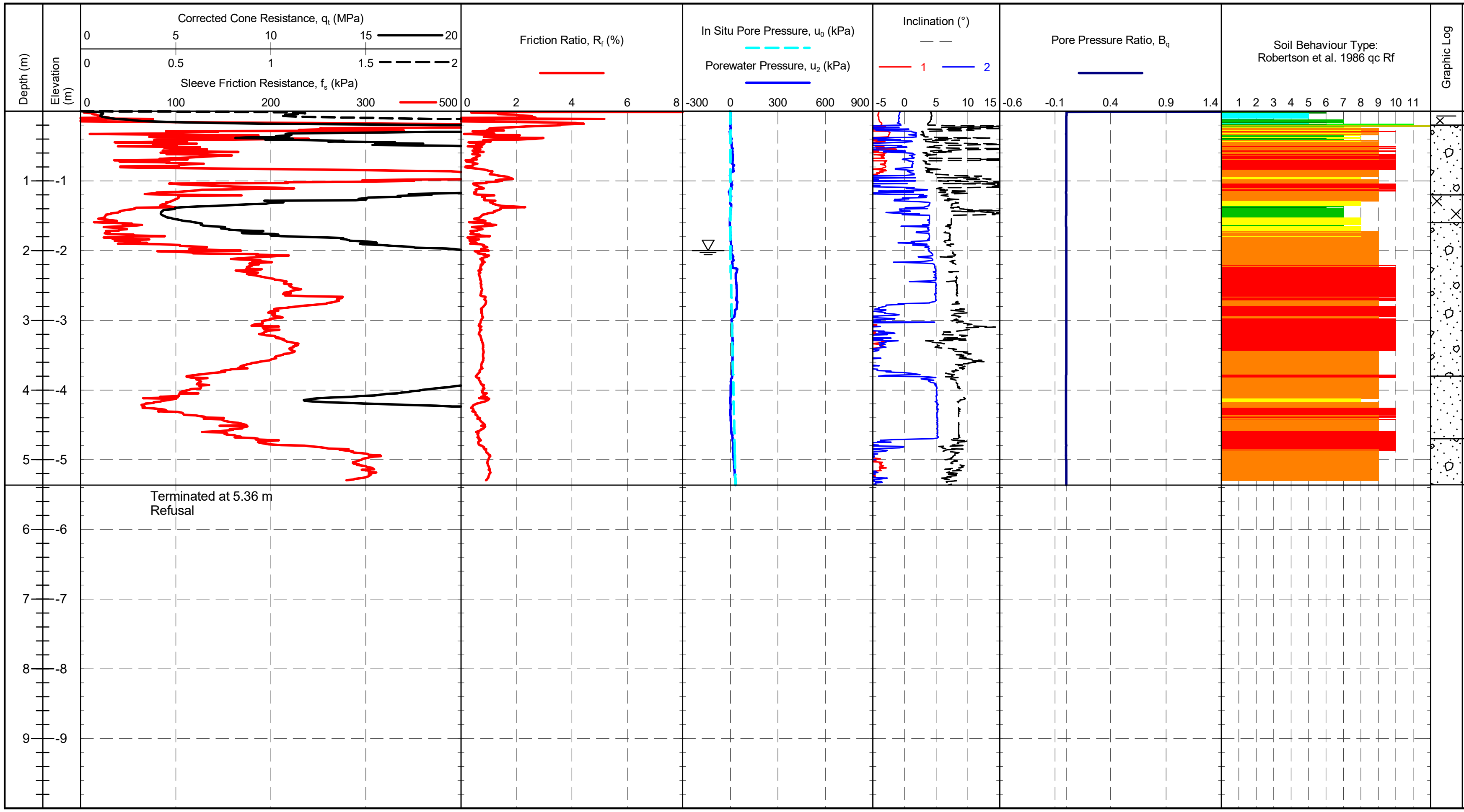
IN SITU SITE INVESTIGATION	TITLE Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 29	DRAWN	DATE 26/10/2020
		CHECKED	DATE 26/10/2020
		SCALE Not To Scale	A4
		PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID
30

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on total pressure.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



Depth	Material Description
0.20	Medium strength silty CLAY to CLAY (4)
1.20	Very dense locally dense gravelly SAND to SAND (10)
1.60	Very high strength sandy SILT to clayey SILT (6)
3.80	Medium dense becoming very dense gravelly SAND to SAND (10)
4.70	Dense to very dense SAND (9)
5.36	Very dense gravelly SAND to SAND (10)

CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm²	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	200 mV	-0.043 MPa
Sleeve	205 mV	201 mV	-0.003 kPa
Pore Pressure 2	220 mV	222 mV	0 kPa
X-Y Inclinometer	2063 mV	2045 mV	

METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

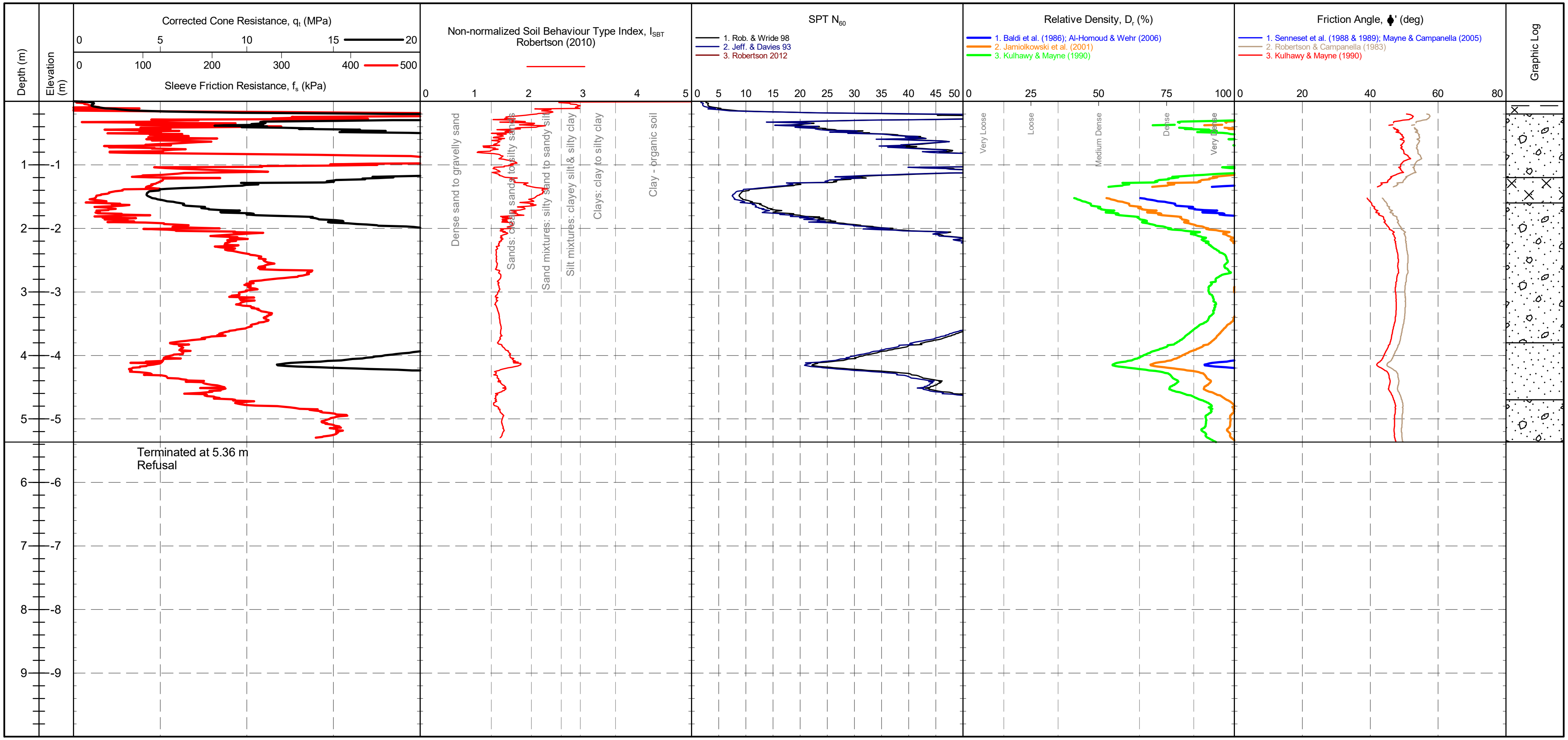
PointID **30**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on total pressure.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	200 mV	-0.043 MPa
Sleeve	205 mV	201 mV	-0.003 kPa
Pore Pressure 2	220 mV	222 mV	0 kPa
X-Y Inclinometer	2063 mV	2045 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

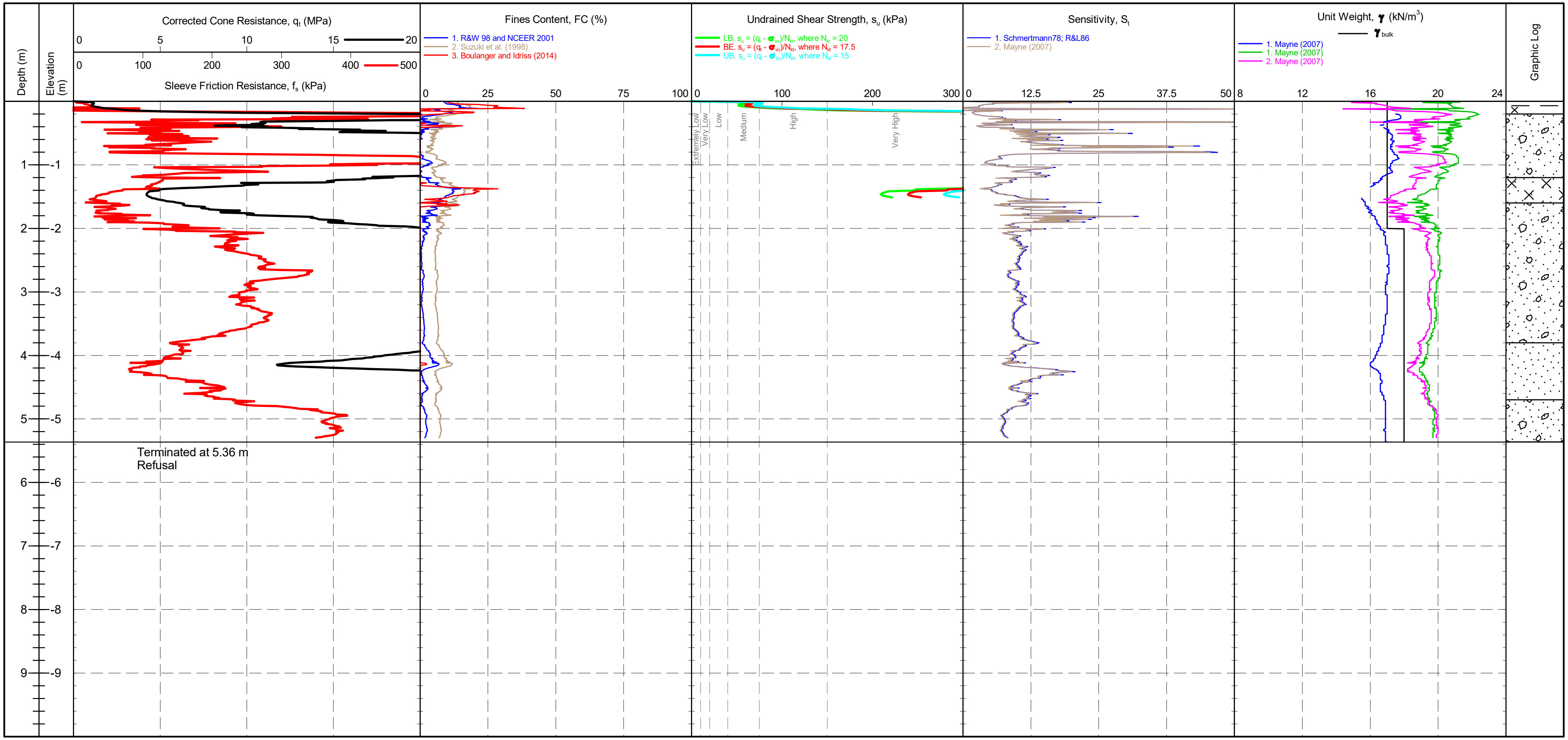
Groundwater Level
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
30

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on total pressure.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

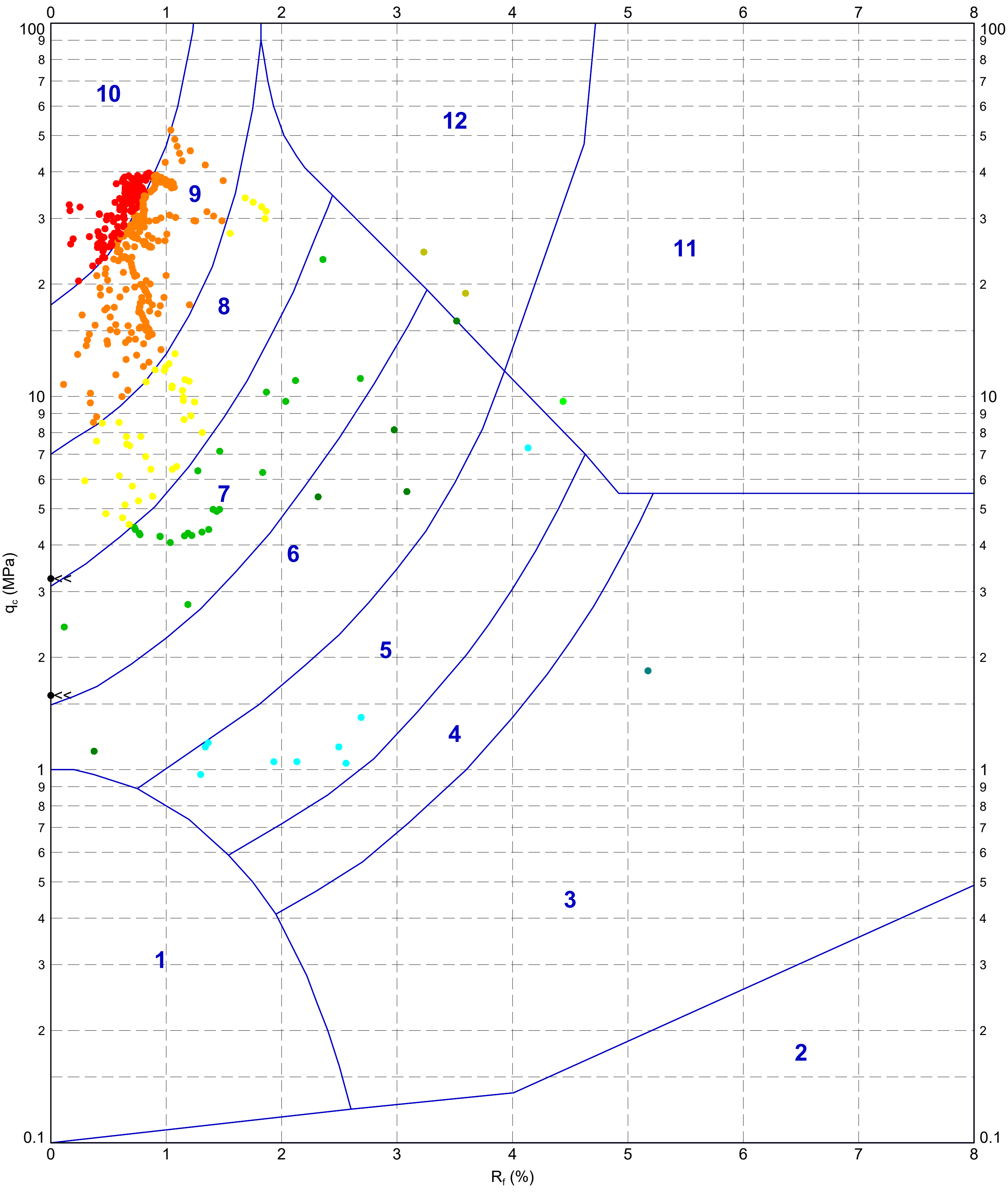
CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	200 mV	-0.043 MPa
Sleeve	205 mV	201 mV	-0.003 kPa
Pore Pressure 2	220 mV	222 mV	0 kPa
X-Y Inclinometer	2063 mV	2045 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

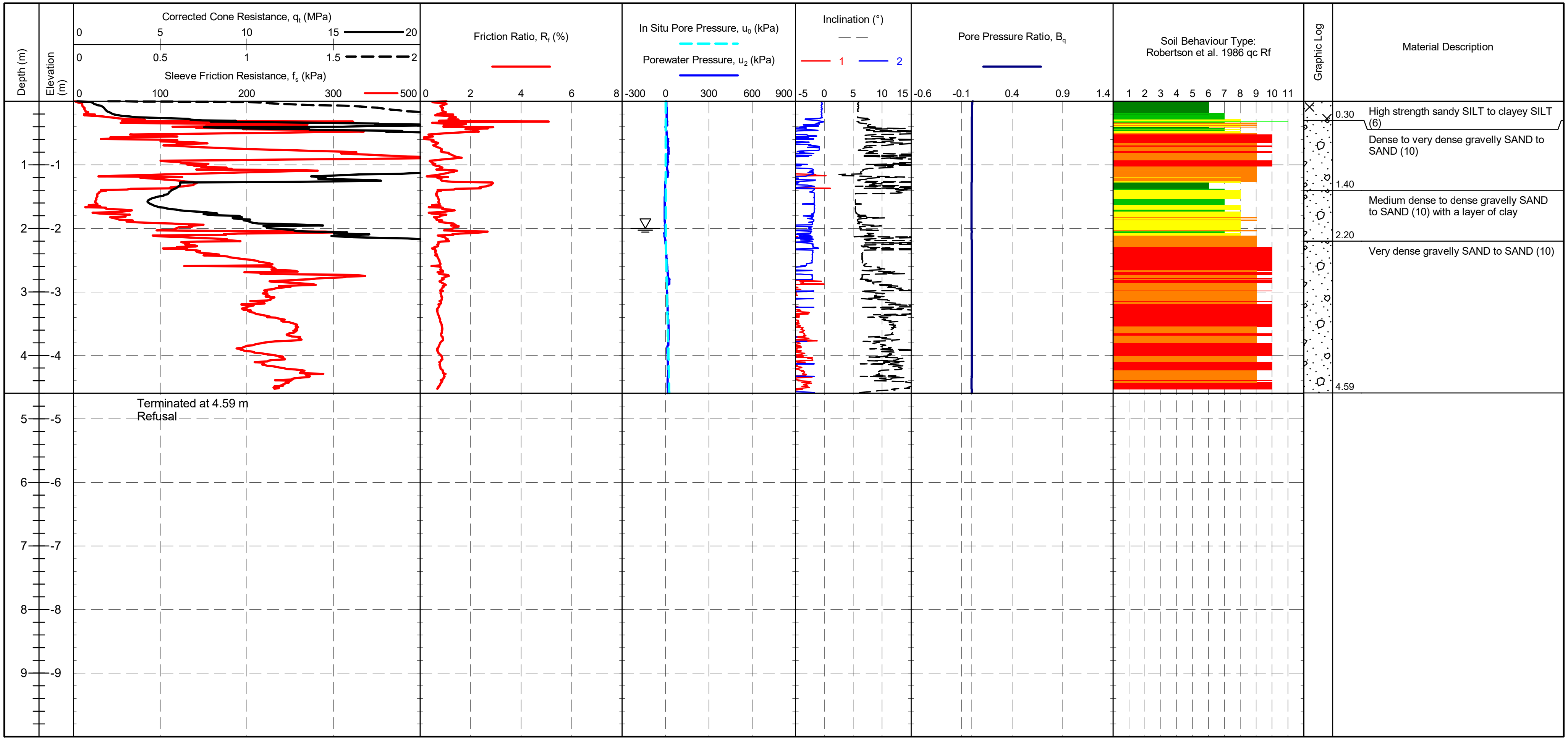
TITLE	DRAWN	DATE
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 30		26/10/2020
	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **31**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on total pressure.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858	TEST TYPE : TE2		
CALIBRATION DATE : 26/07/2020	APPLICATION CLASS : 2		
CONE MODEL : Subtraction	RIG : CPT 017 - Griffen		
CONE AREA : 15cm^2	OPERATOR : RS		
CONE AREA RATIO : 0.79	FRICTION REDUCER : None		
FILTER POSITION : u2	WEATHER : Raining & Mild		
FILTER TYPE : HDPE	GROUNDWATER DEPTH : Assumed for calculation purposes.		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	196 mV	-0.076 MPa
Sleeve	203 mV	199 mV	-0.003 kPa
Pore Pressure 2	230 mV	205 mV	-0.006 kPa
X-Y Inclinometer	1860 mV	1794 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

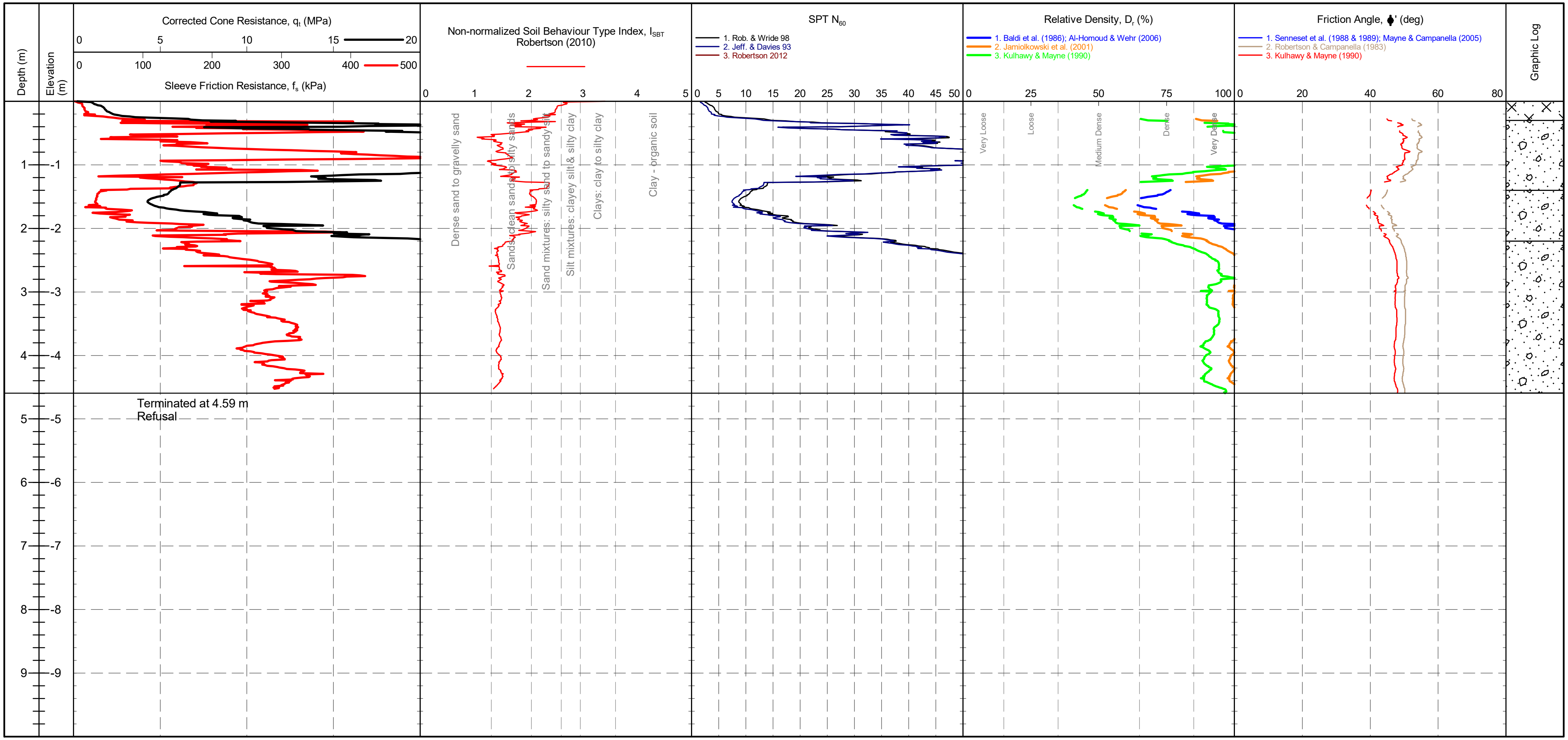
Dissipation Test

CPT LOG 02

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID **31**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on total pressure.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2	Transducer	Pre	Post	Difference
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Tip	203 mV	196 mV	-0.076 MPa
CONE AREA	: 15cm²	RIG	: CPT 017 - Griffen	Sleeve	203 mV	199 mV	-0.003 kPa
CONE AREA RATIO	: 0.79	OPERATOR	: RS	Pore Pressure 2	230 mV	205 mV	-0.006 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	X-Y Inclinometer	1860 mV	1794 mV	
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild				

CPTU ZERO VALUES

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

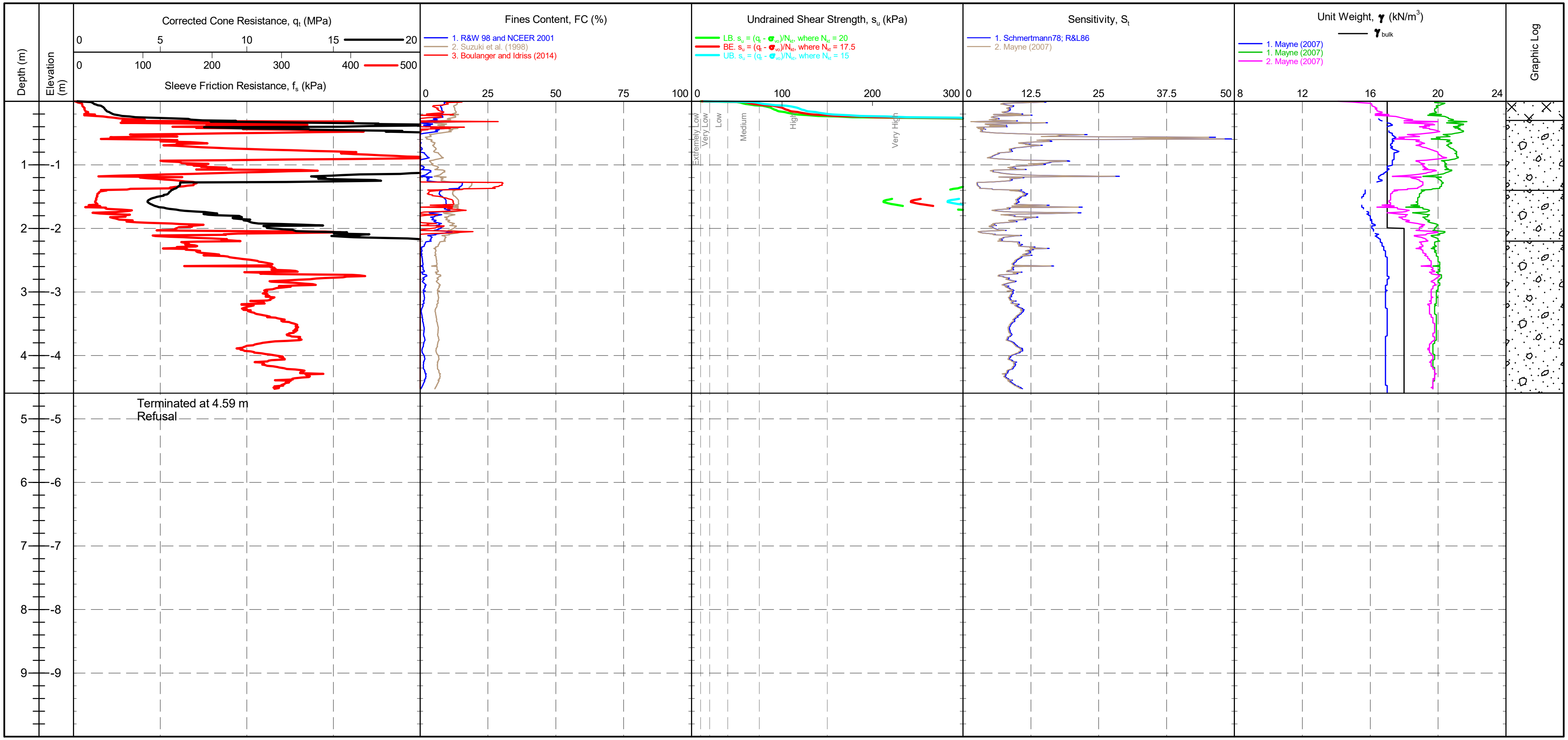
CPT LOG 03

PointID **31**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 26/10/2020
METHOD : ISO 22476-1:2012



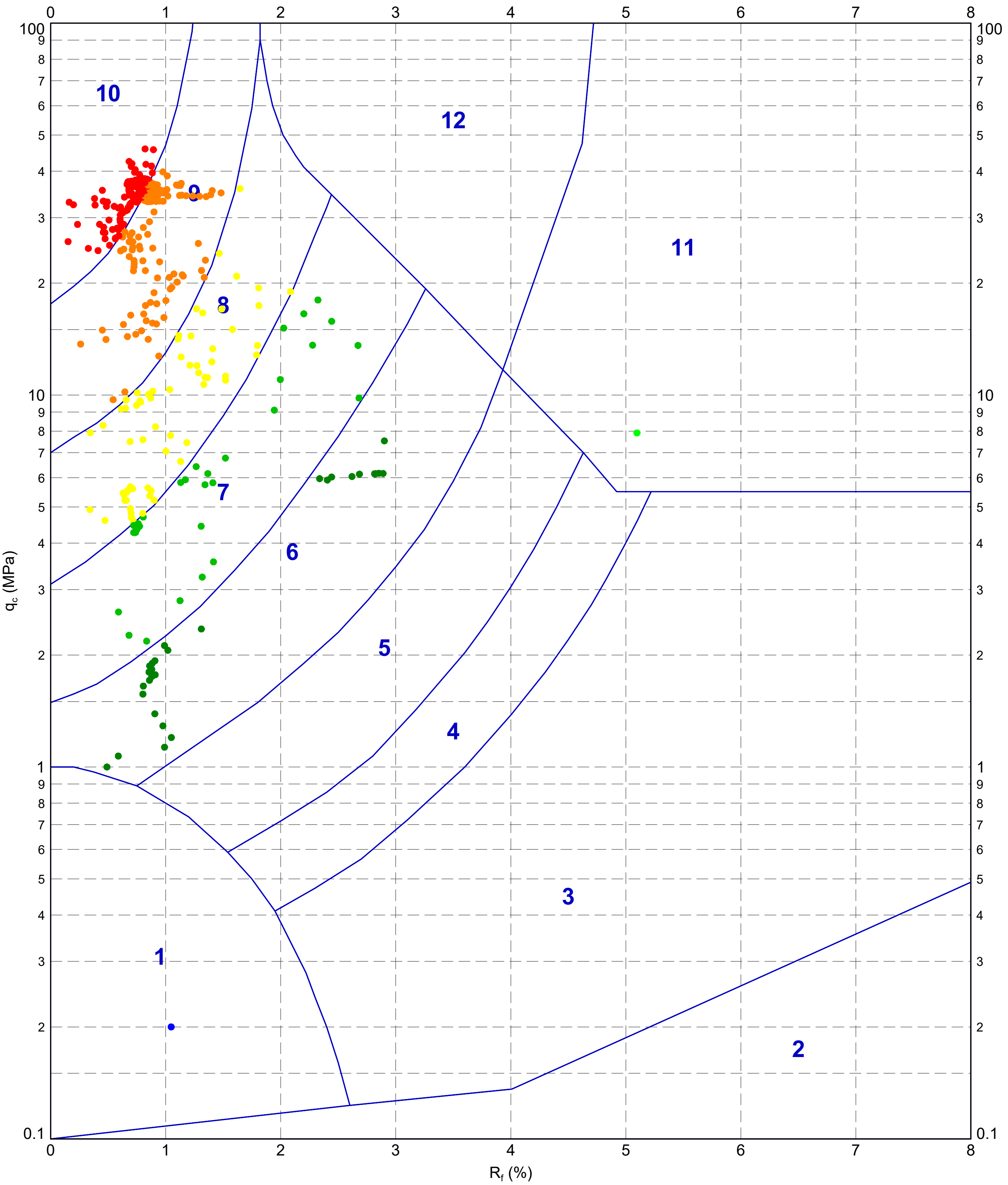
CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2	CPTU ZERO VALUES						
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference			
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen	Tip	203 mV	196 mV	-0.076 MPa			
CONE AREA RATIO	: 0.79	OPERATOR	: RS	Sleeve	203 mV	199 mV	-0.003 kPa			
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	230 mV	205 mV	-0.006 kPa			
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild	X-Y Inclinometer	1860 mV	1794 mV				

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

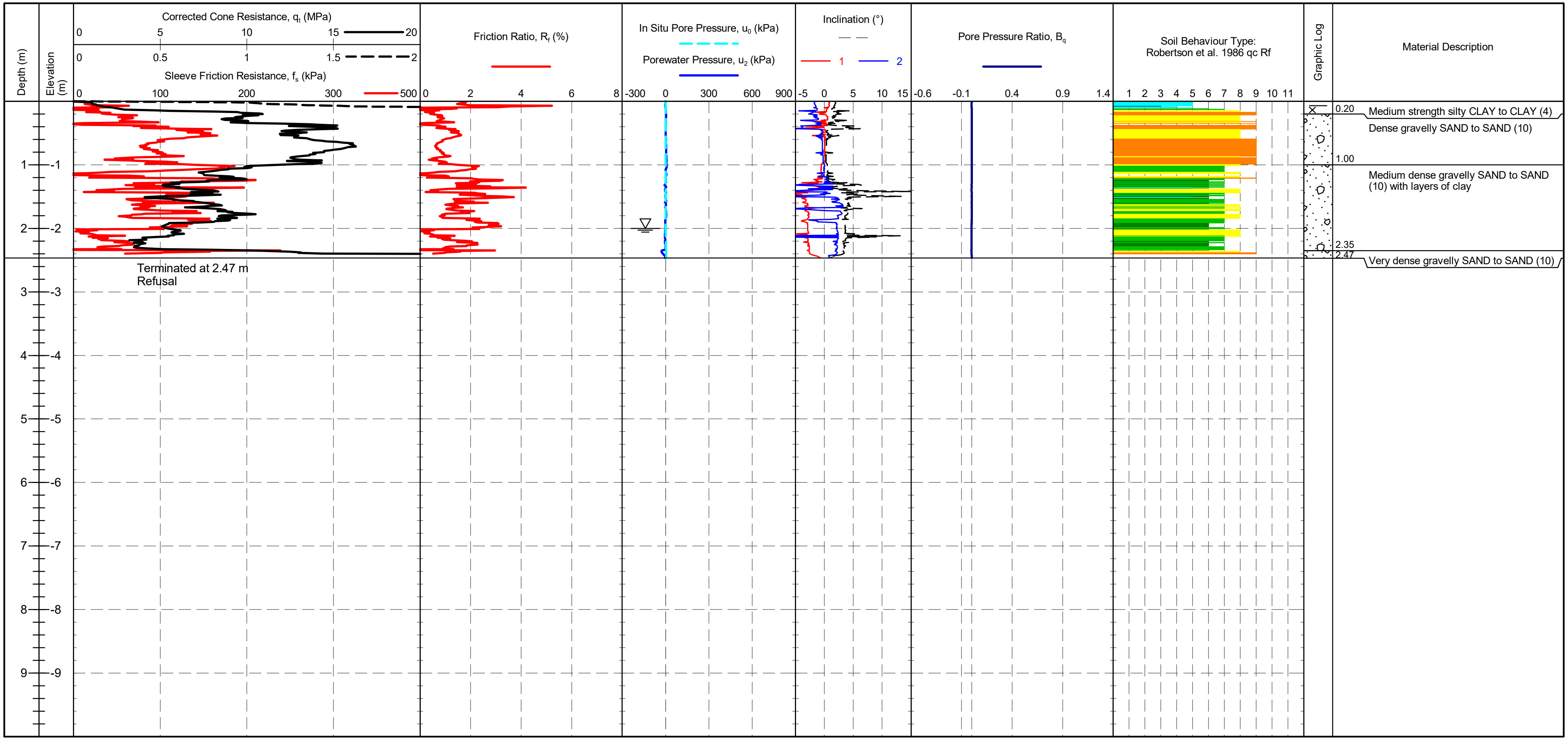
TITLE	DRAWN	DATE
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 31		26/10/2020
	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID **32**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm²	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	203 mV	0 MPa
Sleeve	204 mV	200 mV	-0.003 kPa
Pore Pressure 2	228 mV	224 mV	-0.001 kPa
X-Y Inclinometer	2541 mV	2535 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

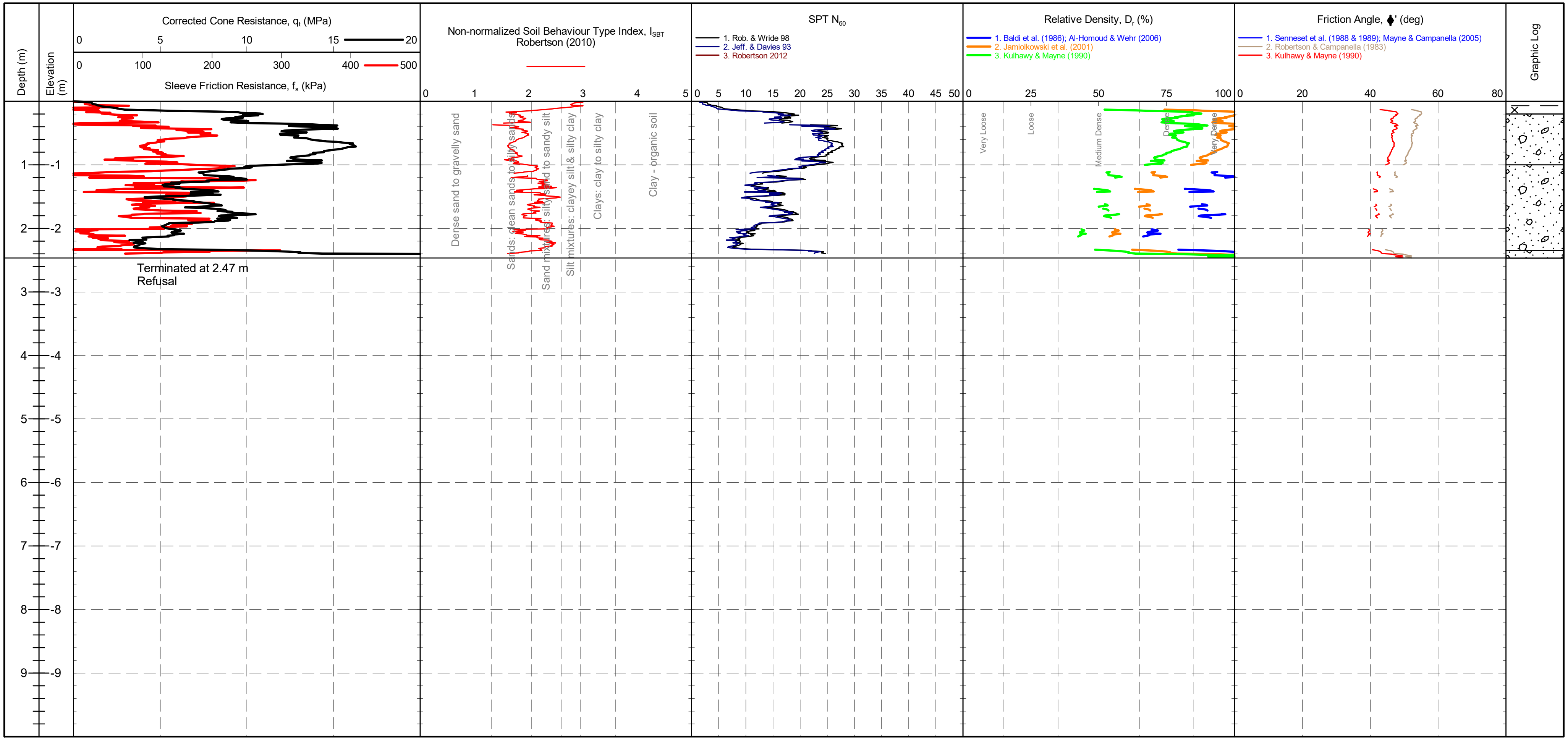
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
32

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 26/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	203 mV	0 MPa
Sleeve	204 mV	200 mV	-0.003 kPa
Pore Pressure 2	228 mV	224 mV	-0.001 kPa
X-Y Inclinometer	2541 mV	2535 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

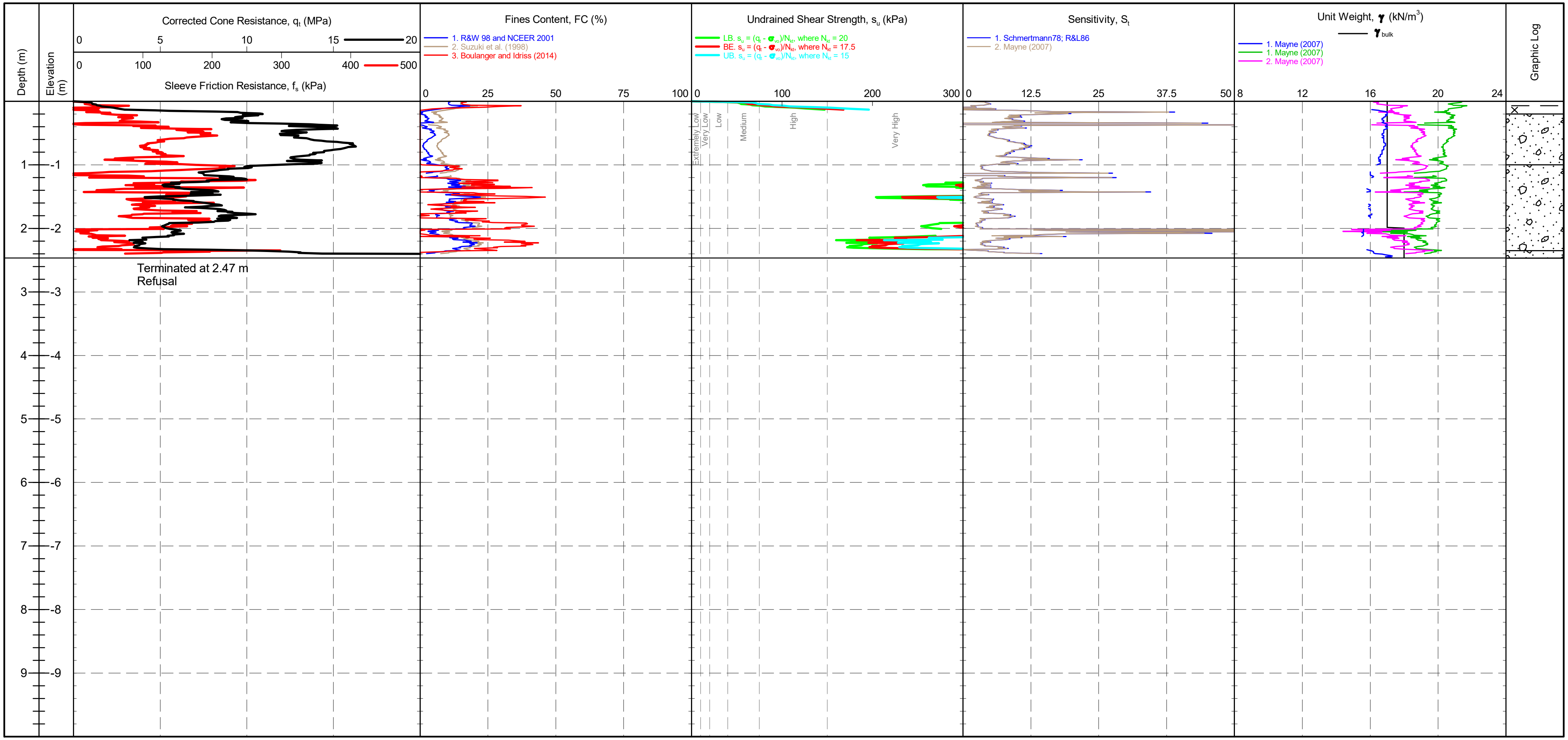
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
32

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

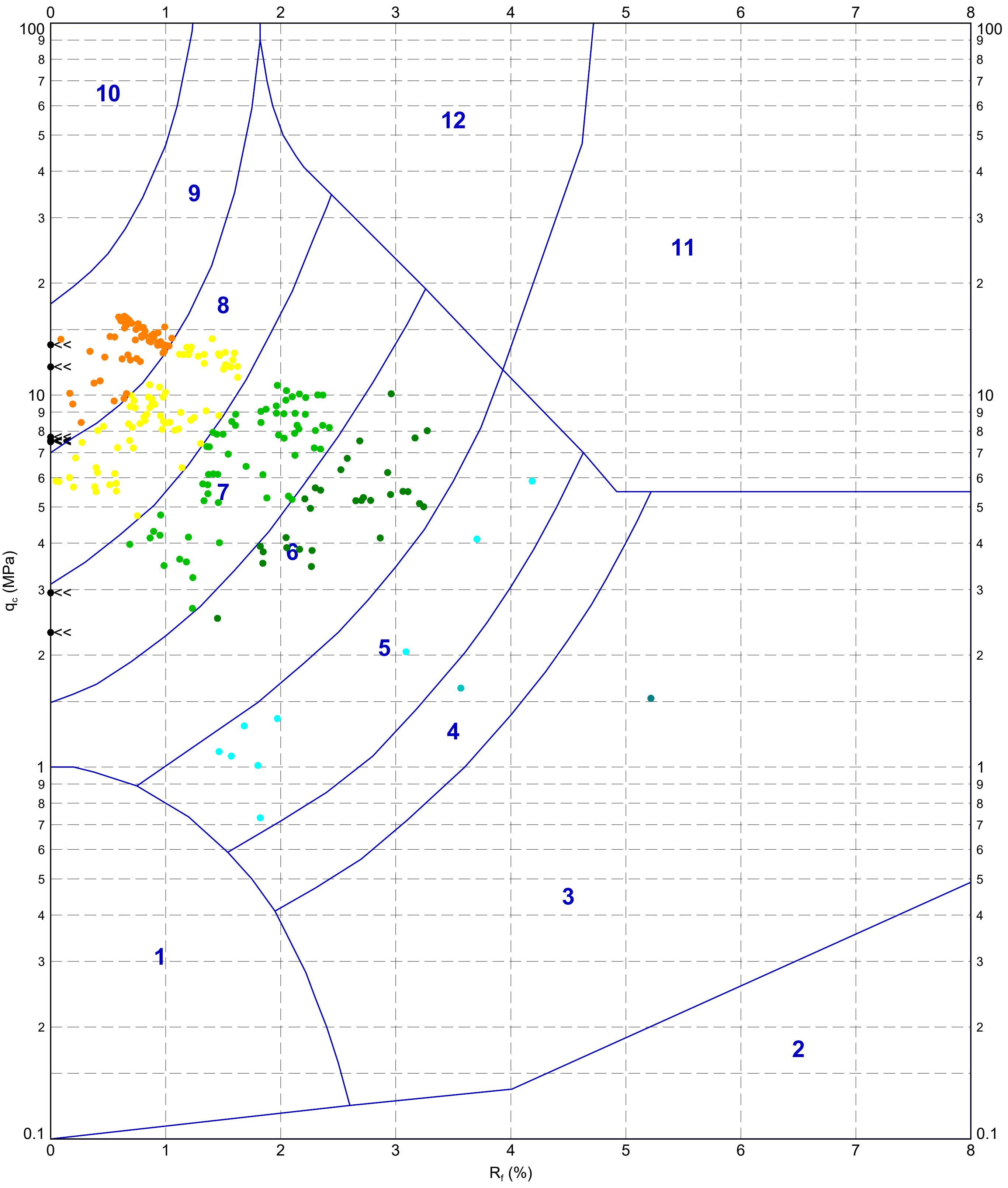
Transducer	Pre	Post	Difference
Tip	203 mV	203 mV	0 MPa
Sleeve	204 mV	200 mV	-0.003 kPa
Pore Pressure 2	228 mV	224 mV	-0.001 kPa
X-Y Inclinometer	2541 mV	2535 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU
SITE INVESTIGATION

TITLE

Soiltechnics
Lossiemouth
Lossiemouth
Robertson et al. 1986 q_c vs. R_f - 32

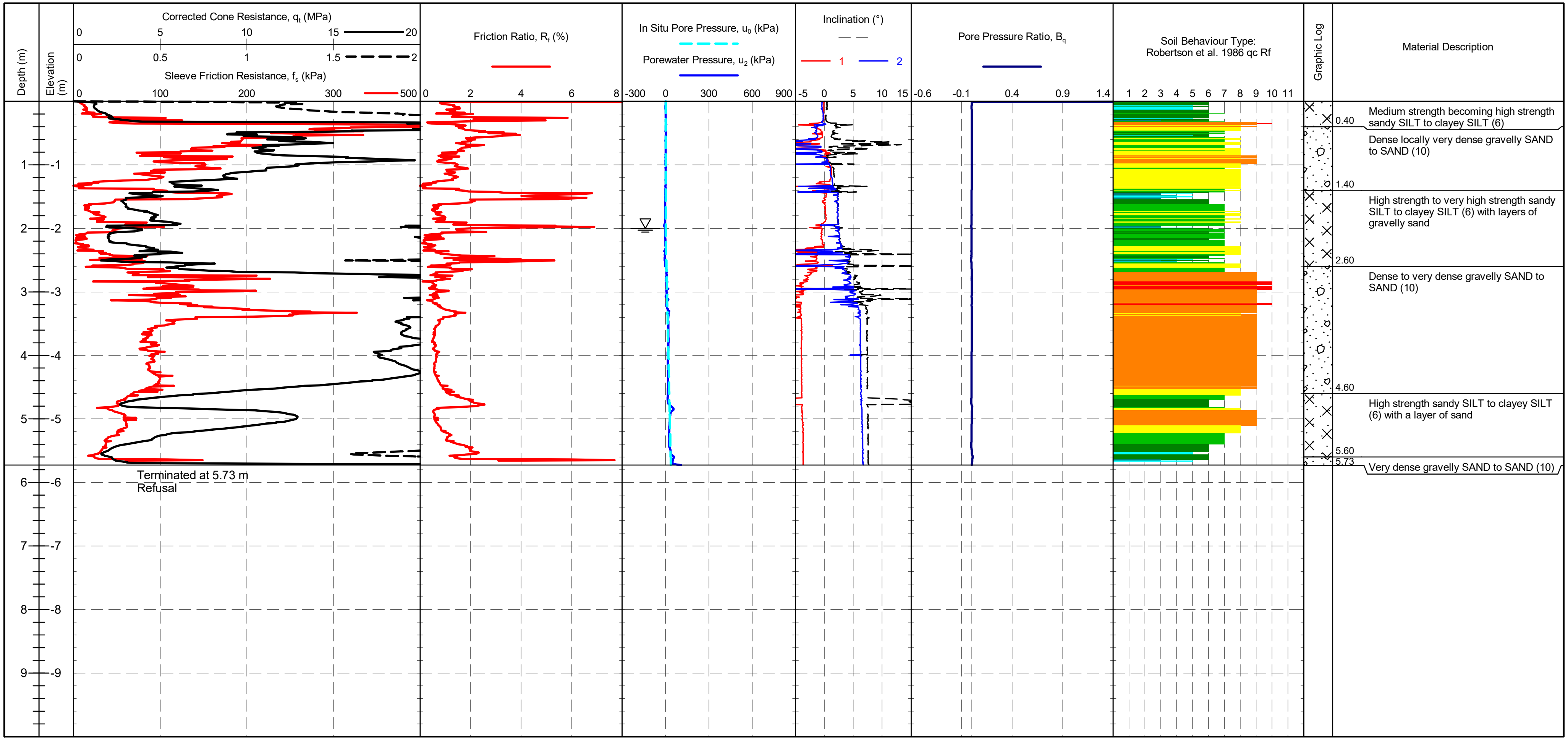
DRAWN		DATE	26/10/2020
CHECKED		DATE	26/10/2020
SCALE	Not To Scale		A4
PROJECT No	1200410	FIGURE No	

CPT LOG 01

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID
33

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CALIBRATION DATE	: 26/07/2020	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm^2	OPERATOR	: RS
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Raining & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	201 mV	-0.022 MPa
Sleeve	201 mV	201 mV	0 kPa
Pore Pressure 2	228 mV	220 mV	-0.002 kPa
X-Y Inclinometer	2448 mV	2433 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

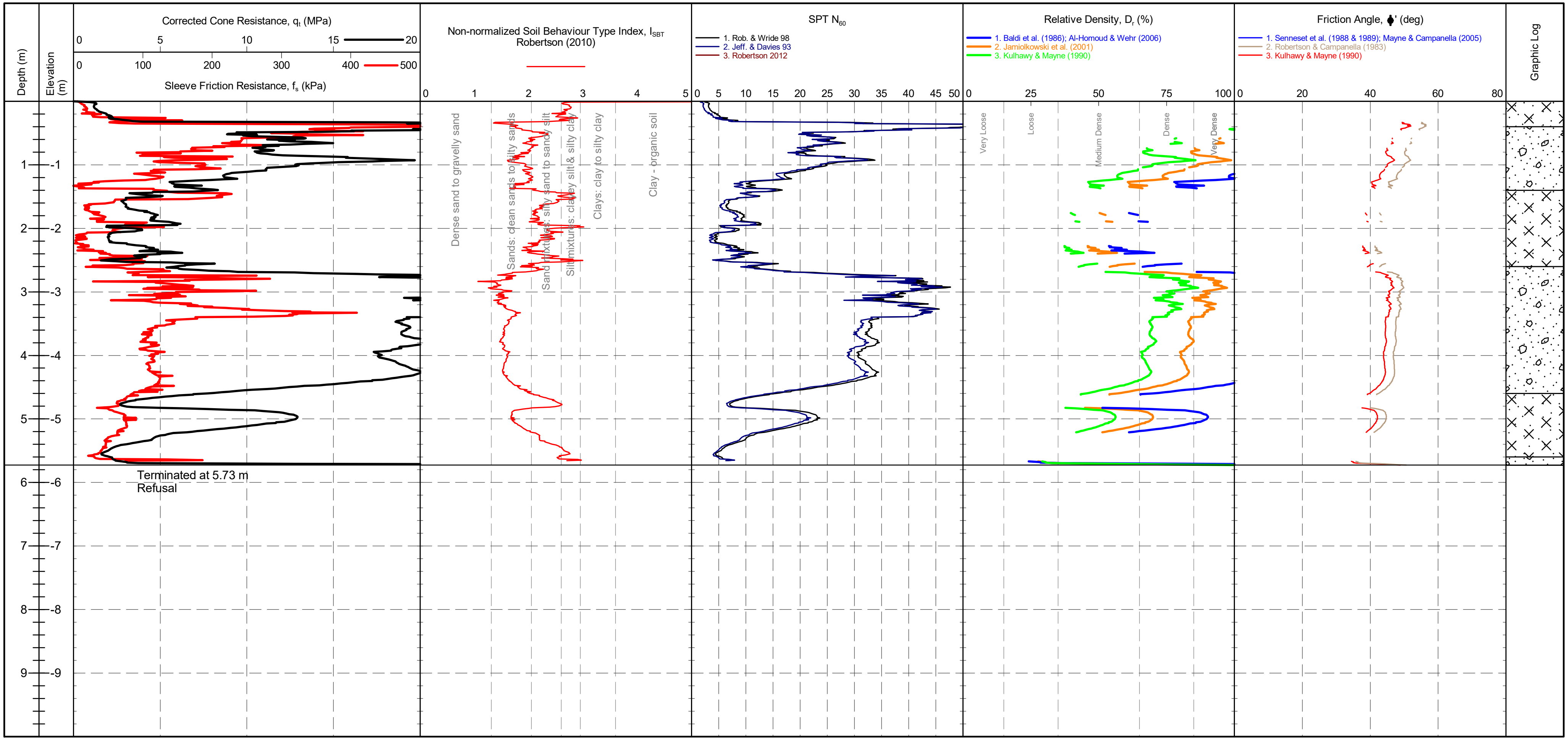
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

PointID
33

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	201 mV	-0.022 MPa
Sleeve	201 mV	201 mV	0 kPa
Pore Pressure 2	228 mV	220 mV	-0.002 kPa
X-Y Inclinometer	2448 mV	2433 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

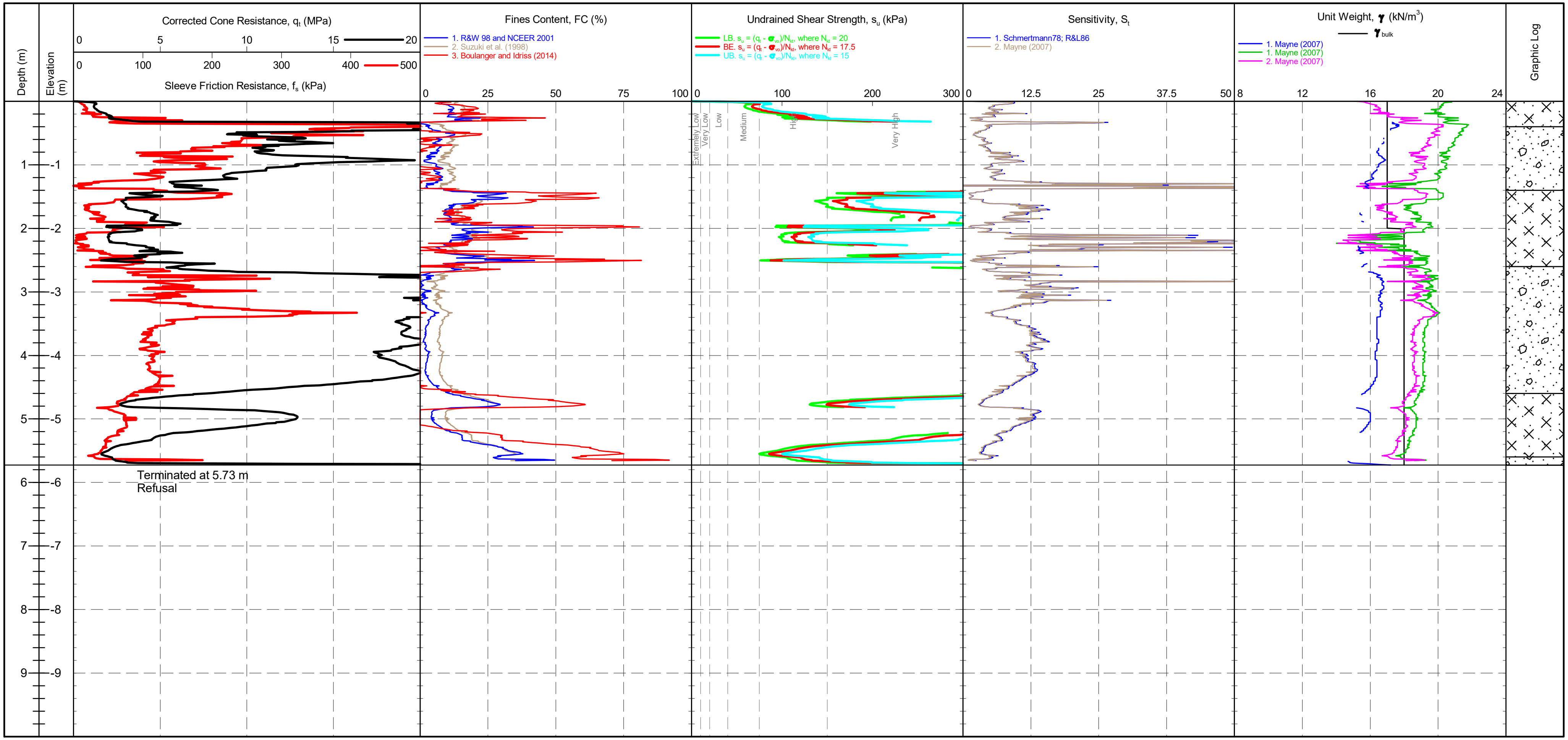
Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

PointID
33

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

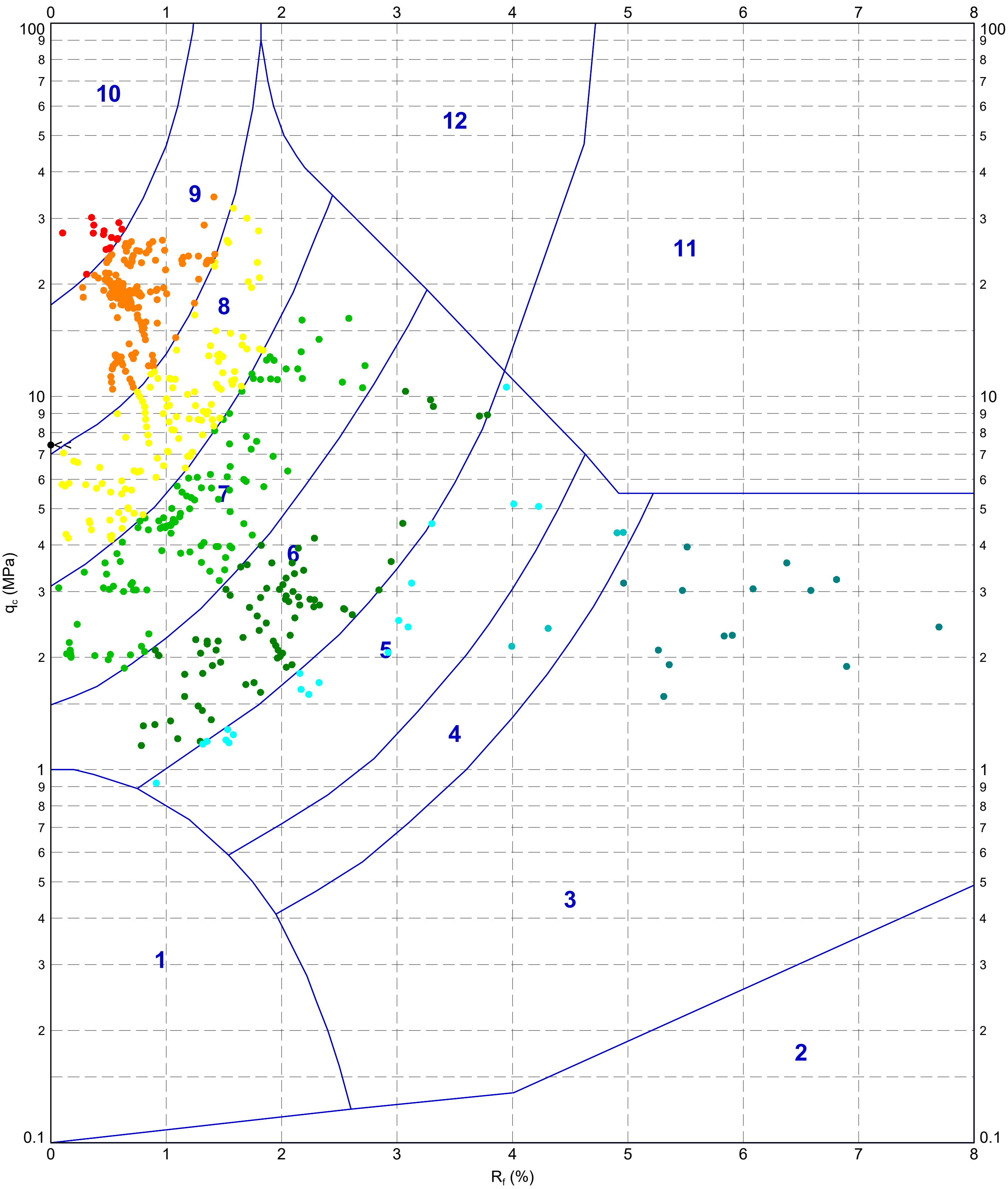
Transducer	Pre	Post	Difference
Tip	203 mV	201 mV	-0.022 MPa
Sleeve	201 mV	201 mV	0 kPa
Pore Pressure 2	228 mV	220 mV	-0.002 kPa
X-Y Inclinometer	2448 mV	2433 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

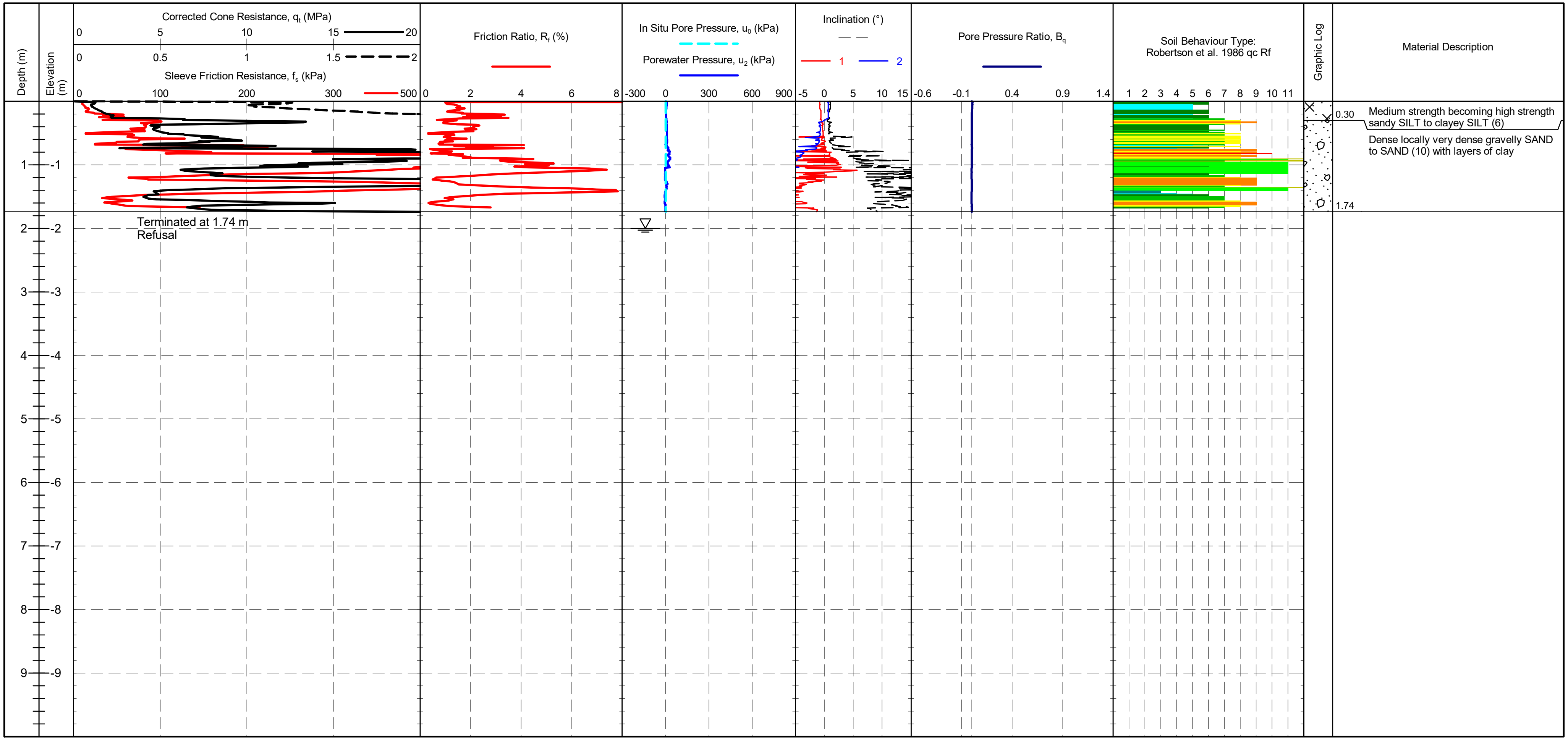
TITLE	DRAWN	DATE 26/10/2020
Soiltechnics Lossiemouth Lossiemouth Robertson et al. 1986 q_c vs. R_f - 33	CHECKED	DATE 26/10/2020
	SCALE Not To Scale	A4
	PROJECT No 1200410	FIGURE No

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 01

PointID
34

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 26/10/2020 METHOD : ISO 22476-1:2012



CONE ID	S15-CFIP.1858	TEST TYPE	TE2
CALIBRATION DATE	26/07/2020	APPLICATION CLASS	2
CONE MODEL	Subtraction	RIG	CPT 017 - Griffen
CONE AREA	15cm^2	OPERATOR	RS
CONE AREA RATIO	0.79	FRICTION REDUCER	None
FILTER POSITION	u2	WEATHER	Raining & Mild
FILTER TYPE	HDPE	GROUNDWATER DEPTH	Assumed for calculation purposes.

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	203 mV	0 MPa
Sleeve	202 mV	193 mV	-0.006 kPa
Pore Pressure 2	228 mV	213 mV	-0.004 kPa
X-Y Inclinometer	2369 mV	2358 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 02

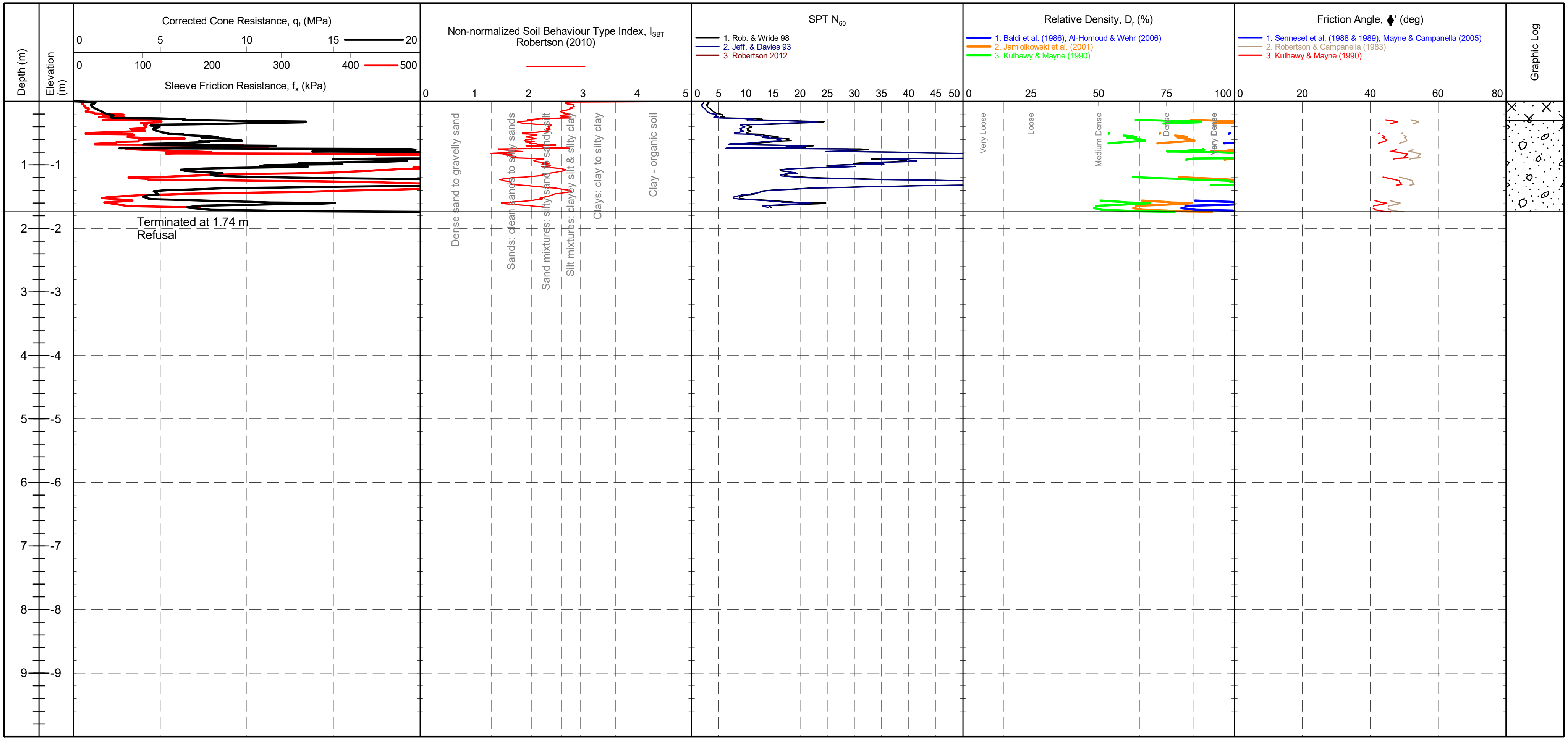
PointID **34**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on inclination.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	203 mV	0 MPa
Sleeve	202 mV	193 mV	-0.006 kPa
Pore Pressure 2	228 mV	213 mV	-0.004 kPa
X-Y Inclinometer	2369 mV	2358 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

CPT LOG 03

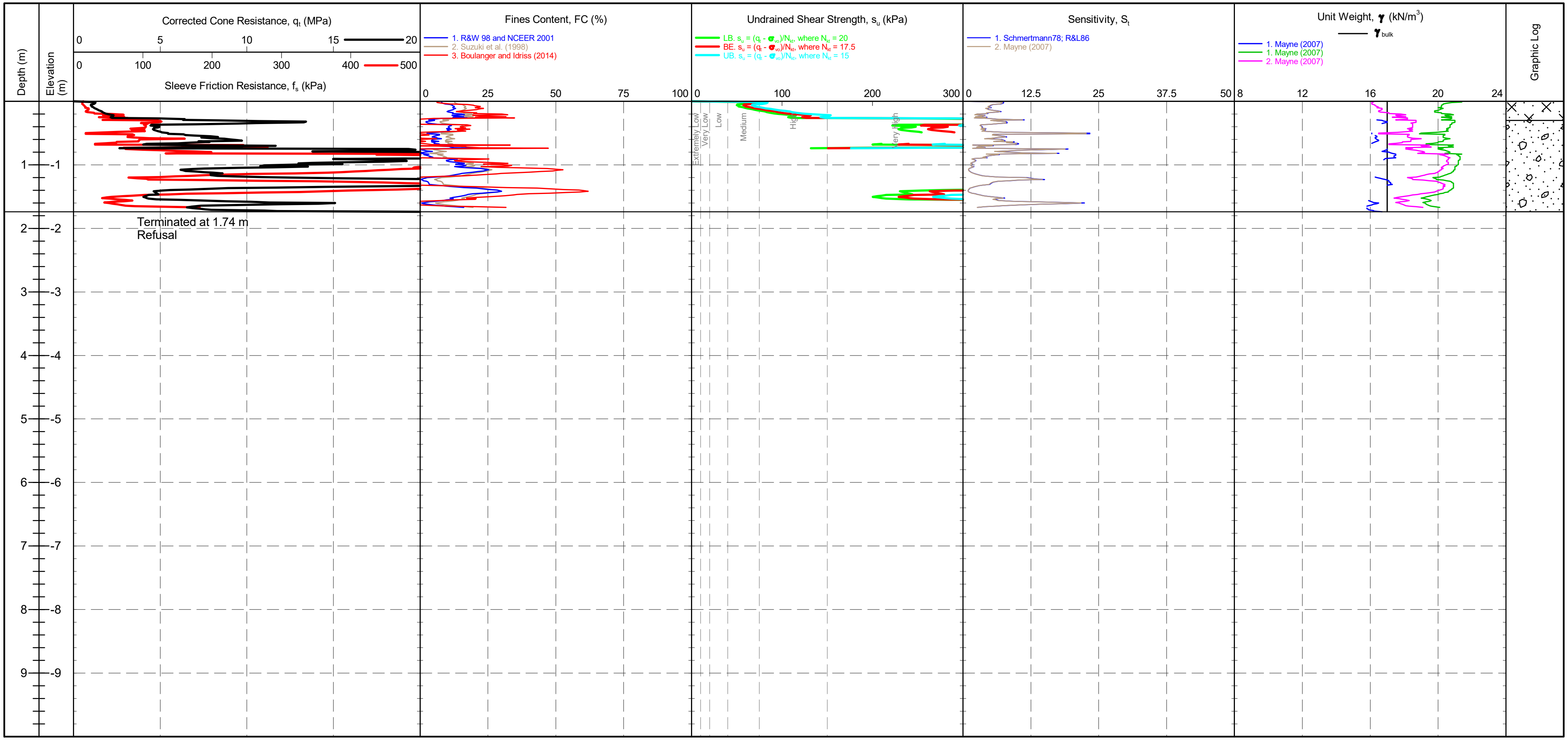
PointID **34**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on inclination.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 26/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

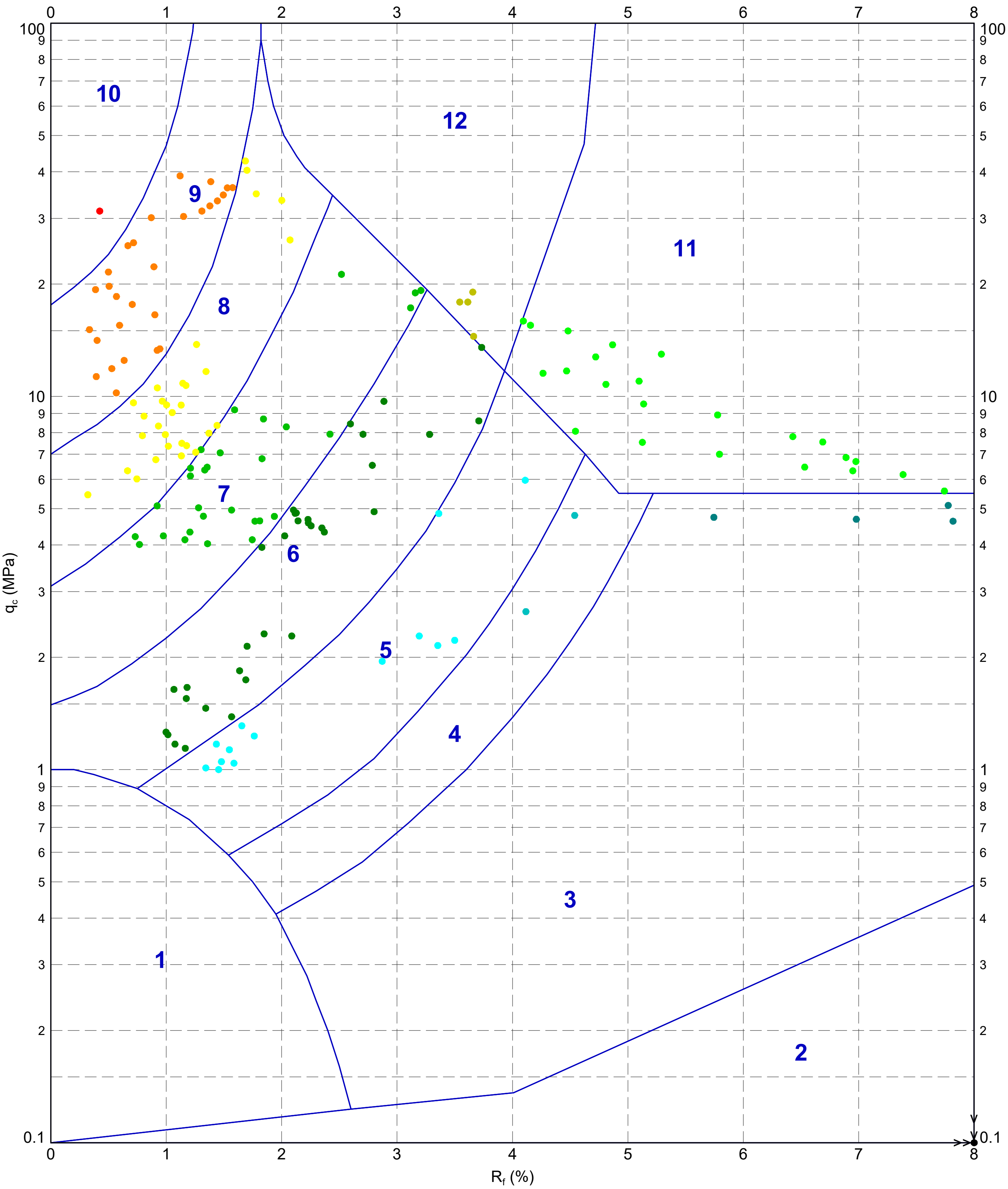
Transducer	Pre	Post	Difference
Tip	203 mV	203 mV	0 MPa
Sleeve	202 mV	193 mV	-0.006 kPa
Pore Pressure 2	228 mV	213 mV	-0.004 kPa
X-Y Inclinometer	2369 mV	2358 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Soiltechnics
Lossiemouth
Lossiemouth
Robertson et al. 1986 q_c vs. R_f - 34

DRAWN	DATE 26/10/2020	
CHECKED	DATE 26/10/2020	
SCALE Not To Scale		A4
PROJECT No 1200410	FIGURE No	

APPENDIX C

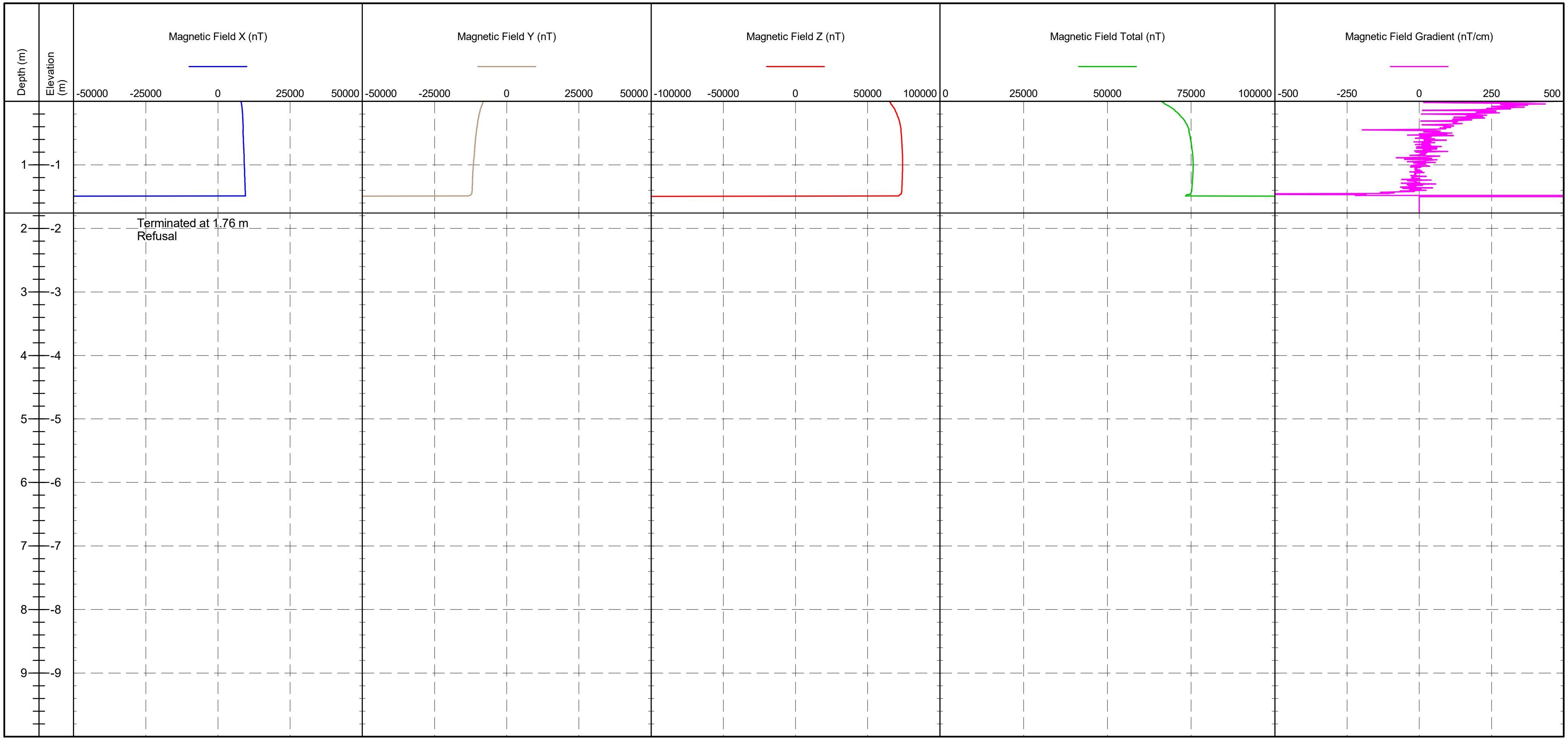
Magnetometer Data

MAG LOG

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

PointID **01**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



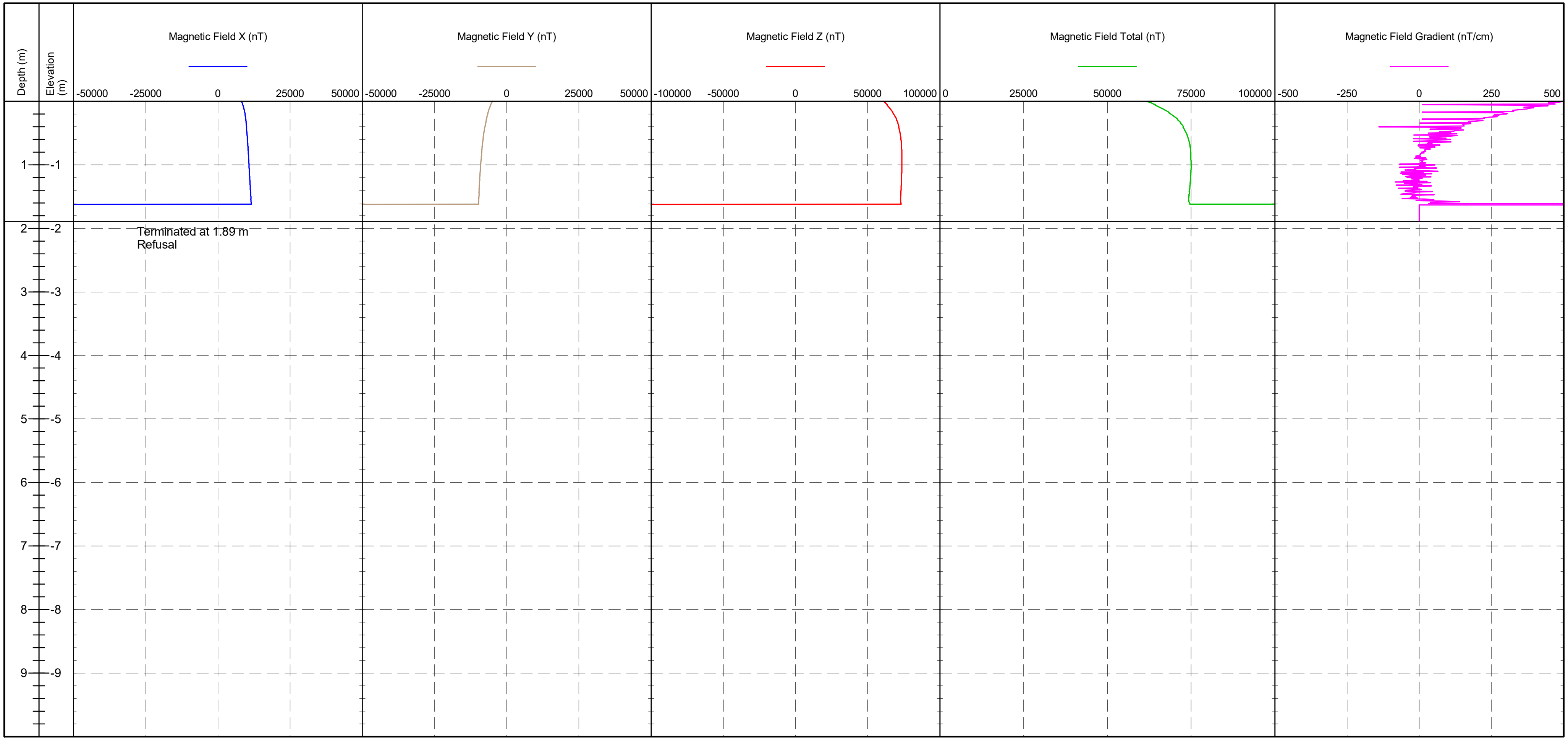
CONE ID : S15-CFIP.1858	TEST TYPE : TE2		CPTU ZERO VALUES			
CONE MODEL : Subtraction	APPLICATION CLASS : 2	Transducer	Pre	Post	Difference
CONE AREA : 15cm^2	RIG : CPT 017 - Griffen	Tip	209 mV	203 mV	-0.065 MPa
CONE AREA RATIO : 0.79	OPERATOR : RS	Sleeve	208 mV	204 mV	-0.003 kPa
FILTER POSITION : u2	FRICTION REDUCER : None	Pore Pressure 2	282 mV	242 mV	-0.01 kPa
FILTER TYPE : HDPE	WEATHER : Raining & Mild	X-Y Inclinometer	2463 mV	2473 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID	02

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858 CONE MODEL : Subtraction CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 017 - Griffen OPERATOR : RS FRICTION REDUCER : None WEATHER : Raining & Mild	

CPTU ZERO VALUES

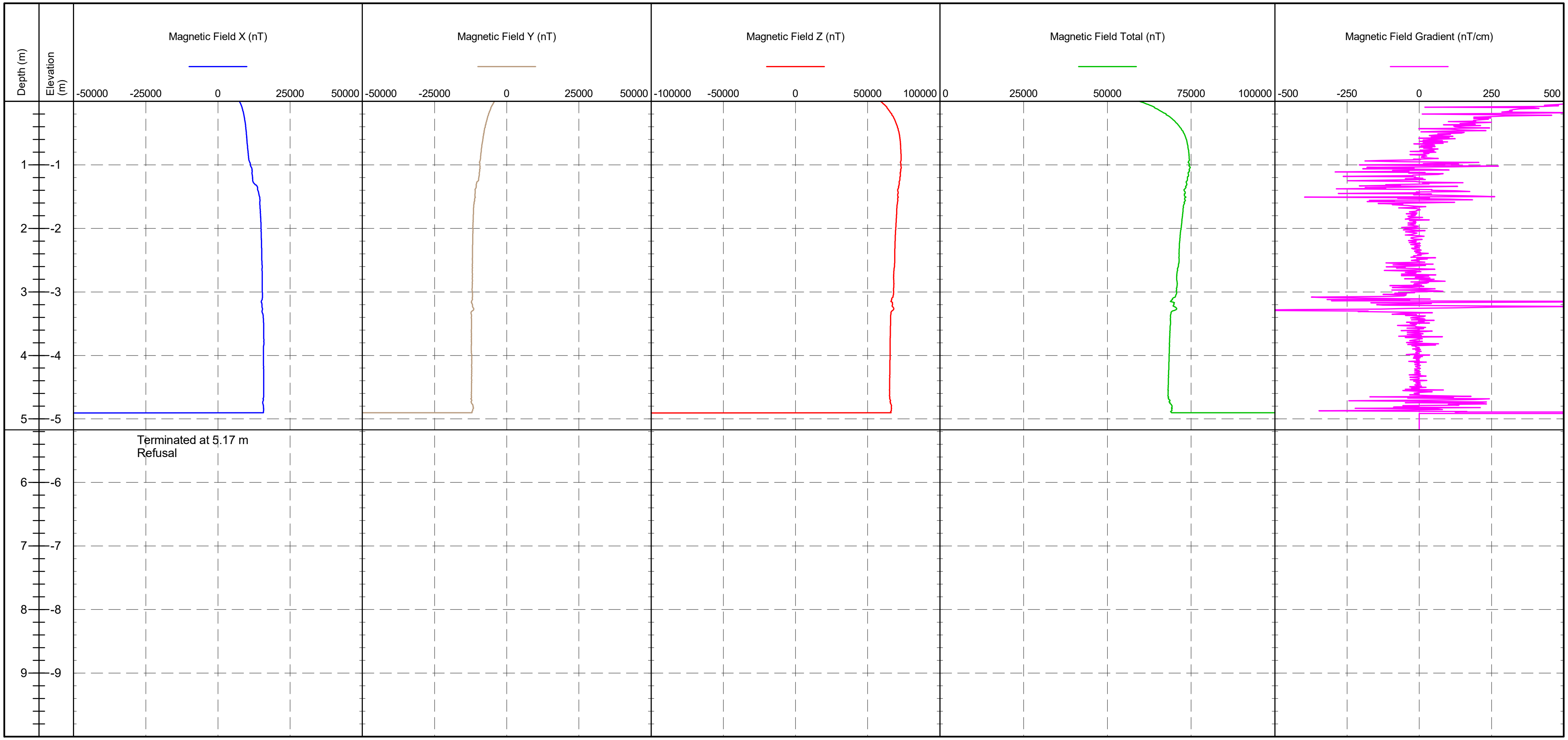
Transducer	Pre	Post	Difference
Tip	207 mV	205 mV	-0.022 MPa
Sleeve	205 mV	204 mV	-0.001 kPa
Pore Pressure 2	255 mV	243 mV	-0.003 kPa
X-Y Inclinometer	2413 mV	2404 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID **03**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 23/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

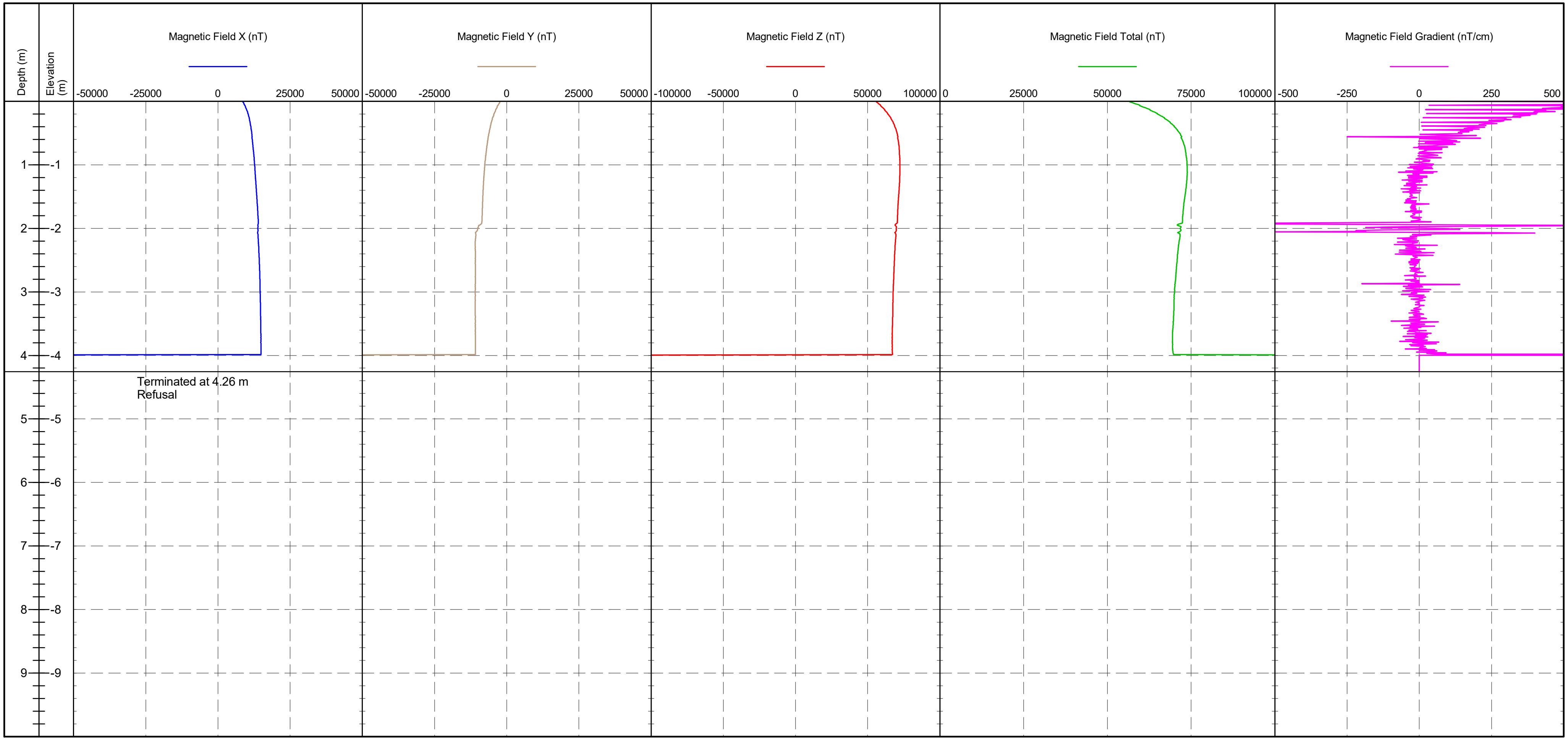
Transducer	Pre	Post	Difference
Tip	206 mV	204 mV	-0.022 MPa
Sleeve	205 mV	204 mV	-0.001 kPa
Pore Pressure 2	249 mV	249 mV	0 kPa
X-Y Inclinometer	2341 mV	2324 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID **04**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



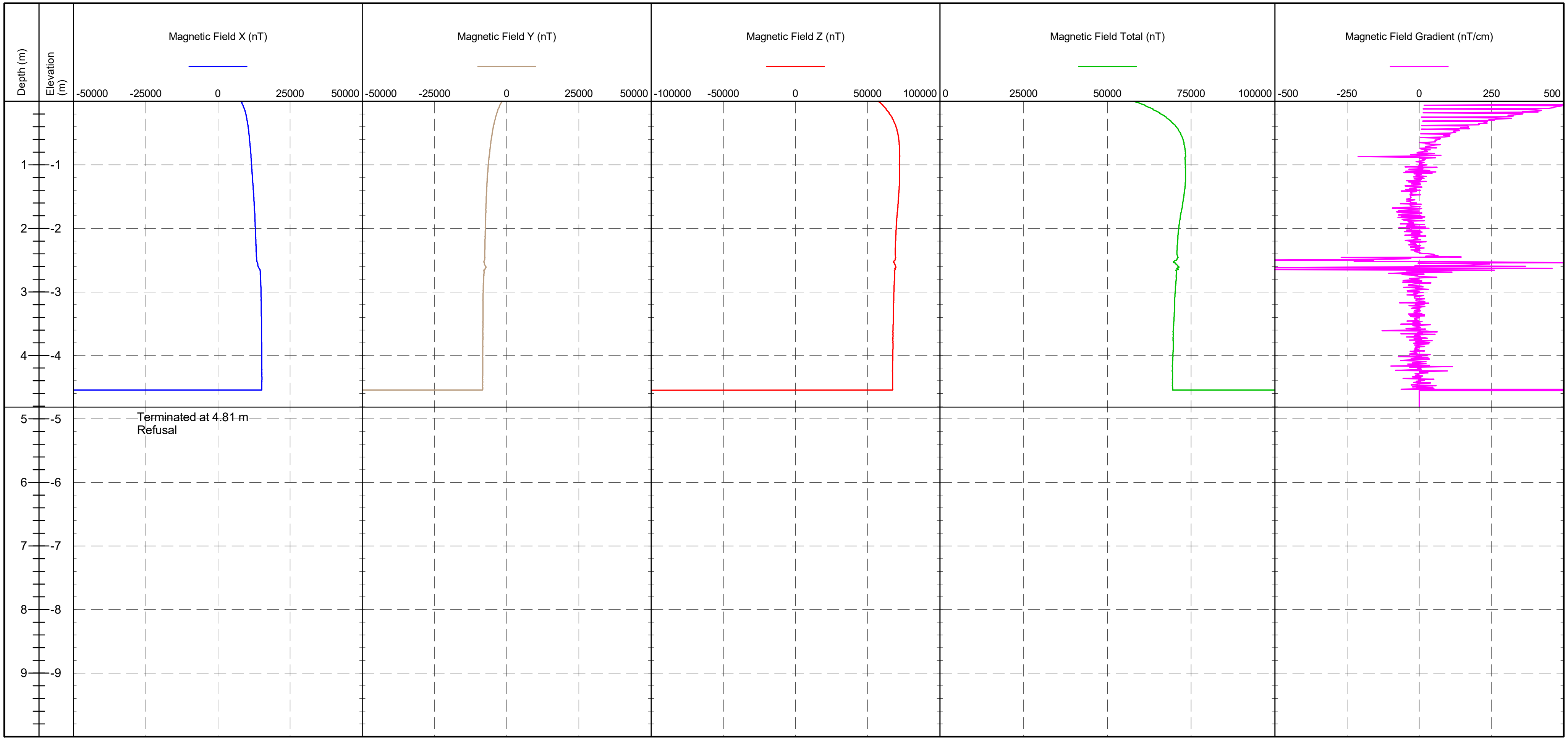
CONE ID : S15-CFIP.1858	TEST TYPE : TE2		CPTU ZERO VALUES			
CONE MODEL : Subtraction	APPLICATION CLASS : 2	Transducer	Pre	Post	Difference	
CONE AREA : 15cm^2	RIG : CPT 017 - Griffen	Tip	207 mV	198 mV	-0.098 MPa	
CONE AREA RATIO : 0.79	OPERATOR : RS	Sleeve	205 mV	201 mV	-0.003 kPa	
FILTER POSITION : u2	FRICTION REDUCER : None	Pore Pressure 2	262 mV	226 mV	-0.009 kPa	
FILTER TYPE : HDPE	WEATHER : Raining & Mild	X-Y Inclinometer	2049 mV	2081 mV		

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID
05

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 23/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen	Tip	207 mV	197 mV	-0.108 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: RS	Sleeve	205 mV	199 mV	-0.004 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	247 mV	214 mV	-0.008 kPa
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild	X-Y Inclinometer	2313 mV	2320 mV	

SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

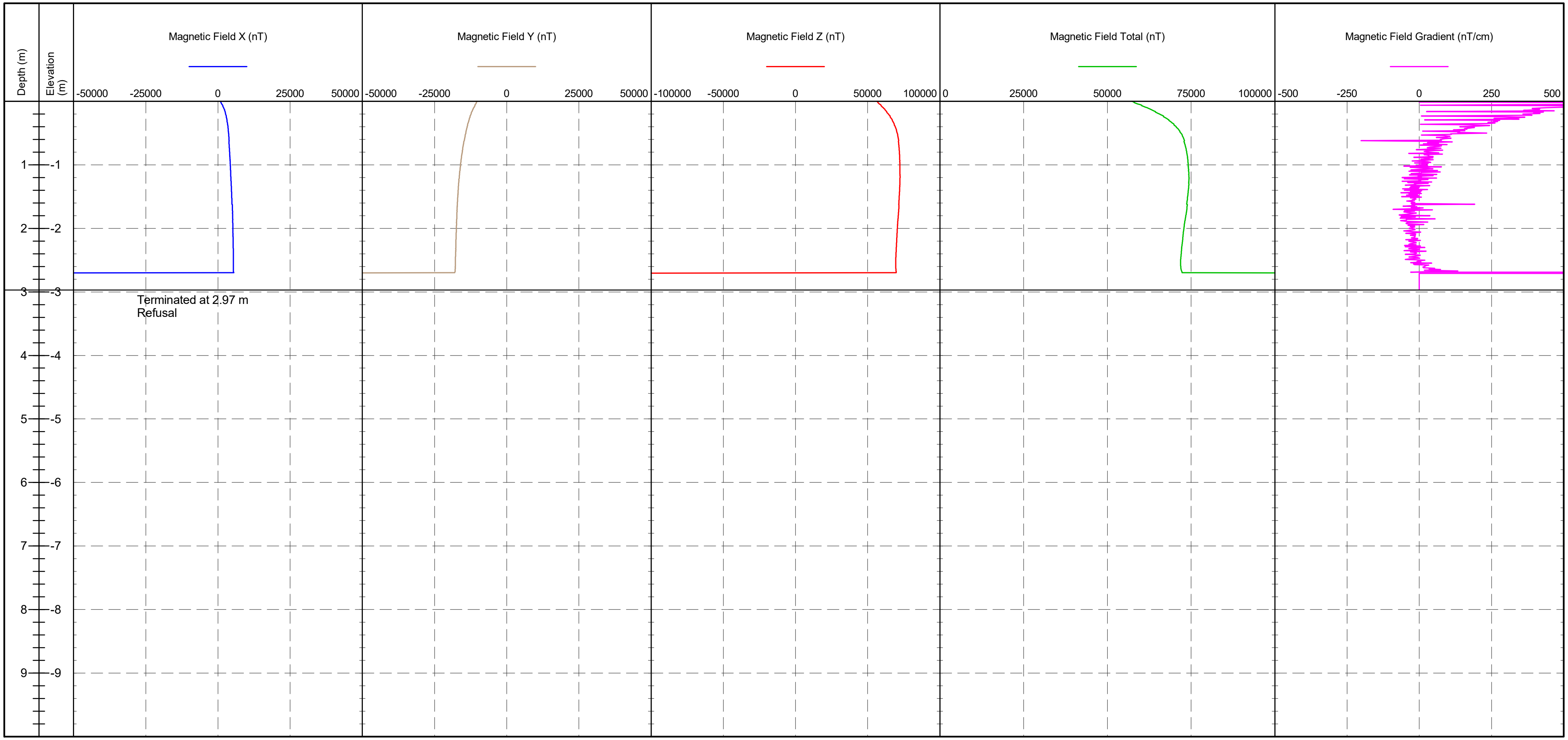
MAG LOG

PointID **06**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 19/10/2020
PLOT DATE : 23/10/2020
METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858	TEST TYPE : TE2
CONE MODEL : Subtraction	APPLICATION CLASS : 2
CONE AREA : 15cm^2	RIG : CPT 017 - Griffen
CONE AREA RATIO : 0.79	OPERATOR : RS
FILTER POSITION : u2	FRICTION REDUCER : None
FILTER TYPE : HDPE	WEATHER : Raining & Mild

CPTU ZERO VALUES

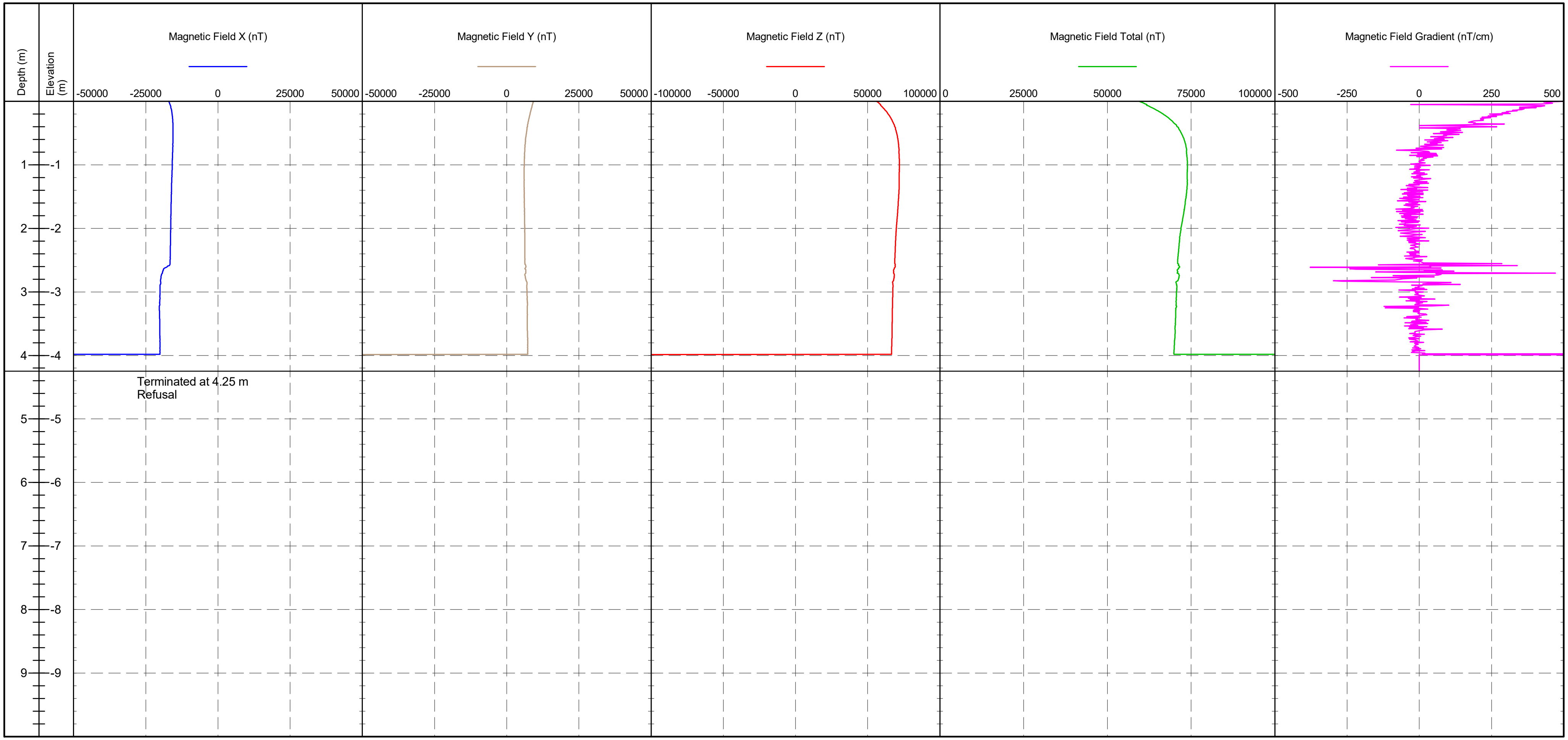
Transducer	Pre	Post	Difference
Tip	208 mV	204 mV	-0.043 MPa
Sleeve	206 mV	204 mV	-0.001 kPa
Pore Pressure 2	245 mV	254 mV	0.002 kPa
X-Y Inclinometer	2358 mV	2354 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID **07**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	15cm^2
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

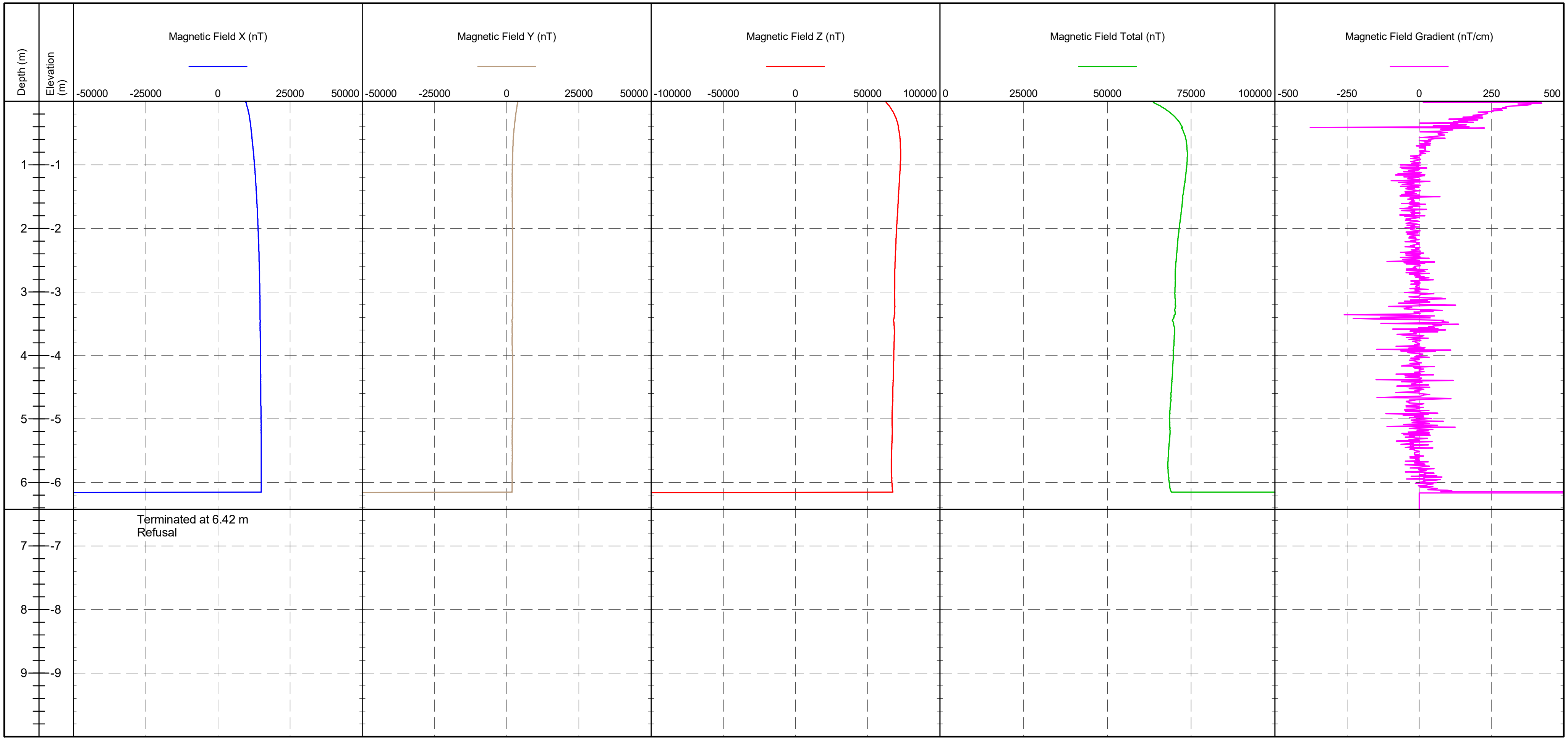
Transducer	Pre	Post	Difference
Tip	206 mV	196 mV	-0.108 MPa
Sleeve	204 mV	198 mV	-0.004 kPa
Pore Pressure 2	259 mV	215 mV	-0.011 kPa
X-Y Inclinometer	2771 mV	2820 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID **08**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



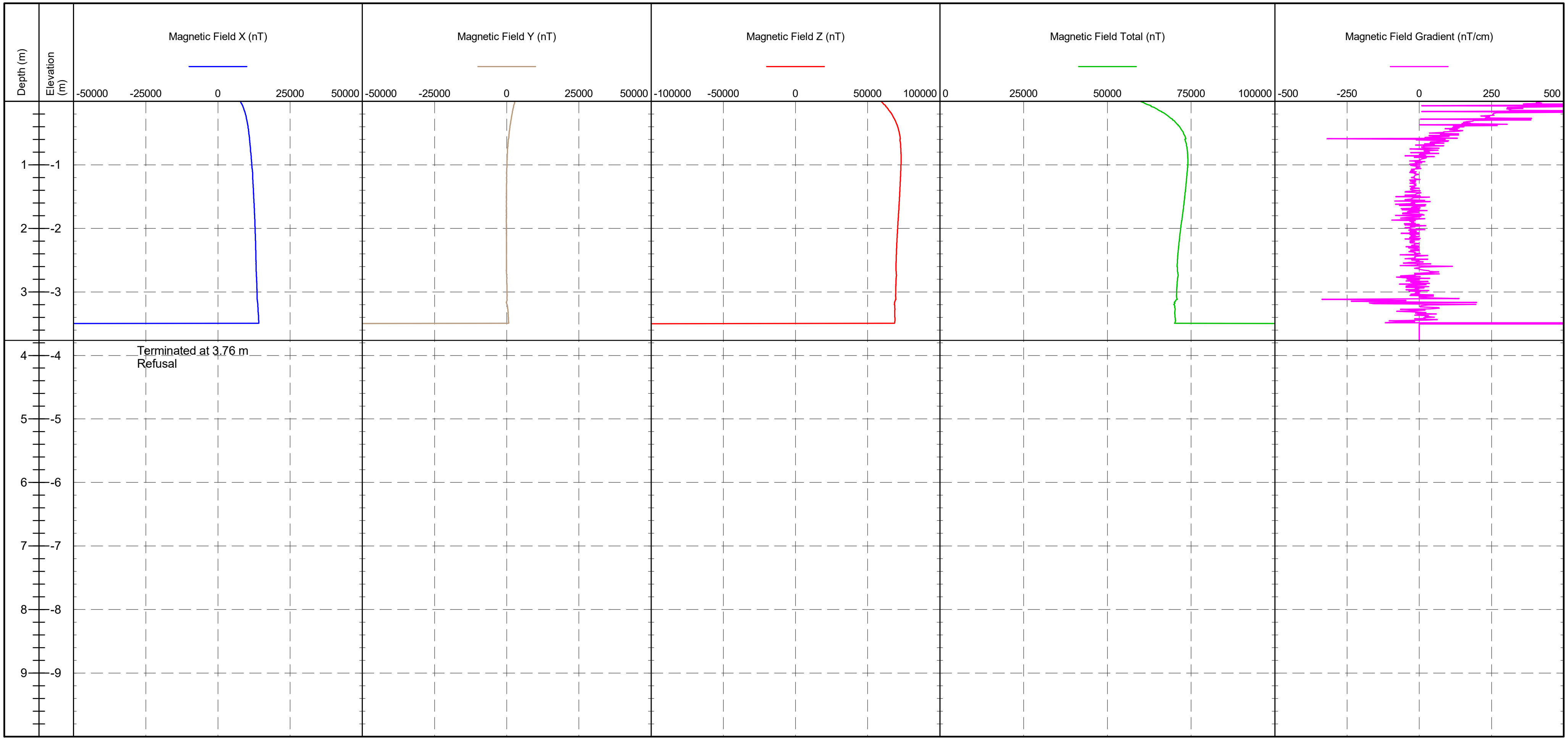
CONE ID	:	S15-CFIP.1858	TEST TYPE	:	TE2	CPTU ZERO VALUES				
CONE MODEL	:	Subtraction	APPLICATION CLASS	:	2	Transducer	Pre	Post	Difference	
CONE AREA	:	15cm^2	RIG	:	CPT 017 - Griffen	Tip	208 mV	199 mV	-0.098 MPa	
CONE AREA RATIO	:	0.79	OPERATOR	:	RS	Sleeve	204 mV	201 mV	-0.002 kPa	
FILTER POSITION	:	u2	FRICTION REDUCER	:	None	Pore Pressure 2	265 mV	229 mV	-0.009 kPa	
FILTER TYPE	:	HDPE	WEATHER	:	Raining & Mild	X-Y Inclinometer	2231 mV	2235 mV		

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID **09**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



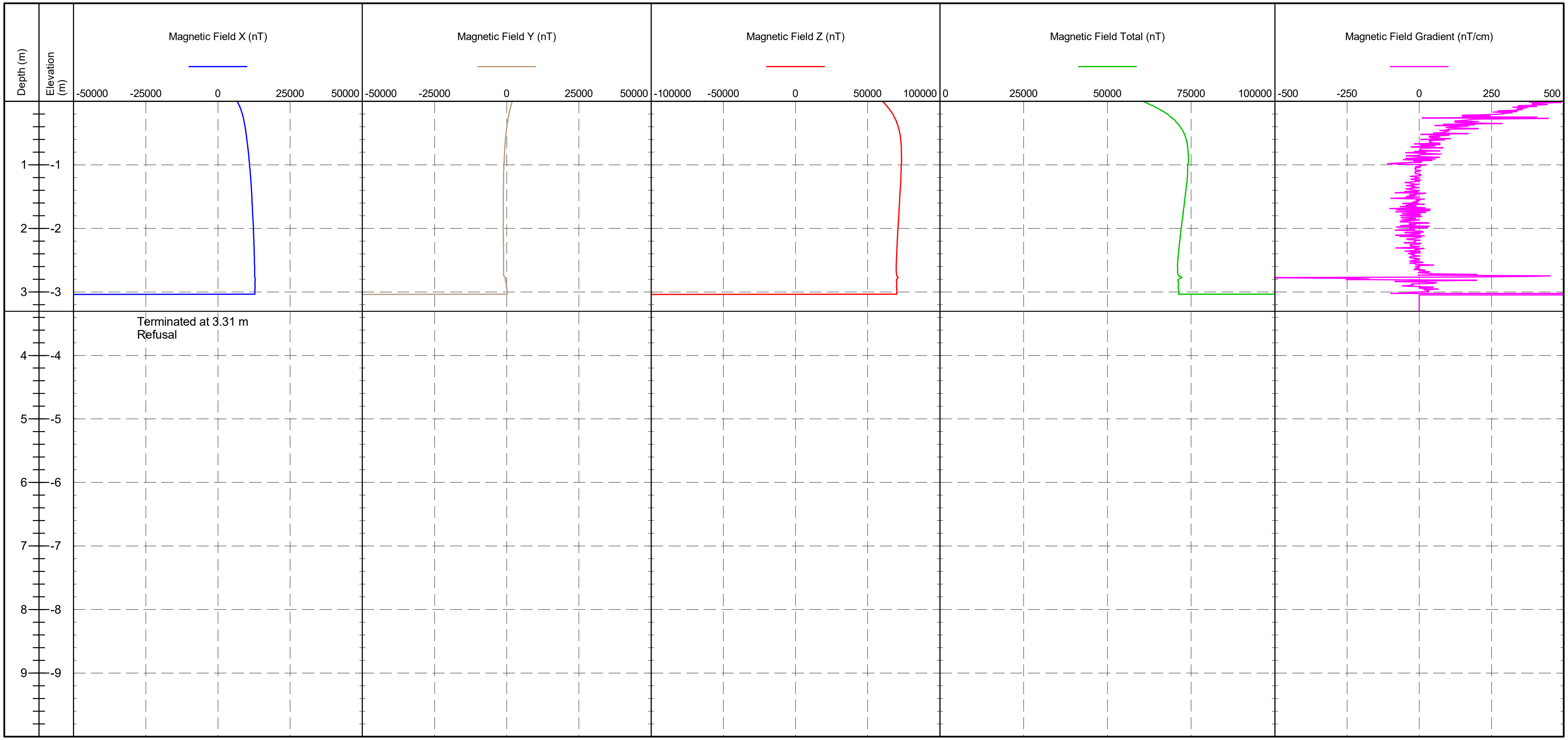
CONE ID : S15-CFIP.1858	TEST TYPE : TE2		CPTU ZERO VALUES		
CONE MODEL : Subtraction	APPLICATION CLASS : 2	Transducer	Pre	Post	Difference
CONE AREA : 15cm^2	RIG : CPT 017 - Griffen	Tip	208 mV	199 mV	-0.098 MPa
CONE AREA RATIO : 0.79	OPERATOR : RS	Sleeve	206 mV	200 mV	-0.004 kPa
FILTER POSITION : u2	FRICTION REDUCER : None	Pore Pressure 2	244 mV	225 mV	-0.005 kPa
FILTER TYPE : HDPE	WEATHER : Raining & Mild	X-Y Inclinometer	2404 mV	2394 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID **10**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 19/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 23/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen	Tip	206 mV	202 mV	-0.043 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: RS	Sleeve	203 mV	202 mV	-0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	250 mV	244 mV	-0.001 kPa
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild	X-Y Inclinometer	2483 mV	2473 mV	

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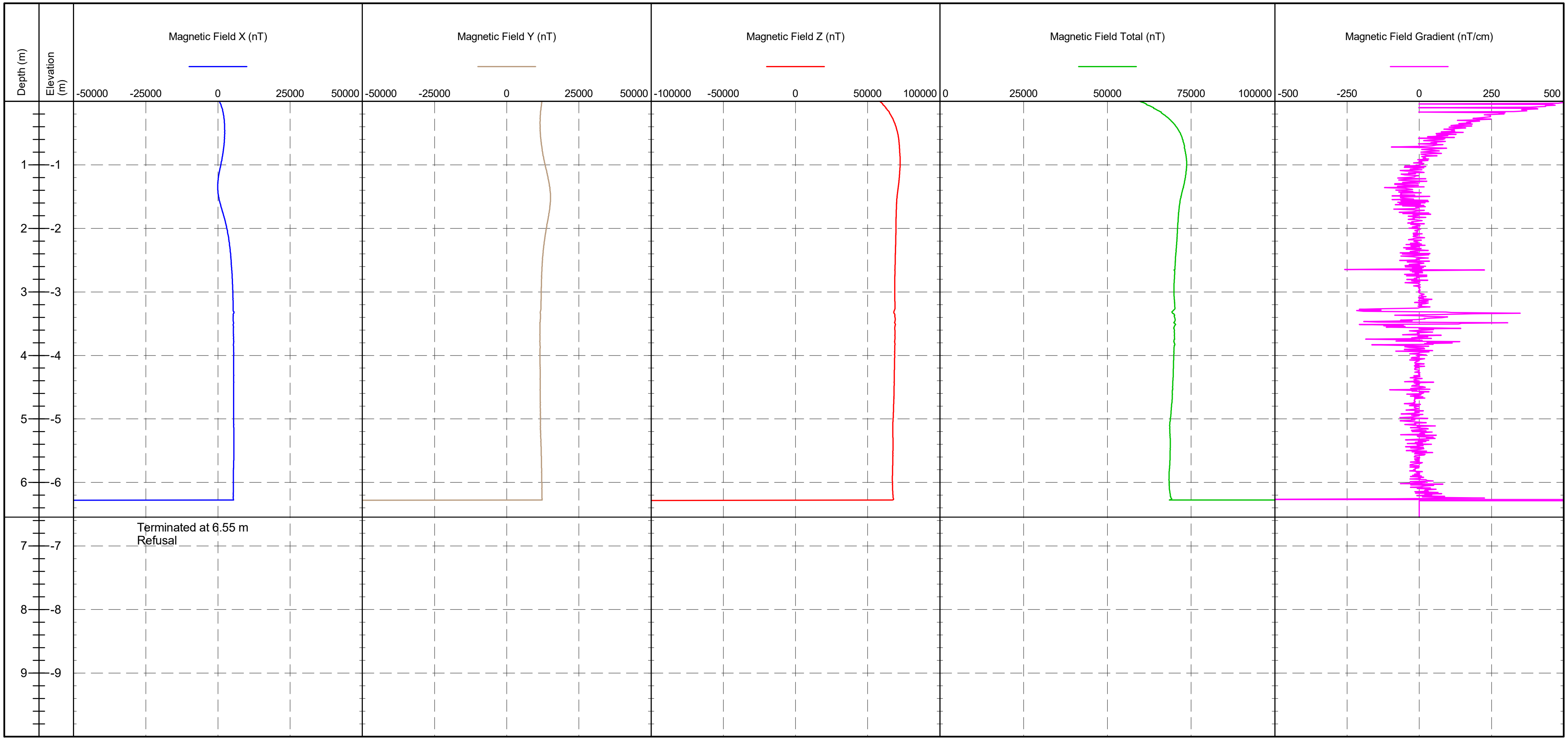
MAG LOG

PointID **11**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	15cm^2
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	200 mV	-0.065 MPa
Sleeve	204 mV	198 mV	-0.004 kPa
Pore Pressure 2	247 mV	253 mV	0.001 kPa
X-Y Inclinometer	2163 mV	2165 mV	

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MAG LOG

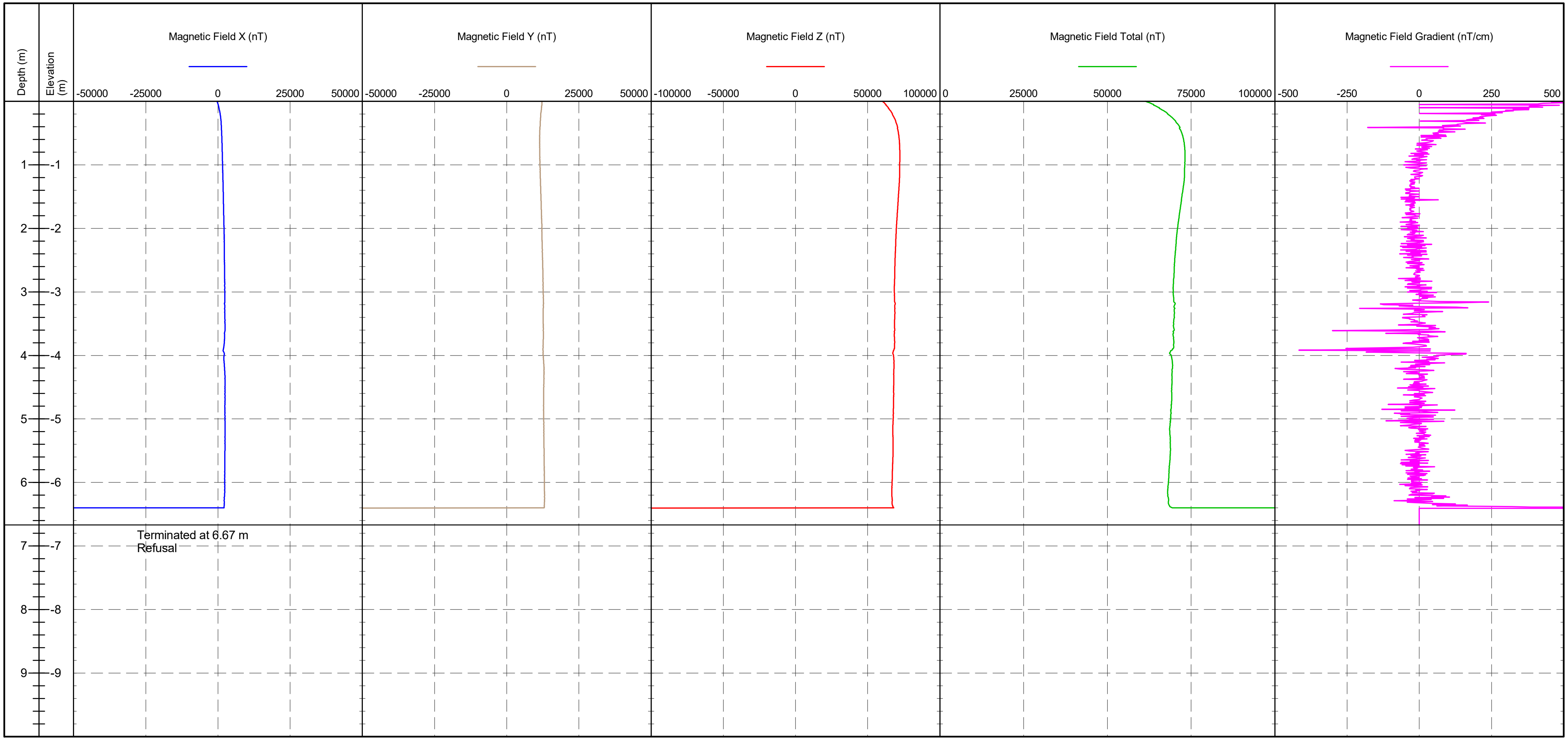
PointID **12**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 19/10/2020
PLOT DATE	: 23/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	199 mV	-0.054 MPa
Sleeve	200 mV	198 mV	-0.001 kPa
Pore Pressure 2	257 mV	236 mV	-0.005 kPa
X-Y Inclinometer	2455 mV	2413 mV	

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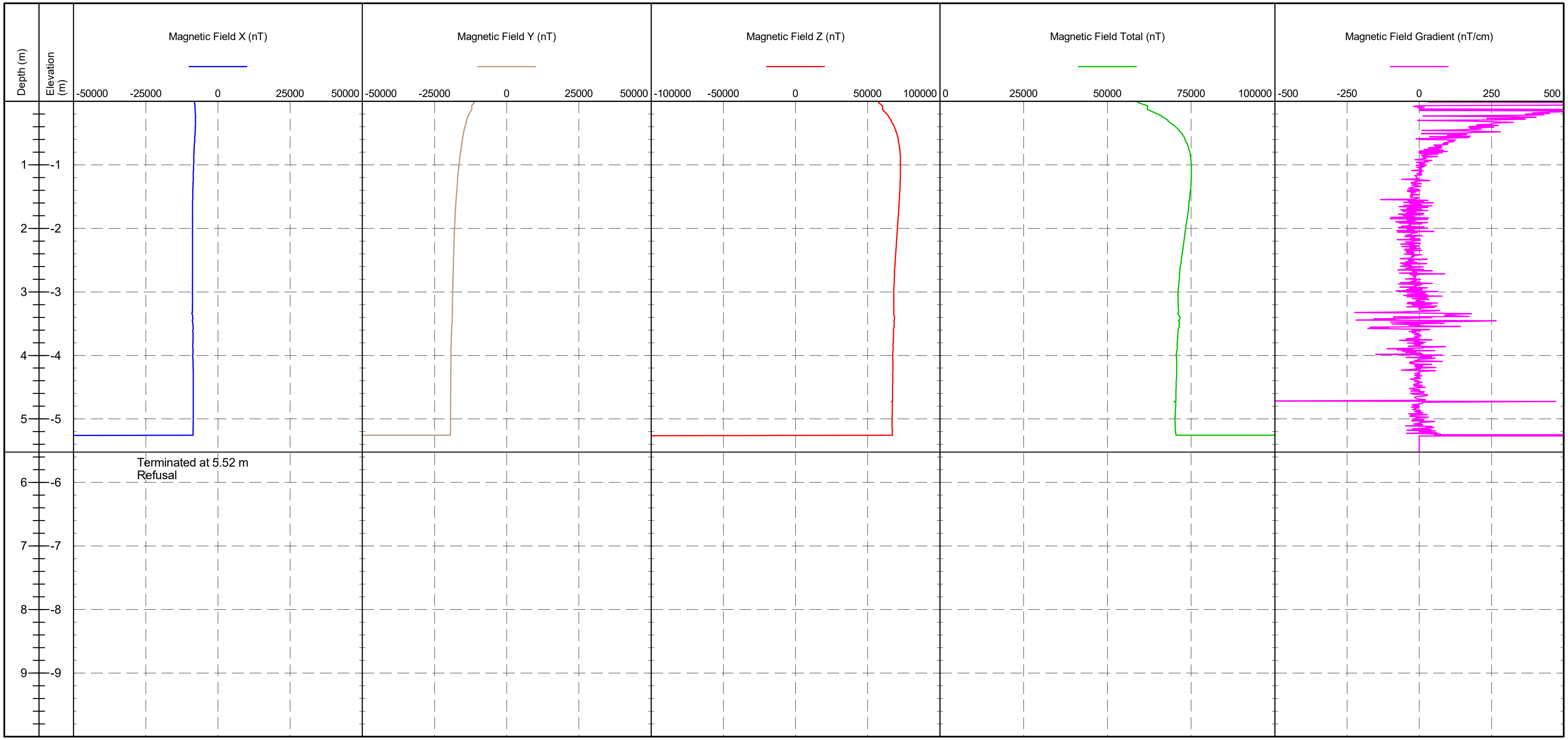
MAG LOG

PointID **13**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 19/10/2020
PLOT DATE : 23/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	206 mV	193 mV	-0.141 MPa
Sleeve	203 mV	196 mV	-0.005 kPa
Pore Pressure 2	245 mV	208 mV	-0.009 kPa
X-Y Inclinometer	2675 mV	2681 mV	

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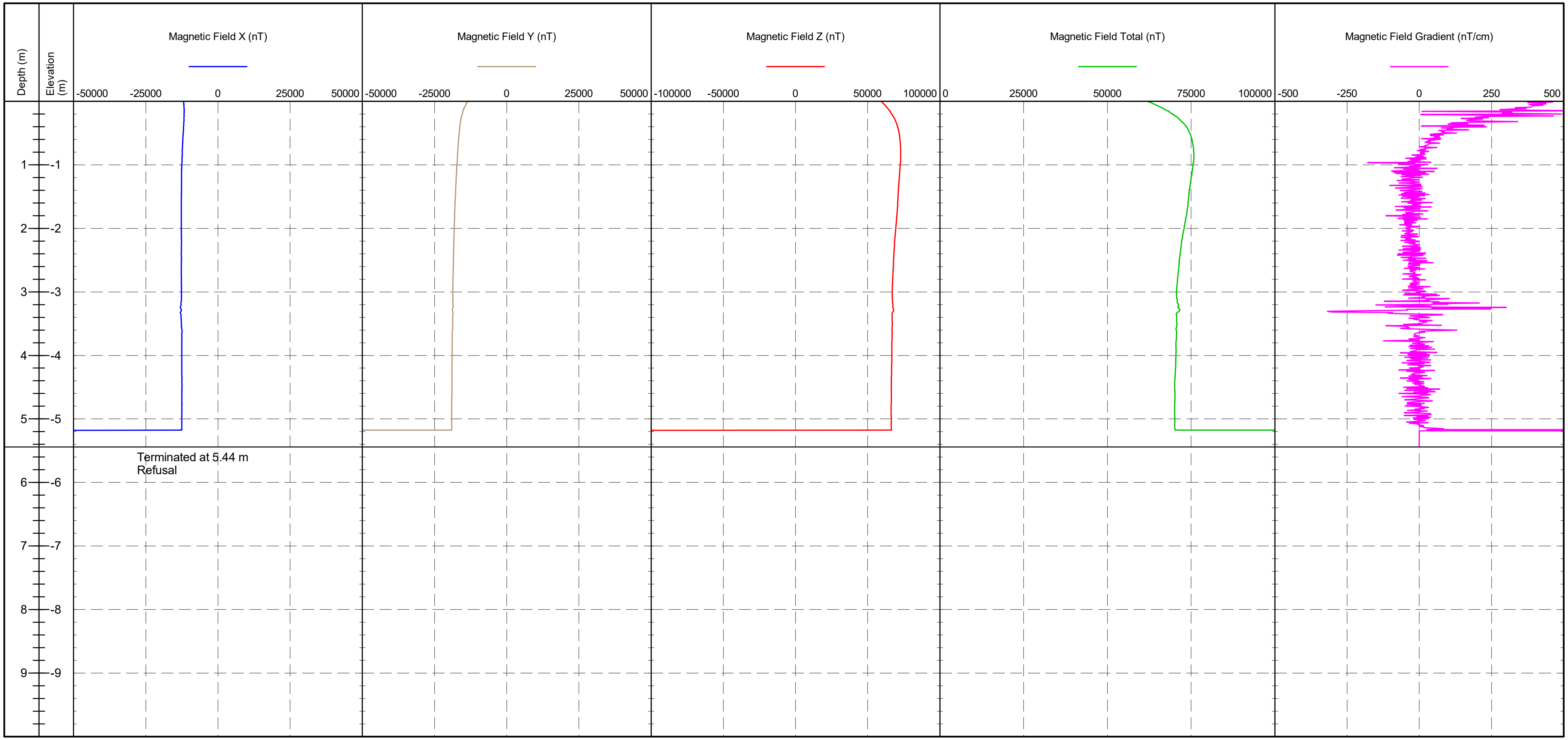
MAG LOG

PointID	14

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 19/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		CPTU ZERO VALUES		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen	Tip	202 mV	193 mV	-0.098 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: RS	Sleeve	201 mV	196 mV	-0.004 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	226 mV	214 mV	-0.003 kPa
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild	X-Y Inclinometer	2889 mV	2908 mV	

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MAG LOG

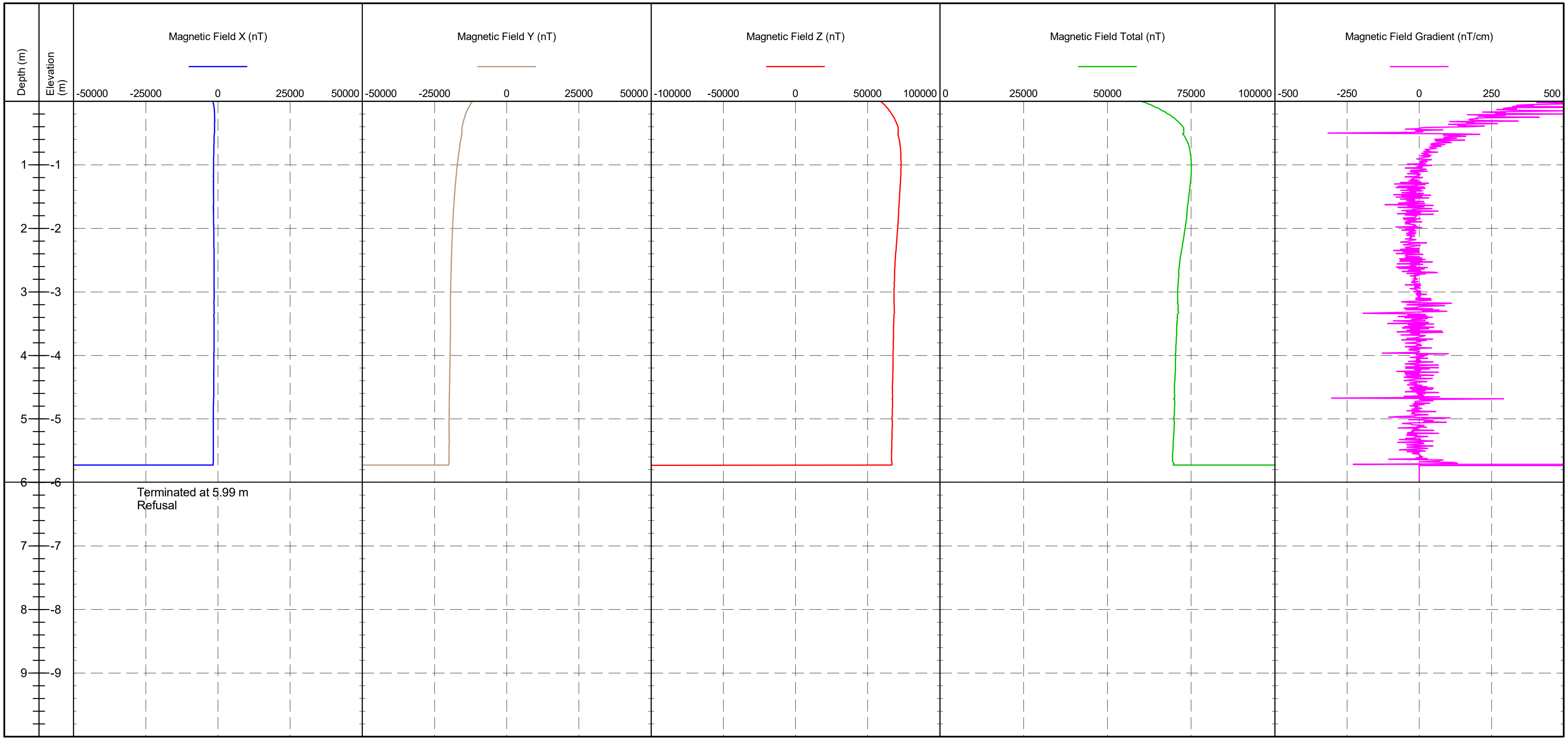
PointID **15**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 19/10/2020
PLOT DATE	: 23/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	$15cm^2$
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	202 mV	196 mV	-0.065 MPa
Sleeve	201 mV	196 mV	-0.004 kPa
Pore Pressure 2	232 mV	240 mV	0.002 kPa
X-Y Inclinometer	2373 mV	2378 mV	

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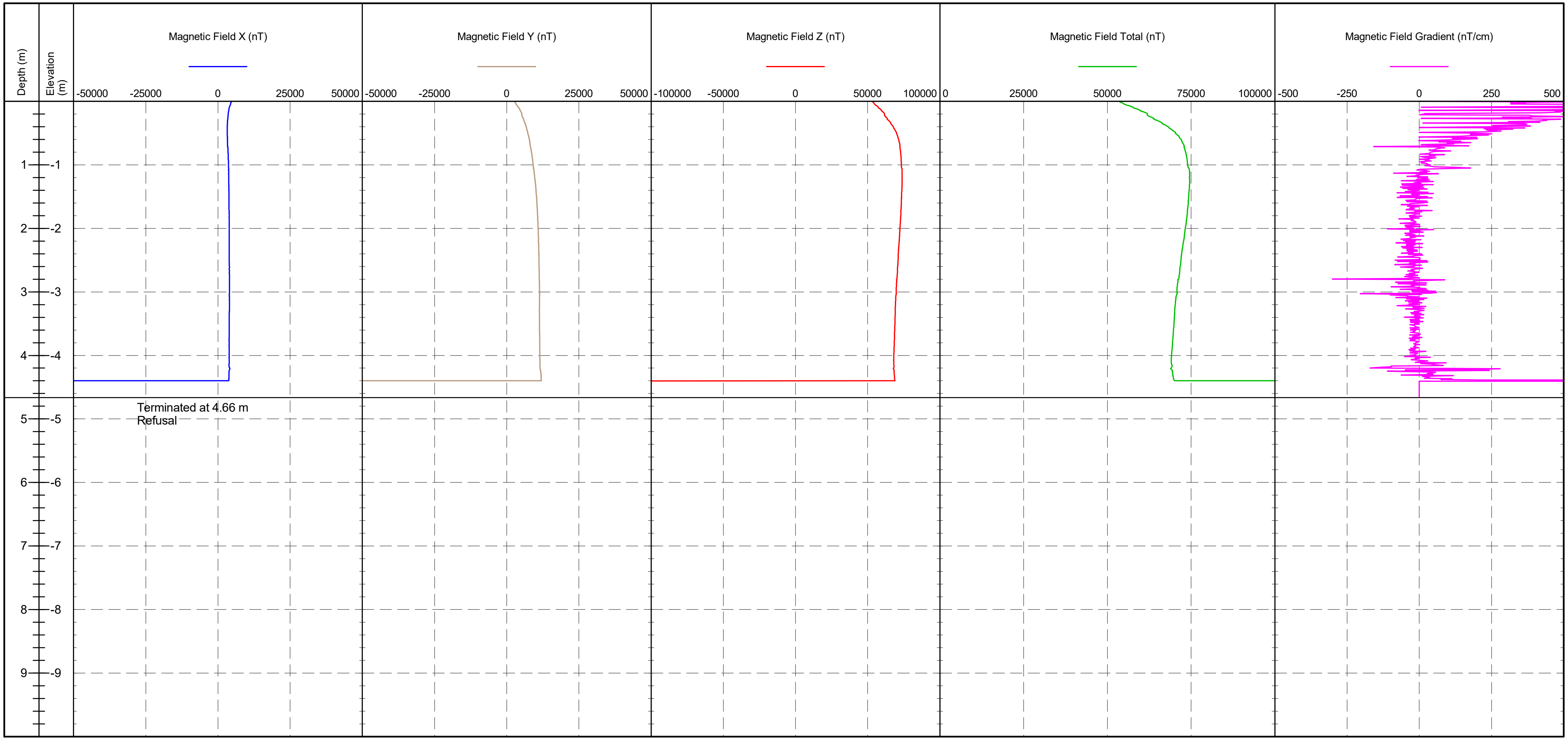
MAG LOG

PointID **16**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 23/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858	TEST TYPE : TE2		CPTU ZERO VALUES	
CONE MODEL : Subtraction	APPLICATION CLASS : 2	Transducer	Pre	Post	Difference
CONE AREA : 15cm^2	RIG : CPT 017 - Griffen	Tip	206 mV	201 mV	-0.054 MPa
CONE AREA RATIO : 0.79	OPERATOR : RS	Sleeve	203 mV	202 mV	-0.001 kPa
FILTER POSITION : u2	FRICTION REDUCER : None	Pore Pressure 2	262 mV	231 mV	-0.008 kPa
FILTER TYPE : HDPE	WEATHER : Raining & Mild	X-Y Inclinometer	2554 mV	2535 mV	

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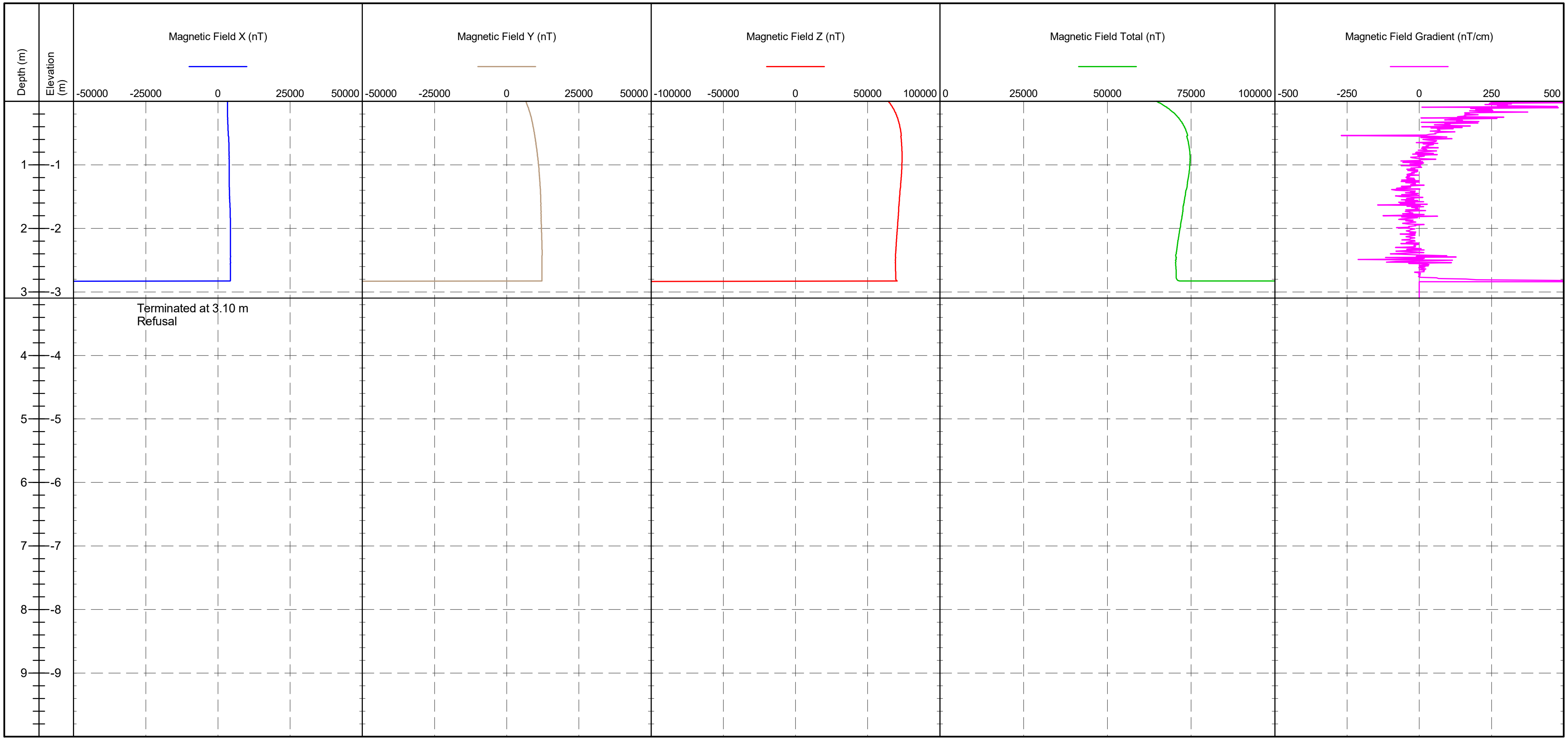
MAG LOG

PointID **17**

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 23/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858	TEST TYPE : TE2		CPTU ZERO VALUES			
CONE MODEL : Subtraction	APPLICATION CLASS : 2	Transducer	Pre	Post	Difference	
CONE AREA : 15cm²	RIG : CPT 017 - Griffen	Tip	207 mV	205 mV	-0.022 MPa	
CONE AREA RATIO : 0.79	OPERATOR : RS	Sleeve	205 mV	207 mV	0.001 kPa	
FILTER POSITION : u2	FRICTION REDUCER : None	Pore Pressure 2	252 mV	241 mV	-0.003 kPa	
FILTER TYPE : HDPE	WEATHER : Raining & Mild	X-Y Inclinometer	2422 mV	2496 mV		

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MAG LOG

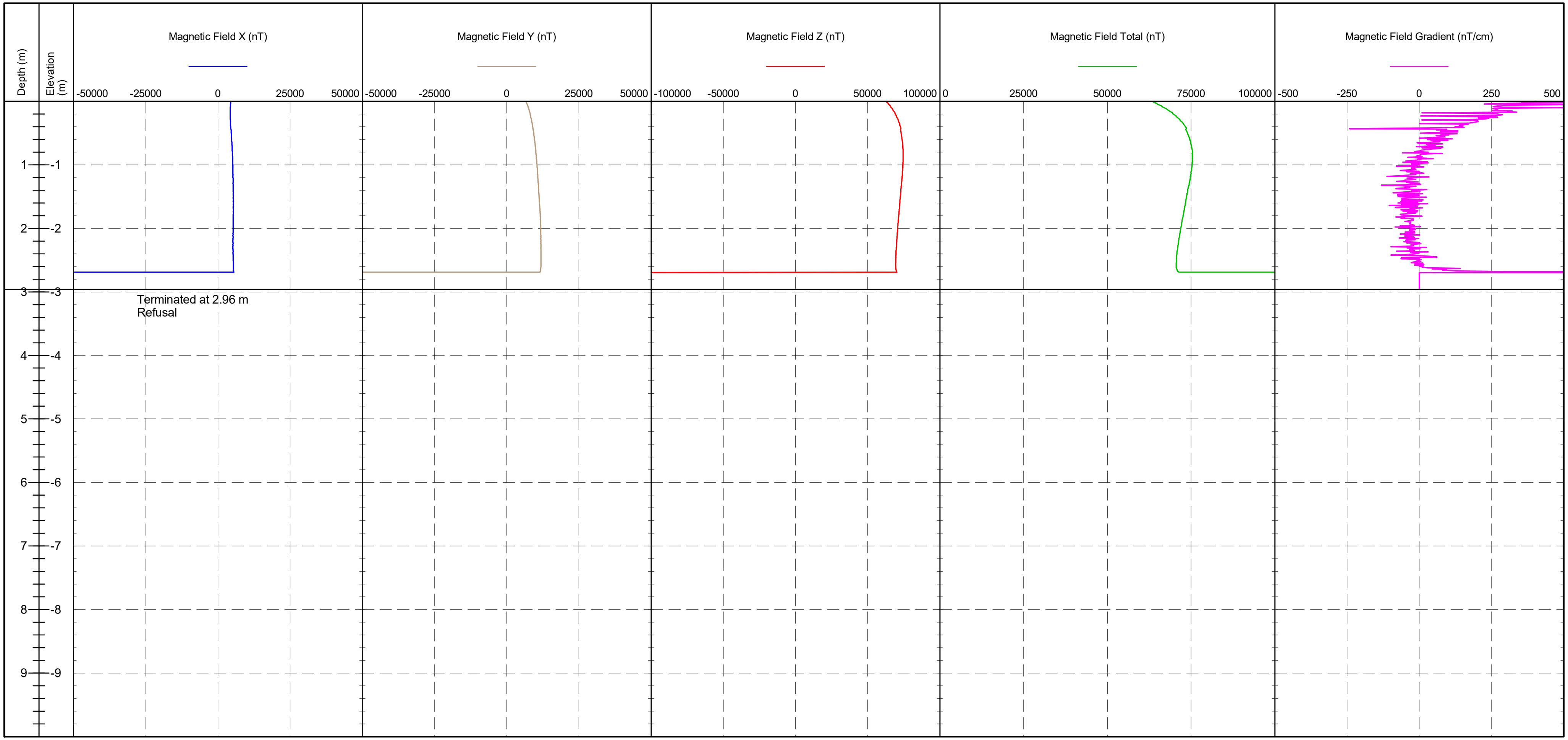
PointID **18**

CLIENT : Soiltechnics
PROJECT : Lossiemouth
LOCATION : Lossiemouth
PROJECT No. : 1200410

EASTING	:	0.0 m
NORTHING	:	0.0 m
ELEVATION	:	0.00 m OD
CHECKED BY	:	LD
TERMINATION REASON	:	Refusal

Remark:
Test refused on tip resistance.

SHEET	:	1 OF 1
STATUS	:	Final
TEST DATE	:	20/10/2020
PLOT DATE	:	23/10/2020
METHOD	:	ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	15cm^2
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	201 mV	206 mV	0.054 MPa
Sleeve	202 mV	205 mV	0.002 kPa
Pore Pressure 2	237 mV	240 mV	0.001 kPa
X-Y Inclinometer	2333 mV	2338 mV	

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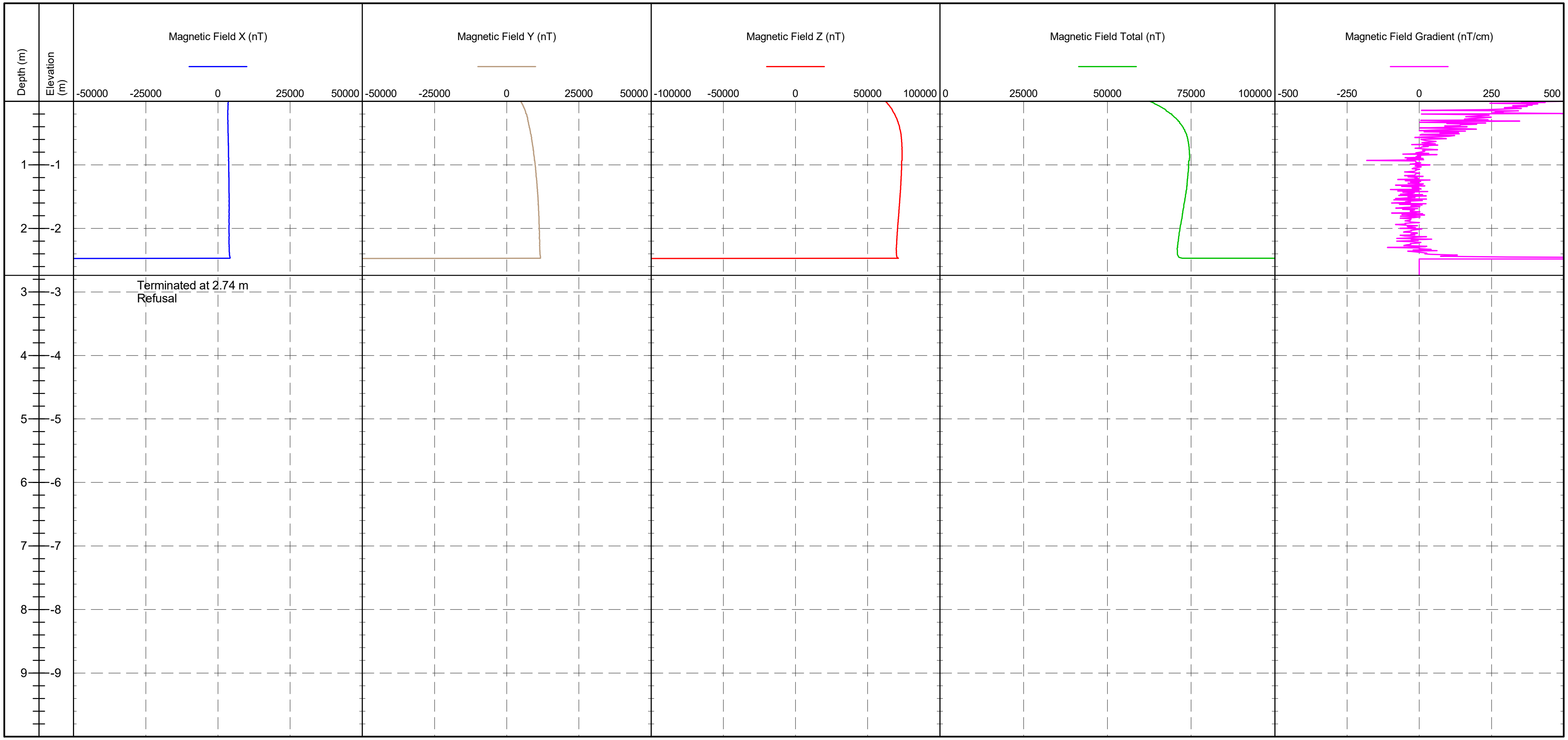
MAG LOG

PointID
19

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858 CONE MODEL : Subtraction CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 017 - Griffen OPERATOR : RS FRICTION REDUCER : None WEATHER : Raining & Mild	

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	198 mV	204 mV	0.065 MPa
Sleeve	200 mV	204 mV	0.003 kPa
Pore Pressure 2	249 mV	249 mV	0 kPa
X-Y Inclinometer	2469 mV	2475 mV	

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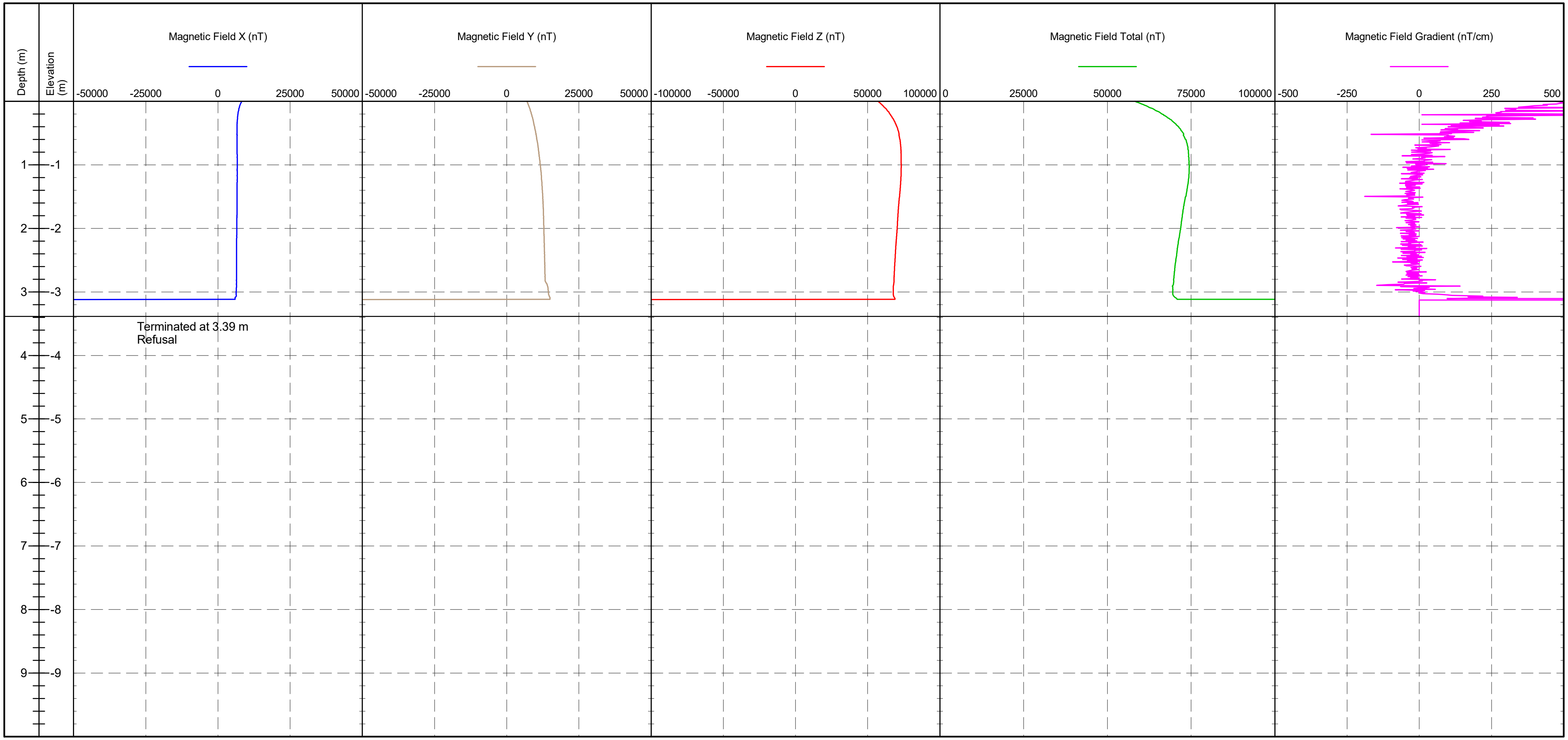
MAG LOG

PointID **20**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858 CONE MODEL : Subtraction CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 017 - Griffen OPERATOR : RS FRICTION REDUCER : None WEATHER : Raining & Mild	

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	207 mV	203 mV	-0.043 MPa
Sleeve	205 mV	203 mV	-0.001 kPa
Pore Pressure 2	260 mV	240 mV	-0.005 kPa
X-Y Inclinometer	2274 mV	2415 mV	

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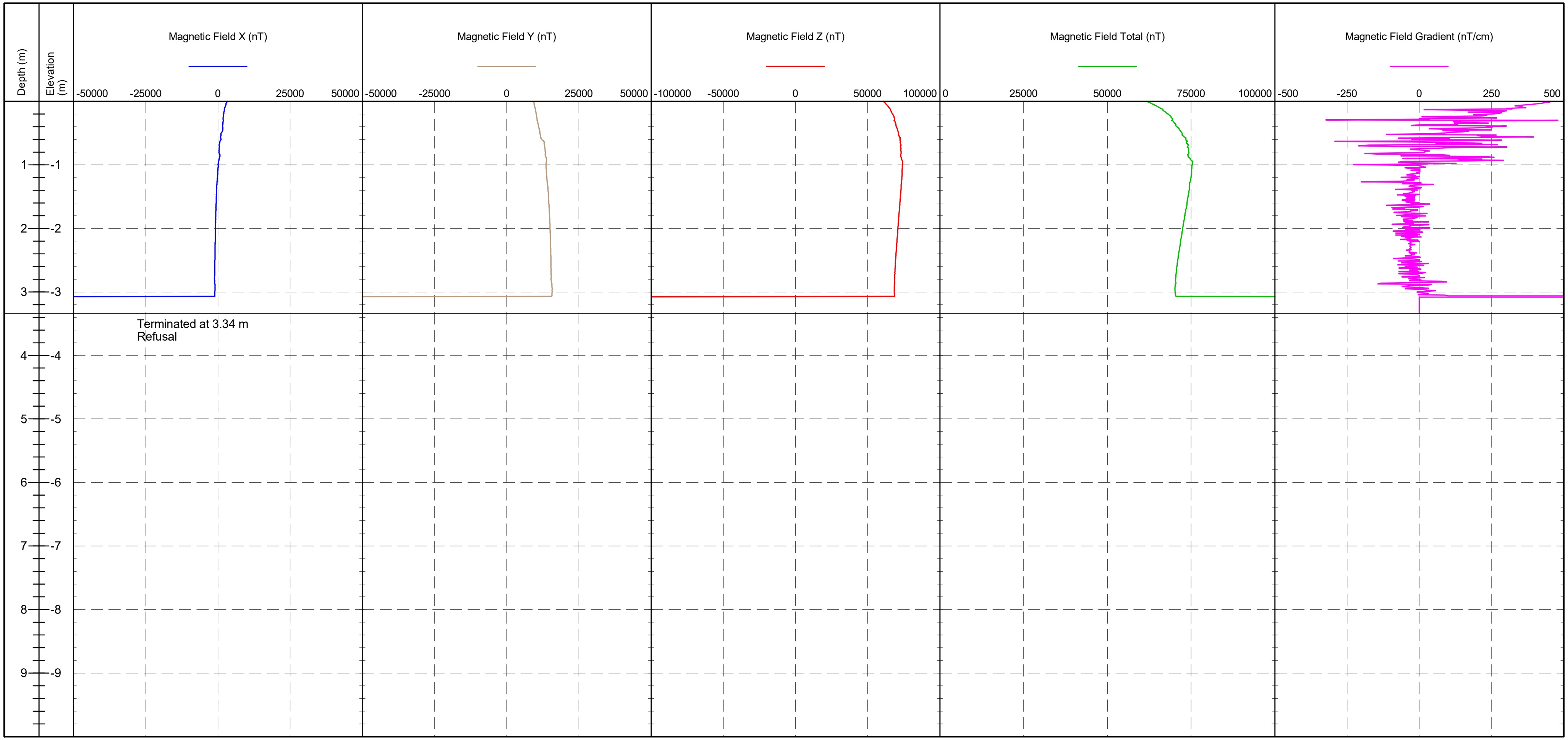
MAG LOG

PointID **21**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 23/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen	Tip	207 mV	205 mV	-0.022 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: RS	Sleeve	204 mV	205 mV	0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	255 mV	236 mV	-0.005 kPa
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild	X-Y Inclinometer	2500 mV	2541 mV	

MAG LOG

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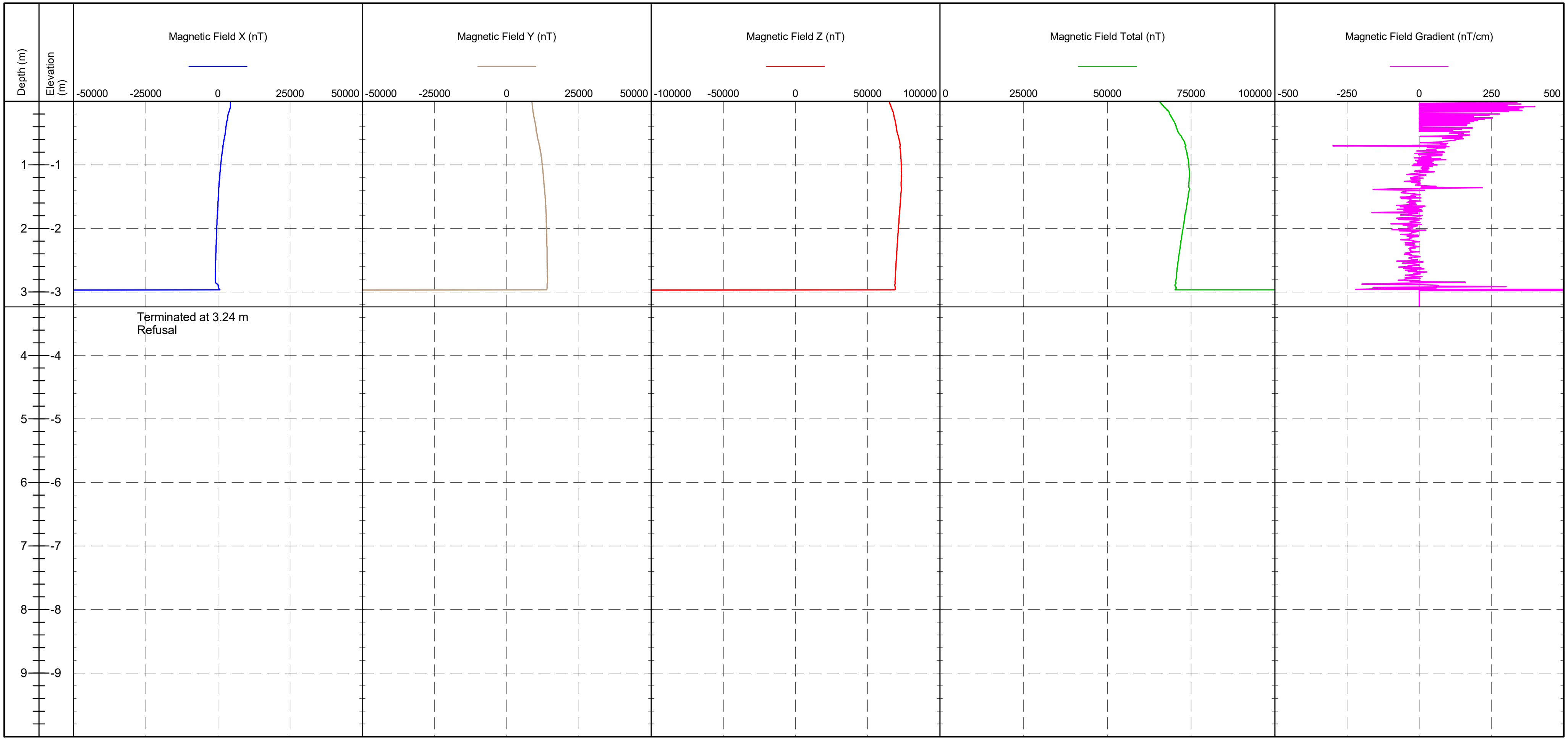
PointID **22**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 23/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	205 mV	203 mV	-0.022 MPa
Sleeve	204 mV	203 mV	-0.001 kPa
Pore Pressure 2	245 mV	236 mV	-0.002 kPa
X-Y Inclinometer	2633 mV	2656 mV	

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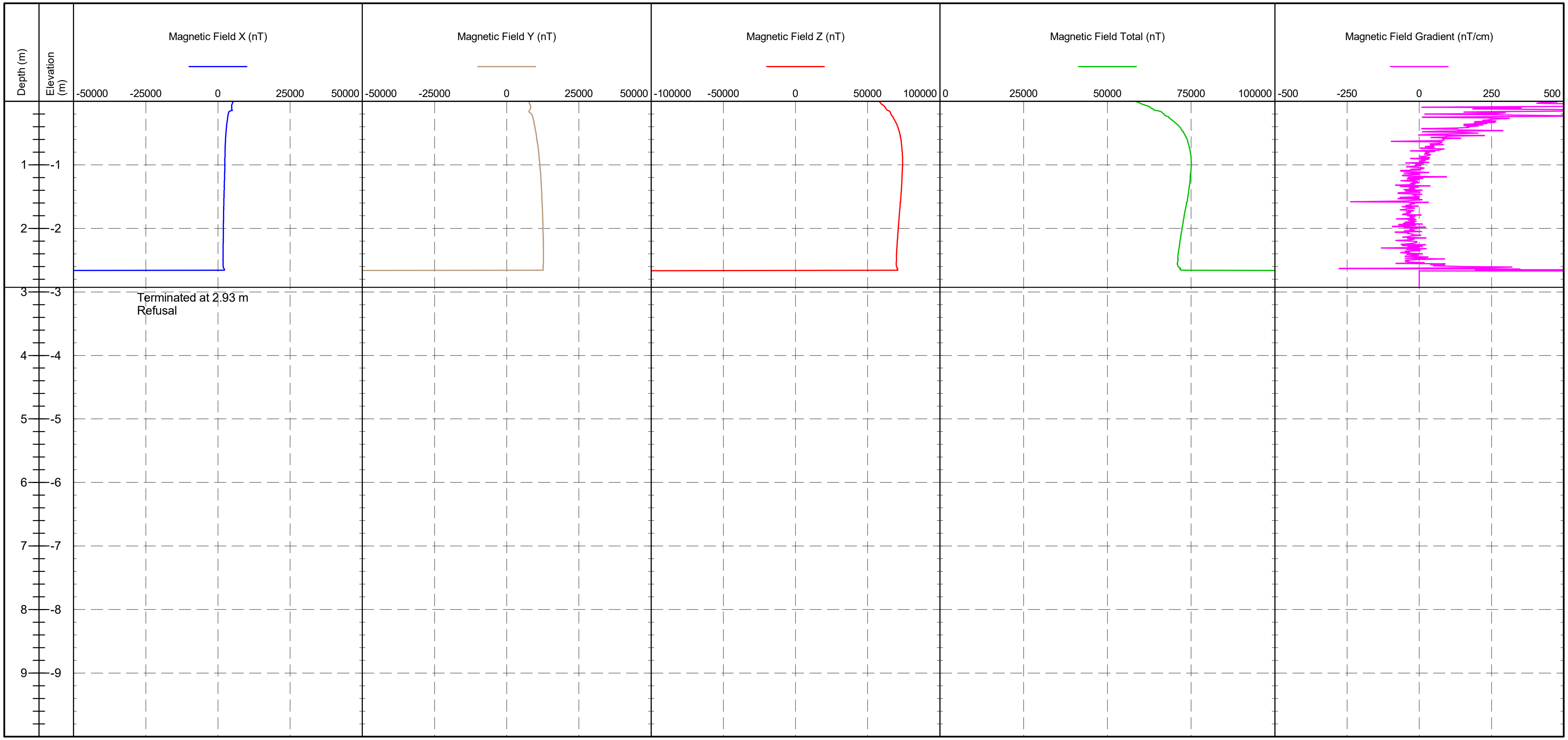
MAG LOG

PointID **23**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858	TEST TYPE : TE2		CPTU ZERO VALUES		
CONE MODEL : Subtraction	APPLICATION CLASS : 2	Transducer	Pre	Post	Difference
CONE AREA : 15cm^2	RIG : CPT 017 - Griffen	Tip	204 mV	203 mV	-0.011 MPa
CONE AREA RATIO : 0.79	OPERATOR : RS	Sleeve	203 mV	203 mV	0 kPa
FILTER POSITION : u2	FRICTION REDUCER : None	Pore Pressure 2	242 mV	234 mV	-0.002 kPa
FILTER TYPE : HDPE	WEATHER : Raining & Mild	X-Y Inclinometer	2346 mV	2362 mV	

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MAG LOG

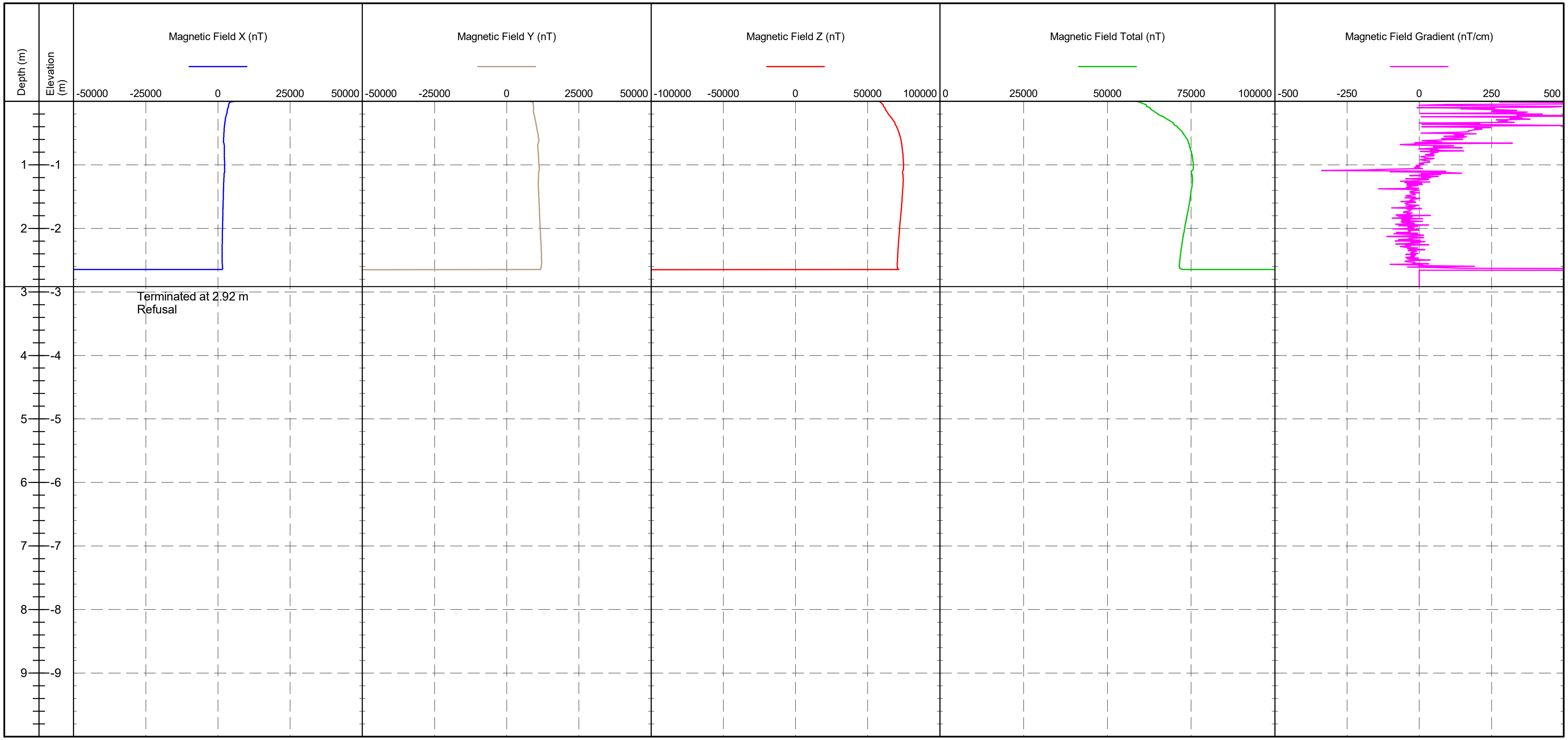
PointID **24**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 23/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	204 mV	0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	239 mV	231 mV	-0.002 kPa
X-Y Inclinometer	2246 mV	2208 mV	

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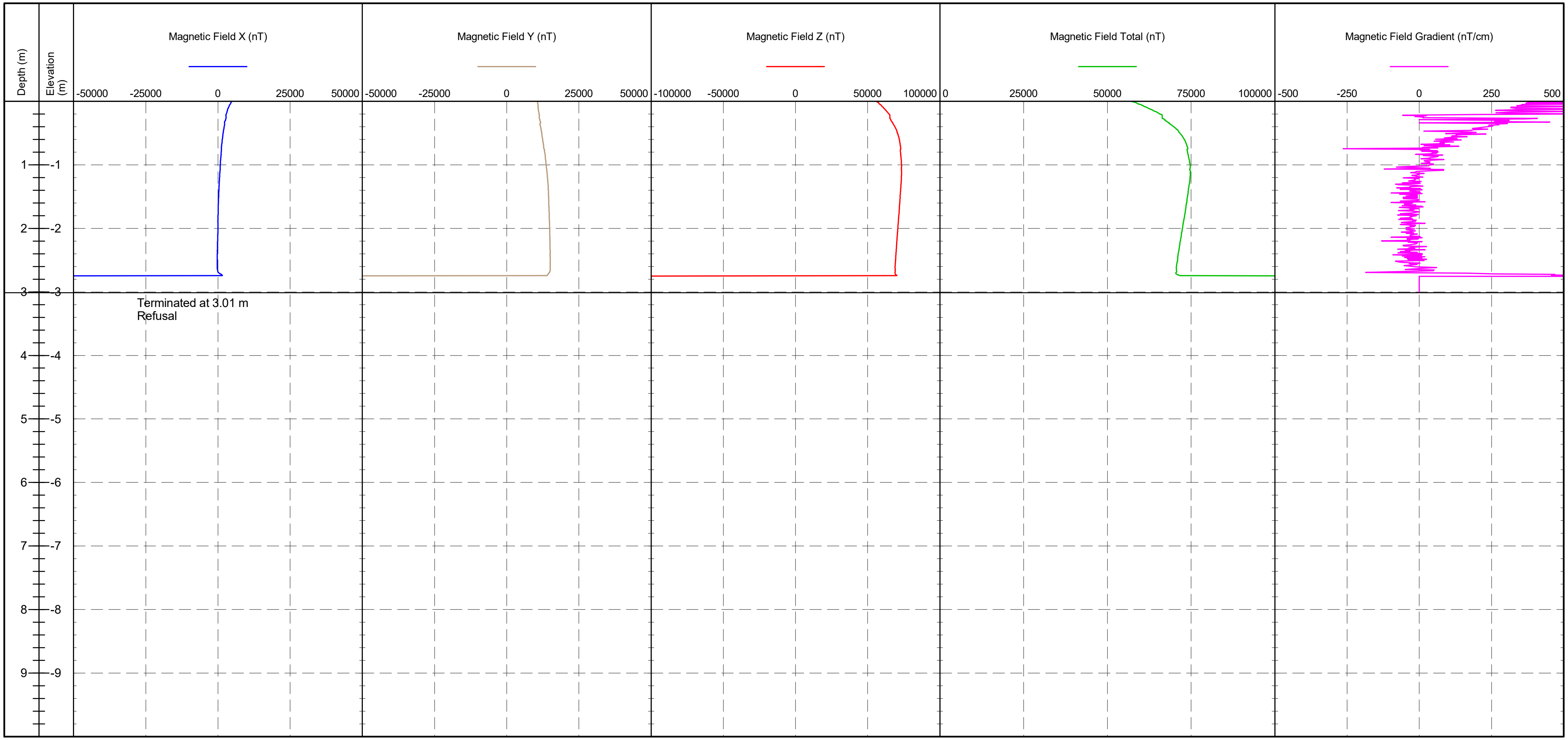
MAG LOG

PointID	25

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen
CONE AREA RATIO	: 0.79	OPERATOR	: RS
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	203 mV	-0.011 MPa
Sleeve	203 mV	203 mV	0 kPa
Pore Pressure 2	239 mV	231 mV	-0.002 kPa
X-Y Inclinometer	2075 mV	2097 mV	

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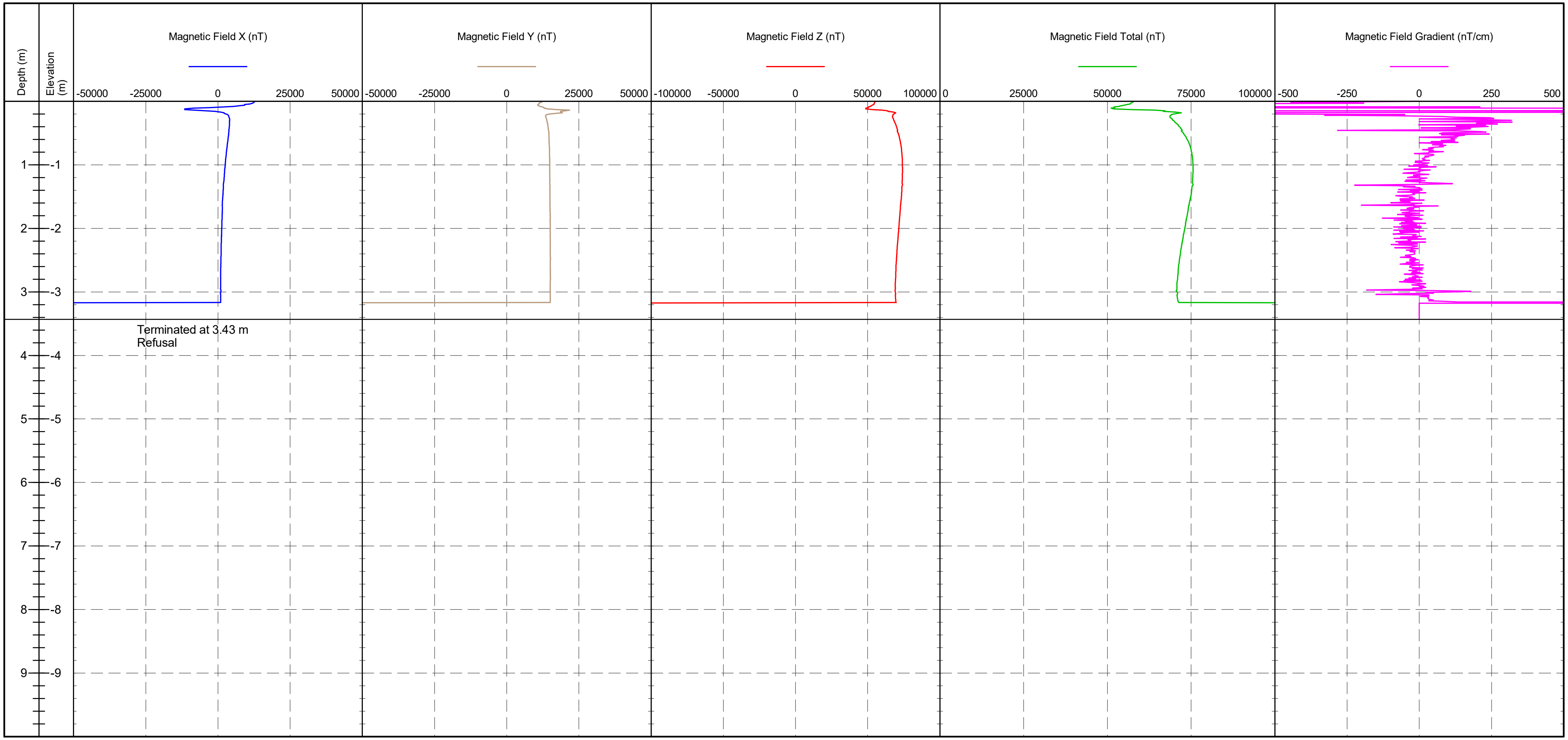
MAG LOG

PointID	26

CLIENT : Soiltechnics	EASTING : 0.0 m	Remark:	SHEET : 1 OF 1
PROJECT : Lossiemouth	NORTHING : 0.0 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD		TEST DATE : 20/10/2020
PROJECT No. : 1200410	CHECKED BY : LD		PLOT DATE : 23/10/2020
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen		
CONE AREA RATIO	: 0.79	OPERATOR	: RS		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	202 mV	-0.022 MPa
Sleeve	202 mV	205 mV	0.002 kPa
Pore Pressure 2	238 mV	223 mV	-0.004 kPa
X-Y Inclinometer	1980 mV	1993 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

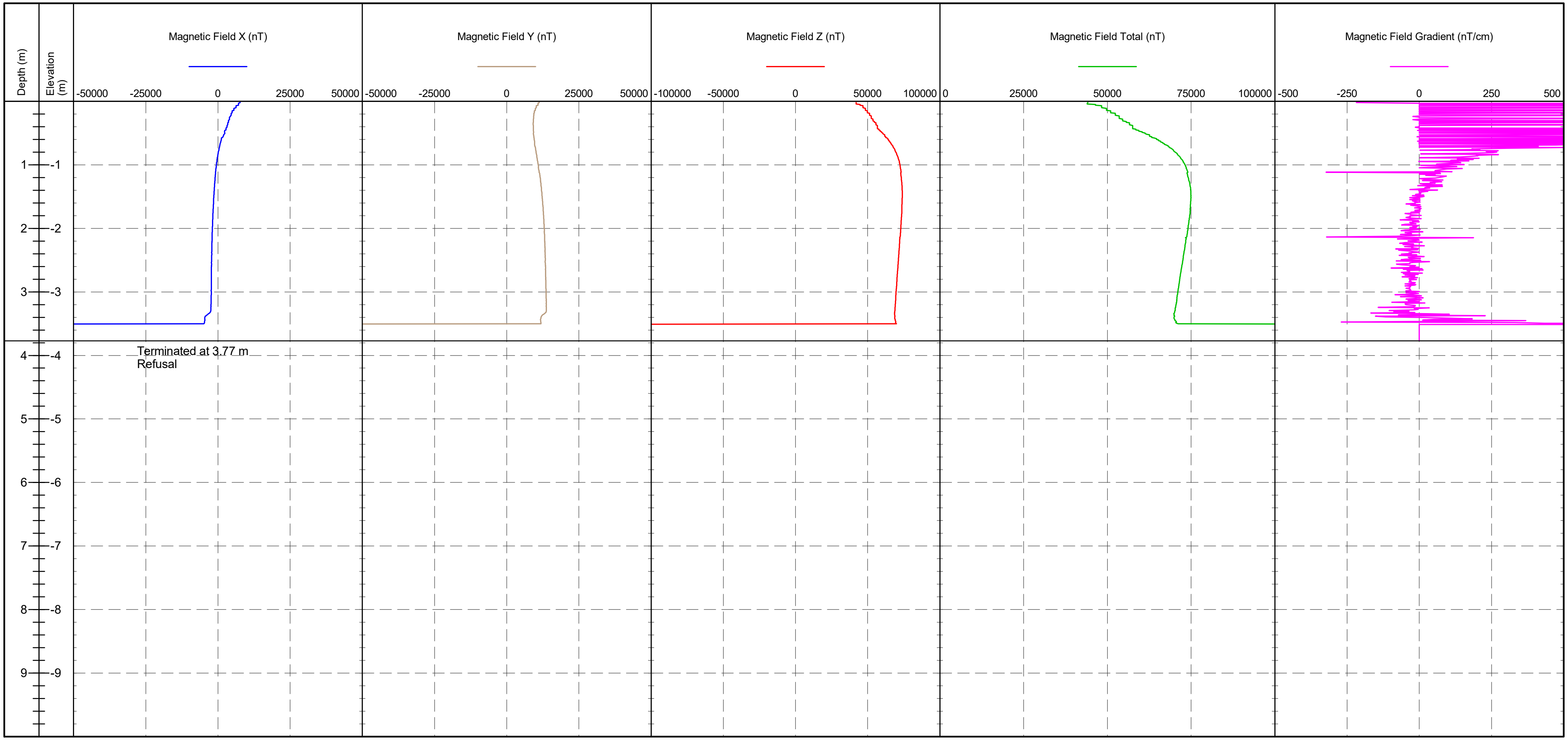
MAG LOG

PointID **27**

CLIENT : Soiltechnics	EASTING : 0.0 m
PROJECT : Lossiemouth	NORTHING : 0.0 m
LOCATION : Lossiemouth	ELEVATION : 0.00 m OD
PROJECT No. : 1200410	CHECKED BY : LD
	TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 23/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen		
CONE AREA RATIO	: 0.79	OPERATOR	: RS		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild		

CPTU ZERO VALUES

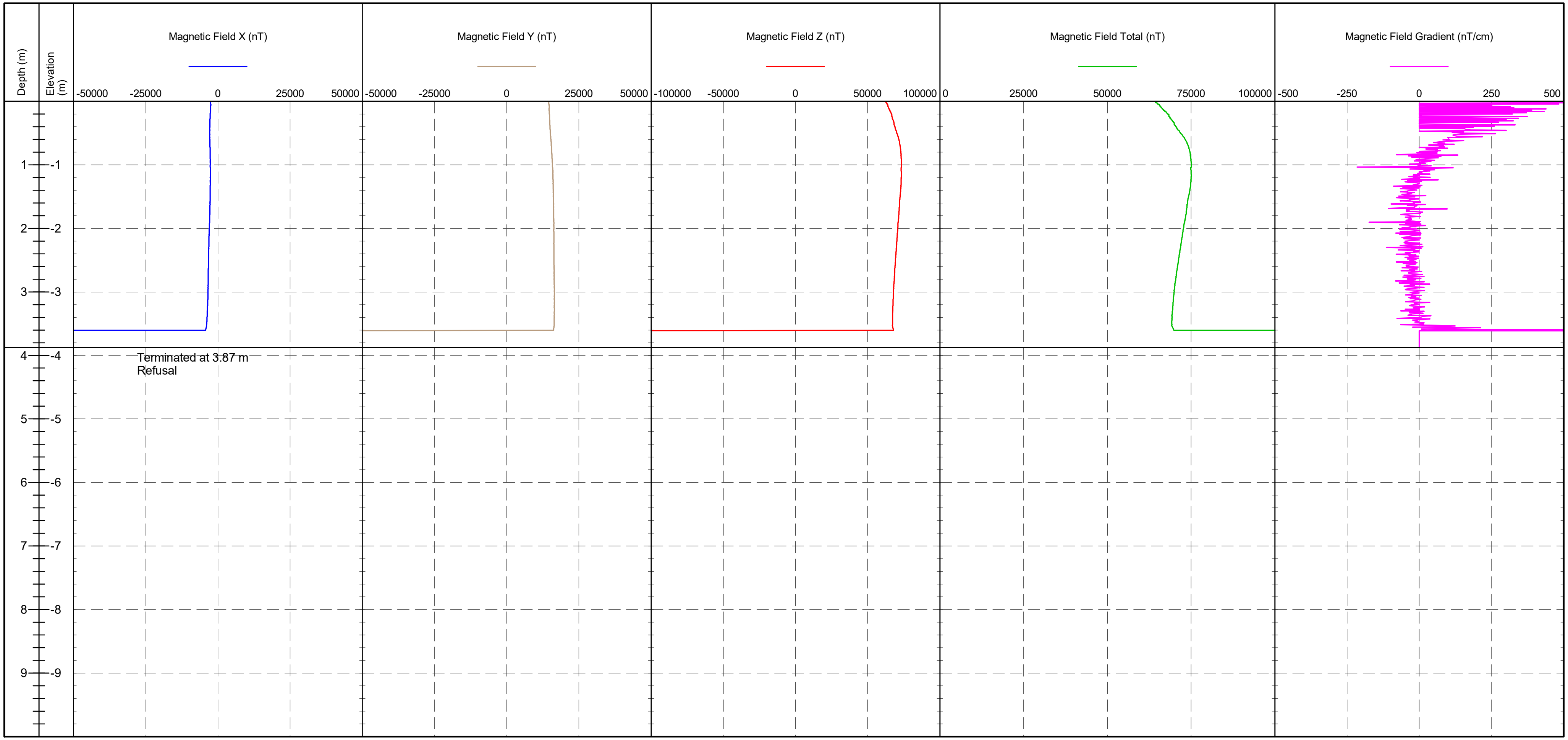
Transducer	Pre	Post	Difference
Tip	206 mV	202 mV	-0.043 MPa
Sleeve	205 mV	202 mV	-0.002 kPa
Pore Pressure 2	238 mV	225 mV	-0.003 kPa
X-Y Inclinometer	2061 mV	2111 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID **28**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858 CONE MODEL : Subtraction CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 017 - Griffen OPERATOR : RS FRICTION REDUCER : None WEATHER : Raining & Mild		

CPTU ZERO VALUES

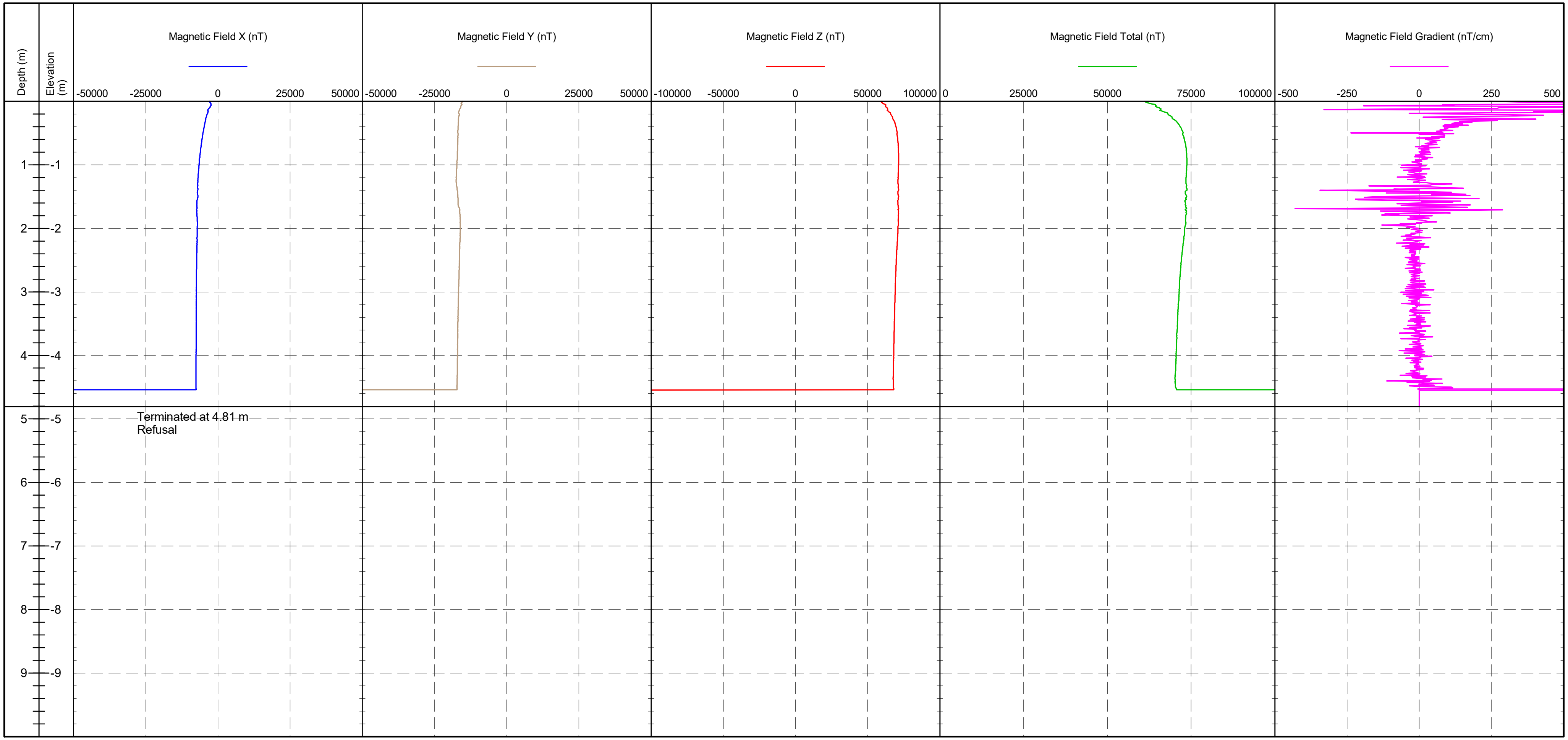
Transducer	Pre	Post	Difference
Tip	203 mV	204 mV	0.011 MPa
Sleeve	202 mV	204 mV	0.001 kPa
Pore Pressure 2	230 mV	231 mV	0 kPa
X-Y Inclinometer	2105 mV	2198 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID **29**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on total pressure.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		CPTU ZERO VALUES		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen	Tip	206 mV	198 mV	-0.087 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: RS	Sleeve	203 mV	203 mV	0 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	254 mV	207 mV	-0.012 kPa
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild	X-Y Inclinometer	2312 mV	2254 mV	

SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

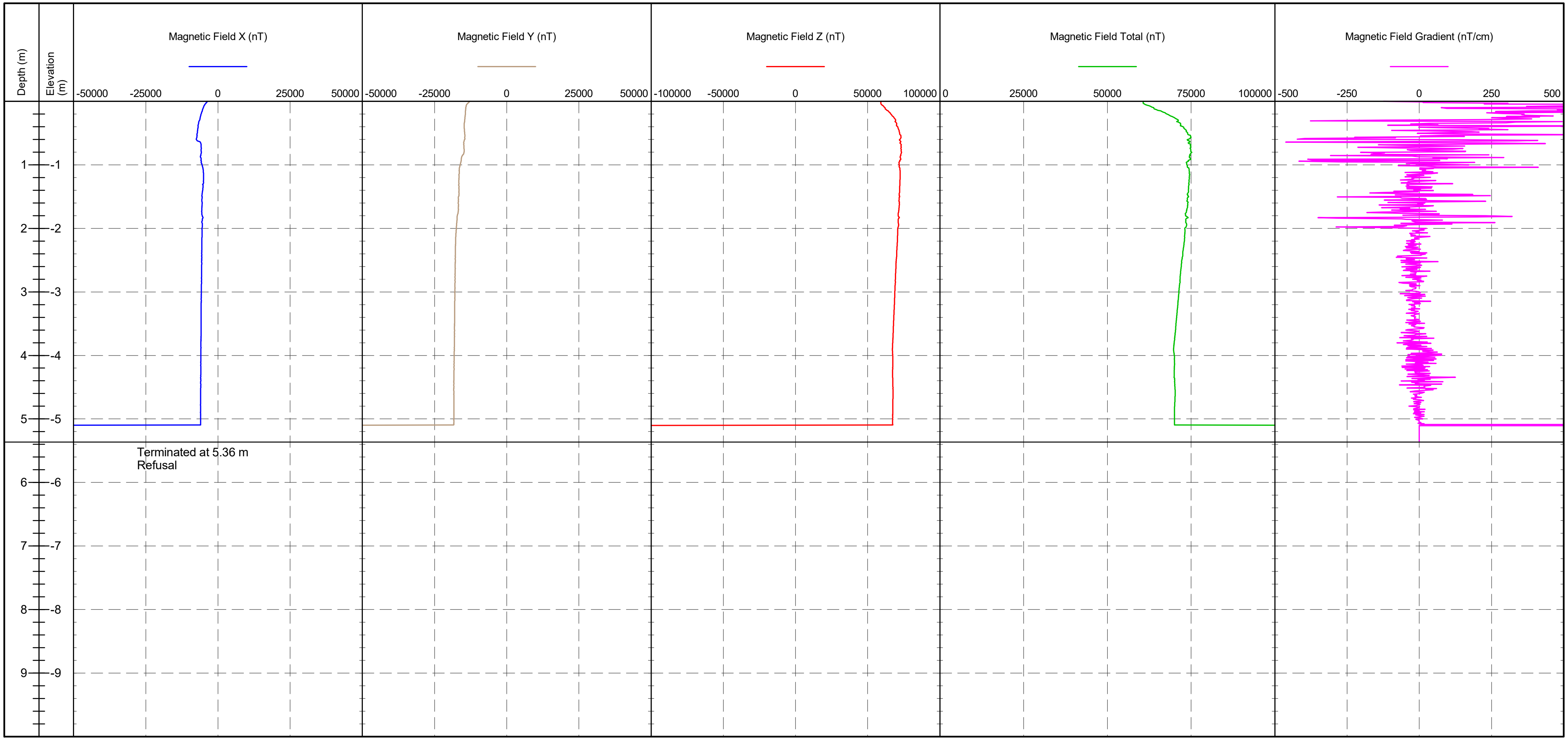
PointID **30**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on total pressure.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 23/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	15cm^2
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	204 mV	200 mV	-0.043 MPa
Sleeve	205 mV	201 mV	-0.003 kPa
Pore Pressure 2	220 mV	222 mV	0 kPa
X-Y Inclinometer	2063 mV	2045 mV	

MAG LOG

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

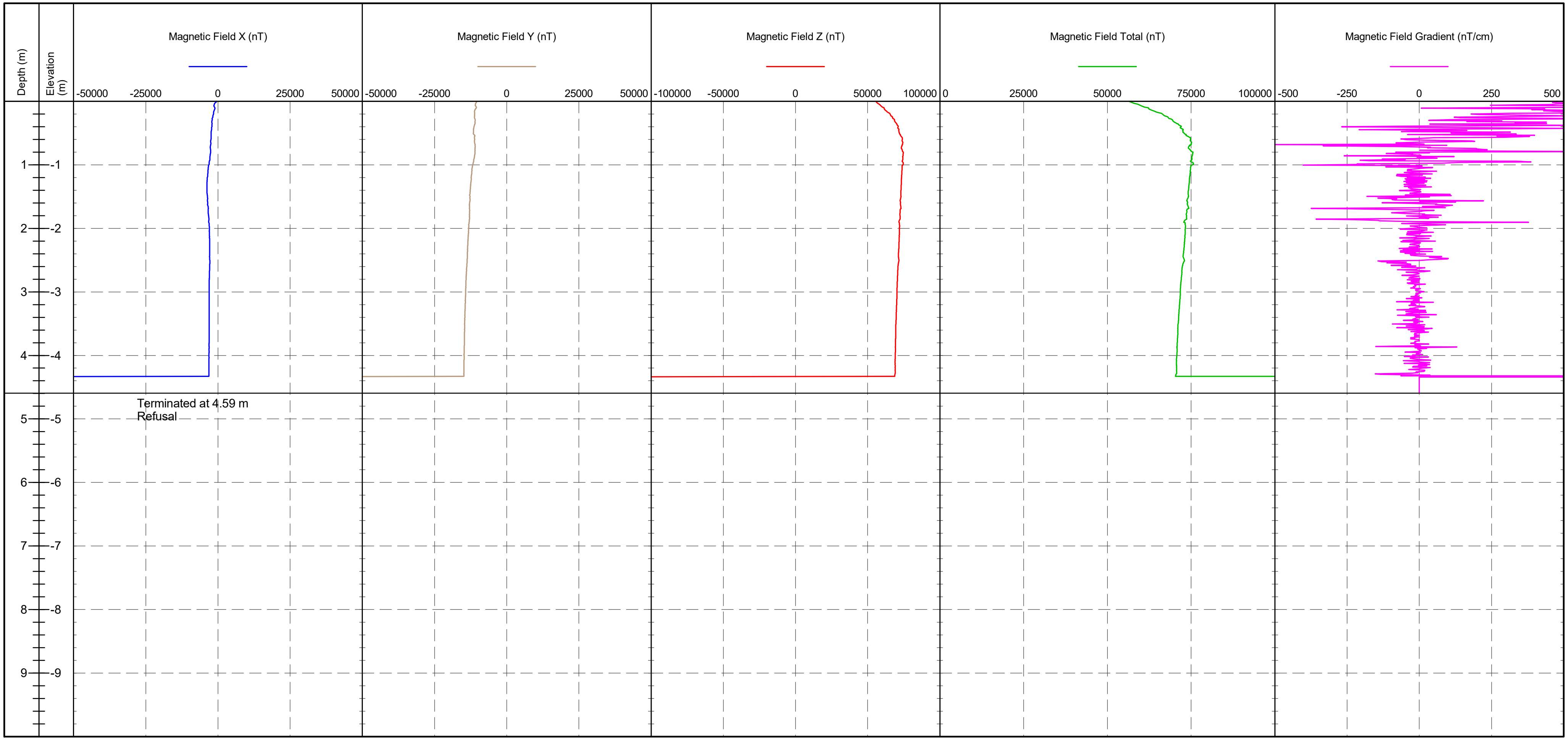
PointID 31

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410

EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on total pressure.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 23/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	:	S15-CFIP.1858
CONE MODEL	:	Subtraction
CONE AREA	:	15cm^2
CONE AREA RATIO	:	0.79
FILTER POSITION	:	u2
FILTER TYPE	:	HDPE

TEST TYPE	:	TE2
APPLICATION CLASS	:	2
RIG	:	CPT 017 - Griffen
OPERATOR	:	RS
FRICTION REDUCER	:	None
WEATHER	:	Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	196 mV	-0.076 MPa
Sleeve	203 mV	199 mV	-0.003 kPa
Pore Pressure 2	230 mV	205 mV	-0.006 kPa
X-Y Inclinometer	1860 mV	1794 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

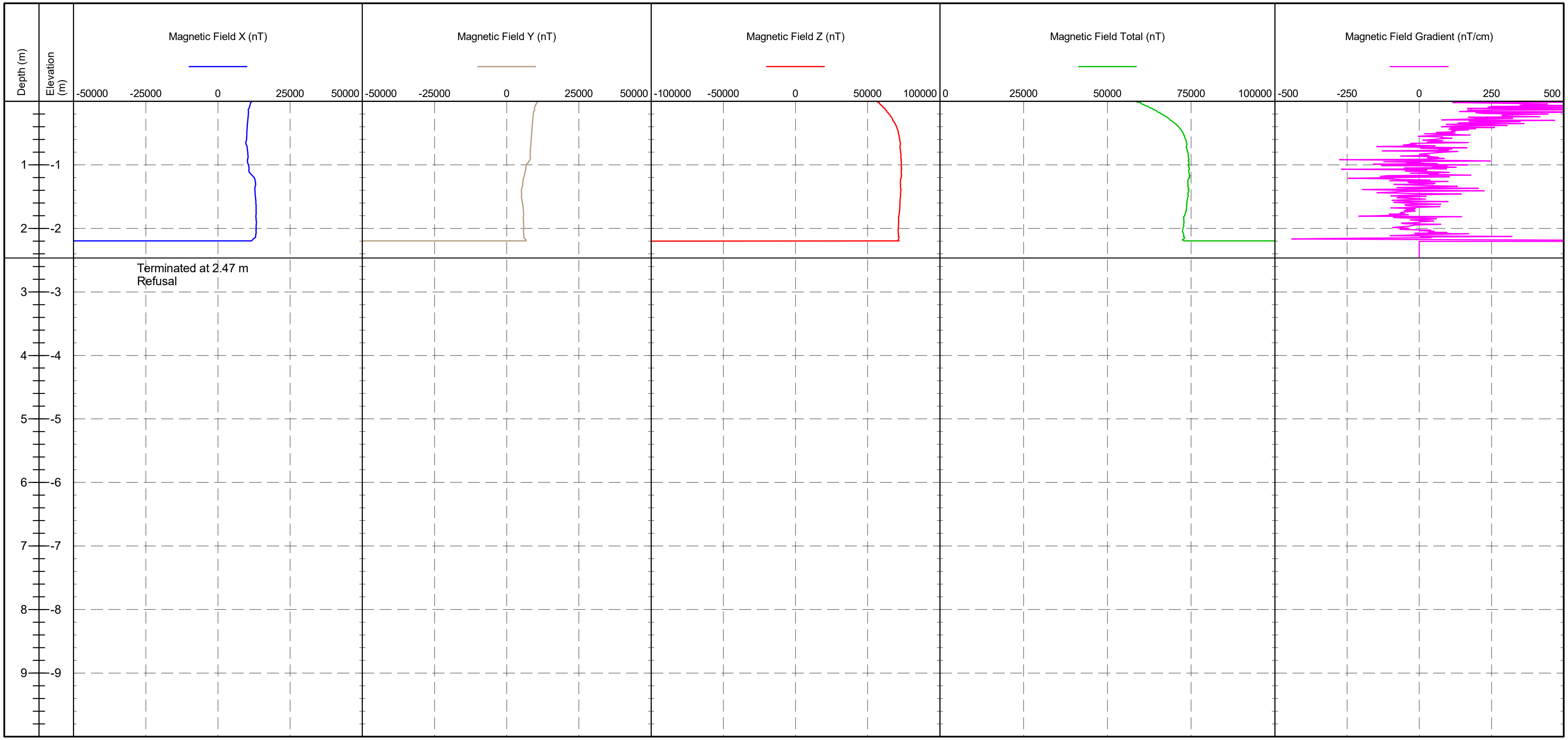
MAG LOG

PointID **32**

CLIENT	: Soiltechnics
PROJECT	: Lossiemouth
LOCATION	: Lossiemouth
PROJECT No.	: 1200410
EASTING	: 0.0 m
NORTHING	: 0.0 m
ELEVATION	: 0.00 m OD
CHECKED BY	: LD
TERMINATION REASON	: Refusal

Remark:
Test refused on tip resistance.

SHEET	: 1 OF 1
STATUS	: Final
TEST DATE	: 20/10/2020
PLOT DATE	: 23/10/2020
METHOD	: ISO 22476-1:2012



CONE ID	: S15-CFIP.1858
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 017 - Griffen
OPERATOR	: RS
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

CPTU ZERO VALUES

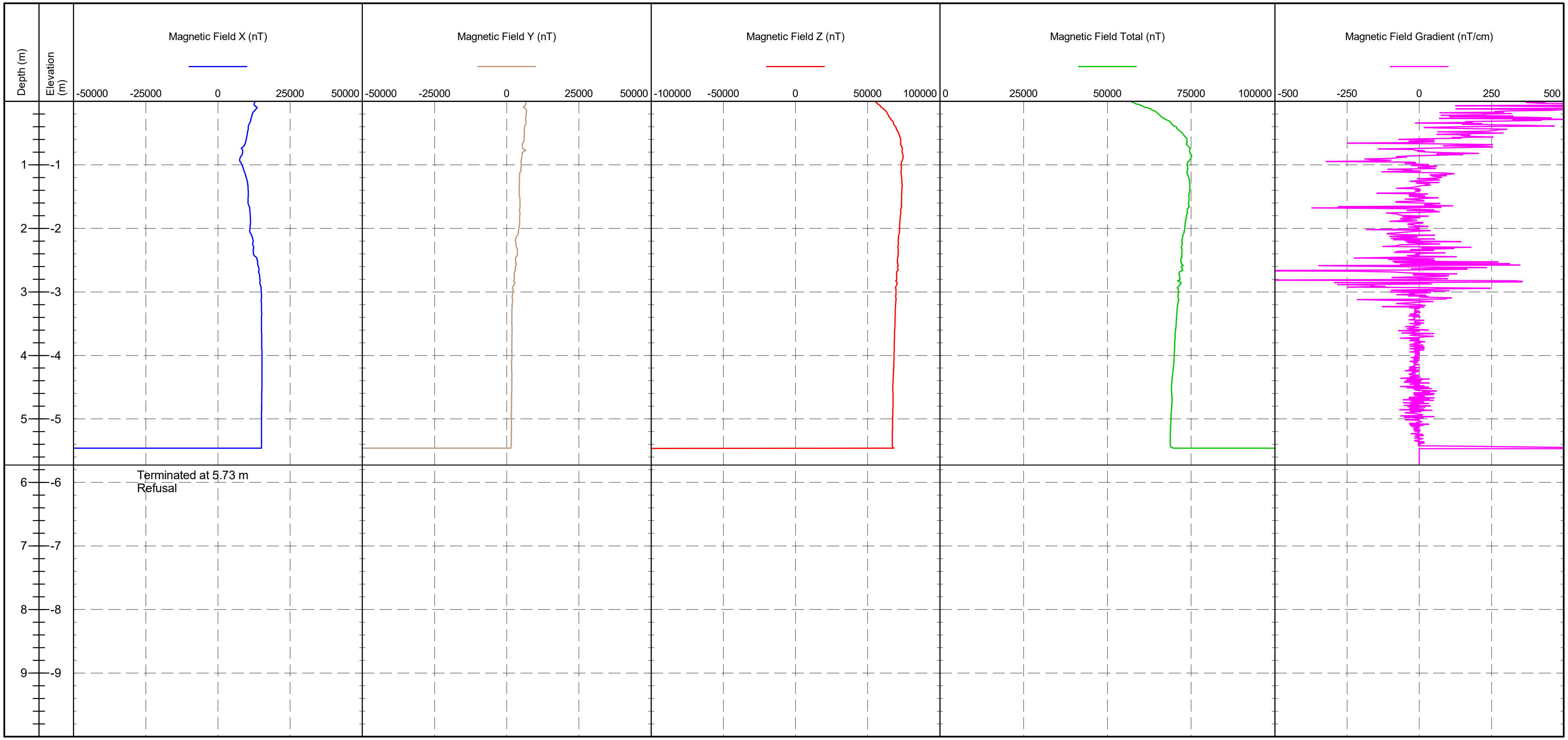
Transducer	Pre	Post	Difference
Tip	203 mV	203 mV	0 MPa
Sleeve	204 mV	200 mV	-0.003 kPa
Pore Pressure 2	228 mV	224 mV	-0.001 kPa
X-Y Inclinometer	2541 mV	2535 mV	

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

MAG LOG

PointID **33**

CLIENT : Soiltechnics PROJECT : Lossiemouth LOCATION : Lossiemouth PROJECT No. : 1200410	EASTING : 0.0 m NORTHING : 0.0 m ELEVATION : 0.00 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 20/10/2020 PLOT DATE : 23/10/2020 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1858	TEST TYPE : TE2		
CONE MODEL : Subtraction	APPLICATION CLASS : 2		
CONE AREA : 15cm^2	RIG : CPT 017 - Griffen		
CONE AREA RATIO : 0.79	OPERATOR : RS		
FILTER POSITION : u2	FRICTION REDUCER : None		
FILTER TYPE : HDPE	WEATHER : Raining & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	201 mV	-0.022 MPa
Sleeve	201 mV	201 mV	0 kPa
Pore Pressure 2	228 mV	220 mV	-0.002 kPa
X-Y Inclinometer	2448 mV	2433 mV	

MAG LOG

IN SITU SITE INVESTIGATION Working with: soiltechnics environmental and geotechnical consultants

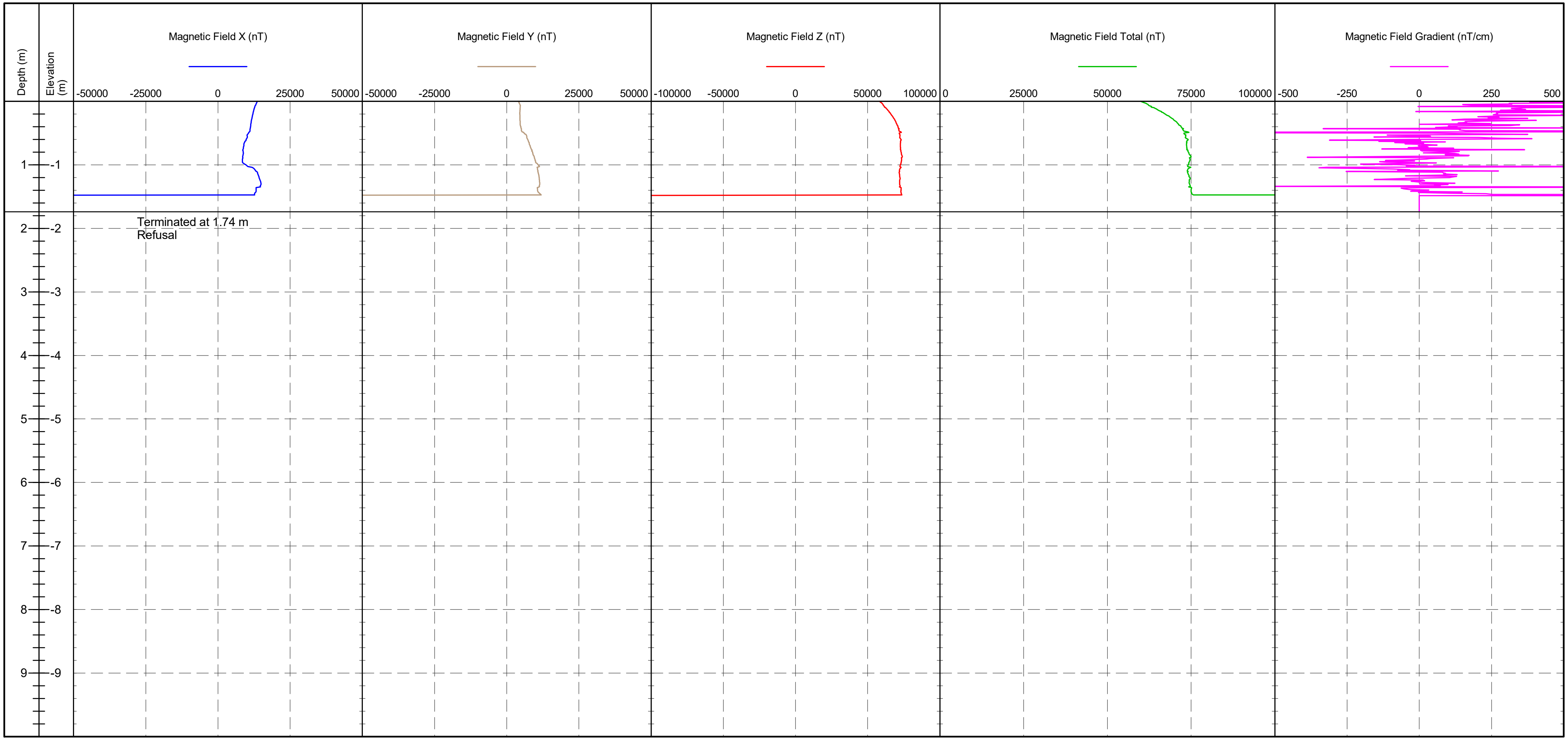
PointID
34

CLIENT : Soiltechnics
PROJECT : Lossiemouth
LOCATION : Lossiemouth
PROJECT No. : 1200410

EASTING : 0.0 m
NORTHING : 0.0 m
ELEVATION : 0.00 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on inclination.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 20/10/2020
PLOT DATE : 23/10/2020
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1858	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 017 - Griffen		
CONE AREA RATIO	: 0.79	OPERATOR	: RS		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Raining & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	203 mV	203 mV	0 MPa
Sleeve	202 mV	193 mV	-0.006 kPa
Pore Pressure 2	228 mV	213 mV	-0.004 kPa
X-Y Inclinometer	2369 mV	2358 mV	

IN SITU SITE INVESTIGATION

Unit 23 Hastings Innovation
Centre,
Highfield Drive
St. Leonards on Sea, East Sussex,
TN38 9UH, U.K.

Company No.: 6339499
VAT No.: 922 3561 41

Appendix C – Hydrology and Flood Risk Assessments

Date:	15th December 2020	Version:	1.0
To:	David Mitchell, Beaver Bridges Ltd.		
From:	Gordon Falconer, cbec eco-engineering UK Ltd		
Project:	Lossiemouth East Beach Footbridge Replacement		
Subject:	Hydrological and Flood Risk Assessments		

1. INTRODUCTION

1.1 SITE DESCRIPTION

The town of Lossiemouth in Moray has several beaches, popular for tourism and recreation. One of the main beaches, adjacent to shops and restaurants, is Lossiemouth East Beach. Access to this beach is over the River Lossie, and has been difficult for pedestrians for over a year, since the existing footbridge was deemed unsafe as a result of flood damage/aging.

There are two proposed locations for the replacement footbridge to East Beach, shown in Figure 1.1.

1) The location of the existing footbridge (323748E, 870409N)
2) From opposite shops on Seatown Road at a historic bridge abutment (323724E, 870636N)

Figure 1.1: Aerial view of Lossiemouth showing the River Lossie, East beach and the two proposed access bridges.

The following sections contain a hydrological assessment of still water levels (tide level plus storm surge) and fluvial flows/levels in the River Lossie and a flood risk assessment (FRA). These analyses are based on topographic/bathymetric survey and tide tables, SEPA guidance and hydraulic modelling.

1.2 APPROACH

The proposed bridge may be subjected to high tide and storm surge from the Moray Firth and high fluvial flood levels from the River Lossie at either location. This assessment will look at a combined tidal and fluvial event for a range of coastal events and both the 200 year and 200 year + climate change fluvial events. Both fluvial and tidal climate change allowances were taken from SEPA technical guidance[1]. Fluvial flows were computed using UK industry standard FEH approaches (section 2.1) and Tidal still water levels (SWL) were taken from the SEPA and EA Flood and Coastal Erosion Risk Management Programme document[2]. To aid the analysis, a topographic/bathymetric survey of the site was conducted by cbec in October 2020 and a Digital Elevation Model (DEM) was generated in AutoCAD civil 3D 2019 (Figure 1.2). This data along with LiDAR was used as the basis for all analysis carried out in this study.

[1] SEPA, *Climate change allowances for flood risk assessment in land use planning, April 2019.*
[2] DEFRA, SEPA, EA *Coastal Flood Boundary Conditions for UK Mainland and Island, SC060064/TR2: Design Sea Levels*

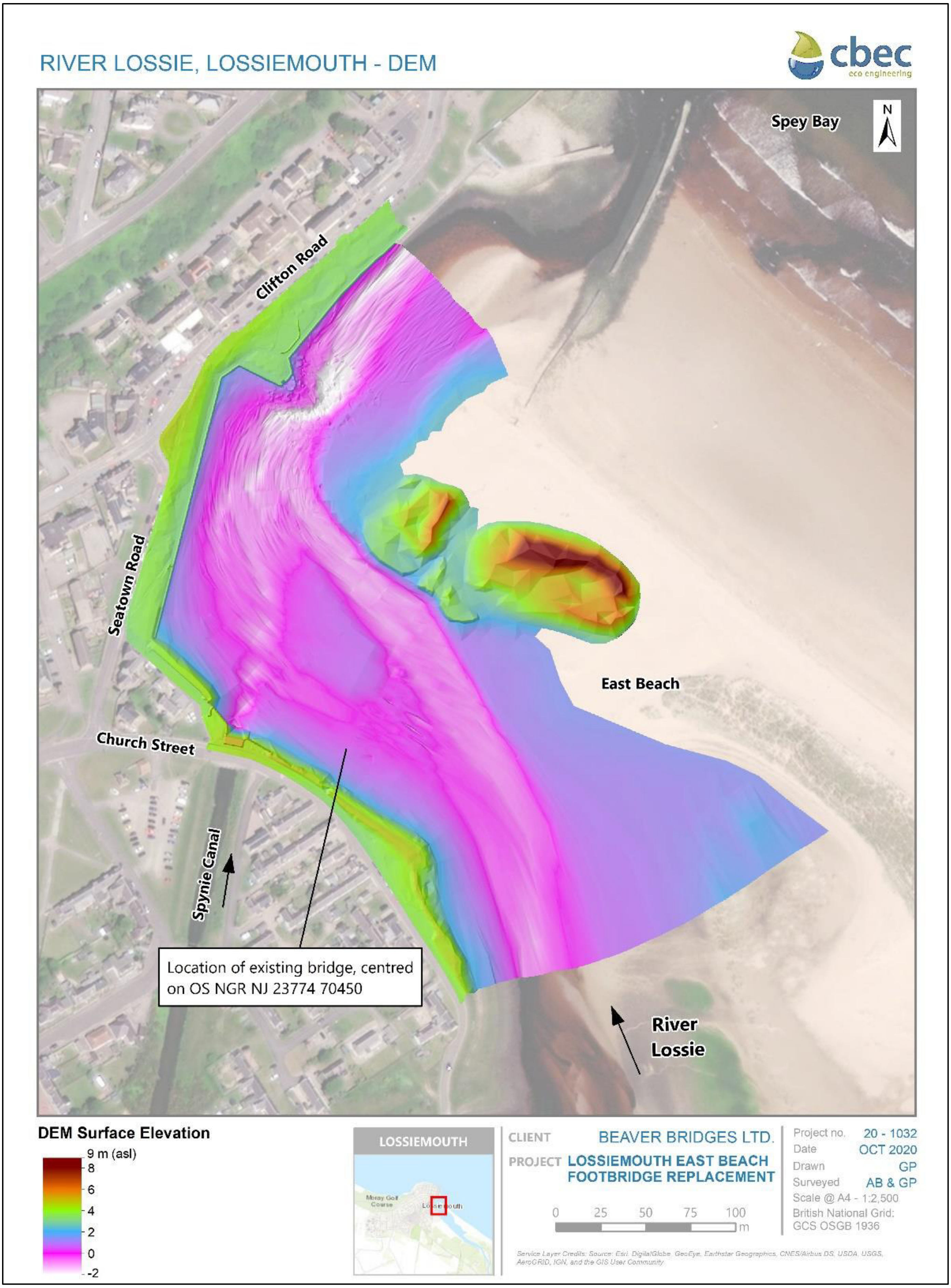


Figure 1.2: Topographic survey carried out by cbec in October 2020

2. ANALYSIS

2.1 HYDROLOGICAL ASSESSMENT

The River Lossie flows through hydrometric area 7 (Findhorn group) before entering the Moray Firth at Lossiemouth. There is a gauge (7003 – Lossie at Sherrifmills) located on the River Lossie upstream of Elgin and a hydrological assessment point (HAP) was chosen to generate catchment descriptors at the tidal limit where the River Lossie flows under the B9103 (Table 2.1).

Table 2.1 Catchment description

Source	Reach Name	OS grid reference	Description	HAP Catchment area (km^2)
FEH web portal (HAP1)	River Lossie	NJ 25300 67200	Tidal boundary under the B9103	270.55
Gauge 7003 Lossie at Sherrifmills	River Lossie	NJ 194 626	Upstream of Elgin	216

Hydrology was computed using UK standard methodologies as recommended by SEPA and the EA, following FEH guidelines. Final design flows used in this analysis are shown in Table 2.2 with all methods used and hydrolical audit sheets found in Appendix A.

Table 2.2 Final design peak flows

Return period (years)	Annual Exceedance Probability (AEP)	River Lossie Tidal Boundary (m^3s)
200	0.5	168.83
200 (+37%CC)	0.5 (+37%CC)	231.30

2.2 EXPECTED WATER LEVELS AND VELOCITIES

As discussed, the proposed bridge may be subjected to high tide and storm surge from the Moray Firth and fluvial flood flows from the River Lossie at either Location. For bridge proposal 1) the ground level on the Seatown side is a gap in the embankment at 3.70 mAOD; for bridge proposal 2) the ground level at the Lossiemouth side is at 3.38 mAOD.

The relevant current high tide levels according to Admiralty Tide Charts at Burghead (8 miles West of Lossiemouth) are tabulated below (Table 2.3):

Table 2.3: High tide levels – Admiralty Tide Charts at Burghead

Tide	Level [mAOD]
Highest astronomical tide (HAT)	2.6
Mean High Water Spring tide (MHWS)	2.0

However, extreme sea levels occur when adverse weather conditions combine with high tides, so the effects of weather are combined with tide levels to give still water levels (SWL) for flood design purposes. The SEPA and EA Flood and Coastal Erosion Risk Management Programme document[3]: suggests a SWL (combined tide and storm surge) of 3.35 m AOD for the Moray Firth.

In addition, SEPA guidance[1] suggests that tide levels in the area may rise as a result of climate change by 0.89 m.

Fluvial flows is the Lossie, were computed using UK industry standard FEH approaches as 168.83 m^3/s for the 200 year return period flood and the expected fluvial uplift as a result of climate change is 37%. Channel slope over the topographic survey extent is 0.0013 and the substrate is sand and boulders (Manning n = 0.025). A 2D shallow water equation hydraulic model was developed using surveyed bathymetry and fluvial boundary conditions at the upstream end, and tidal boundary conditions at the downstream end to investigate the effect of high fluvial flows combined with the effects of tide.

A joint probability study of fluvial, tidal and storm levels is not scoped for as part of this study. A joint 200 year return period storm surge, high tide and 200 year fluvial event is a much rarer occurrence than a 200 year event and so we include in the analysis a 200 year fluvial flood plus highest astronomical tide, and a 200 year plus climate change fluvial event and highest astronomical tide plus climate change uplift. The return period of this event was not computed in this study, but the coincidence of the 200 year fluvial event peak and HAT is likely to be higher than a 200 year return period.

Table 2.1 details the following key expected water levels:

- 200 year tidal/storm still water level (SWL)
- 200 year tidal/storm SWL plus allowance of tidal uplift as a result of climate change
- 200 year fluvial flow in the River Lossie combined with highest astronomical tide (HAT)
- 200 year fluvial flow in the Lossie plus 37% allowance for fluvial climate change combined with HAT with allowance for tidal climate change (+0.89 m)

Wave analysis is not part of the scope of this study.

Table 2.4: Tabulated results

Condition	Level at existing bridge [mAOD]	Level at proposed alternative bridge [mAOD]
200 year RP tidal/storm SWL	3.35	3.35
200 year RP tidal/storm SWL+climate uplift	4.24	4.24
200 year RP fluvial + HAT	2.69	2.64
200 year RP fluvial + 37% cc + HAT + cc	3.55	3.52

[3] *DEFRA*, *SEPA*, EA Coastal Flood Boundary Conditions for UK Mainland and Islands, *SC060064/TR2: Design Sea Levels*

In addition, for bridge scour and safety assessments, the fluvial flow velocities for the 200 year fluvial flood were computed with hydraulic modelling. At HAT, these are around 0.54 m/s for the existing bridge location (1) and 0.80 m/s for the proposed alternative bridge location (2). The critical condition for high velocity in the Lossie is low tide but high discharge because this condition increases water surface slope. These critical velocities were computed using normal depth assumptions in the channel. Maximum velocity at low tide and 200 year + climate change fluvial event is 1.10 m/s at the existing bridge (1) and 2.50 m/s at the proposed alternative bridge location (2).

Extents under water are shown in Figure 2.1 to Figure 2.4.

In these figures the brown polygon is the hydraulic model extent, red and green lines mark the two bridge positions, and black lines indicate survey breaklines such as channel toe, walls etc. The blue shading is the area within the topographic survey extent/combined LiDAR that is predicted to be underwater at each condition and hydraulically connected to the channel.

Figure 2.5 shows the computed velocities in the channel for the 200 year + climate change fluvial flood occurring at low tide.

Figure 2.1: Water level at 200 year tidal/surge SWL

Figure 2.2: Water level at 200 year plus climate change tidal/surge SWL

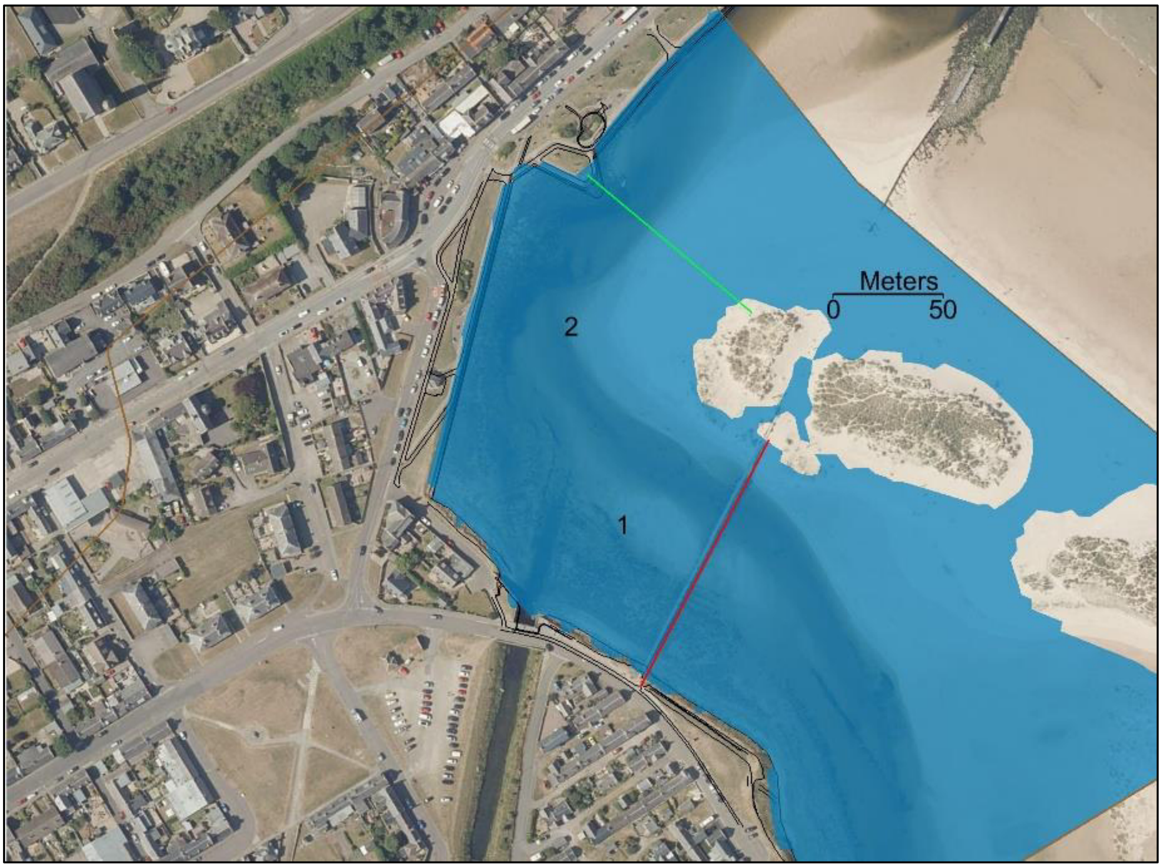


Figure 2.3: Water level at 200 year fluvial flood in Lossie combined with HAT

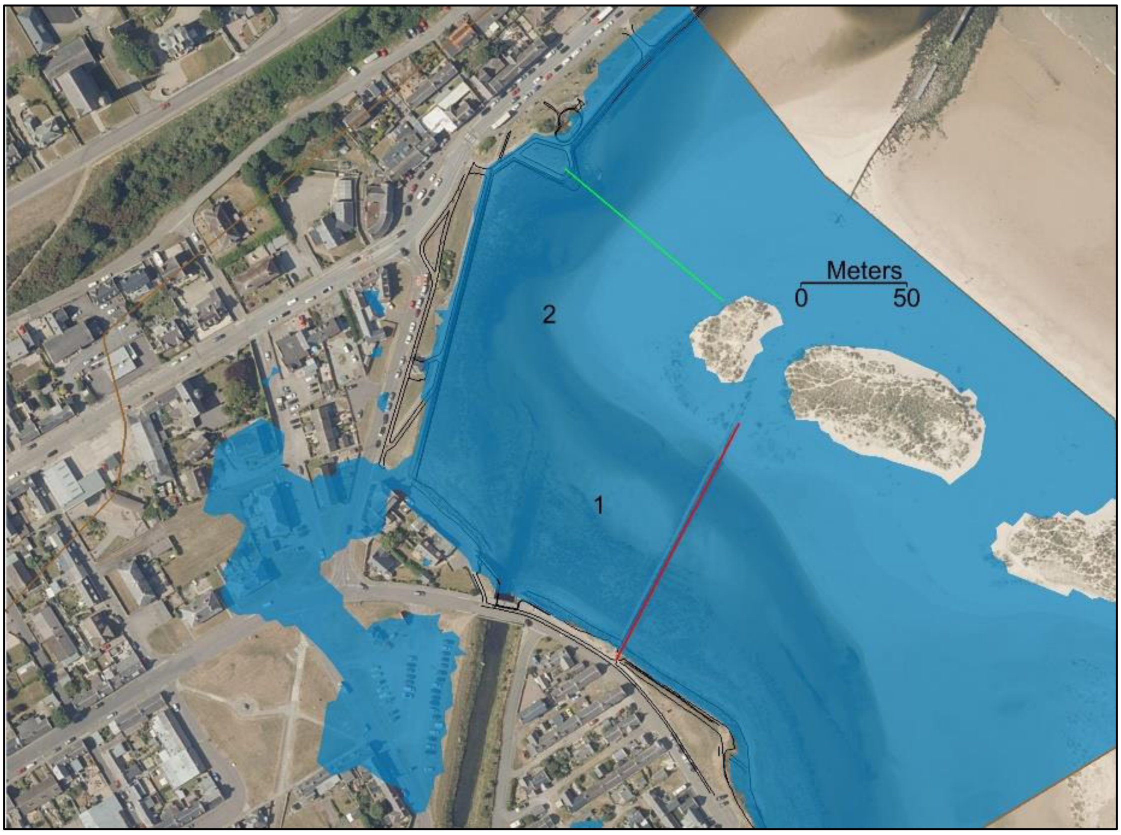


Figure 2.4: Water level at 200 year + climate change fluvial flood in Lossie combined with HAT adjusted for climate change

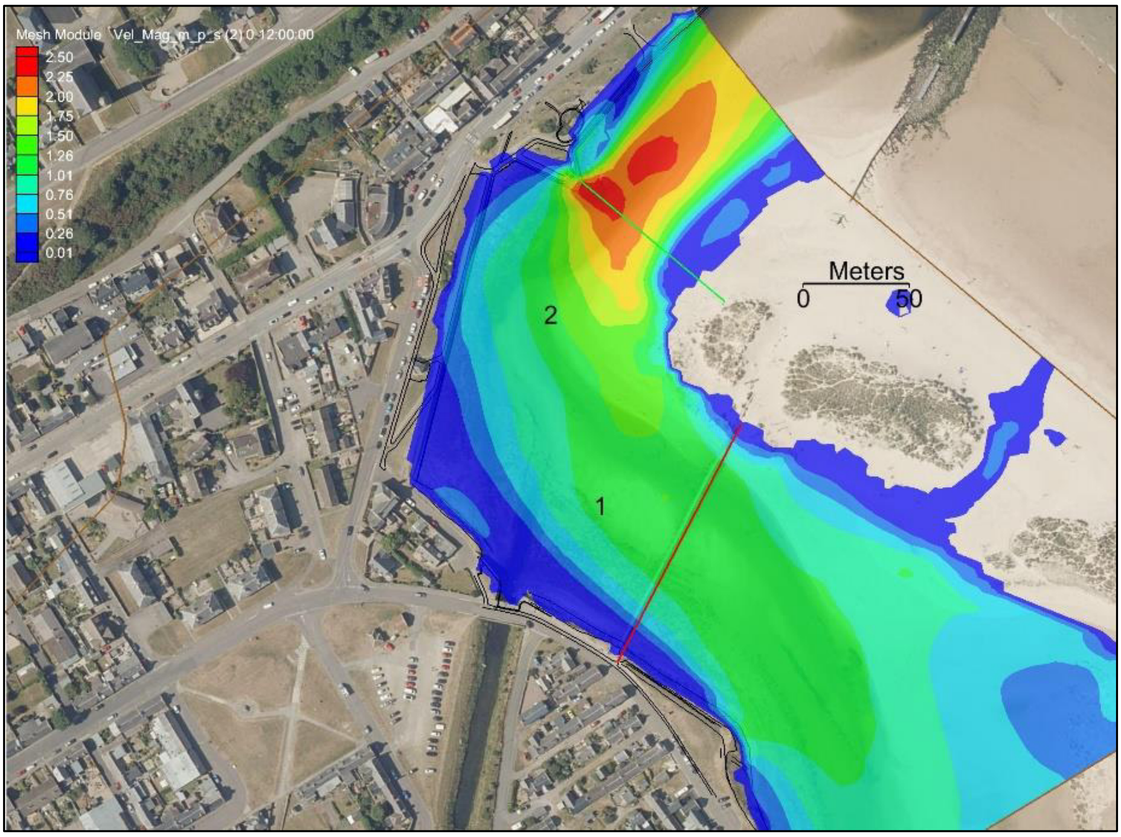


Figure 2.5: Critical velocity condition of 200 year plus climate change fluvial flood in Lossie combined with low tide (normal depth). Peak at existing bridge location (red line) is 1.10 m/s; peak at second bridge location (green line) is 2.50 m/s.

2.3 FLOOD RISK ASSESSMENT

2.3.1. Introduction

As part of this study, a preliminary Flood Risk Assessment (FRA) has been completed, assessing any flood risk concerns raised by the proposed bridge development with Scottish Planning Policy.

This assessment is a comprehensive risk based assessment of potential flooding from both fluvial and coastal flood risk. The assessment also identifies and examines residual risk to the site and any neighbouring properties. The aim of this report is primarily to consider flood risk and satisfy requirements under SPP.

Data and information have been obtained from the following sources:

- Scottish Environment Protection Agency (SEPA),
- Findhorn, Nairn and Speyside: Flood Risk Management Strategy 2015;
- Findhorn, Nairn and Speyside: Local Flood Risk Management Plan (2016);
- Moray Council Strategic Flood Risk Assessment: Proposed Plan;
- Hydraulic model results.

2.3.2. Development proposals

There are two proposed locations for the East Beach footbridge as shown in Figure 2.6.

Figure 2.6: Aerial view of Lossiemouth showing the River Lossie, East beach and the two proposed access bridges.

1) The location of the existing bridge (323748E, 870409N)
2) From opposite shops on Seatown Road at a historic bridge abutment (323724E, 870636N)

2.3.3. Planning policy

FINDHORN, NAIRN AND SPEYSIDE: FLOOD RISK MANAGEMENT STRATEGY 2015;

SEPA's Flood Risk Management Strategy for the Findhorn, Nairn and Speyside districts, the first encompassing the River Lossie, was published in December 2015. Lossiemouth is identified as a Potentially vulnerable Area (PVA) under PVA 05/01 which includes Burghead to Lossiemouth. Flooding is mainly limited to seafront properties in this document however it is expected to be underestimated as wave action is not included. The current number of properties at risk of coastal flooding in Lossiemouth is 70 (30 residential and 40 non-residential). A list of flood events effecting Lossiemouth can be found below, demonstrating its vulnerability to both coastal and fluvial flooding;

- **1829** – Great Muckle spate of August,
- **1852** – Combined fluvial and coastal event resulted flooding along the river Lossie along with harbour flooding at Lossiemouth due to high waves,
- **1983** – Coastal flooding on shore street,
- **2012 and 2013** – Coastal flooding leading to the evacuation of homes in Lossiemouth.

The River Lossie most recently flooded in 2002 however there was no flooding in Lossiemouth and partially built flood defences in Elgin protected the town.

FINDHORN, NAIRN AND SPEYSIDE: LOCAL FLOOD RISK MANAGEMENT PLAN (LFRMP)(INTERIM REPORT) 2019;

Moray Council released their LFRMP in June 2016 in response to SEPA's Strategies outlined the previous year (Section 4.1) and produced an interim report in 2019. The documents lay out the Council's general objectives concerning flood risk to Lossiemouth which includes strategic mapping and modelling of coastal environments. At the time this interim report was written the modelling was not complete however it was due to be completed in 2019.

MORAY COUNCIL STRATEGIC FLOOD RISK ASSESSMENT – MORAY LOCAL DEVELOPMENT PLAN

Moray Council produced this report in December 2018 and is in the process of preparing its MLDP for 2020. The plan states that Lossiemouth is at risk from both coastal and fluvial flooding and areas in close proximity to the coast are at risk from inundation from the sea and will require to incorporate adequate protection measures.

SCOTTISH PLANNING POLICY

Scottish Planning Policy (SPP) seeks to reduce the impact of flooding on new developments, by expecting developers and planning authorities to err on the side of caution in decision making whenever flooding in an issue.

Although the site of interest lies within the functional floodplain (Medium – High risk of flooding), the nature of the design means it cannot be relocated to an area of lower flood risk. The policy states that a precautionary approach to flood risk from all sources must be used, considering the predicted effects of climate change.

2.3.4. Assessment of flood risk

The nature of this bridge development, connecting Lossiemouth to East Beach, means the bridge has to be built in an area of high flood risk. Following the guidelines stated in section 2.3.3, a precautionary approach has been adopted when reviewing flood risk to the proposed bridge locations.

Assessing SEPA flood maps in **Figure 2.7** it is evident that both proposed bridge locations are at risk from both fluvial and coastal flooding with neither being at a lower risk to the other. A JBA assessment into the Lossiemouth Breakwater[4] looked further into wave action and coastal flooding around Lossiemouth however this report did not include any fluvial flood risk information. Similarly, Jacobs carried out a Lossiemouth Coastal Flood Study[5] however this focused on coastal flooding to Lossiemouth and did not look at the combined effects of flooding from the River Lossie.

Figure 2.7: SEPA flood map, ©Crown Copyright. SEPA License Number 100016991.

The analysis carried out provided water levels at both proposed bridge locations (Table 2.5). The data shows that there are minimal differences in water levels between the two locations for the range of events modelled. However, this analysis does not take into consideration wave action and while location 1 (existing bridge) may exhibit marginally higher water levels, it's orientation may protect it from waves more when compared with Location 2 (opposite shops on Seatown Road). Similarly, the analysis showed that velocities around bridge location 1 were lower than those at location 2 as discussed in Section 2.2.

The entrance elevation to bridge location 1 is approximately 3.7 mAOD and location 2 is approximated 3.38 mAOD, however, location 1 has the potentially to extend the bridge further onto the bank where the path varies between 3.7 – 3.9 mAOD, adding safer levels for access.

[4] JBA, Lossiemouth Breakwater Assessment, January 2015
[5] Jacobs, Lossiemouth Coastal Flood Study, October 2018

Table 2.5: Tabulated results

Condition	Level at existing bridge [mAOD]	Level at proposed alternative bridge [mAOD]
200 year RP tidal/storm SWL	3.35	3.35
200 year RP tidal/storm SWL+climate uplift	4.24	4.24
200 year RP fluvial + HAT	2.69	2.64
200 year RP fluvial + 37% cc + HAT + cc	3.55	3.52

2.3.5. Mitigation options and future analysis

This preliminary flood risk assessment assesses still water levels from a range of flood events. It is not possible to produce a full, comprehensive flood risk assessment until final locations/ designs are agreed and developed, however, at this stage there are further analysis/considerations which may benefit the subsequent design phase of works;

- Wave analysis was not taken into consideration during this analysis. We would recommend that this is undertaken for the final proposed design. Data is available from the Moray Firth Directional Waverider buoy[6] which was first deployed in August 2008 and is due to end in 2023.
- SEPA recommends a freeboard of 600 mm added to the still water levels when considering mitigation against a coastal flood event. Using our model results this would produce a deck level of 4.84 mAOD which is approximately 1m higher than the entrance path to the bridge at location 1 (existing bridge).
- SEPA guidance[7] recommends that, where a development is a replacement for an existing development of the same type, opportunities for betterment should be explored.
- Investigate any flood risk modelling and mapping provided under the LFRMP

2.3.6. Conclusions

This preliminary flood risk assessment has demonstrated a range of events which could be used to assess flood risk to the proposed footbridges. These water levels combine both fluvial and coastal flooding for a number of events with differing likelihood. A fully comprehensive FRA would be needed to identify which values are to be used at detailed design stage, however, it is believed that location 1 (existing bridge location) would be the preferential bridge location when considering flood risk. As the design is for a footbridge there will be no change to flood risk from surface or ground water and although the bridge will cross the River Lossie, due to the location of the design and fact there is an existing bridge in its location, it is not expected to have any differing effects on fluvial or coastal flood risk.

[6] http://wavenet.cefas.co.uk/Map

[7] SEPA. SEPA Flood Risk Standing Advice for Planning Authorities and Developers, November 2020.

APPENDIX A

HYDROLOGICAL ASSESSMENT AUDIT

The River Lossie flows through hydrometric area 7 (Findhorn group) before entering the Moray Firth at Lossiemouth. There is a gauge (7003 – Lossie at Sherrifmills) located on the River Lossie upstream of Elgin and a hydrological assessment point (HAP) was generated at the tidal limit where the River Lossie flows under the B9103 (Table 2.1).

Table 2.6 Catchment description

Source	Reach Name	OS grid reference	Description	HAP Catchment area (km²)
FEH web portal (HAP1)	River Lossie	NJ 25300 67200	Tidal boundary under the B9103	270.55
Gauge 7003 Lossie at Sherrifmills	River Lossie	NJ 194 626	Upstream of Elgin	216

FEH Statistical method

FEH statistical method is considered a reliable assessment method for ungauged catchments. It is a feature of Flood Modeller Pro and is based solely on catchment descriptors. After an initial storm duration is input, the software creates a critical storm duration which can then be used to find the critical flood flows. For the River Lossie this critical storm duration was 21.5 hrs and this value was used to generate the tabulated flows.

Revitalised Flood Hydrograph 2 (ReFH 2.3)

ReFH 2.3 uses solely catchment descriptors for input and produces peak flows and hydrographs. It is understood that the robustness of flow estimates using this method are limited due to issues with the underlying rainfall depth-duration- frequency (DDF) model in certain parts of Scotland such as Moray. For this reason, a precautionary approach was taken when considering the results from this method. Similar to the FEH statistical approach, the critical storm duration of 21.5 hrs was used to generate flow estimates.

Single Site analysis

A single site analysis was carried out on the River Lossie gauge (7003 Lossie at Sherrifmills). This method uses gauged data to produce flow estimates for a range or return intervals and station fittings. For this analysis, the Generalised Logistic L-Median fitting method was used as is recommended in the FEH handbook for UK flood data. As the gauge is located upstream of Elgin, flows were linearly scaled from the gauge to the HAP (The tidal boundary where the Lossie flows under the B9103) using catchment area.

Results from the methods discussed are tabulated in Table 2.7 and audit forms from each method are provided in Appendix C:

Table 2.7 Design peak flows – Pooling group and ReFH 2

Return period (years)	Annual Exceedance Probability (AEP)	River Lossie Tidal Boundary (m^3s) ReFH 2.3	River Lossie Tidal Boundary (m^3s) FEH statistical approach	River Lossie Tidal Boundary (m^3s) Single Site analysis
200	0.5	85.95	168.83	222.99
200 (+37%CC)	0.5 (+37%CC)	117.75	231.30	305.50

The different methods offer a wide range of flow estimates, it is therefore crucial to review each method for site suitability before choosing the final design flows.

Revitalised Flood Hydrograph 2 (ReFH 2.3)

The ReFH 2.3 methodology is recommended for producing peak flows at ungauged catchments throughout the UK. There are, however, limitations in its reliability across parts of Scotland, particularly the North East of Scotland including Moray. For this reason, it is not deemed as suitable for use in this study and was discounted.

Single Site analysis

Gauged data is often regarded as the most reliable method of calculated flow estimates across the UK however there are significant limitations in this when looking at peak flood flows such as the 200 year return period. Although the Sherrifmills gauge has a reasonable length of record, it experiences '*significant bypassing'* at higher flows (4 times in 10 years). Flow gauging has been carried out at the site using both Current meter and ADCP however these are only up to 64 m^3s (approximately 1.3 times QMED). Flows above this have been estimated using modelled floodplain flows. The flows shown in Table 2.7 are extremely high and it is therefore down to professional judgement to discount these flows in this study.

FEH Statistical method

The FEH statistical method is often regarded as the most suitable method for hydrological estimation in Scotland for ungauged catchments. It tends to provide conservative flood estimations, especially when the critical storm duration is applied as is the case in this study. As the gauge was deemed as unsuitable, the catchment was treated as ungauged and the FEH statistical method was adopted for flow estimation in the River Lossie catchment. The final design peak flows are tabulated in Table 2.8.

Table 2.8 Final design peak flows

Return period (years)	Annual Exceedance Probability (AEP)	River Lossie (m^3/s)
200	0.5	168.83
200 (+37% CC)	0.5 (+CC)	231.30

APPENDIX B

HYDRAULIC MODEL SETUP

There was only a short stretch of bathymetry data available for the study, and so only an approximate hydraulic model could be created to estimate fluvial water levels and velocities. No other appropriate flood model for the mouth of the Lossie could be found in the literature. A fully 2D model was created at 5 m resolution from the bathymetry and tied into 5 m LiDAR made available by Moray Council. This model used a steady tidal boundary condition (estimated SWL or SWL+climate uplift) or normal depth assumptions (only for the low tide, high fluvial flow case) at the beach end of the model. Model inlet conditions on the Lossie were the peak 200 year and 200 year plus climate change flows. Model runs were steady state. Channel toe and embankments were breaklined in AutoCAD Civil 3D and a hydraulic mesh created in Aquaveo SMS v11.1. This hydraulic mesh can be solved using either TUFLOW FV, or SRH-2D. Both solvers have been shown to be equivalent for this type of study. SRH-2D v3.2 is a free solver, benchmarked against many similar cases worldwide, and was chosen for this study to keep costs to a minimum. Frictions in the model were set at n = 0.025 (appropriate for sand with some cobbles/boulders), n = 0.02 for paved surfaces and n = 0.5 for buildings. No structures were modelled (i.e. neither of the two proposed bridges were modelled because details of their designs were not available at time of writing).

APPENDIX C

HYDROLOGICAL AUDIT SHEETS

FEH Statistical approach

****

Flood Modeller

****

HYDROLOGICAL DATA

Catchment: Lossie

****

Catchment Characteristics

****

Easting : 325300 Northing : 867200

Area : 270.547 km2

DPLBAR : 30.980 km

DPSBAR : 74.400 m/km

PROPWET : 0.420

SAAR : 813.000 mm

Urban Extent : 0.007

c : -0.017

d1 : 0.440

d2 : 0.409

d3 : 0.295

e : 0.253

f : 2.306

SPR : 32.500 %

****

Summary of estimate using Flood Estimation Handbook rainfall-runoff method

****

Estimation of T-year flood

========================

Unit hydrograph time to peak : 11.851 hours

Instantaneous UH time to peak : 11.601 hours

Data interval : 0.500 hours

Design storm duration	:	21.500 hours
Critical storm duration	:	21.485 hours
Return period for design flood	:	200.000 years
requires rain return period	:	246.667 years
ARF	:	0.923
Design storm depth	:	105.947 mm
CWI	:	117.300
Standard Percentage Runoff	:	32.500 %
Percentage runoff	:	39.154 %
Snowmelt rate	:	0.000 mm/day
Unit hydrograph peak	:	5.023 (m3/s/mm)
Quick response hydrograph peak	:	162.903 m3/s
Baseflow	:	5.926 m3/s
Baseflow adjustment	:	0.000 m3/s
Hydrograph peak	:	168.829 m3/s
Hydrograph adjustment factor	:	1.000

Flags

=====

Unit hydrograph flag	:	FSRUH
Tp flag	:	FEHTP
Event rainfall flag	:	FEHER
Rainfall profile flag	:	WINRP
Percentage Runoff flag	:	FEHPR
Baseflow flag	:	F16BF
CWI flag	:	FSRCW

****

Single site analysis

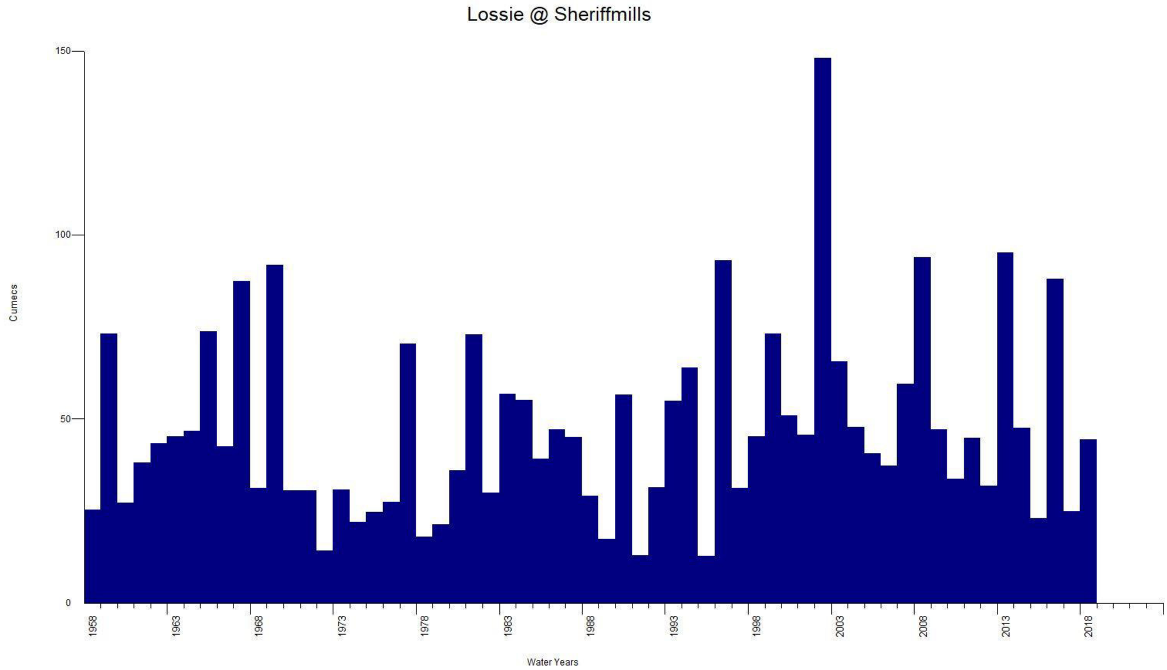


Figure 2.8: AMAX data from the Sherrifmills gauge.

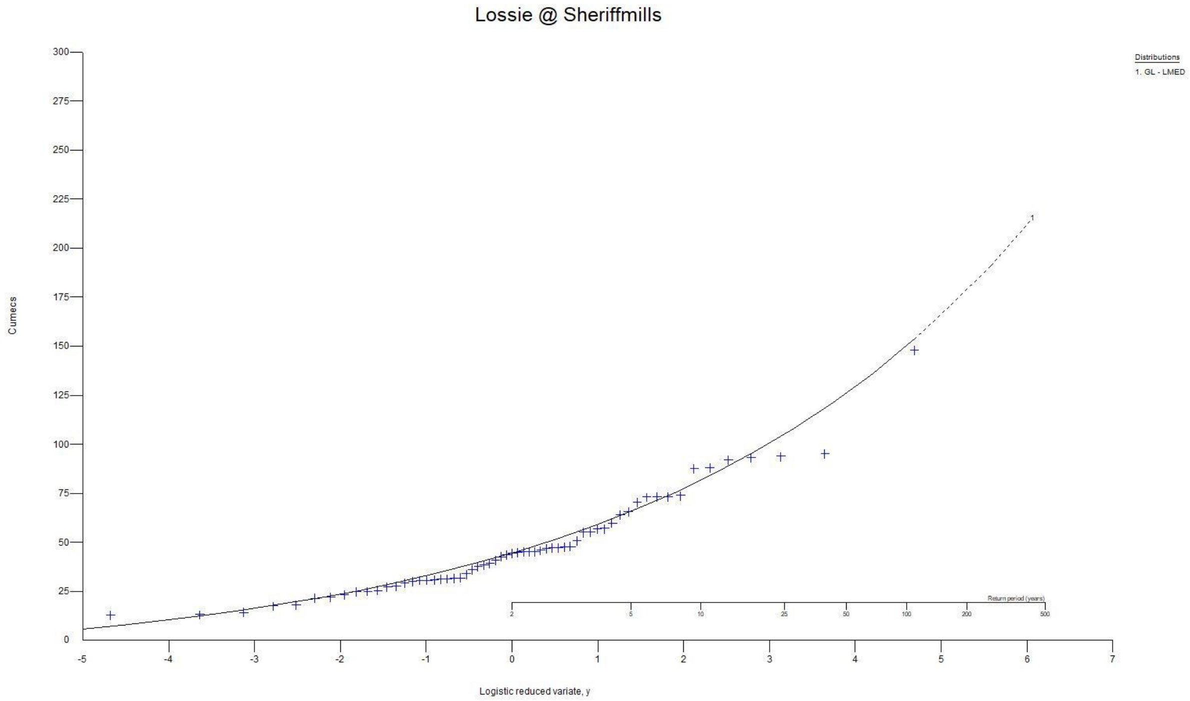


Figure 2.9: Flood frequency curve from single site analysis of the Sherrifmills gauge.

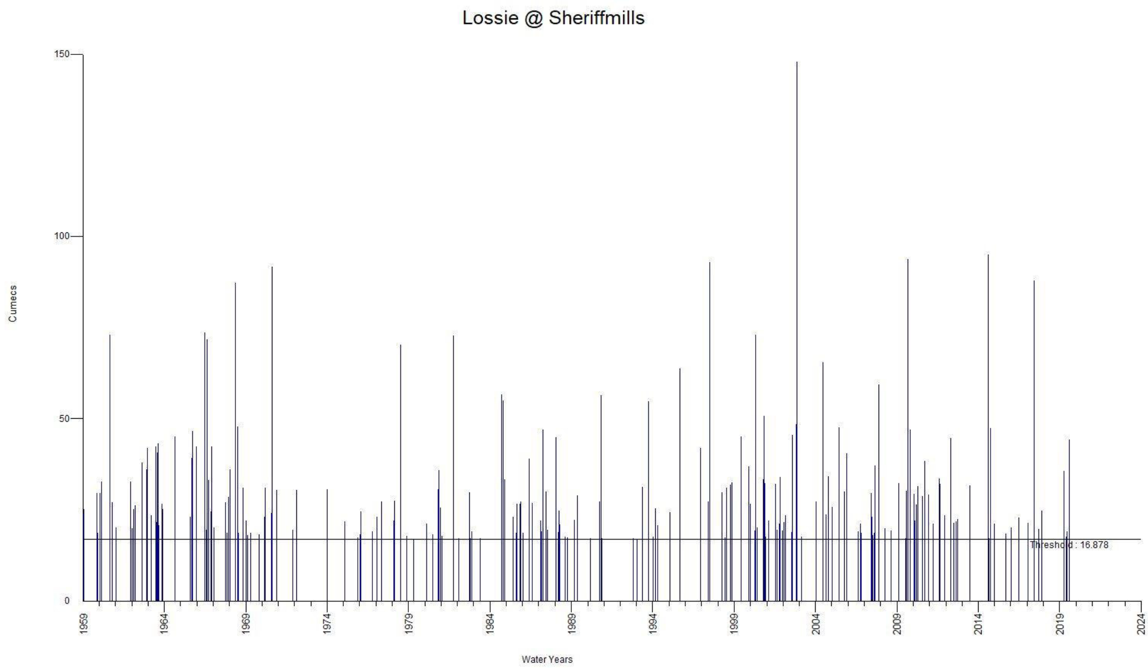


Figure 2.10: POT data from the Sherrifmills gauge.

ReFH 2.3 analysis

UK Design Flood Estimation

Generated on Tuesday, December 15, 2020 6:38:11 PM by gordon
Printed from the ReFH2 Flood Modelling software package, version 3.0.7275.28566

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details Checksum: 3054-CDAF

Site name: River Lossie

Easting: 325300

Northing: 867200

Country: Scotland

Catchment Area (km^2): 270.55

Using plot scale calculations: No

Model: ReFH2.3

Site description: None

Model run: 200 year

Summary of results

Rainfall - FEH 2013 model (mm):	104.61	Total runoff (ML):	4030.10
Total Rainfall (mm):	72.68	Total flow (ML):	10511.37
Peak Rainfall (mm):	4.45	Peak flow (m^3/s):	87.56

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	21:30:00 [11:00:00]	Yes
Timestep (hh:mm:ss)	00:30:00 [01:00:00]	Yes
SCF (Seasonal correction factor)	0.75	No
ARF (Areal reduction factor)	0.92	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	76.87	No
Cmax (mm)	564.2	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?

Tp (hr)	6.32	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	2.76	No
BL (hr)	62.93	No
BR	1.66	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	5.68	No
Urbext 2000	0.01	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.333	0.000	0.047	0.000	2.741	2.741
00:30:00	0.380	0.000	0.054	0.015	2.719	2.734
01:00:00	0.434	0.000	0.062	0.062	2.698	2.761
01:30:00	0.496	0.000	0.071	0.146	2.678	2.825
02:00:00	0.566	0.000	0.082	0.273	2.660	2.933
02:30:00	0.645	0.000	0.094	0.449	2.643	3.092
03:00:00	0.736	0.000	0.108	0.680	2.629	3.309
03:30:00	0.839	0.000	0.125	0.977	2.618	3.595
04:00:00	0.956	0.000	0.143	1.347	2.611	3.958
04:30:00	1.089	0.000	0.165	1.803	2.610	4.412
05:00:00	1.241	0.000	0.191	2.356	2.614	4.970
05:30:00	1.412	0.000	0.220	3.019	2.626	5.645
06:00:00	1.606	0.000	0.255	3.807	2.646	6.454
06:30:00	1.825	0.000	0.295	4.738	2.677	7.416
07:00:00	2.072	0.000	0.342	5.803	2.720	8.523
07:30:00	2.351	0.000	0.398	7.013	2.777	9.790
08:00:00	2.663	0.000	0.462	8.394	2.849	11.243
08:30:00	3.012	0.000	0.538	9.973	2.939	12.912
09:00:00	3.398	0.000	0.626	11.784	3.049	14.834
09:30:00	3.816	0.000	0.727	13.866	3.183	17.049
10:00:00	4.243	0.000	0.839	16.264	3.343	19.607
10:30:00	4.454	0.000	0.915	19.029	3.534	22.563
11:00:00	4.243	0.000	0.904	22.200	3.760	25.960
11:30:00	3.816	0.000	0.836	25.775	4.027	29.802
12:00:00	3.398	0.000	0.766	29.703	4.338	34.041
12:30:00	3.012	0.000	0.696	33.909	4.697	38.607
13:00:00	2.663	0.000	0.629	38.317	5.108	43.425
13:30:00	2.351	0.000	0.566	42.847	5.572	48.419
14:00:00	2.072	0.000	0.507	47.413	6.089	53.502
14:30:00	1.825	0.000	0.452	51.922	6.660	58.582
15:00:00	1.606	0.000	0.403	56.274	7.283	63.557
15:30:00	1.412	0.000	0.358	60.363	7.955	68.318
16:00:00	1.241	0.000	0.317	64.080	8.672	72.752
16:30:00	1.089	0.000	0.281	67.310	9.429	76.739
17:00:00	0.956	0.000	0.248	69.938	10.219	80.157
17:30:00	0.839	0.000	0.219	71.881	11.033	82.914

18:00:00	0.736	0.000	0.193	73.126	11.863	84.989
18:30:00	0.645	0.000	0.170	73.720	12.699	86.419
19:00:00	0.566	0.000	0.150	73.722	13.535	87.257
19:30:00	0.496	0.000	0.132	73.197	14.361	87.558
20:00:00	0.434	0.000	0.116	72.207	15.174	87.381
20:30:00	0.380	0.000	0.102	70.816	15.965	86.781
21:00:00	0.333	0.000	0.089	69.083	16.732	85.815
21:30:00	0.000	0.000	0.000	67.067	17.470	84.537
22:00:00	0.000	0.000	0.000	64.797	18.175	82.973
22:30:00	0.000	0.000	0.000	62.308	18.846	81.154
23:00:00	0.000	0.000	0.000	59.660	19.479	79.138
23:30:00	0.000	0.000	0.000	56.912	20.073	76.985
24:00:00	0.000	0.000	0.000	54.109	20.628	74.738
24:30:00	0.000	0.000	0.000	51.278	21.144	72.422
25:00:00	0.000	0.000	0.000	48.433	21.619	70.052
25:30:00	0.000	0.000	0.000	45.584	22.055	67.639
26:00:00	0.000	0.000	0.000	42.742	22.452	65.194
26:30:00	0.000	0.000	0.000	39.915	22.810	62.725
27:00:00	0.000	0.000	0.000	37.114	23.130	60.243
27:30:00	0.000	0.000	0.000	34.345	23.411	57.756
28:00:00	0.000	0.000	0.000	31.618	23.656	55.274
28:30:00	0.000	0.000	0.000	28.992	23.864	52.856
29:00:00	0.000	0.000	0.000	26.479	24.038	50.517
29:30:00	0.000	0.000	0.000	24.076	24.178	48.254
30:00:00	0.000	0.000	0.000	21.779	24.287	46.067
30:30:00	0.000	0.000	0.000	19.590	24.366	43.957
31:00:00	0.000	0.000	0.000	17.511	24.417	41.928
31:30:00	0.000	0.000	0.000	15.545	24.441	39.986
32:00:00	0.000	0.000	0.000	13.698	24.440	38.138
32:30:00	0.000	0.000	0.000	11.979	24.416	36.395
33:00:00	0.000	0.000	0.000	10.401	24.370	34.771
33:30:00	0.000	0.000	0.000	8.975	24.305	33.279
34:00:00	0.000	0.000	0.000	7.708	24.222	31.931
34:30:00	0.000	0.000	0.000	6.594	24.125	30.719
35:00:00	0.000	0.000	0.000	5.609	24.015	29.624
35:30:00	0.000	0.000	0.000	4.743	23.893	28.636
36:00:00	0.000	0.000	0.000	3.985	23.762	27.747
36:30:00	0.000	0.000	0.000	3.324	23.622	26.946
37:00:00	0.000	0.000	0.000	2.751	23.476	26.226

37:30:00	0.000	0.000	0.000	2.256	23.323	25.579
38:00:00	0.000	0.000	0.000	1.831	23.166	24.996
38:30:00	0.000	0.000	0.000	1.468	23.004	24.472
39:00:00	0.000	0.000	0.000	1.161	22.840	24.000
39:30:00	0.000	0.000	0.000	0.901	22.673	23.574
40:00:00	0.000	0.000	0.000	0.685	22.504	23.189
40:30:00	0.000	0.000	0.000	0.507	22.334	22.840
41:00:00	0.000	0.000	0.000	0.362	22.163	22.524
41:30:00	0.000	0.000	0.000	0.246	21.991	22.237
42:00:00	0.000	0.000	0.000	0.157	21.820	21.977
42:30:00	0.000	0.000	0.000	0.090	21.649	21.739
43:00:00	0.000	0.000	0.000	0.044	21.478	21.522
43:30:00	0.000	0.000	0.000	0.015	21.309	21.323
44:00:00	0.000	0.000	0.000	0.001	21.140	21.142
44:30:00	0.000	0.000	0.000	0.000	20.973	20.973
45:00:00	0.000	0.000	0.000	0.000	20.807	20.807
45:30:00	0.000	0.000	0.000	0.000	20.642	20.642
46:00:00	0.000	0.000	0.000	0.000	20.479	20.479
46:30:00	0.000	0.000	0.000	0.000	20.317	20.317
47:00:00	0.000	0.000	0.000	0.000	20.156	20.156
47:30:00	0.000	0.000	0.000	0.000	19.996	19.996
48:00:00	0.000	0.000	0.000	0.000	19.838	19.838
48:30:00	0.000	0.000	0.000	0.000	19.681	19.681
49:00:00	0.000	0.000	0.000	0.000	19.525	19.525
49:30:00	0.000	0.000	0.000	0.000	19.371	19.371
50:00:00	0.000	0.000	0.000	0.000	19.218	19.218
50:30:00	0.000	0.000	0.000	0.000	19.065	19.065
51:00:00	0.000	0.000	0.000	0.000	18.915	18.915
51:30:00	0.000	0.000	0.000	0.000	18.765	18.765
52:00:00	0.000	0.000	0.000	0.000	18.616	18.616
52:30:00	0.000	0.000	0.000	0.000	18.469	18.469
53:00:00	0.000	0.000	0.000	0.000	18.323	18.323
53:30:00	0.000	0.000	0.000	0.000	18.178	18.178
54:00:00	0.000	0.000	0.000	0.000	18.034	18.034
54:30:00	0.000	0.000	0.000	0.000	17.891	17.891
55:00:00	0.000	0.000	0.000	0.000	17.750	17.750
55:30:00	0.000	0.000	0.000	0.000	17.609	17.609
56:00:00	0.000	0.000	0.000	0.000	17.470	17.470
56:30:00	0.000	0.000	0.000	0.000	17.332	17.332

57:00:00	0.000	0.000	0.000	0.000	17.194	17.194
57:30:00	0.000	0.000	0.000	0.000	17.058	17.058
58:00:00	0.000	0.000	0.000	0.000	16.923	16.923
58:30:00	0.000	0.000	0.000	0.000	16.789	16.789
59:00:00	0.000	0.000	0.000	0.000	16.657	16.657
59:30:00	0.000	0.000	0.000	0.000	16.525	16.525
60:00:00	0.000	0.000	0.000	0.000	16.394	16.394
60:30:00	0.000	0.000	0.000	0.000	16.264	16.264
61:00:00	0.000	0.000	0.000	0.000	16.135	16.135
61:30:00	0.000	0.000	0.000	0.000	16.008	16.008
62:00:00	0.000	0.000	0.000	0.000	15.881	15.881
62:30:00	0.000	0.000	0.000	0.000	15.755	15.755
63:00:00	0.000	0.000	0.000	0.000	15.631	15.631
63:30:00	0.000	0.000	0.000	0.000	15.507	15.507
64:00:00	0.000	0.000	0.000	0.000	15.384	15.384
64:30:00	0.000	0.000	0.000	0.000	15.262	15.262
65:00:00	0.000	0.000	0.000	0.000	15.142	15.142
65:30:00	0.000	0.000	0.000	0.000	15.022	15.022
66:00:00	0.000	0.000	0.000	0.000	14.903	14.903
66:30:00	0.000	0.000	0.000	0.000	14.785	14.785
67:00:00	0.000	0.000	0.000	0.000	14.668	14.668
67:30:00	0.000	0.000	0.000	0.000	14.552	14.552
68:00:00	0.000	0.000	0.000	0.000	14.437	14.437
68:30:00	0.000	0.000	0.000	0.000	14.323	14.323
69:00:00	0.000	0.000	0.000	0.000	14.209	14.209
69:30:00	0.000	0.000	0.000	0.000	14.097	14.097
70:00:00	0.000	0.000	0.000	0.000	13.985	13.985
70:30:00	0.000	0.000	0.000	0.000	13.874	13.874
71:00:00	0.000	0.000	0.000	0.000	13.765	13.765
71:30:00	0.000	0.000	0.000	0.000	13.656	13.656
72:00:00	0.000	0.000	0.000	0.000	13.548	13.548
72:30:00	0.000	0.000	0.000	0.000	13.440	13.440
73:00:00	0.000	0.000	0.000	0.000	13.334	13.334
73:30:00	0.000	0.000	0.000	0.000	13.229	13.229
74:00:00	0.000	0.000	0.000	0.000	13.124	13.124
74:30:00	0.000	0.000	0.000	0.000	13.020	13.020
75:00:00	0.000	0.000	0.000	0.000	12.917	12.917
75:30:00	0.000	0.000	0.000	0.000	12.815	12.815
76:00:00	0.000	0.000	0.000	0.000	12.713	12.713

76:30:00	0.000	0.000	0.000	0.000	12.613	12.613
77:00:00	0.000	0.000	0.000	0.000	12.513	12.513
77:30:00	0.000	0.000	0.000	0.000	12.414	12.414
78:00:00	0.000	0.000	0.000	0.000	12.316	12.316
78:30:00	0.000	0.000	0.000	0.000	12.218	12.218
79:00:00	0.000	0.000	0.000	0.000	12.121	12.121
79:30:00	0.000	0.000	0.000	0.000	12.025	12.025
80:00:00	0.000	0.000	0.000	0.000	11.930	11.930
80:30:00	0.000	0.000	0.000	0.000	11.836	11.836
81:00:00	0.000	0.000	0.000	0.000	11.742	11.742
81:30:00	0.000	0.000	0.000	0.000	11.649	11.649
82:00:00	0.000	0.000	0.000	0.000	11.557	11.557
82:30:00	0.000	0.000	0.000	0.000	11.466	11.466
83:00:00	0.000	0.000	0.000	0.000	11.375	11.375
83:30:00	0.000	0.000	0.000	0.000	11.285	11.285
84:00:00	0.000	0.000	0.000	0.000	11.196	11.196
84:30:00	0.000	0.000	0.000	0.000	11.107	11.107
85:00:00	0.000	0.000	0.000	0.000	11.019	11.019
85:30:00	0.000	0.000	0.000	0.000	10.932	10.932
86:00:00	0.000	0.000	0.000	0.000	10.845	10.845
86:30:00	0.000	0.000	0.000	0.000	10.759	10.759
87:00:00	0.000	0.000	0.000	0.000	10.674	10.674
87:30:00	0.000	0.000	0.000	0.000	10.590	10.590
88:00:00	0.000	0.000	0.000	0.000	10.506	10.506
88:30:00	0.000	0.000	0.000	0.000	10.423	10.423
89:00:00	0.000	0.000	0.000	0.000	10.340	10.340
89:30:00	0.000	0.000	0.000	0.000	10.259	10.259
90:00:00	0.000	0.000	0.000	0.000	10.177	10.177
90:30:00	0.000	0.000	0.000	0.000	10.097	10.097
91:00:00	0.000	0.000	0.000	0.000	10.017	10.017
91:30:00	0.000	0.000	0.000	0.000	9.938	9.938
92:00:00	0.000	0.000	0.000	0.000	9.859	9.859
92:30:00	0.000	0.000	0.000	0.000	9.781	9.781
93:00:00	0.000	0.000	0.000	0.000	9.704	9.704
93:30:00	0.000	0.000	0.000	0.000	9.627	9.627
94:00:00	0.000	0.000	0.000	0.000	9.551	9.551
94:30:00	0.000	0.000	0.000	0.000	9.475	9.475
95:00:00	0.000	0.000	0.000	0.000	9.400	9.400
95:30:00	0.000	0.000	0.000	0.000	9.326	9.326

96:00:00	0.000	0.000	0.000	0.000	9.252	9.252
96:30:00	0.000	0.000	0.000	0.000	9.179	9.179
97:00:00	0.000	0.000	0.000	0.000	9.106	9.106
97:30:00	0.000	0.000	0.000	0.000	9.034	9.034
98:00:00	0.000	0.000	0.000	0.000	8.962	8.962
98:30:00	0.000	0.000	0.000	0.000	8.891	8.891
99:00:00	0.000	0.000	0.000	0.000	8.821	8.821
99:30:00	0.000	0.000	0.000	0.000	8.751	8.751
100:00:00	0.000	0.000	0.000	0.000	8.682	8.682
100:30:00	0.000	0.000	0.000	0.000	8.613	8.613
101:00:00	0.000	0.000	0.000	0.000	8.545	8.545
101:30:00	0.000	0.000	0.000	0.000	8.477	8.477
102:00:00	0.000	0.000	0.000	0.000	8.410	8.410
102:30:00	0.000	0.000	0.000	0.000	8.344	8.344
103:00:00	0.000	0.000	0.000	0.000	8.278	8.278
103:30:00	0.000	0.000	0.000	0.000	8.212	8.212
104:00:00	0.000	0.000	0.000	0.000	8.147	8.147
104:30:00	0.000	0.000	0.000	0.000	8.083	8.083
105:00:00	0.000	0.000	0.000	0.000	8.019	8.019
105:30:00	0.000	0.000	0.000	0.000	7.955	7.955
106:00:00	0.000	0.000	0.000	0.000	7.892	7.892
106:30:00	0.000	0.000	0.000	0.000	7.830	7.830
107:00:00	0.000	0.000	0.000	0.000	7.768	7.768
107:30:00	0.000	0.000	0.000	0.000	7.706	7.706
108:00:00	0.000	0.000	0.000	0.000	7.645	7.645
108:30:00	0.000	0.000	0.000	0.000	7.585	7.585
109:00:00	0.000	0.000	0.000	0.000	7.525	7.525
109:30:00	0.000	0.000	0.000	0.000	7.465	7.465
110:00:00	0.000	0.000	0.000	0.000	7.406	7.406
110:30:00	0.000	0.000	0.000	0.000	7.348	7.348
111:00:00	0.000	0.000	0.000	0.000	7.290	7.290
111:30:00	0.000	0.000	0.000	0.000	7.232	7.232
112:00:00	0.000	0.000	0.000	0.000	7.175	7.175
112:30:00	0.000	0.000	0.000	0.000	7.118	7.118
113:00:00	0.000	0.000	0.000	0.000	7.062	7.062
113:30:00	0.000	0.000	0.000	0.000	7.006	7.006
114:00:00	0.000	0.000	0.000	0.000	6.950	6.950
114:30:00	0.000	0.000	0.000	0.000	6.895	6.895
115:00:00	0.000	0.000	0.000	0.000	6.841	6.841

115:30:00	0.000	0.000	0.000	0.000	6.786	6.786
116:00:00	0.000	0.000	0.000	0.000	6.733	6.733
116:30:00	0.000	0.000	0.000	0.000	6.679	6.679
117:00:00	0.000	0.000	0.000	0.000	6.627	6.627
117:30:00	0.000	0.000	0.000	0.000	6.574	6.574
118:00:00	0.000	0.000	0.000	0.000	6.522	6.522
118:30:00	0.000	0.000	0.000	0.000	6.471	6.471
119:00:00	0.000	0.000	0.000	0.000	6.419	6.419
119:30:00	0.000	0.000	0.000	0.000	6.368	6.368
120:00:00	0.000	0.000	0.000	0.000	6.318	6.318
120:30:00	0.000	0.000	0.000	0.000	6.268	6.268
121:00:00	0.000	0.000	0.000	0.000	6.218	6.218
121:30:00	0.000	0.000	0.000	0.000	6.169	6.169
122:00:00	0.000	0.000	0.000	0.000	6.120	6.120
122:30:00	0.000	0.000	0.000	0.000	6.072	6.072
123:00:00	0.000	0.000	0.000	0.000	6.024	6.024
123:30:00	0.000	0.000	0.000	0.000	5.976	5.976
124:00:00	0.000	0.000	0.000	0.000	5.929	5.929
124:30:00	0.000	0.000	0.000	0.000	5.882	5.882
125:00:00	0.000	0.000	0.000	0.000	5.835	5.835
125:30:00	0.000	0.000	0.000	0.000	5.789	5.789
126:00:00	0.000	0.000	0.000	0.000	5.743	5.743
126:30:00	0.000	0.000	0.000	0.000	5.698	5.698
127:00:00	0.000	0.000	0.000	0.000	5.653	5.653
127:30:00	0.000	0.000	0.000	0.000	5.608	5.608
128:00:00	0.000	0.000	0.000	0.000	5.564	5.564
128:30:00	0.000	0.000	0.000	0.000	5.520	5.520
129:00:00	0.000	0.000	0.000	0.000	5.476	5.476
129:30:00	0.000	0.000	0.000	0.000	5.433	5.433
130:00:00	0.000	0.000	0.000	0.000	5.390	5.390
130:30:00	0.000	0.000	0.000	0.000	5.347	5.347
131:00:00	0.000	0.000	0.000	0.000	5.305	5.305
131:30:00	0.000	0.000	0.000	0.000	5.263	5.263
132:00:00	0.000	0.000	0.000	0.000	5.221	5.221
132:30:00	0.000	0.000	0.000	0.000	5.180	5.180
133:00:00	0.000	0.000	0.000	0.000	5.139	5.139
133:30:00	0.000	0.000	0.000	0.000	5.098	5.098
134:00:00	0.000	0.000	0.000	0.000	5.058	5.058
134:30:00	0.000	0.000	0.000	0.000	5.018	5.018

135:00:00	0.000	0.000	0.000	0.000	4.978	4.978
135:30:00	0.000	0.000	0.000	0.000	4.939	4.939
136:00:00	0.000	0.000	0.000	0.000	4.900	4.900
136:30:00	0.000	0.000	0.000	0.000	4.861	4.861
137:00:00	0.000	0.000	0.000	0.000	4.822	4.822
137:30:00	0.000	0.000	0.000	0.000	4.784	4.784
138:00:00	0.000	0.000	0.000	0.000	4.746	4.746
138:30:00	0.000	0.000	0.000	0.000	4.709	4.709
139:00:00	0.000	0.000	0.000	0.000	4.671	4.671
139:30:00	0.000	0.000	0.000	0.000	4.635	4.635
140:00:00	0.000	0.000	0.000	0.000	4.598	4.598
140:30:00	0.000	0.000	0.000	0.000	4.561	4.561
141:00:00	0.000	0.000	0.000	0.000	4.525	4.525
141:30:00	0.000	0.000	0.000	0.000	4.490	4.490
142:00:00	0.000	0.000	0.000	0.000	4.454	4.454
142:30:00	0.000	0.000	0.000	0.000	4.419	4.419
143:00:00	0.000	0.000	0.000	0.000	4.384	4.384
143:30:00	0.000	0.000	0.000	0.000	4.349	4.349
144:00:00	0.000	0.000	0.000	0.000	4.315	4.315
144:30:00	0.000	0.000	0.000	0.000	4.281	4.281
145:00:00	0.000	0.000	0.000	0.000	4.247	4.247
145:30:00	0.000	0.000	0.000	0.000	4.213	4.213
146:00:00	0.000	0.000	0.000	0.000	4.180	4.180
146:30:00	0.000	0.000	0.000	0.000	4.147	4.147
147:00:00	0.000	0.000	0.000	0.000	4.114	4.114
147:30:00	0.000	0.000	0.000	0.000	4.081	4.081
148:00:00	0.000	0.000	0.000	0.000	4.049	4.049
148:30:00	0.000	0.000	0.000	0.000	4.017	4.017
149:00:00	0.000	0.000	0.000	0.000	3.985	3.985
149:30:00	0.000	0.000	0.000	0.000	3.954	3.954
150:00:00	0.000	0.000	0.000	0.000	3.922	3.922
150:30:00	0.000	0.000	0.000	0.000	3.891	3.891
151:00:00	0.000	0.000	0.000	0.000	3.860	3.860
151:30:00	0.000	0.000	0.000	0.000	3.830	3.830
152:00:00	0.000	0.000	0.000	0.000	3.800	3.800
152:30:00	0.000	0.000	0.000	0.000	3.769	3.769
153:00:00	0.000	0.000	0.000	0.000	3.740	3.740
153:30:00	0.000	0.000	0.000	0.000	3.710	3.710
154:00:00	0.000	0.000	0.000	0.000	3.681	3.681

154:30:00	0.000	0.000	0.000	0.000	3.652	3.652
155:00:00	0.000	0.000	0.000	0.000	3.623	3.623
155:30:00	0.000	0.000	0.000	0.000	3.594	3.594
156:00:00	0.000	0.000	0.000	0.000	3.566	3.566
156:30:00	0.000	0.000	0.000	0.000	3.537	3.537
157:00:00	0.000	0.000	0.000	0.000	3.509	3.509
157:30:00	0.000	0.000	0.000	0.000	3.482	3.482
158:00:00	0.000	0.000	0.000	0.000	3.454	3.454
158:30:00	0.000	0.000	0.000	0.000	3.427	3.427
159:00:00	0.000	0.000	0.000	0.000	3.400	3.400
159:30:00	0.000	0.000	0.000	0.000	3.373	3.373
160:00:00	0.000	0.000	0.000	0.000	3.346	3.346
160:30:00	0.000	0.000	0.000	0.000	3.319	3.319
161:00:00	0.000	0.000	0.000	0.000	3.293	3.293
161:30:00	0.000	0.000	0.000	0.000	3.267	3.267
162:00:00	0.000	0.000	0.000	0.000	3.241	3.241
162:30:00	0.000	0.000	0.000	0.000	3.216	3.216
163:00:00	0.000	0.000	0.000	0.000	3.190	3.190
163:30:00	0.000	0.000	0.000	0.000	3.165	3.165
164:00:00	0.000	0.000	0.000	0.000	3.140	3.140
164:30:00	0.000	0.000	0.000	0.000	3.115	3.115
165:00:00	0.000	0.000	0.000	0.000	3.090	3.090
165:30:00	0.000	0.000	0.000	0.000	3.066	3.066
166:00:00	0.000	0.000	0.000	0.000	3.042	3.042
166:30:00	0.000	0.000	0.000	0.000	3.018	3.018
167:00:00	0.000	0.000	0.000	0.000	2.994	2.994
167:30:00	0.000	0.000	0.000	0.000	2.970	2.970
168:00:00	0.000	0.000	0.000	0.000	2.947	2.947
168:30:00	0.000	0.000	0.000	0.000	2.923	2.923
169:00:00	0.000	0.000	0.000	0.000	2.900	2.900
169:30:00	0.000	0.000	0.000	0.000	2.877	2.877
170:00:00	0.000	0.000	0.000	0.000	2.854	2.854
170:30:00	0.000	0.000	0.000	0.000	2.832	2.832
171:00:00	0.000	0.000	0.000	0.000	2.809	2.809
171:30:00	0.000	0.000	0.000	0.000	2.787	2.787
172:00:00	0.000	0.000	0.000	0.000	2.765	2.765

Appendix

Catchment descriptors

Name	Value	User-defined value used?
Area (km^2)	270.55	No
ALTBAR	169	No
ASPBAR	2	No
ASPVAR	0.34	No
BFIHOST	0.62	No
BFIHOST19	0.63	No
DPLBAR (km)	30.98	No
DPSBAR (mkm^{-1})	74.4	No
FARL	0.98	No
LDP	56.2	No
PROPWET (mm)	0.42	No
RMED1H	9	No
RMED1D	37.1	No
RMED2D	47.5	No
SAAR (mm)	813	No
SAAR4170 (mm)	871	No
SPRHOST	32.5	No
Urbext2000	0.01	No
Urbext1990	0.01	No
URBCONC	0.86	No
URBLOC	0.41	No
DDF parameter C	-0.02	No
DDF parameter D1	0.44	No
DDF parameter D2	0.41	No
DDF parameter D3	0.3	No
DDF parameter E	0.25	No
DDF parameter F	2.31	No
DDF parameter C (1km grid value)	-0.01	No
DDF parameter D1 (1km grid value)	0.41	No
DDF parameter D2 (1km grid value)	0.35	No
DDF parameter D3 (1km grid value)	0.28	No
DDF parameter E (1km grid value)	0.25	No
DDF parameter F (1km grid value)	2.25	No

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Appendix D – Sediment Movement Study

cbec eco engineering

LOSSIEMOUTH EAST BEACH FOOTBRIDGE REPLACEMENT

SEDIMENT MOVEMENT STUDY

Prepared for

Beaver Bridges Ltd

Prepared by

cbec eco-engineering UK Ltd

December 2020

cbec Project #: 20-1032

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Inverness, IV2 3BL

Client: Beaver Bridges Ltd

Project Name: Lossiemouth East Beach Footbridge Replacement

Project Reference: 20-1032

Document Type: Draft

Author(s): Dr Chrystiann Lavarini

Reviewer(s): Dr Stephanie Davidson, Dr Peter Downs

Revision History

Version	Issued To	Date of Issue
1.0	David Mitchell	15th December 2020

Services provided pursuant to this agreement are intended solely for the use and benefit of Beaver Bridges Ltd. No other person or entity shall be entitled to rely on the services, opinions, recommendations, plans or specifications provided pursuant to this agreement without the express written consent of cbec eco-engineering UK Ltd., The Green House, Beechwood Park North, Inverness, IV2 3BL.

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1. INTRODUCTION

cbec eco-engineering UK Ltd (cbec) was contracted by Beaver Bridges Ltd to conduct environmental studies of potential factors influencing the design of the proposed replacement bridge at Lossiemouth East Beach, on the River Lossie at Lossiemouth, Moray. This document presents a study undertaken to assess the potential implications of sediment movement on the proposed replacement bridge. Specifically, this study assesses:

- The current sediment dynamics along the River Lossie valley and potential factors that can further influence the bridge stability.
- How sediment dynamics have changed over time, their rates of change in terms of river morphology, and, associated factors that can have caused the failure of the old footbridge and can impact the long-term stability of the alternative proposed bridge.
- The potential impact of morphodynamic changes on the foundation stability for the two bridge replacement options.

2. APPROACH

2.1 HISTORICAL SEDIMENT DYNAMICS

A desk-based assessment of historical sediment mobility historic was undertaken using a combination of (1) a series of historical maps made publicly available by the National Library of Scotland (NLS)[1] for the period between 1747 and 1957 and, (2), aerial images made publicly available by the Google Earth for the period 2007-2020. Data from the National River Flow Archive (2020) and literature review were also used. Together, this sequence of maps, aerial images and flow data permit a long-term understanding of changes in river planform, sediment dynamics and land cover, which provide a timeline to unravel sediment movement within the recent Anthropocene period, that is, the geological epoch dating from the commencement of significant human impact on Earth's geology to today. A detailed description of the methods and results of this historic assessment is provided as Appendix B ('Historic Sediment Dynamics').

2.2 CURRENT SEDIMENT DYNAMICS

A geomorphological walkover ('fluvial audit') to characterise geomorphic and built elements along the valley floor was undertaken in October 2020 by two experienced geomorphologists on a ≈4.4 km length of the river. The survey is considered sufficient to interpret both fluvial processes upstream to the limit of the tidal influence at Arthur's Bridge at OS NGR NJ 2535 6720, and coastal processes related to the dune area to the north of the channel at OS NGR NJ 23940 70768. A detailed description of the methods and results of this geomorphological walkover is provided as Appendix A ('Geomorphic Walkover Survey').

2.3 FOOTBRIDGE OPTIONS APPRAISAL

Based on the current and historic sediment movement assessments, the two footbridge replacement locations proposed by Moray Council[2] are analysed in terms of propensity for foundational instability resulting from sediment accumulation (bridge overloading) and removal (bridge scour). The two

[1] National Library of Scotland (NLS) can be accessed at https://www.nls.uk/.

[2] Moray Council (2020). Lossiemouth East Beach Footbridge Replacement Site Plan. Available in Appendix C ('Proposed Bridge Locations').

options for the bridge replacement are the actual footbridge and another section just upstream of the Old Harbour.

3. SEDIMENT MOVEMENT STUDY: MAIN FINDINGS

3.1 HISTORIC ASSESSMENT: 1747 – 1957

The river centreline migration rate between the late 1800s (1865-1870) and the present (2019) varies from ≈0.2 m yr^{-1} (at the footbridge) to ≈0.4 m yr^{-1} upstream of the Old Harbour (in the location of the alternative proposed bridge). Similarly, the centreline migration rate to the west between 1957 and the present varies from ≈0.1 m yr^{1} near the footbridge to ≈0.4 m yr^{-1} near the Old Harbour.

These rates and dates indicate that the average centreline migration rate has slowed in the more recent years (1957-2019) adjacent to the current footbridge cross-section but increased slightly in the alternative section proposed for the new footbridge (near the Old Harbour). They also indicate that the preferential areas of scour and deposition in the valley have varied over time. This variation of sediment dynamics within the channel might have been enhanced by dune migration which may be one of the sources of instability that undermined the existing footbridge (although further investigation would be required to test this hypothesis). While scour related to the migrating channel may have reduced the foundation's stability, in-migration of large volumes of sand below the bridge may also have assisted in causing overloading.

In the literature, Smith (1982)[3] supports that the Lossiemouth coastline evolution is linked to a shoreline regression (i.e., sedimentation of clastic sediments towards the continent), with an increase of sand in dune formation. Their report also highlights that the western portion is currently the most dynamic one, including a seasonal accumulation of sand from the outer to the inner shoreline. In addition, Dargie (2001)[4] classified 10.5 ha of the East Lossiemouth area as 'mobile dunes', reinforcing the potential of dune migration as a relevant process in the local landscape dynamics. However, although these reports suggest that the western area near the River Lossie outlet has mobile dunes and an inward seasonal sand accumulation, the scale of their studies is too large to allow a definition of the extent and magnitude of this process in the current river geometry. Therefore, this is still a hypothesis requiring further field investigation.

3.2 HISTORIC ASSESSMENT: 2007 – 2019

Analysis of aerial imagery supports a large variation in river width related to diurnal and seasonal tidal levels rather than upstream changes in river discharge (Table 3.1). Overall, the river width is considerably narrower in the section of the alternative proposed bridge location than in the current one, which might be linked to a lateral constriction in the Old Harbour area resulting from the historical dune and river channel centreline migration.

[3] Smith, J.S. (1982). Lossiemouth (East). In: Ritchie, W. (1982). Northeast Scotland coastal field guide and geographical analysis. Available at https://apps.dtic.mil/sti/pdfs/ADA134861.pdf

[4] Dargie, T. (2001). Sand dune vegetation survey of Scotland: Moray Firth, vol. 1. Available at https://bit.ly/2IEWfk1

Table 3.1: Mean discharge, catchment daily rainfall recorded in the nearby gauge station (7003-Lossie at Sheriffmills) and river width identified at the current River Lossie footbridge and at the alternative proposed footbridge, near the outlet. Hydrologic data were collected from National River Flow Archive website and the aerial images from Google Earth (made available by Maxar Technologies).

Date	Discharge (m^3/s)	Precipitation (mm)	River width (m) at location of current bridge	River width (m) at alternative proposed location
03/02/2007	2.3	0	127.2	47.6
09/05/2008	1.5	0	110.7	39.6
24/03/2014	1.0	0	25.1	23.4
20/05/2014	0.8	3.8	21.4	12.0
26/06/2016	1.9	3.4	33.4	11.3
12/05/2017	0.89	0.2	95.1	39.7
09/02/2018	2.5	-	50.7	16.9
27/04/2018	1.3	-	103.3	33.8
25/06/2018	0.8	-	103.3	48.0
07/01/2019	1.0	-	111.6	45.5
06/02/2019	3.1	-	112.3	49.8
08/07/2019	1.0	-	33.6	11.8

3.3 GEOMORPHIC SURVEY

The geomorphic field survey confirmed that the River Lossie near its outlet is controlled by a combination of fluvial and tidal influences, and, potentially, by dune migration. Understandably, the tidal influence decreases upstream. Observed river geometries (i.e., width, slope, and depth) arise because of fluvial and tidal hydraulic forces in combination with a sediment supply derived both from the upstream catchment driven by fluvial processes and from the coastal sand dune migration driven by aeolian (wind-blown) processes. Evidence for dune migration by wind-blown is partly supported by the historic assessment undertaken within this report (Appendix A). In terms of active and stable sediment deposits, this reach combines large active sandbars within the channel and in the coastal area, with stable fluvial island and floodplains upstream from the coastal zone.

3.4 BRIDGE OPTIONS APPRAISAL

The following morpho-dynamic characteristics have been noticed in the location proposed for the footbridges:

- **Current footbridge location**: a reduction in the river centreline migration rate (from ≈ 0.2 m yr^{-1} to ≈ 0.1 m yr^{1}) in the recent decades (1957-2019) compared to the longer timeframe (1870 to present), and a larger diurnal/seasonal variation (93.6 m) in river width due to tidal influence in recent years (2007-2019) than the alternative footbridge area.
- **Alternative footbridge location**: a steady river centreline migration rate (≈0.4 m yr^{-1}) from 1870 to present, and a smaller diurnal/seasonal variation (38.5 m) in river width due to tidal influence in recent years (2007-2019) than the current footbridge area.

These results indicate that the regular increase in river width during tidal rises appears to result in a larger spatial occurrence of scour in the vicinity of the current footbridge locations than in the vicinity of the alternative location, but deeper in the latter. This narrower width (possibly related to river constriction by dune migration) is presumed to have produced higher scour depths because of deeper water levels (therefore, shear stress) at the thalweg of the alternative proposed bridge area. However, further assessment is required to test this hypothesis, given that no thalweg measurements are available.

4. CONCLUSION

In addition to the potential influence of fluvial scour in undermining the bridge piers, sand accumulation (overloading) has likely been an active factor in the River Lossie outlet as whole. However, overall, in evaluating the dynamic nature of both the dunes and riverbed within the area of the proposed footbridge relocation, there appears to be a lower risk of failure due to sediment dynamics at the site of the existing footbridge than the alternative one. This conclusion is based on apparently lower rates of channel migration and a wider channel that appears to facilitate broader rather than more focused scour associated with tidal fluctuations.

Please note that the field- and desk-based assessment conducted here provides an analysis of sediment movement based on historic assessment; future sediment dynamics, particularly under conditions of climate change and sea-level rise, may vary from that discussed.

APPENDIX A

History of Sediment Dynamics

HISTORY OF SEDIMENT DYNAMICS

This historic assessment of sediment mobility can be grouped within two historical ranges. The first time range comprises a period between 1747 and 1957, representing a series of historical maps made publicly available by the National Library of Scotland (NLS)[5]. The second time range is more recent (2007-2020), and is composed of aerial images made publicly available by Google Earth. Together, this sequence of maps and aerial images permit a long-term understanding of changes in river planform, sediment dynamics and land cover, which provide a timeline to assess sediment movement.

HISTORIC ASSESSMENT: 1747 – 1957

The oldest maps of the study area were produced by William Roy (Roy Highlands maps) in 1747-1752, and chronologically followed by those of James Dorret (1750), Aaron Arrowsmith (1807), and, later, Ordnance Survey (OS) maps (editions in 1896, 1900, 1923, 1872, 1903, 1905, 1957, 1965, and 1968).

In the Roy Highlands maps (1747-1752), the Lossiemouth peninsula is portrayed with the least human-altered landscape of all records available, reflecting a pre-industrial revolution Scottish landscape with possible farming human-induced changes (Figure A1). From large-scale maps, the River Lossie at that time shows similarities to its current planform in that the dominant flow direction is to the north, with a significant change to north-west at the coastal interface. Morphologically, it is noticeable that the River Lossie in 1747-1752 has a well-defined meandering planform throughout the mapped reaches. Some features (e.g. coastline sand beaches and dunes) seem overrepresented by the Roy maps and caution must be taken when comparing this map with more recent data.

[5] National Library of Scotland (NLS) can be accessed at https://www.nls.uk/.

Figure A1: Roy Highlands maps (1747-1752, above), and aerial images of Maxar (2020, below). These figures represent a similar extent of the landscape with a time difference of 268-273 years.

The next high-quality map was surveyed by the Ordnance Survey (OS) in 1865-1870 (and published in 1905) (Figure A2 and Figure A3). It shows an intensification of development with infrastructure such as Arthur's Bridge at the upstream extent of the study area, and an increase in housing, canal infrastructure and other anthropogenic interventions.

Similar to the current planform, the predominant river channel morphology in most of the upstream reach (i.e. before flowing to the north-west adjacent to the coastal dunes) shows lower sinuosity, with a narrower cross-sectional geometry. There are no significant changes in the river channel centreline from 1865-1870 to present.

However, in the north-west flowing reach, the position of highly dynamic depositional features (e.g. sandbars) within the channel and the spatial distribution of river geometry do not resemble present characteristics. For example, at the location of the current footbridge, the channel cross-sectional width varies from 21 m (in 1865-1870) to 32 m (present). Although in large-scale the dunes and shoreline have remained as they are currently, the river channel centreline and the dunes separating the river from the sea at the outlet were further east. In the location of the current footbridge, the channel centreline was ≈ 28 m further right from its present position (2020). In a downstream cross-section (113 m) from the current footbridge, the change in the river channel centreline was even higher: ≈ 68.5 m towards the river left from its past position in 1865-1870. These distances provide a river channel centreline migration rate of ≈ 0.2 m yr^{-1} at the footbridge and ≈ 0.4 m yr^{-1} at the downstream cross-section. These centreline migrations are likely to be a response to dune migration in the same direction (NW) over time, causing the associated footbridge issues.

These differences in planform location demonstrate that the alluvial channel near the sea has been more mobile over the last three centuries than its upstream reach. Because the quality of details in these maps is superior to that of Roy Highlands (1747-1752), it is not possible to directly compare the these data, but it is likely that anthropogenic pressures, and in particular the development of Lossiemouth itself, have historically impacted sediment dynamics within the lower River Lossie.

Another important record in the 1865-1870 map is the presence of the Spynie Canal (in the left margin) and of the Inness Canal (right margin) near the River Lossie. The creation of the Canal allowed the once extensive Spynie Loch to be drained and the resulting dry area made available for agriculture (see Figure A1). The Spynie Canal was damaged by inundation during the Great Flood of 1829 but was later repaired with dikes thrown up along the canal's banks. The Innes Canal was built at the same time (i.e. in the early 19th century) for farming purposes.

Figure A2: Downstream reach where the river flows to the NW. Note the river changes near the old harbour (last fluvial area near the sea) and in sandbars along the channel. The first map is an OS map surveyed in 1865-1870 (published in 1905), and the second map is an aerial image of Maxar from 2020.

Figure A3: Upstream study reach with the river flowing to the N-NW. Note that the river planform has remained largely unchanged from 1865-1870 to the present.

The subsequent maps (OS surveyed published in 1957, and more recent maps) show a channel centreline that is much closer to the current planform near the river outlet (Figure A4). However, it also shows a spatial distribution of sandbars and channel boundaries that does not fit the current morphology. Those changes are more visible in the section near the footbridge and in the Old Harbour, and, together, they reinforce the existence of a highly dynamic channel in human timescales (i.e., decadal).

In this area, the distance of the centreline from the footbridge, which serves as a static reference point, highlights these changes in the river planform over time. Near the current footbridge, there was a change in the river centreline of ≈ 6 m (an averaged migration rate of ≈ 0.09 m yr^{-1}. In the area in front of the Old Harbour, there were changes in the river centreline varying from 8 to 27 m (an averaged migration rate of ≈ 0.12 m yr^{-1} and ≈0.42 m yr^{-1}, respectively). The area in front of the Old Pier remained constant over time.

Figure A4: Downstream reach in 1957 map (top) and the status (bottom) in 2020. Note that the distribution of the channel sandbars are very different.

HISTORIC ASSESSMENT: 2007 – 2020

Free satellite images from the outlet of the River Lossie were taken by Maxar Technologies on 03/02/2007, 09/05/2008, 24/03/2014, 20/05/2014, 26/06/2016, 12/05/2017, 09/02/2018, 27/04/2018, 25/06/2018, 07/01/2019, 06/02/2019, 08/07/2019, 14/10/2019, 25/10/2019, 20/02/2020, and 30/05/2020. These images can be accessed on the Google Earth platform. In combination with these images, hydrologic data collected from National River Flow Archive is used to provide a more robust analysis.

Overall, the main features observed in the sequence of photographs are:

- River Lossie width changes significantly between dry (April to August) and wet seasons (September to March), although this is due largely to tidal (rather than precipitation) variations (Table A1).
- These data also suggest that the river is narrower in cross sectional geometry in the alternative proposed site for the bridge than in the location of the existing footbridge.

- The tidal influence on the channel width is supported by a comparison between daily mean flow discharge (m^3/s) and catchment daily rainfall (mm) recorded in the nearby gauge station ≈14 km upstream of the River Lossie outlet (data recorded by National River Flow Archive).
- Diurnal range in high and low tides are expected to impact in sediment transport. During base level rise (in this case, the sea where the river flows to), there is a reduction in water slope, which impacts directly on stream power by reducing the competence to transport sediment, therefore, promoting sediment deposition. On the contrary, during stages of base level fall, stream power increases because of higher water slopes. Consequently, river competence to transport coarser particles increases, promoting erosion in a reach scale during diurnal tidal variations.
- In addition to this alternating erosional process, the change in river geometry (width, depth and slope) resulting from the diurnal rise and fall of base level may also expose sand bars to entrainment during high tides and deposition during the falling stages. This exposure-hiding effect generates an additional factor of complexity to sediment dynamics.
- This combined effect of base level fall and rise on river width and stream power produce a trade-off between erosion and deposition over time.

Table A1: Mean discharge, catchment daily rainfall recorded in the nearby gauge station (7003-Lossie at Sheriffmills) and river width identified at the current River Lossie footbridge and at the alternative proposed footbridge, near the outlet. Hydrologic data were collected from National River Flow Archive website and the aerial images from Google Earth (made available by Maxar Technologies).

Date	Discharge (m^3/s)	Precipitation (mm)	River width (m) at location of current bridge	River width (m) at alternative proposed location
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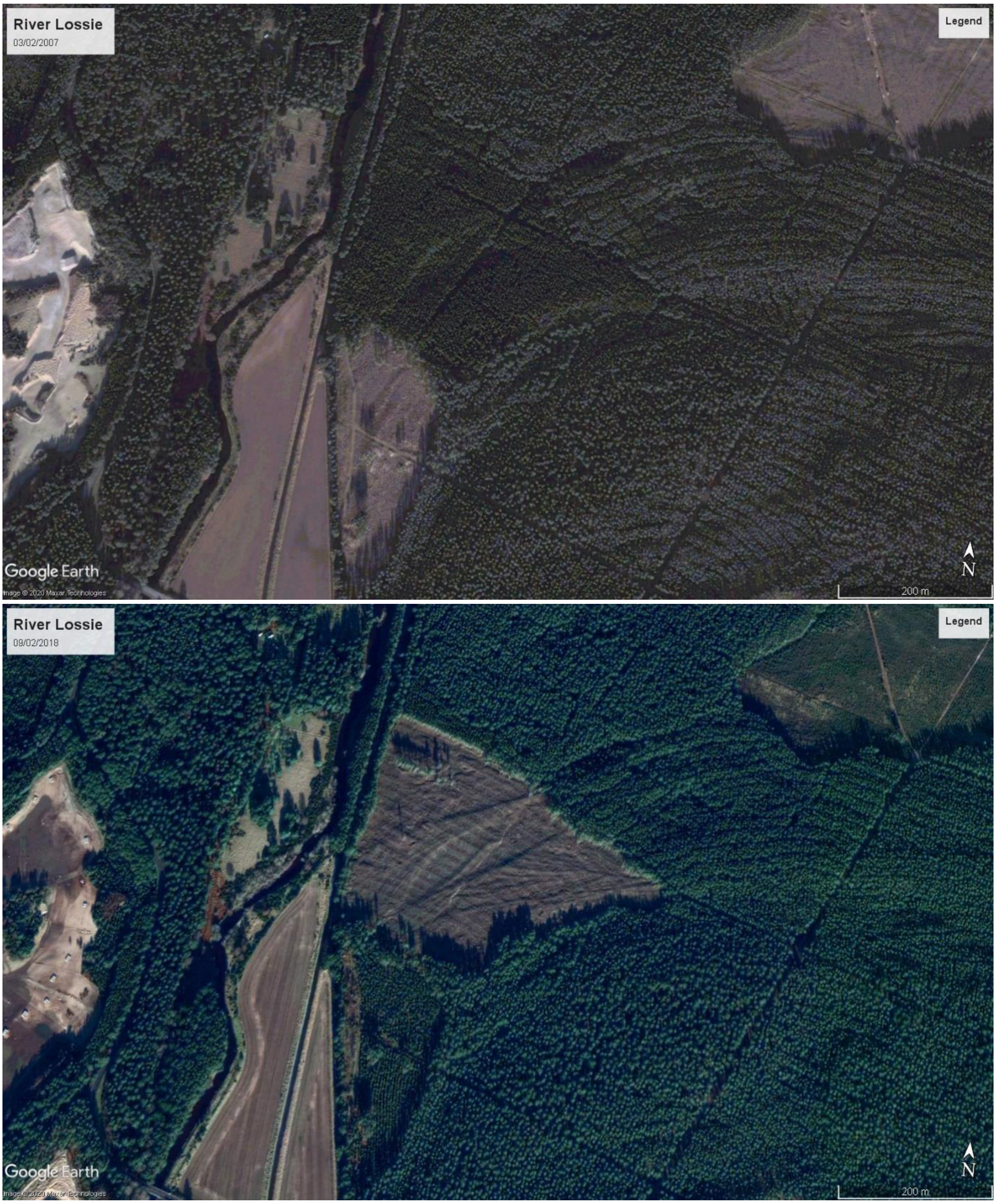
20/05/2014	0.8	3.8	21.4	12.0
26/06/2016	1.9	3.4	33.4	11.3
12/05/2017	0.9	0.2	95.1	39.7
09/02/2018	2.5	-	50.7	16.9
27/04/2018	1.3	-	103.3	33.8
25/06/2018	0.8	-	103.3	48.0
07/01/2019	1.0	-	111.6	45.5
06/02/2019	3.1	-	112.3	49.8
08/07/2019	1.0	-	33.6	11.8

Aerial images (page 1 of 3) showing the variation in wetted channel width due to tidal influence at the mouth of the river

Aerial images (page 2 of 3) showing the variation in wetted channel width due to tidal influence at the mouth of the river

Aerial images (page 3 of 3) showing the variation in wetted channel width due to tidal influence at the mouth of the river



Aerial images showing the River Lossie upstream of the study reach, taken during both low and high tide.

APPENDIX B

Current Sediment Dynamics

CURRENT SEDIMENT DYNAMICS

GEOMORPHIC SURVEY

cbec conducted a geomorphological walkover ('fluvial audit') to characterise geomorphic and built elements along the valley floor as part of the Sediment Movement Study. The survey included a length of the River Lossie sufficient to interpret fluvial process (i.e. upstream to the limit of the tidal influence at Arthur's Bridge at OS NGR NJ 2535 6720) and the dune area to the north of the channel (at OS NGR NJ 23940 70768).

Location

The walkover was conducted along the River Lossie, covering a total distance of ≈4.4 km, between OS NGR NJ 2535 6720 (upstream extent) and NJ 23940 70768 (downstream extent).

Method

A fluvial audit of the reach was carried out in October 2020. The entire length of the reach was walked by two surveyors. Locations and characteristics of physical features were recorded using a hand-held, GPS-enabled tablet and camera. The data were subsequently transformed into GIS format to allow visualisation and further analysis. The types of features and characteristics recorded are listed below.

- **Reach scale channel morphology** (using a classification scheme that draws on aspects of other recognised procedures - Montgomery and Buffington 1997; Brierley and Fryirs, 2000; SEPA, 2012).
- **Sediment sources/ storage** (e.g. tributaries, bank erosion, within-channel storage in barforms), noting dominant sediment sizes.
- **Indicators of the sediment transport regime** (e.g. the form, texture and vegetation cover of bar features and bed forms).
- **Vegetation** - both in-channel vegetation (e.g. 'large woody material', macrophytes) and riparian/bankside cover, as well as invasive alien species.
- **River engineering pressures** (e.g. culverts, bank protection, canalisation/ realignment, embankments, hydraulic structures, bridge crossings, etc.).

To facilitate analysis, the survey was divided into three river reaches as a means of providing spatial units within which further examination of physical processes could be undertaken and compared.

The three reaches surveyed are summarised in Table B1. These reaches represent distinct hydrodynamic environments, with sediments associated to varying sources and controlling factors.

Table B1: Studied reaches, their description and length.

Reach ID	Description	Length (m)	Sediment dynamics
1	River Lossie from the Arthur's bridge (OS NGR NJ 2535 6720) to the beginning of the river change to the more alluvial channel (OS NGR NJ 25512 68262).	1.2 km	Fluvial processes, gravel-sand dominated,
2	From the upstream extent of the more alluvial channel (OS NGR NJ 25512 68262) to the upstream extent the major tributary of river right (OS NGR NJ 25207 69133).	1 km	Transitional between fluvial and coastal processes
3	From the upstream extent of the major tributary of river right (OS NGR NJ 25207 69133) to the river outlet (OS NGR NJ 23940 70768).	2.2 km	Coastal processes, sand dominated

In Reach 1, there is a prevalence of fluvial activity in sediment transport, sediment sources are exclusively from upstream and the river channel is supply limited (i.e. there is more stream power than sediment available). In comparison, Reach 3 is marked by a tidal influence on sediment transport and sediment source. Along Reach 3, both aeolian and coastal processes are major factors, defining a transport-limited channel (i.e. there is more sediment available than the river is capable of transporting). This is evident through the presence of a shifting mosaic of barforms throughout the reach, which is absent from Reach 1. Reach 2 is more reflective of a transport dominated reach, acting as a transitional zone between Reaches 1 and 3.

According to the British Geological Survey[6]map (scale 1:50,000), River Lossie in Reaches 1 and 2 flows over an alluvial cover of clay, silt, sand, and gravel from fluvial activity. The hillslopes surrounding those reaches are Storm Beach Deposits associated to shallow-marine environment (i.e. forming beaches and bars in a coastal setting). Besides the surface geology explained earlier, the River Lossie in Reach 3 flows through a setting of Marine Beach Deposit related to shorelines. The bedrock geology in all Reaches is part of the Kingsteps Sandstone Formation, a Sedimentary Bedrock formed during the Devonian Period.

The soil in each of the river reaches (OS map[7], scale 1:250,000) has been classified as Humus-iron podzols evolved from beach terraces with gentle slopes. The land use map[8] shows that Reach 1 has arable land including rotation grass (in the right margin, near the upstream extent) that transitions to forests and woodland downstream, and along the river left. In addition, the there is also a small section classified as heathland and moorland or rough hill pasture in Reach 1. In Reach 2, there are forests

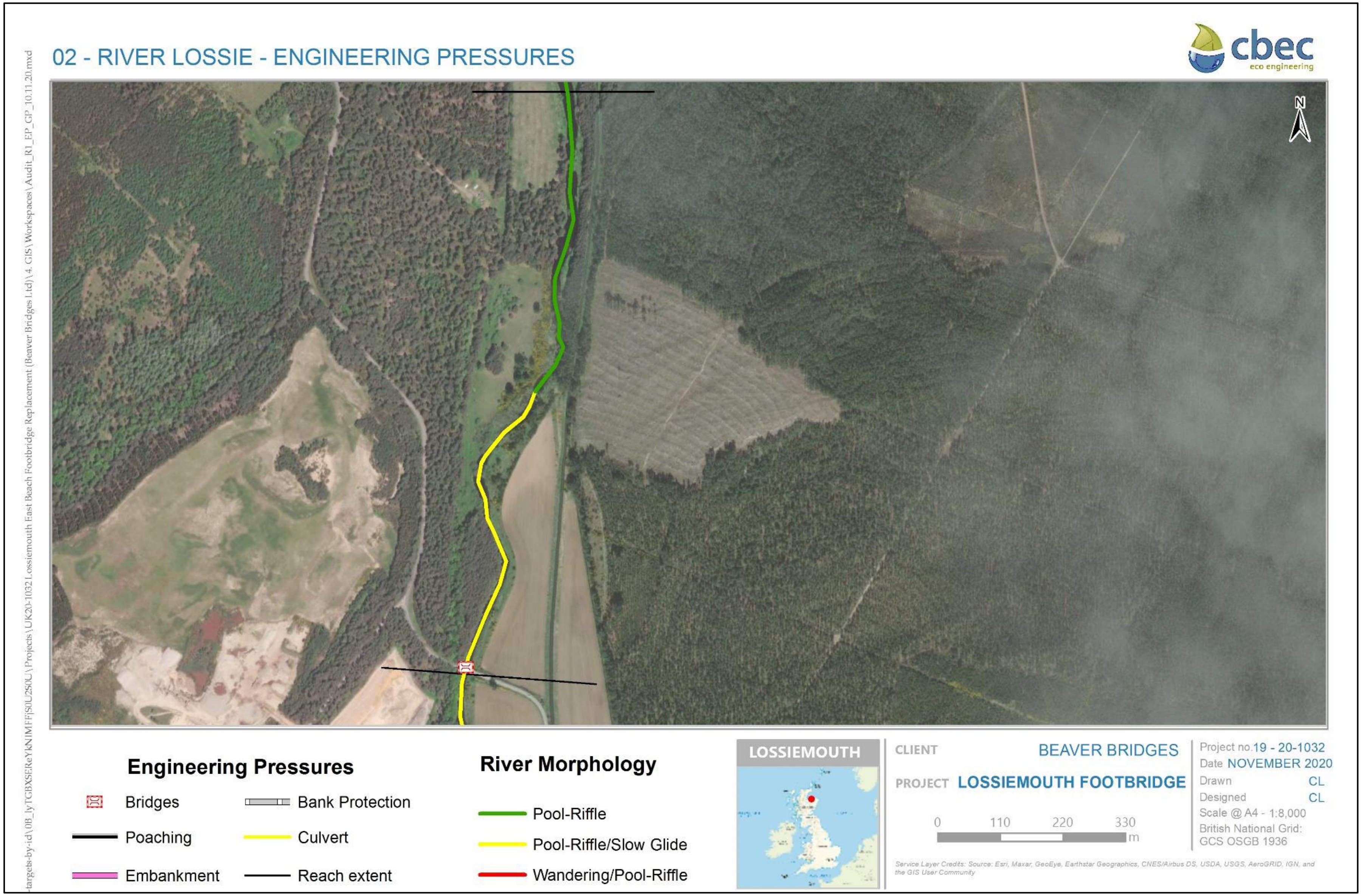
[6] Available at https://mapapps.bgs.ac.uk/geologyofbritain/home.html.
[7] Soils of Scotland, 1:250,000. Available at James Hutton Institute https://www.hutton.ac.uk/sites/default/files/files/soils/Soil250k_3_Northern_Scotland_full.pdf
[8] National Library of Scotland, available at https://maps.nls.uk/projects/landuse/#zoom=14&lat=57.6935&lon=-3.2559

and woodland only. In Reach 3, there are forests and woodlands in the upstream areas, transitioning to a heathland and moorland or rough hill pasture towards the river outlet.

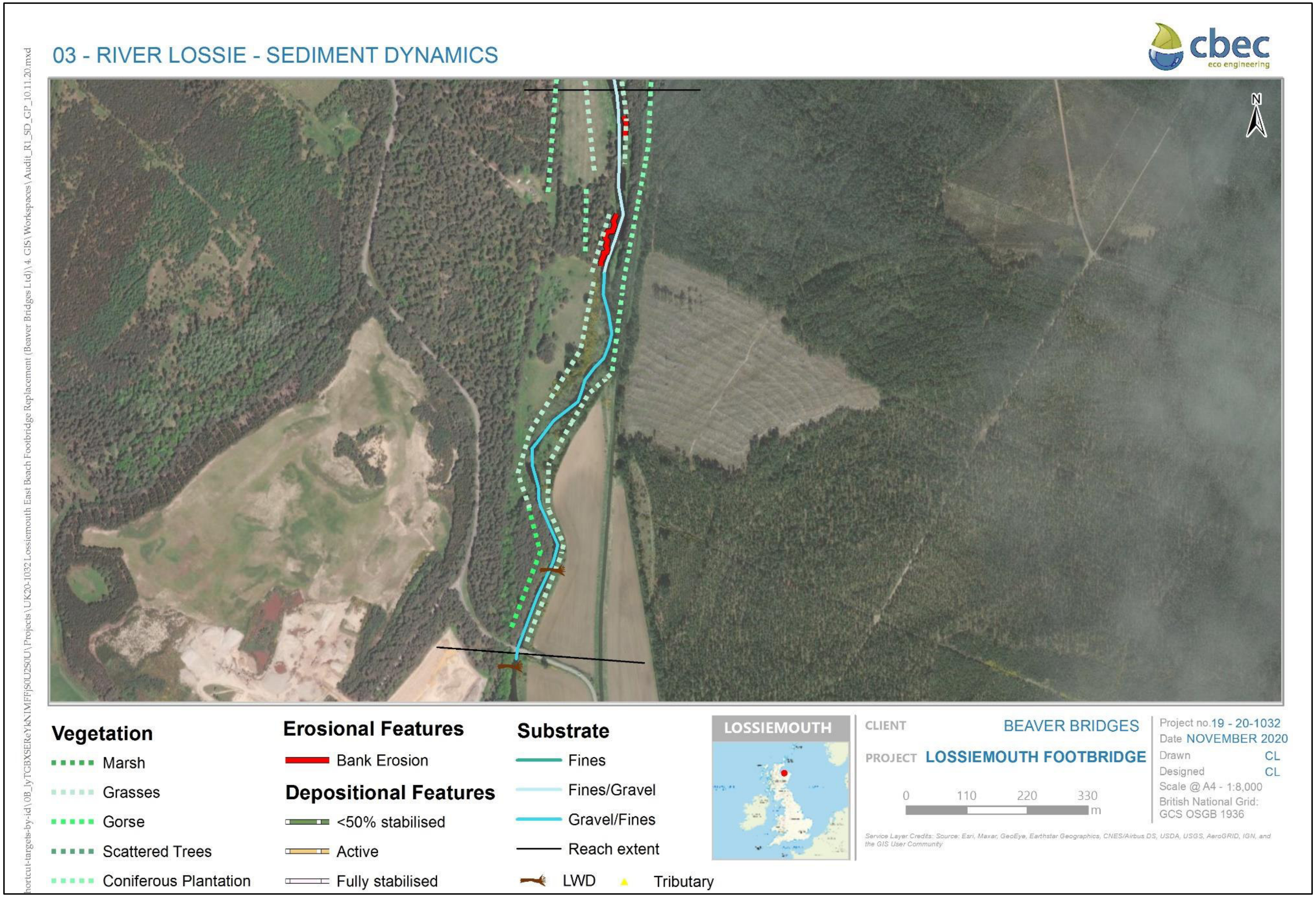
An overview map of the reaches is presented on the following page. Information on existing engineering pressures and sediment dynamics within the surveyed reaches is presented in the subsequent maps, tables, and photographs.

River Lossie and the Reaches studied in this report

Reach 1 – Physical Character and Morphological Pressures



Physical Character and Engineering Pressures of Reach 1.



Physical Character and Engineering Pressures of Reach 1.

Fluvial Audit Survey Outputs from Reach 1.

Location	Reach 1
Length (m)	1.2 km
Setting	The River Lossie flows through an unconfined valley setting with a broad floodplain consisting of grasses, scattered trees, coniferous plantation, and gorse. In the left margin, near the bridge, there is a wide occurrence of well-rounded gravel layers, probably related to the Storm Beach Deposits of a previously existing shallow-marine environment.
Morphological pressures	• The River Lossie has a canalised channel (Inness Canal) flowing near the right margin. This canalised channel joins the mainstem near the downstream extent of Reach 2. • The upstream extent of Reach 1 is marked by Arthur's bridge.
Physical behaviour and characteristics	• Channel bed morphology is a combination of pool-riffle and slow-glide features. Near the middle of the reach, it transitions to a typical pool-riffle morphology. • The river substrate and floodplain deposits are gravel-dominated with fines in the upstream part and transitions to a fine-dominated bed further downstream. The floodplain at this reach is made of brown sandy sediments generally covered by dark organic matter. This area has been classified by the BGS (scale 1:50,000) as alluvium. • The floodplain width increases slightly towards the downstream extent (≈5 m), indicating a less steep, lower energy site than upstream. • Sedimentary features near Arthur's bridge show rounded pebbles with coarse sand as matrix, typical of ancient alluvial/marine deposits. These sedimentary features represent Storm Beach Deposits in the BGS map (1:50,000), which comprise a low rounded ridge of coarse materials (gravels, cobbles, and boulders) piled up by very powerful storm waves at the inland margin of a beach, above the level reached by normal spring tides. These deposits are now ≈ 16 m above modern sea level and is ≈ 6m higher than the current riverbed. • Large Wood Debris (LWD) are present a few metres upstream and downstream of Arthur's bridge. • Moderate to severe bank erosion has been noticed in the river left and right from the middle of the reach to further downstream. • The valley vegetation is a mix of grasses, scattered trees, coniferous plantation, and gorse. The floodplain is predominantly grasses, arable land, and gorse.

Photos	 **Bank erosion with associated gravitational failure on the river right, near the downstream extent of Reach 1.**  **Upstream view of the river showing a slow-glide/pool-riffle morphology.**

Typical vegetation along the river valley in Reach 1, likely correlating to distinct sedimentary environments, i.e. floodplain with grasses and gorses, and ancient marine deposits/river terraces with coniferous plantation.

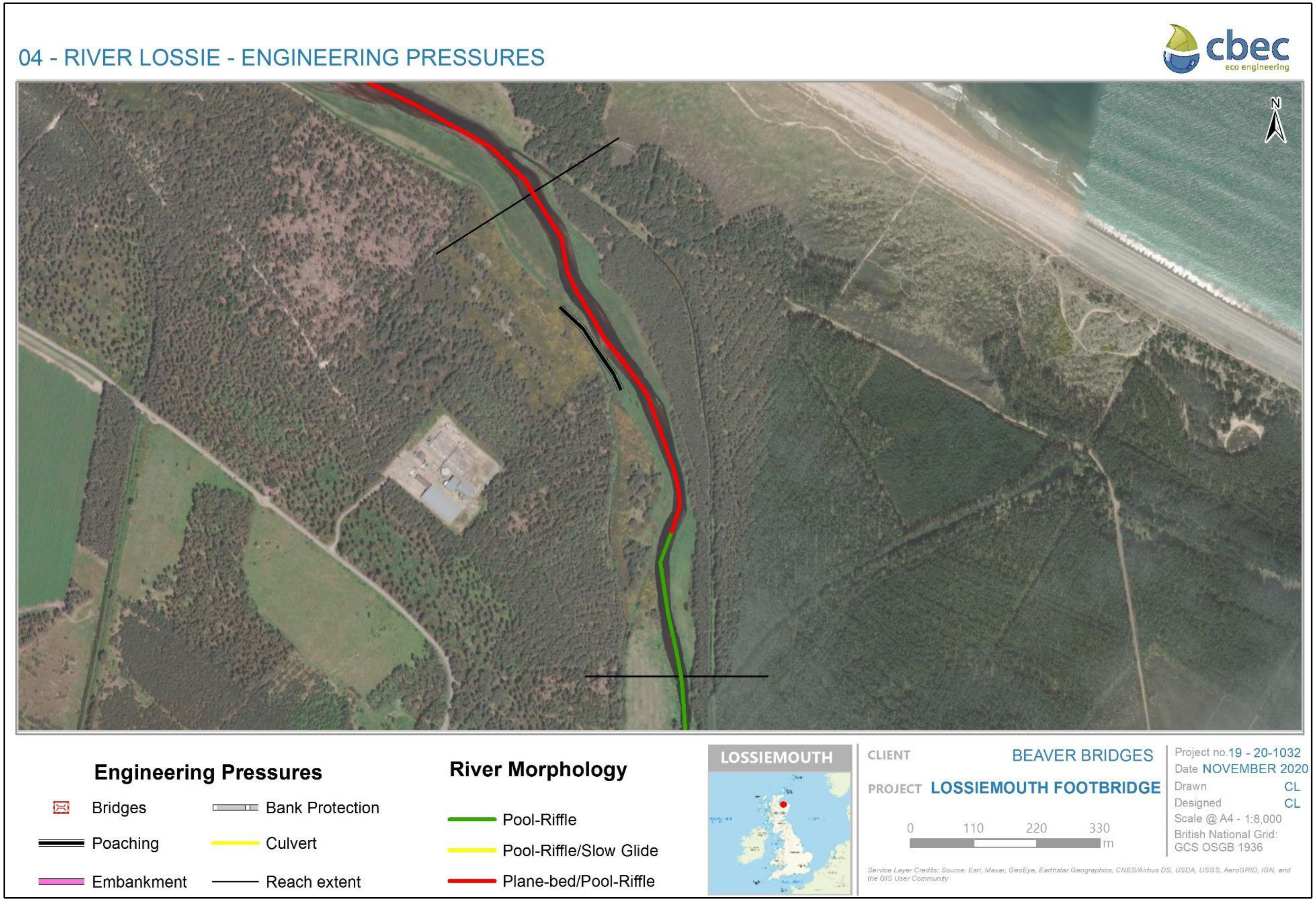
Bank erosion along the left bank. Note the existence of a pool-riffle morphology, and scattered trees with grasses along the valley.

Sedimentary characteristics of the floodplain deposits in Reach 1. The soil within this reach has been classified as Humus-iron podzols evolved from beach terraces with gentle slopes (James Hutton Institute, 2020; scale 1: 250,000).

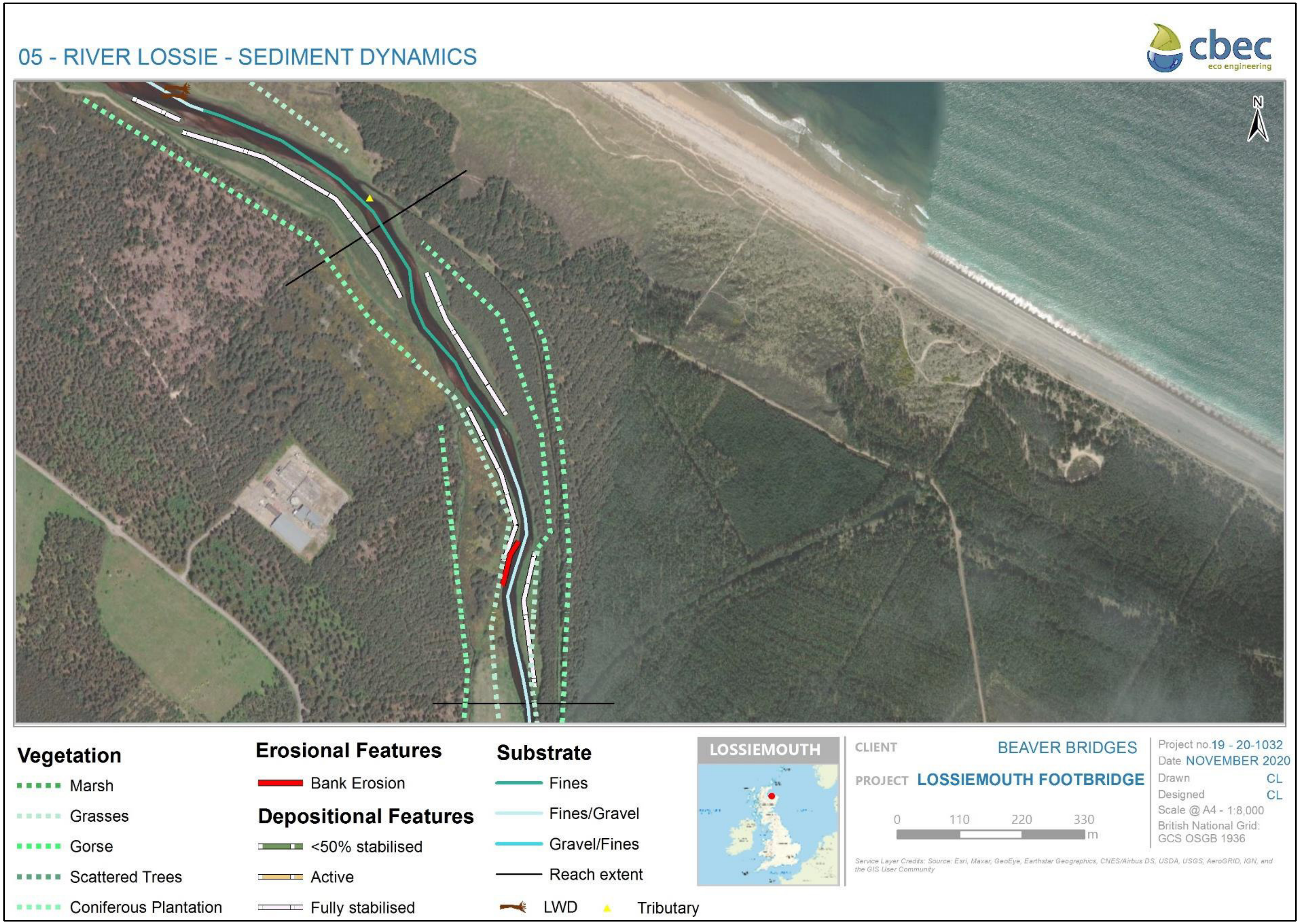
Ancient fluvial deposit primarily made of gravel to cobble sized clasts and supported by a coarse sand matrix. The BGS suggest these to be Storm Beach Deposits associated to shallow-marine environment (i.e. forming beaches and bars in a coastal setting).

	 **Upstream extent of Reach 1, which is coincident with a road bridge (Arthur's bridge) and associated B9103 access road.**

Reach 2 – Physical Character and Morphological Pressures



Physical Character and Engineering Pressures of Reach 2.



Physical Character and Engineering Pressures of Reach 2.

Fluvial Audit Survey Outputs from Reach 2.

Location	Reach 2
Length (m)	1 km
Setting	The River Lossie flows through an unconfined valley setting with a wide floodplain consisting of grasses, scattered trees, coniferous plantation, and gorse. This reach marks a transition from fluvial to tidal processes in sediment dynamics, including changes in substrate size, and river morphology.
Morphological pressures	• The River Lossie has a canalised channel flowing near the right margin (Inness Canal). This canalised channel joins the main stem a few metres, near the downstream extent of Reach 2. According to the Aberdeenshire Council, this canal was built c.1808 for farming purposes. • Poaching due to human activity has been recorded in the river left.
Physical behaviour and characteristics	• Channel morphology is mostly pool-riffle near the upstream extent. Downstream from it, it transitions to a plane-bed/pool-riffle river morphology. • The river and floodplain substrate are composed of sand with gravel in the upstream part and transitions to a sand-dominated bed further downstream. According to the British Geological Survey map (scale 1:50,000), River Lossie in Reach 2 flows through an alluvial corridor of clay, silt, sand, and gravel. The hillslopes surrounding are Storm Beach Deposits associated to shallow-marine environment (i.e. forming beaches and bars in a coastal setting), and the bedrock geology is part of the Kingsteps Sandstone Formation. • The valley vegetation is a mix of grasses, scattered trees, coniferous plantation, and gorse. In the floodplain, grasses, gorse, and scattered trees dominate, whereas in the hillslopes there is a prevalence of scattered trees, and coniferous plantation. In Reach 2, there are forests and woodland only (OS map, scale 1:250,000). • Moderate to severe bank erosion occurs in the river left. • The floodplain at this reach has multiple indicators of stability, including vegetation cover, and large amount of cohesive material (e.g. clay) as matrix. • The floodplain at the downstream extent is ≈40 m wider than upstream extent. The river width at the downstream extent is ≈24 m wider in than the upstream extent as the influence of the tidal flow prism becomes dominant. • On the other hand, small and shallow sandbars located within the channel are active, as attested by their absence of stable factors (e.g. vegetation and clary minerals). • A small low energy tributary crosses the floodplain in a meandering planform before joining the main stem in the left margin. • This small tributary exposes part of the basal sedimentary units of the floodplain. This unit is made primarily of gravel-cobble substrate. In areas of even lower energy, the tributary has fines (clay to sand) as substrate.

Photos	 **Stratigraphic characteristics of the floodplain deposits in Reach 2. Note the existence of brown sandy horizontal bedding along the profile. The soil at this reach has been classified as Humus-iron podzols evolved from beach terraces with gentle slopes (James Hutton Institute, 2020; scale 1: 250,000).**

	 **River left floodplain showing evidence of stability from vegetation cover (machair).**  **Downstream view of the River Lossie in Reach 2. Note that the channel and floodplain width has largely increased from upstream.**

	 **Tributary reaching the river left.**  **Substrate of the tributary of the river left in Reach 2 showing a gravel-cobble dominated bed.**

	 **Substrate of the tributary of the river left in Reach 2, dominated by fine bed material.**

Reach 3 – Physical Character and Morphological Pressures

Physical Character and Engineering Pressures of Reach 3.

Physical Character and Engineering Pressures of Reach 3.

Fluvial Audit Survey Outputs from Reach 3.

Location	Reach 3
Length (m)	2.2 km
Setting	The River Lossie flows through an estuary setting consisting of a broad dune complex consisting of grasses, scattered trees, coniferous plantation, marsh, and gorse. At the downstream extent it joins the sea. This reach is marked by tidal processes in sediment dynamics, and large influence of windblown sand movement and fine particles within the channel (sandbars).
Morphological pressures	• There are two culverts with associated bridges entering the river left. These culverts were built to transfer the waters from the Spynie Canal to the River Lossie. • An embankment is present along 220 m in the river left near the Seatown and Clifton Roads. • The footbridge to be replaced is one of the morphological pressures in the area. It is ≈ 200 m wide and crosses the river and dunes. • Concrete hard bank protection in the river left occurs along an approx. 410 m extent. There is also concrete protection along ≈190 m by the Old Pier. • Rip-rap bank protection is present in the river left extending for ≈185 m.
Physical behaviour and characteristics	• Channel morphology is transitional plane-bed/ pool-riffle through the reach. • The river substrate is composed of fines in the upstream part and transitions to a fines/gravel dominated bed further downstream. Sediments in the floodplain/beach complex get finer downstream as coastal dune processes attain dominance over fluvial sediment transport processes. • Sediment dynamics are very complex, with stable vegetated floodplains and several active sandbars within the channel. • The vegetation is a mix of grasses, scattered trees, coniferous plantation, marsh, and gorse. • Tidal influence on river hydraulics is likely to impact sediment transport through this reach due to variations in bed and bank shear stress. • Another geomorphic controlling factor - together with hillslope processes - is the wind activity that feeds sand into the river channel and promotes dune migration around the location of the current footbridge. Dune migration has been supported by the historic assessment provided in Appendix A of this report.

Photos	 **The exit of the Spynie Canal into the main stem Lossie.**  **Downstream extent of the River Lossie showing the Old Pier in the back and gravel deposits in the front.**

	 **Upstream view of the footbridge and river left. Note the hard bank protections and the Spynie Canal joining the main stem.**  **Floodplain on the river left showing signs of poaching.**

	 **Ephemeral channels in the river left. Also, note the stable island within the channel.**  **Sediment characteristics in the floodplain. The material is fine gravel supported by coarse to fine sand. The soil in the area has been classified as Humus-iron podzols evolved from beach terraces with gentle slopes (James Hutton Institute, 2020; scale 1: 250,000).**

	 **Sediment characteristics in the floodplain upstream from the previous picture. The material is fine to medium gravel supported by coarse to fine sand. According to the BSG map, Reach 3 flows in a Marine Beach Deposit related to shorelines. The bedrock geology is part of the Kingsteps Sandstone Formation.**  **Side channel with fine sediments in the bed. Note that gravel is being released to the channel from the ancient deposits.**

Uppermost part of the river reach where stable fluvial islands are still present. Note a lack of visible sandbars.

Upstream extent of the reach showing a reduction in in-channel features, also illustrating the spatial change in vegetation.

Photographs taken in the same day showing the effects of the tide near the footbridge. The top photo was taken during a low tide (late afternoon), while the bottom image was taken during a high tide (early morning).

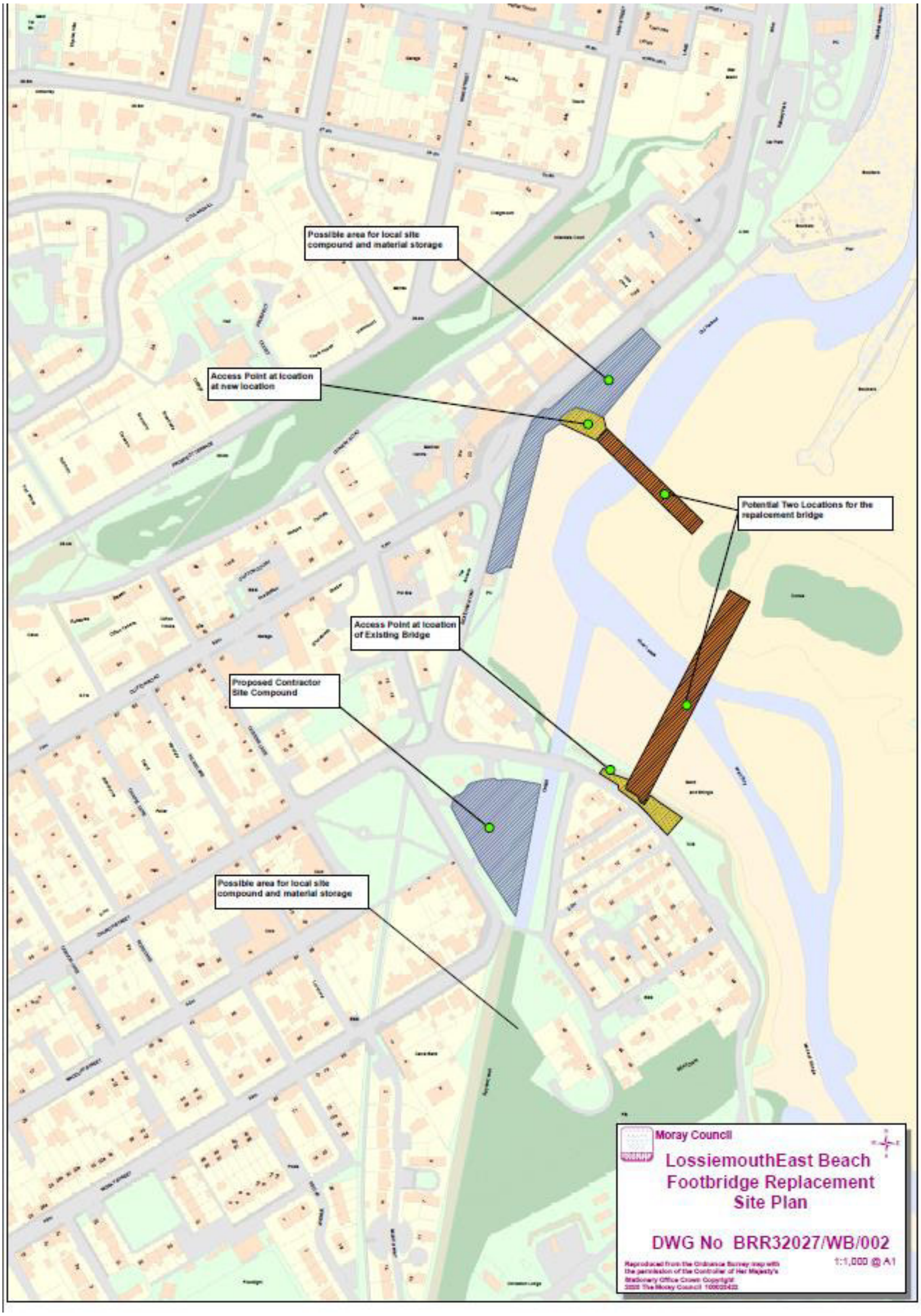
REFERENCES

Brierley G.J., Fryirs K. 2000. River styles, a geomorphic approach to catchment characterization: implications for river rehabilitation in the Bega catchment, New South Wales, Australia. Environmental Management 25, 661-679.

Montgomery, D.R. and Buffington, J.M., 1997. Channel-reach morphology in mountain drainage basins. Geological Society of America Bulletin, 109(5), pp.596-611.

APPENDIX C

Proposed Bridge Locations



Map showing the potential locations of the replacement footbridge.

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Appendix E - Preliminary Ecological Appraisal

East beach footbridge, Lossiemouth

Preliminary ecological appraisal – survey report

Prepared by:

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Commissioned by:

Beaver bridges

Partners: Chris York & Tamsin Morris

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Produced: October 21st, 2020

Reference number: WTTPEA20-07

Contents

Summary

A replacement footbridge is required between Lossiemouth town and the east beach. A preliminary ecological appraisal of the site was carried out in October 2020.

The bridge will replace an existing footbridge and will link an urban area to an area of sand dune habitat. The bridge will cross the River Lossie, which is tidal at this point. There are areas of sand dune with marram grass and small patches of salt marsh habitat in the immediate vicinity of the bridge. These are two habitats which are included on the Scottish Biodiversity List and therefore damage to the habitats should be avoided if possible and the site footprint kept as small as possible.

Otter have been sighted within the river and are likely to pass through. However, there is no suitable resting place habitat for them close to the bridge. Work should be undertaken in a manner which avoids disturbance to otter passing through the site.

The bridge itself provides no bat roost habitat as it is very open, with no crevices or cracks which could be used for roosting.

A wide range of bird species are present in the surrounding area, but the area closest to the bridge is unlikely to be suitable for nesting. However, if possible, works should avoid the bird nesting season and if this is not possible, a check for nesting birds should be undertaken prior to works commencing.

If pile driving is likely to be required, then an additional assessment should be undertaken to establish likely impacts on migratory fish and marine mammals in the adjacent area. .

1 Introduction

The client, Beaver bridges, has been commissioned to design a replacement footbridge at this site. The work proposed will involve removing the existing bridge and installing a replacement. The site location is at the centre of the map in Appendix 1.

A walkover survey of the site was undertaken on October 14th, 2020 by Tamsin Morris, Chartered Ecologist. The survey included an extended Phase 1 survey to assess the type and condition of wildlife habitats in the surrounding area and a search for signs of any relevant protected species.

1.1 Objectives

The survey aimed to assess the habitats present in the area surrounding the proposed new bridge and whether they would be impacted by the development. It also aimed to establish whether the area contained any protected species which may be affected by the development. The survey also aimed to establish any ecological constraints which may need to be mitigated as part of an Ecological Impact Assessment process.

1.2 Relevant legislation

There are several relevant pieces of legislation which could affect this development. These include:

- The Wildlife and Countryside Act 1981 (as amended) was the main source of wildlife law in the UK. It has since been amended by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2011. This legislation provides protection to a range of species, including birds, plants and animals.

- The Nature Conservation (Scotland) Act 2004 sets out the requirement to produce a Scotland list of Biodiversity Action Plan habitats of principal importance.

- The EU Habitats and Birds Directives provide protection to a range of species and areas. They are translated into Scottish law via the Conservation (Natural Habitats etc) Regulations 2004 and the Wildlife and Countryside Act 1981 (as amended). This legislation provides protection to specific species such as otter and specific sites, such as Spey Bay and the Moray Firth.

2 Site assessment

2.1 Methods – habitat assessment

An area surrounding the bridge of approximately 250m in all directions was surveyed on foot. This involved walking upstream and downstream from the bridge and crossing the remaining area in a zig zag manner to assess habitats, where this did not involve accessing private land. The bridge itself was also examined to see if it provided potential bat roost habitat. The bridge was not crossed, but both pillars / banks were walked. The survey took place on a sunny day, starting at high tide and working through until just before low tide. Habitats were recorded according to the JNCC Phase 1 system (JNCC, 2010).

2.2 Methods – desk based assessment

Nature Scot's SiteLink website (https://sitelink.nature.scot/home) was used to check for protected areas within the vicinity of the site and the National Biodiversity Network Atlas website (https://nbnatlas.org/) was used to check for records of some species in the local area.

A search was also commissioned by the local biological records centre (NESBReC) for records within a 500metre radius of the current bridge location. The results of that search are included as Appendix 2 of this report.

2.3 Constraints

The bridge itself was not crossed as it is not longer safe for pedestrian access. The central part of the structure was examined using binoculars from both banks and it appears to have a similar construction throughout. A number of private houses are present within the adjacent area and the gardens of these houses were not entered or surveyed.

3 Baseline ecological conditions

3.1 Site context

The site is located between an urban area and open dunes. The bridge spans the River Lossie where it joins the sea and the river is tidal within this section. The left bank contains houses, car parks etc and is heavily modified, whilst the right bank is unmodified, but very mobile sand dune habitat.

3.2 Designated sites

The following designated sites are located within a 5 kilometre radius of the bridge:

The Moray Firth Special Area of Conservation (SAC) has its western boundary adjacent to the left bank of the River Lossie as it enters the sea, so is located approximately 850 metres to the north of the bridge. The Moray Firth is designated for its subtidal sand banks and bottlenose dolphin (*Tursiops truncates*) population. The Lossiemouth East Quarry Site of Special Scientific Interest (SSSI) is located approximately 200 metres to the north-west of the bridge. The quarry area is designated for its geological and palaeontological features. The Lossiemouth shore SSSI is located approximately 1 kilometre to the north-west of the bridge and is designated for its geological features. The Loch Spynie Special Protection Area (SPA) and SSSI is located approximately 3.5km to the south of the site and is designated for its freshwater habitats, woodland, breeding bird assemblage and greylag goose (*Anser anser*) population. The Spey Bay SAC and SSSI is located approximately 3km to the south-east of the site. The SAC is designated for its floodplain alder woodland and coastal shingle habitats, whilst the SSSI is designated for its geomorphology, its fen, shingle, saltmarsh and wet woodland habitats, its plant assemblage and the presence of the small blue (*Cupido minimus*) and dingy skipper (*Erynnis tages*) butterflies.

The NESBReC search highlighted that the Lossiemouth and Spey Bay area are included on a list known as the Study of Environmentally Sensitive Areas for ornithology and geomorphology. This is a list of locally important sites, which was compiled in the 1980s by the former Grampian Regional Council.

3.3 Phase 1 habitats present on the site

The following habitats were recorded. These are shown on the map in Appendix 1.

3.3.1 Improved grassland

There are areas of improved grassland between the river and the road on the left bank and in amongst the buildings within the town. These are predominantly areas for recreational / amenity use and contain very little plant diversity.

Within the the areas of improved grassland on the left bank, there are some patches of ornamental shrubs. This have been planted for visual / amenity value and contain a mix of non-native 'garden' species, such as Escalonia, Cotoneaster, Rosa rugosa and palms.

3.3.2 Dune grassland

Immediately adjacent to the river, along the left bank where building work has 'stabilised' the dune system, a narrow strip of dune grassland has developed. This contains a diverse mix of species, including lyme grass (*Leymus arenarius*) frosted orache (*Atriplex lacinata*), sea plantain (*Plantago maritima*), sea aster (*Aster tripolium*) and dwarf mallow (*Malva neglecta*).

3.3.3 Open water and saltmarsh / dune interface

The river is tidal at this point and during high tide extends across a large area, including beneath the bridge. Areas which are exposed except at high tides contain swards of common saltmarsh grass (*Puccinellia maritima*) which grade into open dune and dune grassland areas on the right bank.

3.3.4 Open dune

On the right bank, there is an area of open dune between the river's edge and the sea. This is a reasonably narrow strip of yellow open dune, which is dominated by marram grass (*Ammophila arenaria*), although lyme grass, catsear (*Hypochaeris radicata*), sea rocket (*Cakile maritima*) and occasional Scots pine seedlings (*Pinus sylvestris*) are also present.

3.3.5 Broad leaved semi natural woodland

Adjacent to Prospect Terrace, to the north-east of the bridge, within the area of the Lossiemouth East Quarry SSSI there is a strip of broad-leaved woodland. This is dominated by mature sycamore (*Acer pseudoplatanus*) trees, but also contains gorse (*Ulex europaeus*), ivy (*Hedera helix*) and stands of rosebay willowherb (*Chamerion angustifolium*).

There is also a short section of woodland at the upstream end of the Spynie canal, where ash (*Fraxinus excelsior*) and sycamore trees have grown up, interspersed with ivy and gorse scrub and some garden escapees such as Leylandii trees.

3.3.6 Unimproved neutral grassland

Adjacent to the Spynie canal, on the left bank there is a narrow strip of grassland which is reasonably diverse and has probably never been agriculturally improved (although the nutrient loading within the canal waters may be quite high). It includes species such as yarrow (*Achillea millefolium*), ribwort plantain (*Plantago lanceolata*), cocksfoot (*Dactylis glomerata*), nettles (*Urtica dioica*) and ragwort (*Senecio jacobaea*).

3.3.7 Broad-leaved plantation

On the right bank of the Spynie canal, a number of small trees have been planted. These included alder (*Alnus glutinsoa*), holly (*Ilex aquifolium*) and birch (*Betula pendula*) as well as some more garden type species such as cotoneaster, buddleia and snowberry (*Symphoricarpus albus*).

3.3.8 Dense scrub

Further upstream on the left bank of the Spynie canal there is an area of dense gorse. It was not possible to enter into this area due to the dense cover and steep slopes.

3.4 Species

The site has the potential to provide habitat for a range of protected species, including bats, otter, badgers and birds.

3.4.1 Bats

The bridge does not provide suitable bat roost habitat due to its construction and the extent of deterioration. There are no enclosed holes or crevices within the structure – whilst there are narrow gaps between slats and supporting beams, none of these gaps have a 'back', so they do not provide suitable shelter in the same way as a crevice or hole could. The deterioration of the bridge also means that many of these gaps are now wider than when originally constructed and so light can be clearly seen through the gaps. The extent of movement on the bridge when it was in use would also deter bats.

The bridge is considered to have negligible bat roost potential and therefore further bat surveys are not required.

3.4.2 Other mammals

The river does not provide suitable habitat for watervole (*Arvicola amphibius*) as it is reasonably fast flowing and tidal in this section. The left bank has extensive human activity and the right bank is mobile sand dune, which would not be suitable for creating burrows. No field signs of watervole were detected.

The river is likely to be used by otter and there are anecdotal otter sightings in the water at this site. No field signs of otter were found within the survey area and there is no suitable habitat within the survey area for otter resting places, due to the mobility of the sediment.

Otter should be expected to be passing through but are unlikely to use either bank for resting.

Red squirrel (*Sciurus vulgaris*) will occur within the large coniferous woodland area to the east of the site. The search on NBN Atlas and the NESBReC search highlighted sightings of squirrel close to the caravan park and amongst the houses and they will be likely to pass through the area closer to the bridge occasionally. However, there are no suitable trees for use as dreys close to the bridge site.

Pine marten (*Martes martes*) are also likely to use the woodland area, though no field signs were found and they would not be expected to use this area due to the mobile sand dunes, high water levels and extent of human disturbance.

No field signs of badger (*Meles meles*) were found and they would not be able to create a sett within the mobile sand ground conditions. A brown hare (*Lepus europapaeus)* record from within the town was included within the NESBReC search data, but this was from 1970 and it is unlikely that brown hare would use such an urban habitat area.

3.4.3 Amphibians

There are no ponds close to the site. Great crested newts (*Triturus cristatus*) have not been recorded from the Lossiemouth area (the nearest records are currently from Fife and Nairn), therefore they would not be expected to be found at this site.

3.4.4 Birds

The small areas of shrubs will provide some habitat for perching birds, but the extent of human disturbance means they are unlikely to be used for nesting. The large gorse area near the caravan park will also be used by perching birds and will be suitable for some nesting.

The salt marsh / sand dune areas will provide habitat for a wide range of freshwater, wading and coastal birds. Widgeon (*Anas penelope*), heron (*Ardea cinerea*), ringed plover (*Charadrius hiatula*), redshank (*Tringa tetanus*) oystercatcher (*Haematopus ostralegus*), mallard (*Anas platyrhynchos*), herring (*Larus argentatus*) and black backed gulls (*Larus marinus*) were all seen during the survey. The NESBReC search also highlighted sightings of dunlin (*Calidris alpina*) and bar-tailed godwit (*Limosa lapponica*).

Most of these species are unlikely to nest or breed close to the footprint of the bridge as the left bank is too heavily disturbed and the right bank is too mobile and at risk of inundation. However, nesting is a possibility in these areas and so ideally any development works should take place outwith the bird breeding season.

3.4.5 Plants

No nationally rare plants were noted on the site. However, coastal salt marsh and coastal sand dunes are habitats listed in the Scottish Biodiversity List, therefore public authorities should try to protect and enhance this habitat.

3.4.6 Invertebrates

The substrate within the river is unsuitable for pearl mussel as it is very mobile and dominated by sand.

The intertidal areas are likely to contain a range of mud-dwelling invertebrates which provide a food source for wading birds such as redshank.

The flowering plants within the grassland areas will also provide a nectar source for a number of invertebrate species, including butterflies such as the dingy skipper.

3.4.7 Fish

The Lossie river system provides habitat for a range of freshwater fish species, including salmon (*Salmo salar*) and trout (*Salmo trutta*). The substrate around the bridge is too sand dominated and mobile to be used for spawning, however, fish can be expected to be passing through and around the area by the bridge.

3.4.8 Seals

There have been anecdotal sightings of grey (*Halichoerus grypus)* and common (*Phoca vitulina vitulina*) seals at and around Lossiemouth beach, although only one sighting has been recorded with NESBReC – however this is likely to be due to a lack of sightings being reported, rather than an absence of sightings. The site is not a designated seal haul out under the Protection of Seals (Designation of Haul-out Sites) (Scotland) Order 2014.

3.4.9 Invasive species

No invasive species were recorded at the site, although there are a number of non-native garden species planted within the amenity / urban areas.

4 Ecological constraints and opportunities - habitats

4.1 Potential constraints

The surrounding salt marsh and dune grassland areas are habitats which the Scottish Biodiversity List identifies as requiring conservation action and / or where negative impacts should be avoided.

There are a number of designated sites in the surrounding area. The works are not considered to have an impact on the sites designated for their geological features. There is potential for the work to have an indirect impact on Spey Bay SAC through the increase in foot traffic accessing this area. However, as a bridge has been in place at this site for a number of years, and has only recently been removed from use, it is not considered that replacing the bridge will increase this disturbance beyond historic levels. Spey Bay SAC is also accessible from a number of other pedestrian routes, therefore access via this footbridge is not the only potential source of disturbance.

The bridge site is outwith the Moray Firth SAC sub tidal sandbank areas and the work should not have an impact on the distribution or movement of these features within the firth.

The habitats at Spynie Loch should not be affected by the work as it is upstream of the proposed work site.

4.2 Mitigation measures

The proposed works to replace the bridge will have an impact on their immediate footprint which encompasses the saltmarsh and dune habitat. Efforts should therefore be made to limit the footprint of the work area as much as possible. For example, if a site compound is required, it should be established on the existing hard standing areas, not on the grassland areas. This will help to minimise any damage to this habitat.

5 Ecological constraints and opportunities - species

5.1 Otter

5.1.1 Potential constraints

The river will be used by otter travelling between feeding sites. There is no suitable resting place habitat within the area surrounding the bridge, therefore the works should have no impact on otter. However, as otter are likely to be passing through, construction methods should take this into account to avoid any accidental disturbance.

5.1.2 Mitigation measures

To avoid any disturbance to otter using the river, the following construction methods should be followed:

Works in the vicinity of the river should not take place during the hours of darkness or within 2 hours after sunrise and 2 hours before sunset. Any exposed pipe systems should be capped when workers are off site, and exit ramps will be provided on any exposed trenches or holes that are left overnight.

All personnel working on the site should be informed about the presence of otter on the site and the mitigation actions that have been taken. This can take the form of a 'toolbox talk' to all personnel.

5.2 Birds

5.2.1 Potential constraints

The grassland and dune areas have the potential to provide some nesting habitat for birds and the site is also within 5km of a SPA designated for bird populations. There is also potential for some nesting of small bird species in the end of the current bridge where it joins the right bank and is more sheltered. However, the instability of the dune habitat and the extent of human disturbance on the left bank is likely to discourage most birds from nesting in the immediate vicinity of the bridge.

5.2.2 Mitigation measures

Ideally, work should avoid the main bird breeding season (Feb – July). However, if this is not possible, the site should be checked for the presence of nesting birds before works commence.

5.3 Fish

5.3.1 Potential constraints

The river will be used by a range of fish species, but the bridge site does not contain suitable habitat for spawning salmon or trout.

5.3.2 Mitigation measures

If pile driving is required, particularly underwater, this has the potential to cause disturbance to migrating fish and a separate risk assessment should be undertaken.

5.4 Marine mammals

5.4.1 Potential constraints

The Moray Firth is home to a population of bottlenose dolphins and also to harbour porpoises (*Phocoena phocoena*). Marine mammals can be disturbed by the underwater sounds created by pile driving.

Seals are also likely to be sighted in the area and may haul out on the sand banks at the beach.

5.4.2 Mitigation measures

If pile driving is required, this has the potential to cause disturbance to marine mammals in the surrounding area and therefore an additional risk assessment should be completed, taking into account the timing, location and extent of pile driving required.

It is an offence to intentionally or recklessly kill, injure or take a seal at any time of year and it is also an offence to harass seals at a designated haul out. Although the Lossiemouth beach is not a designated haul out, the increase in movement of people and dogs as a result of reinstating the bridge could result in increased disturbance of any seals which have hauled out on the beach. As the bridge is a replacement, and as the beach appears to be used by surfers, any seals which do haul out may well be habituated to disturbance. However, the longer the bridge is out of use, the greater the chance that more seals will start to use the beach and could be at risk of disturbance from people using the bridge to access the beach.

During construction, work should stop if seals come close to the site, or start to use it to haul out. Work should only resume once the seal has left the area, to avoid any risk of accidental injury.

6 Water environment

In order to avoid any potential pollution of the river, care should be taken to minimise the risk of accidental pollution events. Authorisation from SEPA will be required for the works.

7 Additional requirements

The following additional actions should be undertaken prior to works taking place:

- If the work takes place during the bird breeding season, the site footprint should be checked for nesting birds.

8 Conclusions

The proposed works are in an area which has significant human disturbance. The dune and saltmarsh grasslands are an important habitat, and damage to these areas should be kept to a minimum. A range of bird species use the area, but are relatively unlikely to nest close to the bridge. However, any disturbance of breeding should be avoided by either timing the works outwith the breeding season or checking the ground prior to commencing work.

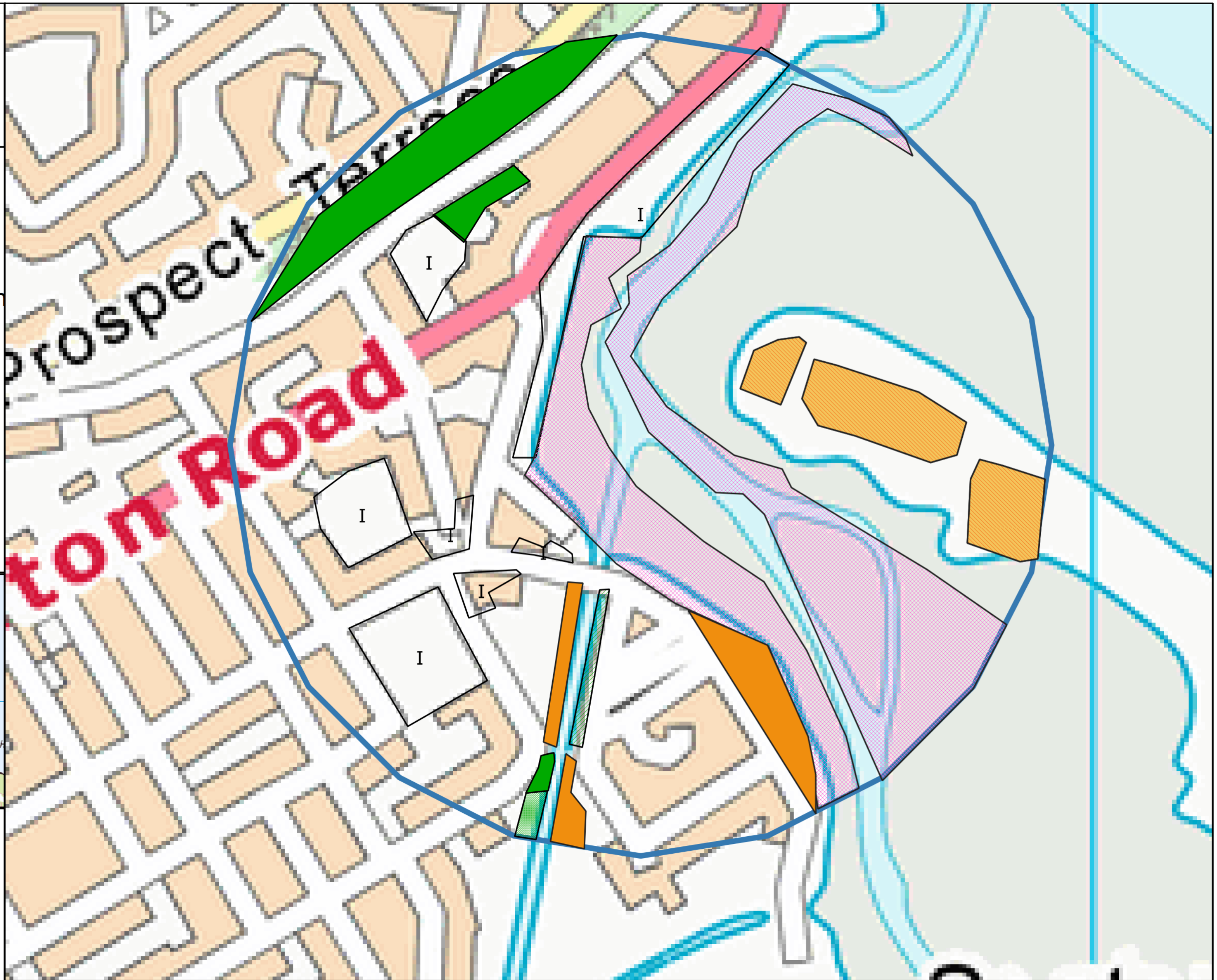
References

Joint Nature Conservation Committee 2010. Handbook for Phase 1 habitat survey.

Appendix 1 – phase 1 habitat map of site

Appendix 2 – NESBReC search results

Appendix1 - Phase 1 habitat survey of footbridge site



Legend

habitats

- Broad-leaved semi-natural
- Broad-leaved plantation
- Dense scrub
- I Improved grassland
- Salt marsh scattered plants
- Dune grassland
- Unimproved neutral grassland
- 250m survey area

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0 0.1 0.2 km

Revision number: 1.0

Map produced by Tamsin Morris
Created on 26/10/2020

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16 December 2020

Dear Tamsin

NESBReC report – River Lossie, Bridge at Lossimouth

Please find below the results of the data search you requested from NESBReC.
The search was carried out with a 500m radius from NJ 23780 70462.

Results table:

Ref no	Data set	Interest	Locality	Grid Ref	Proposal
20201216	Designated Species	**ANNEX 1** Bar-tailed Godwit (Limosa lapponica) **UK BAP** Common Seal (Phoca vitulina) Brown Hare (Lepus europaeus) Eurasian Red Squirrel (Sciurus vulgaris) **SBL S2** Dunlin (Calidris alpina)	Lossiemouth	NJ 23780 70462	data search
	geological conservation review sites	Lossiemouth, East Quarry - Permian-Triassic Reptilia			
	SSSI	Lossiemouth East Quarry - GEOLOGICAL			
	*SESA geology	G37:Lossiemouth East Quarry - One of Britain's most important vertebrate fossil sites, yielding Triassic reptiles including early dinosaur.			
	*SESA geomorphology	GM2:Lossie-Spey Bay - A complex current and geological recent set of shingle bars with intervening swales. Both the Spey and Lossie spits at the respective river moth are of great interest physiographically because of their dynamic nature.			
	*SESA ornithology	O39:Lossiemouth - Passage and wintering waders and wildfowl.			

*SESA stands for 'Study of Environmentally Sensitive Areas'. These are lists of locally important sites identified during the 1980s by the former Grampian Regional Council.

Maps showing all the search results are included below.

Yours sincerely

D Caffrey
GIS Project Officer

PLEASE READ THE FOLLOWING NOTES:

1) **Search was done to within 500 metres of the area of interest. This is indicated on the map by a broken line around the site.**
2) **Search areas or centroids are highlighted in red.**
3) **The dots on any maps depicting the locations of a species are positioned at the centre of a square representing the resolution of the recorded grid reference. Care should be taken over interpretation**
4) **Due to the limits of the map display function, all records may not be visible on the species maps. However, all species are listed in the relevant table above the map and a full list of records can be supplied in Excel format.**
5) **Scientific names are only used to identify species on maps when no common name is in general accepted usage.**
6) **For maps without a key, the relevant information is provided in the table.**
7) **The ownership of the data within this report remains with the original recorder and is subject to the laws defining Intellectual Property Copyright.**
8) **This report and the data held within it are to be used solely for those purposes described under the terms of any agreement between the applicant and NESBReC.**
9) **Some, or all of the data held within this report may be of a sensitive or confidential nature. Such information will be marked as such and if required an appropriate contact for further correspondence will be given (otherwise NESBReC should be contacted).**
10) **Although NESBReC makes every possible effort to ensure that the data it provides is accurate and up to date, this report should only be considered to represent the most recent version of each dataset as available at the time of the search.**
11) **NE LBAP Locally Important Species are species that are not on existing designated species lists but have been identified as important in the local context.**

For designated species, the following abbreviated sub-headings are used to describe different levels of importance:
Protection of Badgers Act (1992)
ANNEX 1, 2.1, 2.2 – EC Birds Directive
UK BAP - UK BAP list of Priority Species
SBL S2 - Scottish Biodiversity List: International Obligations
SBL S3 - Scottish Biodiversity List: Nationally Rare at UK level, found in only 1-15 10km squares
SBL S4 - Scottish Biodiversity List: Present in 5 or fewer 10km squares or sites in Scotland
SBL S5 - Scottish Biodiversity List: Decline of 25% or more in Scotland in last 25 years

Note, a species may be designated under several of these lists, but will only be listed under its highest level designation within this report. The ranking order used here is Protection of Badgers Act (1992), ANNEX 1, ANNEX 2.1, UK BAP, ANNEX 2.2, SBL S2-SBL S5.

20201216	Designated Species	**ANNEX 1** Bar-tailed Godwit (Limosa lapponica) **UK BAP** Common Seal (Phoca vitulina) Brown Hare (Lepus europaeus) Eurasian Red Squirrel (Sciurus vulgaris) **SBL S2** Dunlin (Calidris alpina)	Lossiemouth	NJ 23780 70462	data search

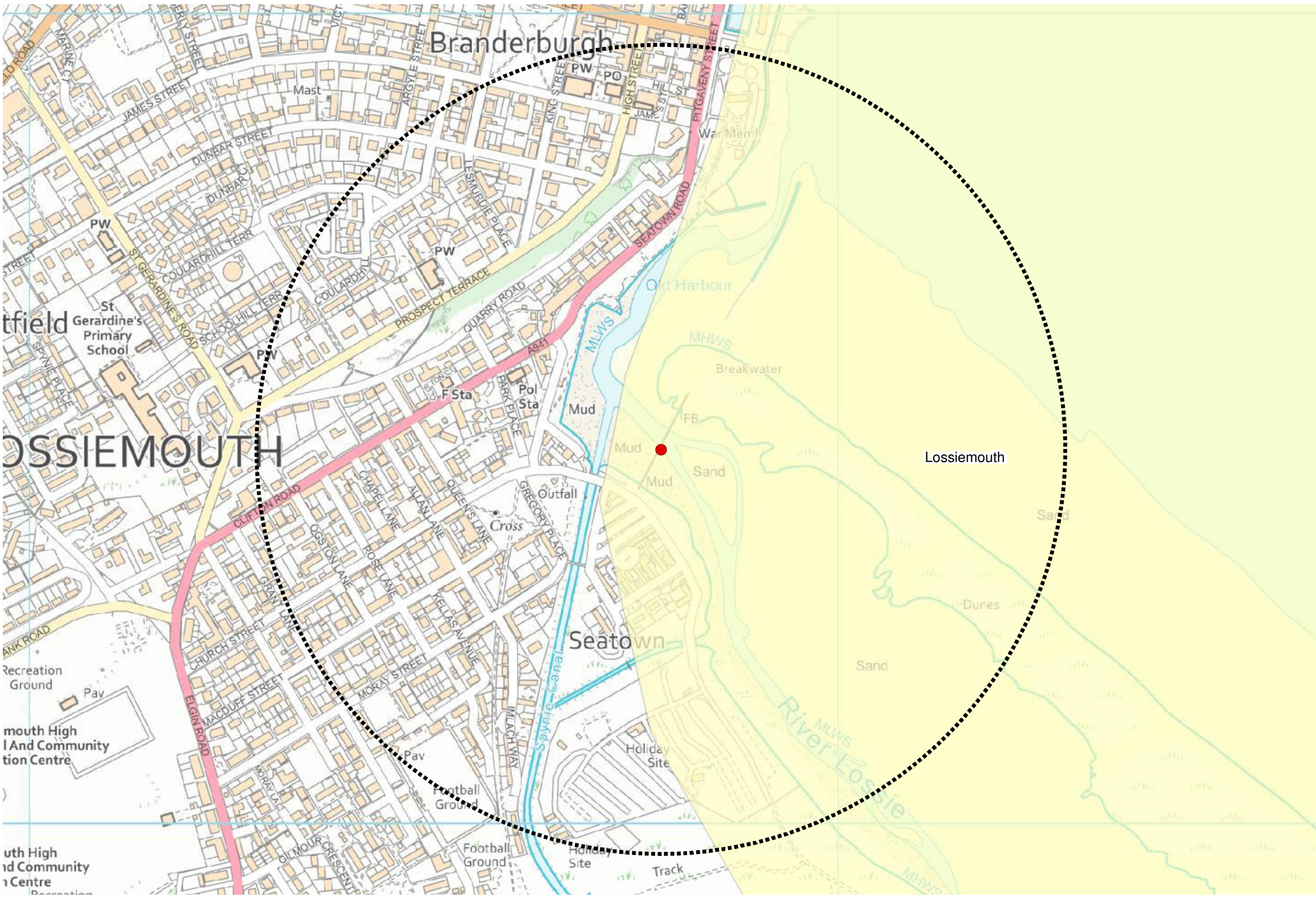
20201216	geological conservation review sites	Lossiemouth, East Quarry - Permian-Triassic Reptilia	Lossiemouth	NJ 23780 70462	data search

20201216	SSSI	Lossiemouth East Quarry - GEOLOGICAL	Lossiemouth	NJ 23780 70462	data search

20201216	SESA geology	G37:Lossiemouth East Quarry - One of Britain’s most important vertebrate fossil sites, yielding Triassic reptiles including early dinosaur.	Lossiemouth	NJ 23780 70462	data search

20201216	SESA geomorphology	GM2:Lossie-Spey Bay - A complex current and geological recent set of shingle bars with intervening swales. Both the Spey and Lossie spits at the respective river moth are of great interest physiographically because of their dynamic nature.	Lossiemouth	NJ 23780 70462	data search

20201216	SESA ornithology	O39:Lossiemouth - Passage and wintering waders and wildfowl.	Lossiemouth	NJ 23780 70462	data search



Appendix F - Existing Footbridge Closure Notice

Lossiemouth East Sands Footbridge

Closure in the Interest of Public Safety on 24.7.19

Introduction
The town of Lossiemouth is located to the west of the mouth of the River Lossie into the Moray Firth. Beyond the river estuary lies the attractive East Sands beach, popular with locals and tourists alike, with the West Sands beach located to the other side of the town. The more tourist-based shops (cafes, ice-cream shops, bucket and spade shops etc.) are also located at the east side of the town, fronting onto the River. For many years the town has relied on a footbridge to access the popular beach.

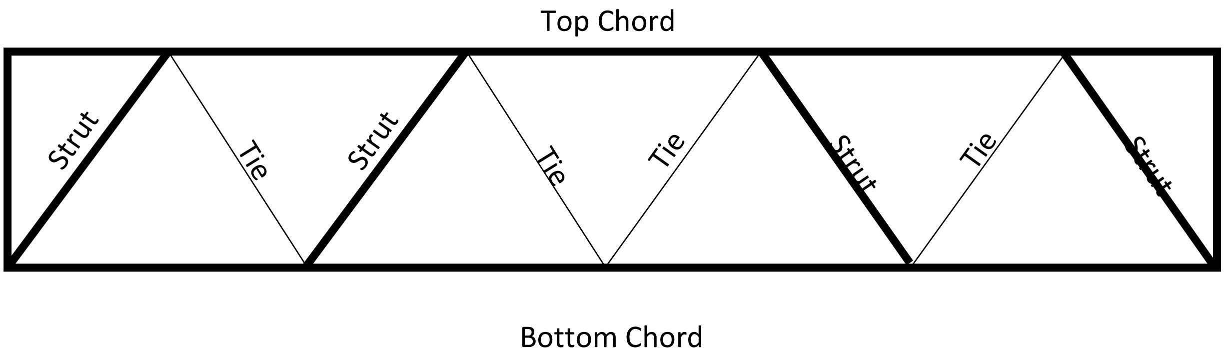
NOTE: This report has been produced to reflect the evidence upon which the closure decision on 24.7.19 was based. It is not warranted and may not be relied upon for any other purpose. For the purposes of future repair or use independent advice on the structure should be sought.

The Bridge
Lossiemouth East Sands Footbridge is a multi-span steel through truss, supported on timber pile piers. These have been driven into the sand river-bed, to provide a stable footing. The deck on the bridge is of timber planks, spanning between the bottom chords of the two trusses. There are also transverse and diagonal steel angles tying the bottom chords of the trusses together. The transverse ties extend outwards, with steel angles extending up from the outer ends to provide lateral restraint to the top chords.

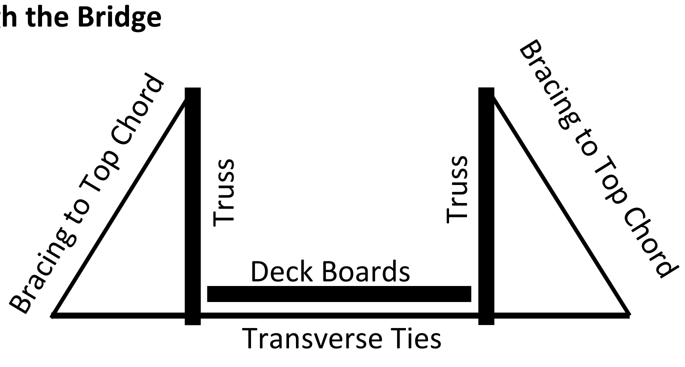
The bridge is a considerable number of decades old, with a number of the trusses believed to have been reused from the previous bridge (dating from 1913). The current bridge is understood to have been built in its current location 1918.

Ownership of the bridge is not known, although it has been demonstrated to be not in Council Ownership.

Glossary of a Truss



Cross-Section Through the Bridge



General Condition of the Bridge

On inspection it was evident that there has been no maintenance undertaken on the bridge for a significant period of time.

- The paint system has entirely broken down and the steel elements are heavily corroded.
- The top chord is of steel angle, with the vertical leg in better condition, with a maximum of around 25% section loss in the worst areas. However, the horizontal leg is more severely damaged with up to 95% missing in some areas. Where these areas of section loss coincide, the chord has around 40% of its section remaining.
- The bottom chords are severely corroded, they are partially hidden by the timber decking, but an estimate of section loss would be approximately 70%.
- A significant number of the truss ties are broken, with a few missing entirely. Those that remain have substantial section loss, up to 80% or more in places.
- All riveted connections and connection brackets are severely corroded, with over 90% section loss in some places. There is a minimum of 50% loss in almost all connection areas.
- Although a substantial proportion of the steel elements have corroded away, the remaining material has until now been sufficient to carry the loading which the bridge carries.
- The pile piers appear to be in good condition.
    - The areas below low tide level should be fine as they are in a salty environment (salt acts as a preservative on wood) and being always submerged, there is very little oxygen to encourage rot.
    - The areas above high tide level are generally dry other than during rain. The area most likely to suffer rot is the end-grain at the top of the piles, and rot was not visible at the time of inspection.
    - The area between high and low tide levels is the area of possible concern, as this environment has been known to encourage microbial degradation of timber piles, which can occur from the inside, so no signs are visible until the pile fails. However, if the pile were to fail this would most likely be during a storm event, rather than under pedestrian loading (as the force of storm water flowing across the piles is much greater than the force of people on the bridge). As such, the public risk posed by the piles is considered very low.

Timeline Leading to Closure of the Bridge

Following reports of concerns from members of the public on Wednesday 24th July, officers from Building Standards went to the site around 15:30 along with the council's Senior Bridge Engineer who is a qualified civil engineer specialising in structures.

Under S.29 of the Building (S) Act 2003 the council must act where a building/structure is considered to constitute a danger to the public. The council must carry out such work it considers necessary to prevent access to the dangerous structure and do what is necessary to protect the public.

On arrival at site, it became clear that there had been a significant change in the bridge which was seen to be leaning to the side and after inspection, assessment of the defects and liaison with Grampian Police and the Council's Consultancy, Building Standards, Legal and Roads officers at 17:15 a decision was taken that the bridge was unsafe for normal use and had to be closed to ensure the safety of the public. That is a decision made by the Principal Building Standards Officer.

The council's Emergency Response Co-Ordinator then took responsibility for making the arrangements to clear the beach. This process began at 17:35. Following an onsite dynamic risk assessment, based on observations at the time, and on an outline qualitative assessment of the new load-paths within the damaged structure, pedestrians were permitted to exit the beach in a controlled manner in small groups and no further access across the bridge was permitted. Clearance was completed by 18:30. Signs were placed on both sides of the bridge and at other points from which walkers commonly take access along Lossie East Beach.

Problem Posing a Risk to Public Safety

On Wednesday 24th July 2019 Moray Council was informed, from a number of local sources that on Tuesday 23rd July, at approximately 17:30, when a crowd of pedestrians was crossing the middle span of the three higher spans over the navigation channel there was an audible "PING" noise. The bridge dropped noticeably towards the downstream side, and a piece of the steel truss was observed to drop into the River below.

On inspection on the afternoon of Wednesday 24th July it is clear that:

- The middle of the three higher spans is now distorted with a substantial lean towards the downstream side.
- All the ties on this section of the downstream truss appear to now be broken or missing.
    - The attached photographs show each of the broken ties. It is noted that the broken ends of the ties do not align, due to the distortion in the bridge after the failure.
    - In the picture with the hand visible, the broken end is dark, rather than rusty red, suggesting that it is a recent break which has only occurred within the past few days. It appears that it was this last remaining tie that failed on the 23rd.
    - The failure of the ties prevents the steel elements from acting as a Truss, meaning the bridge has structurally failed.
    - Fortunately an alternative load path is available, with the top chord and bottom chord on this side of the bridge both now acting in tension, meaning this side of the bridge is now acting as a suspension bridge, with the compression struts now acting as ties to share the load between the two chords.
    - The upstream side of the same span is still acting as a truss.

This is a problem because:

- The bridge was never design to act as a suspension bridge, and the sections and connections are not of the correct type or arrangement for this to work reliably or safely.
- Suspension bridges are flexible in their nature, hence the noticeable "bounciness" now apparent in this span of the bridge.
- As the elements of the bridge are generally of stiff steel angles (rather than flexible cables usually used for suspension bridges) they will likely suffer from fatigue as the bridge "bounces" which will lead to a relatively rapid reduction in their strength
- As the elements of the bridge are so heavily corroded, their strength is already greatly reduced, so further weakening by fatigue action may cause further failure quite rapidly.
- As a suspension structure, there is now no further alternative load path available, and if there is a further failure, this will almost certainly result in sudden collapse.
- Unfortunately the most likely time for such a sudden collapse to occur is when the bridge is most heavily loaded, i.e. when the largest number of people are crossing it.
    - A sudden unexpected fall into cold water carries a high risk of panic which often can lead to drowning.
    - People falling will be surrounded by sharp broken pieces of the bridge, and the risk of injury is quite high.
    - At low tide the water is relatively shallow and falling people may be injured when they hit the river bed.
    - The nearby timber piles also pose a hazard as people may strike their head as they fall, which could cause unconsciousness, potentially leading to drowning.
- The upstream site truss has been deformed sideways by the distortion of the bridge. This is twisting it out of alignment, adding additional stress to already weakened elements.

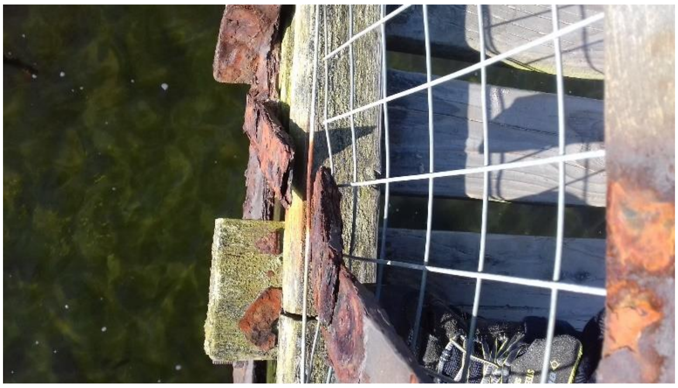
Why Did it Fail Now?

- We are in the middle of a heat-wave. This means that the steel of the bridge expands, introducing additional stress into the weakened steel.
- The hot weather, in the middle of the summer holidays, has increased the number of users on the bridge, leading to a peak in loading, introducing additional stress into the weakened steel. Indeed on the day before the closure, in excess of 3800 users were reported to have crossed the bridge, a much higher number than is the norm.
- Several persons were jumping from the bridge into the water below when the tie failed. When people jump from the bridge it is felt to vibrate, and it is likely that this also introduced additional stress into the weakened steel.

This combination of factors, all arising from the hot weather in the summer holidays have contributed together to the failure of the bridge.

Photographs of the damaged ties


Broken tie, ends out of alignment due to distortion


Broken tie, with missing central section


Broken tie, with missing central section


Broken tie, with dark area, failed in last few days


Broken tie, ends out of alignment due to distortion


Broken tie, ends out of alignment due to distortion


Broken tie, ends out of alignment due to distortion


Broken tie, ends out of alignment due to distortion

Appendix G - Bridge Survey Comments

Q2 Comments

Answered: 324 Skipped: 650

#	RESPONSES	DATE
1	The bridge has been in its present position for my whole lifetime. Photographed and painted by so many people. Please keep it there.	11/30/2020 8:26 PM
2	I think esplanade would be to busy with traffic. Kero where it is roughly	11/30/2020 8:04 PM
3	present position is near parking. wouldnt want the streets clogged with people parking up for the day and stopping passing trade to the shops.	11/30/2020 7:22 PM
4	I like the way it looks and just want it replaced.	11/30/2020 5:30 PM
5	From the Esplanade would create horrendous parking problems in an already congested area.	11/30/2020 3:59 PM
6	The bridge is fine if able to be repaired, just need functional bridge to allow safe access to beach.	11/30/2020 3:26 PM
7	The point of access of the replacement bridge could be from either spots. It would surely be sensible to use the most economical starting point.	11/30/2020 11:27 AM
8	I would like the bridge to remain in the same location for a few reasons - safety, longevity, logistics and tradition. While I'm no expert on currents, the speed of the river at the esplanade side makes me wonder about how long a bridge could withstand the water. Also, with bridge jumping being popular with youths for decades, they could be jumping into very deep and very fast flowing waters without knowing the dangers. Having grown up in Lossiemouth, the bridge in its current location has also been an iconic part of the landscape and much loved by locals and visitors alike. Being close to the public car park, it also makes it easy access for visitors - to move it to the esplanade side could cause a lot of problems with traffic.	11/30/2020 11:21 AM
9	The present sighting is near enough the esplanade to be easily accessible whilst spreading out gluts of people at busy times. It has a car park nearby. Parking on the esplanade can be very difficult at the best of times. It is also aesthetically pleasing where it is.	11/30/2020 9:33 AM
10	Traffic concerns on esplanade	11/30/2020 9:17 AM
11	It's a footbridge, copy and paste!	11/30/2020 6:28 AM
12	Better for parking. Also get too congested if placed on esplanade.	11/30/2020 6:10 AM
13	It's such an iconic view - it would be unthinkable to change its position.	11/30/2020 12:32 AM
14	The local & wider community love this beach. We need a bridge to access it safely.	11/29/2020 11:58 PM
15	Keep it where it had always been	11/29/2020 11:27 PM
16	Present position is the only option which makes sense.	11/29/2020 10:48 PM
17	Car parking easier from original position, also esplanade footfall would be too much and views would be diminished from esplanade if built there	11/29/2020 10:40 PM
18	Who knows how things will change since the collapse of the breakwater	11/29/2020 10:34 PM
19	Needs to be disabled friendly	11/29/2020 10:33 PM
20	Wouldn't be the same if the bridge wasn't in the place, and also parking is better there.	11/29/2020 10:18 PM
21	The present position provides a degree of protection, of placed at the esplanade there will need to be work to sort the breakwater.	11/29/2020 10:15 PM
22	Parking and ease of access is prevelant and is at present at the correct location for that.	11/29/2020 10:11 PM
23	We need the bridges	11/29/2020 9:48 PM
24	As part of the project the present car park near bridge and signage for bridge should be included in the refurbishment	11/29/2020 9:35 PM
25	As long as the bridge has access to parking near by and public toilets without having to walk too far this would be great	11/29/2020 8:44 PM
26	The bride is fine where it is it has parking at that point too if moved could cause more congestion	11/29/2020 8:11 PM
27	Asap preferred!!	11/29/2020 8:05 PM

28	Build the best option quickest	11/29/2020 8:03 PM
29	There is already car parking close to this bridge and it will keep traffic away from an already busy sea front (ie beside mieles etc) and also could the lossie raft race take place if the bridge is moved?!?	11/29/2020 7:38 PM
30	In the same place incase we are left with 2 because money runs out to dismantle the only bridge I've known	11/29/2020 7:37 PM
31	With the way the beach changes by tidal movements, I think that it is better where it is.	11/29/2020 7:31 PM
32	Disabled access on the beach	11/29/2020 7:17 PM
33	If the bridge connects to the esplanade, then more, free , parking should be available close to the bridge	11/29/2020 7:09 PM
34	Any other position would cause a gridlock.	11/29/2020 6:52 PM
35	As lo g as there is a bridge location doesn't really matter	11/29/2020 6:49 PM
36	If you have it installed at the esplanade there will be too munch traffic and no parking, unless the esplanade it non traffic, so the logical position is it current/original.	11/29/2020 6:23 PM
37	Absolutely from where the shops are. It's a pain to walk over to where the bridge currently is. Although, any bridge will do!!	11/29/2020 6:12 PM
38	A bridge is a bridge as long as there is one that can be used.	11/29/2020 6:04 PM
39	It would be my preference for the bridge to remain in the same area as the current one. This would allow the car park park to be used to its full potential rather than in Clifton Road at the esplanade.	11/29/2020 5:47 PM
40	From a point of view of best position to benefit local retail the esplanade is ideal position. However looking at a parking prospective having it in the same place as original would be the choice. Not likely to happen but what would be good is if they installed a wooden decking area with seating on the beach side of the bridge a bit like a wooden pier. This would give disabled better access to enjoy the beach	11/29/2020 5:44 PM
41	It will be better protected from storm damage at the original place. That is probably why the original briggie has lasted so long.	11/29/2020 5:25 PM
42	Makes more sense to come of the main esplanade	11/29/2020 5:20 PM
43	Keeping it where it is would be ideal dur to the postioning of the car park.	11/29/2020 5:14 PM
44	Don't think a new one should be built. It should become a wildlife haven.	11/29/2020 5:11 PM
45	Near to current bridge taking into account the need for parking	11/29/2020 5:10 PM
46	And dŕedge the mouth off the riverup to the bridge and other side aswell	11/29/2020 4:39 PM
47	Current position has the small car park nearby and keeps rubbish from Esplanade to a minimum. If on Esplanade all the visitors will take their ice creams etc over the bridge, drop them into the water or onto the beach as they arrive. Plus parking will be a nightmare. NB Also better for watching the raft race from in current position.	11/29/2020 4:37 PM
48	Traffic & pedestrians is bad enough let alone putting the bridge from the esplanade	11/29/2020 4:36 PM
49	It's such an iconic bridge that everyone recognises and photographs that a replica would be wonderful	11/29/2020 4:30 PM
50	Surely health & safety wouldn't allow a bridge from the esplanade!!	11/29/2020 4:28 PM
51	Better for use of local facilities.	11/29/2020 4:25 PM
52	The position of the bridge should be governed by data - economic, environemental, cost of construction and redevelopment of access - with the best opton being the one that provides best value for money.	11/29/2020 4:24 PM
53	It might be easier for those with young children or the elderly if the position was shifted to the esplanade. However, we just want a bridge so we can get back to the beach.	11/29/2020 4:22 PM

54	I feel the promenade is busy enough in the summer without adding more vehicles.	11/29/2020 4:19 PM
55	Original bridge was from the esplanade and was washed away!	11/29/2020 4:17 PM
56	don't know the reason for moving the bridge from the esplanade to the current position but that should be taken into consideration	11/29/2020 4:17 PM
57	Just build a bridge…	11/29/2020 4:15 PM
58	Previous history suggests bridge from esplanade would be mire more vulnerable to waves, tidal erosion etc. Also its good to encourage people to park and or walk further away from esplanade.	11/29/2020 4:14 PM
59	Everything is set up for the bridge in its present position- parking etc	11/29/2020 4:13 PM
60	Anywhere is better than nothing so the quicker it is completed the better	11/29/2020 4:11 PM
61	Whichever is most cost effective	11/29/2020 4:02 PM
62	Why change where it is, the present position is where it should be	11/29/2020 4:02 PM
63	Parking wise, at least there is a small car park near the present bridge. The esplanade is chaos enough now, people wouldn't use the existing car park as much, I don't think, so it would cause more issues on the esplanade.	11/29/2020 4:01 PM
64	I prefer this position as there is better access to parking.	11/29/2020 4:00 PM
65	Its near Carparking just now Logical place keros the image of such an Iconic Bridge and view	11/29/2020 3:58 PM
66	Replacement bridge in current position would ensure that the sea front area would not be over run with people and traffic. This area is can get busy and a bridge from there would cause chaos	11/29/2020 3:56 PM
67	I live in elgin. I feel there is more room for parking and foot traffic where it is.	11/29/2020 3:53 PM
68	Not enough parking at esplanade	11/29/2020 3:52 PM
69	Looking forward to having a crossing again, the people of Lossiemouth and others have missed it.	11/29/2020 3:52 PM
70	Please dont take too long, we all miss the beach.	11/29/2020 3:50 PM
71	I think if position moved to esplanade it may cause issues in the summer months if tourists are unaware if alternative car parking. Too many children in the area for an increase in cars.	11/29/2020 3:48 PM
72	It is very sheltered where it currently is and am concerned moving it will cause difficulties with erosion.	11/29/2020 3:44 PM
73	The current wooden footbridge is picturesque and is a historic feature of the town. I would prefer if the new bridge did not obscure the old bridge, and that it should be located far away from the old one.	11/29/2020 3:43 PM
74	Our household feel a rebuild at present position is best for traffic control, parking and safety for pedestrians	11/29/2020 3:25 PM
75	The best place according to the bridge engineers	11/29/2020 3:20 PM
76	It should be situated in the same site. The car park is convenient and there are better facilities to get cleaned up.	11/28/2020 11:28 PM
77	Whatever is going to last longest	11/28/2020 9:56 PM
78	I believe a bridge from the esplanade will lead to higher more casual footfall on the beach leading to higher pollution. This will be mainly due to wrappers and other litter being brought from the stores along that road.	11/28/2020 8:22 PM
79	If the present bridge could be preserved and the new bridge built on the east side. The old bridge represents Lossiemouth. If the old bridge would have to go the esplanade option is preferred.	11/28/2020 8:10 PM
80	It is iconic in its present position	11/28/2020 6:47 PM
81	old bridge has been around in it's present position with no problems. At esplanade i feel it	11/28/2020 6:44 PM

	would cause so many problems being so near to main road.	
82	Would be a nice change	11/28/2020 6:44 PM
83	Clifton Road is already congested with traffic so if a bridge is sighted there then parking restrictions will have to be adopted.	11/28/2020 6:43 PM
84	A car park is available next to the current bridge. The esplanade area is already too congested with traffic for access to the beach to come from there.	11/27/2020 3:32 PM
85	You wouldnt move the forth railway bridge so it started in kirkcaldy! Keep the bridge where it is!	11/27/2020 7:12 AM
86	The sooner the better, we miss it!	11/27/2020 6:47 AM
87	I dont mind where the bridge is, it would be great to have it back. Would traffic increase though at the esplanade,.both car and people, that would be my only concern	11/26/2020 10:46 PM
88	Position of bridge should stay, but considerations should be made to make it taller to incorporate a bungee jumping facility	11/26/2020 9:56 PM
89	same location may be slightly more expensive but would avoid major added conjestion at esplanade area.	11/26/2020 7:29 PM
90	Looking forward to Lossie having a bridge again so locals and visitors alike can enjoy the beach and all the town has to offer.	11/25/2020 2:30 PM
91	This allows easy access to the beach from a large car parking area. The Esplanade has limited street parking which could cause difficulty for the flow of traffic along the A941.	11/25/2020 10:42 AM
92	Cheapest and easiesr	11/24/2020 3:43 PM
93	Style will be changing but the location should stay traditional	11/24/2020 8:43 AM
94	More parking facilities for beach users rather than clogging up the esplanade which is already full and extremely busy on a hot day	11/23/2020 10:06 PM
95	Need to consider there is already some parking facility near east beach so it would be less congestion to the already congested riverside opposite the shops	11/23/2020 9:57 PM
96	A bridge from the esplanade will increase traffic and reduce parking beside the shops, it will also be more dangerous as closer to the sea, children will always want to jump off the bridge, they have done it for generations and will continue to do so, there is already parking beside the original bridge and traffic less busy there	11/23/2020 9:45 PM
97	There are compelling aesthetic reasons for a new bridge ok the current position. The view from Lossie promenade across to the dunes would be much depleted if a bridge was built there. And then there are the traffic pressures. It seems such an obvious decision to replace it where it is currently.	11/23/2020 8:46 PM
98	Car parking near present position. Esplanade site may cause parking problems on busy sunny days	11/23/2020 8:39 PM
99	A bridge that is is keeping with the surroundings	11/23/2020 8:17 PM
100	Bridge from Esplanade would cause major traffic issues. Also, you would not have the iconic view as it is now.	11/23/2020 5:16 PM
101	It has to go in it's present position for car parking and for the Lossie raft race, which brings a lot of revenue to local businesses and Charities, if it was moved to the Esplanade there is insufficient parking available and there would be no raft race.	11/23/2020 3:39 PM
102	Solid structure please, design that follows landscape and will not spoil a photo.	11/23/2020 3:08 PM
103	Really would like a bridge , however I think the esplanade would be a better option . Although I presume this would depend on costing regarding moving sand. However what ever they do it needs to be one for the long haul .	11/23/2020 12:49 PM
104	The current location is better for parking etc, and with a car park close by it makes more sense to keep it where it is. The bridge will also be better protected in bad weather.	11/23/2020 11:49 AM
105	Pedestrianise the front from [redacted] to the War Memorial except for buses and residents access/deliveries.	11/22/2020 5:44 PM

106	Best to have the bridge where there is adequate parking. The esplanade.is busy enough with traffic and families at the shops on warm days, there is not room for additional parking along the front to cater for busy days and it will become dangerously congested.	11/22/2020 4:12 PM
107	The present look and location is iconic - very much a key characteristic of Lossie. All I have spoken to favour the present location with a similar looking bridge.	11/21/2020 8:25 PM
108	If the decision is taken to replace the bridge in its present position I would hope that it is done sympathetically to reflect the existing iconic Lossiemouth attraction.	11/21/2020 10:56 AM
109	Putting bridge back at esplanade not a good idea due to swell and current I feel that it would be an accident waiting happen with kids jumping of bridge.	11/21/2020 9:08 AM
110	Keep the bridge in the same place or just next to where it currently is	11/20/2020 9:58 PM
111	Easier to get to the toilets and shops	11/20/2020 6:04 PM
112	I think a bridge from the esplanade would cause a bottleneck with parking etc. For me the present position is the best location Location	11/20/2020 4:55 PM
113	The bridge is important for the Lossie community and tourists who visit the area	11/19/2020 9:31 PM
114	The bridge is protected by the dunes in the present position. If the bridge is placed at the esplanade it will get eroded faster due to stormy weather and sea states. Also, you will have to think of the depth of the water changes a lot next to the Esplanade due to two different types of currents both meeting from the river and the sea. This means if the bridge is built in current placement it will be more protected and will last longer.	11/19/2020 9:13 PM
115	Near parking for access to the east beach, and shorter.	11/19/2020 8:53 PM
116	Has there been any thoughts on how to keep east beach clean? Need to be careful it doesn't get ruined	11/19/2020 8:44 PM
117	New bridge please. Expedite a decision!!! Please, please don't let this drag on and on through committee after committee.	11/19/2020 8:39 PM
118	The area in front of the esplanade is well used by paddle boarders and other water sports, a bridge would prevent this	11/19/2020 8:03 PM
119	The current siting of the bridge allows use of the sheltered corner of the estuary in favour of watersports	11/19/2020 7:33 PM
120	Please build a nice bridge. Something arty, a sculpture. It’ll be a landmark so please make sure it’s nice	11/19/2020 6:42 PM
121	We use the area between the bridge and the Esplanade for Paddlebaod sessions would be good to keep this clear.	11/19/2020 6:36 PM
122	This will leave the esplanade clear to foot traffic.	11/18/2020 7:00 PM
123	The current location for the bridge was never an issue before. It has been at the esplanade before and was moved. Putting it back there will just make traffic congestion especially in the summer horrendous. Parking will also be made even worse on a road which is already extremely busy. Due to to current restrictions with COVID surely a bridge where there is more space and the ability to keep more of a distance from others, if necessary, would be more advantageous. Whatever the decision I hope it’s made soon. We miss East Beach!!	11/18/2020 6:16 PM
124	A bridge from opposite [redacted] would cause traffic and pedestrian chaos as well as the structure being more susceptible to storms.	11/18/2020 4:53 PM
125	The Esplanade is very busy with pedestrians and even more so vehicles, I believe this would be compounded by the bridge moving location to the Esplanade. I think it would encourage people to attempt to park near the bridge and make the street a nightmare. The bridge has worked well in its current location for years, where is it close to a car park and gives access to locals who only want to access the beach without going to the busy Esplanade.	11/17/2020 8:59 PM
126	The bridge running from the esplanade, if possible, would be a great boost for local businesses.	11/17/2020 3:15 PM
127	Sooner the better. At least in time for next summer.	11/16/2020 4:26 PM

128	I personally don't think it would be a great idea to positioning the bridge at the Esplanade due to people's mobility and car traffic. It is very busy during with the car traffic and crowded area with people the summer and a health and safety consideration must be taken.	11/16/2020 12:18 PM
129	Its just makes so much more sense. A shorter path directly from local businesses and it Will look beautiful in tourism photos!	11/16/2020 10:43 AM
130	Seems more appropriate to have it from esplanade	11/15/2020 10:43 PM
131	Feel bringing bridge into Pitgavny Rd. would caused parking problems. Park already in place in present position.	11/15/2020 5:17 PM
132	More parking beside where the bridge is now. There’s a lot of folk drive to the beach.	11/14/2020 8:57 PM
133	I think it should stay in its current location as it’s very convenient having the car park there and will ease congestion in the town also I believe it will help alleviate any littering from people having ice creams and food then directly going to the beach.	11/14/2020 12:36 PM
134	If the bridge were replaced from the esplanade there would most probably be issues with litter. People would most likely not have finished their ice cream or snacks by the time they got to the bridge and would bring litter to the beach and not take it back. Litter was already a problem and it would most likely be exacerbated by the relocation of the bridge. Parking for the east beach is convenient in its current location. Water sports enthusiasts and the surf school use the bridge and carry their equipment over. Making this journey longer may be a slight inconvenience. Perhaps the bridge could go beside the canal to reduce the distance from the car park. I think aesthetically the bridge would look better at the esplanade which in turn would help Lossiemouth become an iconic beach town but in reality the functionality of replacing it in its current location would serve the beach and it's users more favourably.	11/14/2020 9:41 AM
135	Would like it to be placed near the toilets for easy use for the people on the beach.	11/14/2020 8:39 AM
136	I was told the last bridge in previous position was damaged by wild weather due to be in a more 'open' location.	11/14/2020 7:37 AM
137	Be nice at the Esplanade but makes more sense for parking to leave it where it is !	11/14/2020 4:53 AM
138	I think having the bridge on the esplanade would cause lots of parking problems and congestion in a place where it is already tricky in summer months and busy periods.	11/13/2020 10:11 PM
139	Closer to carpark	11/13/2020 9:15 PM
140	Parking and traffic is congested at the hight of the summer season by the esplanade. By keeping the bridge in the present position will allow cars to park at the riverside or in moray Street. The first crossing that was built to access the beach was from the esplanade, which was constantly damaged by tide so was moved to its present position. Makes sense to keep the crossing where it is.	11/13/2020 8:46 PM
141	In the nicest possible way. Any beach will be a positive.	11/13/2020 7:55 PM
142	If the bridge goes from the Esplanade, there will be more cars parked there, perhaps for the full day. Parking is scarce on a sunny day anyway and I think additional parked cars would have a detrimental effect on the shops. There is a car park by the current bridge all ready. Also, 100 years ago, a bridge was washed away from an Esplanade site, whereas the current site is more sheltered.	11/13/2020 7:44 PM
143	if the bridge were moved to the esplanade, would if not cause significant congestion issues?	11/13/2020 5:37 PM
144	Just need a bridge so this beautiful resource can be enjoyed again	11/13/2020 4:11 PM
145	If the bridge is placed on the esplanade, it will cause a problem with parking. So as long as this is considered, I don't care where the bridge goes!	11/13/2020 3:38 PM
146	I hope that a temporary bridge can be put up in the interim p	11/13/2020 1:41 PM
147	The prevailing wind means the current position offers some shelter from the dunes to those crossing, it's one reason it was moved from the esplanade in early 1900's	11/13/2020 12:48 PM
148	Please can it be architecturally amazing to show off local engineering.	11/13/2020 11:49 AM
149	Would be lovely for the old bridge to be closed off but left where it is, it’s a piece of history and would be a shame for it to go	11/13/2020 11:43 AM

150	Parking would be a huge issue if the bridge was on esplanade. That road is already chaotic on nice days due to number of customers parking to visit the 2 ice cream shops and 3 restaurants on that section of Clifton Road.	11/12/2020 5:46 PM
151	A bridge from the esplanade would have to take into account the landward movement of the dunes. Plus, any off street parking is closer to the existing bridge.	11/12/2020 4:42 PM
152	There is some degree of parking where it is located at present, if its moved there will be total chaos with parking which will cause safety issues for pedestrians especially children.	11/12/2020 3:50 PM
153	Prime reason for this response is better parking available nearby, and also more sheltered from sea.	11/12/2020 12:48 PM
154	Putting the bridge back were it is ,will allow for parking close by and prevent the esplanade from becoming congested	11/12/2020 12:28 PM
155	I think parking would be a concern if the bridge were to be sited on the esplanade	11/12/2020 12:16 PM
156	The bridge is placed well between the esplanade and the caravan park. There is also a car park near by. I would worry that moving the bridge near the esplanade would cause a lot of extra traffic in an area that gets very busy already as people will try and park as close as possible and they won't necessarily use the harbour car park. The only bonus would be being closer to the shops to grab ice creams but people have happily walked up to now so don't see the need to move it	11/12/2020 12:01 PM
157	Considering parking & congestion the current position has significant advantages	11/12/2020 11:57 AM
158	For parking and to ease congestion at the esplanade, the new bridge should stay in the same location	11/12/2020 11:54 AM
159	Due to the available car parking for visitors and locals alike, I feel the best place is in the present position. The fact that it stood so long also indicates that it was a good foundation for weather, tides etc.	11/12/2020 11:39 AM
160	Really miss using this beach!	11/12/2020 11:36 AM
161	It makes more sense where it is because of parking. People are inherently lazy and will park as close as possible, so if it was on the Esplanade parking could get ridiculous especially on nice days.	11/12/2020 11:29 AM
162	It brings back so many memories	11/10/2020 11:32 PM
163	Certainly would be of a benefit to public if bridge was adjacent to esplanade and may attract more business for the wee shops adjacent.	11/10/2020 1:27 PM
164	The close proximity of the car park to the current bridge is ideal for anyone driving to the beach: family day out with kids & kit to carry, watersports enthusiasts etc.	11/10/2020 11:46 AM
165	I think both options have pros and cons and I will be happy to see access to the beach wherever the bridge is placed. I think the bridge from the esplanade would tie the beach to the rest of the esplanade making access to the local shops and restaurants easier. I think this connection to the esplanade would make visiting the beach more even more enjoyable than in the existing location. My concern would be a lack of parking, especially disabled parking.	11/10/2020 12:35 AM
166	Worried about parking at option 2 & children running across road to ice cream shop if bridge put at esplanade	11/9/2020 5:14 PM
167	Need more information to make a decision	11/9/2020 4:20 PM
168	The Esplanade would be my preference as long as it doesn't create problems for parking/access.	11/9/2020 3:18 PM
169	Concern about the Esplanade parking is the only drawback to this option as it should be cheaper.	11/9/2020 3:16 PM
170	I fear that moving the bridge to the esplanade causes even more parking issues there.	11/9/2020 10:47 AM
171	The time for surveys is past. Action is required	11/9/2020 10:18 AM
172	Whatever works best	11/9/2020 8:59 AM

173	Personally I think the bridge should be left where its presently at .there's a carpark not far from it ,moving it to the esplanade would create a influx of traffic trying to park on the main road	11/9/2020 3:58 AM
174	I think the new bridge should mimic the old bridge as far as possible.	11/9/2020 3:48 AM
175	Whatever is the safest and cost effective	11/8/2020 10:46 PM
176	What was the original reason for the bridge to be placed where it stands at present ? This should be a factor in the decision	11/8/2020 10:24 PM
177	For safety	11/8/2020 7:57 PM
178	or built as Near the present to the present bridge bridge foundations as possible	11/8/2020 5:06 PM
179	Seems to be the best place in my opinion	11/8/2020 9:55 AM
180	Such an iconic bridge should be rebuilt where it is.	11/8/2020 8:41 AM
181	All the car parking is over that way, esplanade/Clifton Road parking is limited at best of times.	11/8/2020 8:22 AM
182	The bridge is much safer where it is. Too much underwater turbulence/currents in the river at that point of the esplanade, far too dangerous and accident waiting to happen in my opinion.	11/8/2020 12:28 AM
183	Too near mouth of river if moved to esplanade also thought needs to be given to the problem with parking which already is terrible at the esplanade.	11/7/2020 9:43 PM
184	the esplanade is summer is busy enough. if the bridge is moved with traffic moving through it will be an accident waiting to happen. there's also a car park close to the current location. moving the bridge would cause more vehicle traffic and congestion	11/7/2020 8:55 PM
185	Time the bridge was back.	11/7/2020 8:17 PM
186	Just love the design and position as the bridge stands	11/7/2020 7:49 PM
187	The main photos of Lossie are the beautiful ones of the bridge, if it was moved these would not be possible, and lossie would lack in beauty.	11/7/2020 5:11 PM
188	The current Bridge has been put there for a reason. The swell from esplanade during very high tide would make the bridge unusable or damaged. I can not understand any reason for moving it. Please let logic prevail.	11/7/2020 5:08 PM
189	The bridge in its current position allows quiet, uncongested crossing where Parkin is also available. Putting a new bridge on the esplanade where it already gets highly busy in the height of Summer when most people cross the bridge to the beach would most likely create a congestion of people, cars, as well as distruption to the seals who come there and surfers who use that place to cross.	11/7/2020 4:33 PM
190	Protected more from elements; has large parking area opposite; safer than having large numbers of public coming straight on to esplanade + traffic; congestion if by esplanade; the esplanade is a place for relaxation, walking, sitting and admiring the view, not having swathes of visitors/members of the public (just think of the numbers we had in the summer the bridge was closed) going to and fro; ** it is also close to where seals often come and rest on the sand and large numbers of people in that proximity would be damaging	11/7/2020 4:26 PM
191	To have any replacement bridge would be wonderful as long as it is safe and sustainable.	11/7/2020 4:17 PM
192	There is a car park available at its present position	11/7/2020 4:17 PM
193	It is in the ideal place. Crossed it every time I come to visit.	11/7/2020 4:06 PM
194	Bridge from the explanade would be preferable but only if there is adequate car parking infrastructure built into the design otherwise build a replacement bridge in its present position.	11/7/2020 3:04 PM
195	Esplanade is falling intonthe river and would not supoort a bridge, huge extra funding would be required. The shops in and around the esplanade would be advesrely affected by lazy people parkingnas close as they could to a new brudge from thenesplande. Replace or repair the bridge inthe existing location....they knew what they were dojng when they built it there.	11/7/2020 3:02 PM
196	Esplanade. Example; I'm on the beach and want an ice cream? I can cross the bridge, get my family ice cream and return back over the bridge. In the current (old bridge) location it wasn't as feasible. Seems small, but I think legitimate.	11/7/2020 3:00 PM

197	The current bridge has nearby car parking, a bridge on the esplanade might attract more people to use the shops on entering/exiting the bridge which might support local business but I still prefer the current bridge location. I think it creates a longer crossing that has a greater impact.	11/7/2020 2:11 PM
198	I don't think it matter to anyone where the bridge is, so longneck as we can actually get on and get it built so we can all access that beautiful beach again!	11/7/2020 1:51 PM
199	The current position allows the beauty of the bridge to be appreciated from many vantage points. It's practical as there is good parking nearby but within easy walking distance if the Clifton Road shops and cafes. Putting the new bridge over from Clifton Road would undoubtedly increase traffic and congestion there. I understand the original bridge was there but was replaced after only a few year by the current bridge. That leads me to suspect there were difficulties with that location. It may be more likely to be damaged by big storm waves coming in the river mouth. Even the general wear and tear of the tides would likely be greater there.	11/7/2020 1:43 PM
200	Great where it is	11/7/2020 12:57 PM
201	Few towns are as fortunate as Lossie in having a beautiful beach either side of the town. In the present position the Bridge is as iconic to the East in Lossie as the Lighthouse is to the West. It is also ideally placed with a large car park already in place thus keeping cars away from an already congested Clifton road.	11/7/2020 12:48 PM
202	It is better access to shops	11/7/2020 11:00 AM
203	Keep bridge where it is	11/7/2020 10:10 AM
204	Better for parking, to reduce traffic in the esplanade and to maintain its iconic location.	11/7/2020 10:02 AM
205	Get it done ASAP, we are all desperate for it to be back…….	11/7/2020 10:01 AM
206	Ease of access to the bridge. The shops on the esplanade would benefit greatly.	11/7/2020 9:57 AM
207	The bridge should stay where it is for safety reasons. The river around the esplanade is particularly dangerous and there have been drownings there in the past. It is iconic where it is and part of our heritage and my childhood. I am concerned about increased traffic on Clifton road if it is moved and that may cause bad congestion there.	11/7/2020 9:46 AM
208	Although there is much to recommend the Esplanade placement, the problems of traffic and visitor numbers has made me opt for a replacement on the present site. This will allow the Moray St car park to be used, and for visitors to filter towards the shops and restaurants rather than focusing on that area.	11/7/2020 9:36 AM
209	The sooner the better	11/7/2020 9:28 AM
210	No parking if from Esplanade. Congested enough as it is in summer . Parking for ice cream!! Purpose built car park at existing bridge. Also heavy swell when high tide and northly wind/gale that would put bridge in danger. Existing bridge there was washed away. New bridge just round the bend of the river near or on existing bridge site would be ideal. Seemingly there was a vote for the esplanade a couple years ago but it was never published. Just the local business people I believe. I and many many others never even knew about it till it was done!!	11/7/2020 9:19 AM
211	It should stay in its current and iconic position	11/7/2020 9:19 AM
212	With climate.change to put back on esplanade where it was washed away bu high tides would be too risky of the same occurring. The traffic on clifton Road is too congested in the summer to encourage beach users to park there too. If you were to begin building by the esplanade it would most likely collapse as it is already unstable and in poor repair. Making the esplanade option a far more expensive one than replacing in its current position .	11/7/2020 9:14 AM
213	I fell if the bridge is at the esplanade it will become very overcrowded. It already get very busy. This would make it difficult for people with nervous dogs to take them on to the beach. Also not everyone likes dogs. It would also be difficult for surfers with their large boards to get through the crowds too.	11/7/2020 9:00 AM
214	Preferably An aesthetics pleasing bridge. But I really don't mind where it goes!	11/7/2020 7:43 AM
215	The esplanade will become congested if the bridge is built there.	11/7/2020 7:01 AM
216	If from Esplanade I feel the shops/restaurants will benefit more as people can easily go back	11/7/2020 6:12 AM

	and forth if required for food/drink. The originally placing is a bit of a walk I believe for a "quick nip".	
217	The Esplanade is always busy with traffic ad people buying ice cream!	11/7/2020 6:02 AM
218	Lossiemouth would never be the same if the bridge was moved being where it is brings many memories back to me of my late husband [redacted] fishing	11/7/2020 3:48 AM
219	Think it best replaced where it is now as parking would be an issue	11/7/2020 2:28 AM
220	Just replace it in same place	11/7/2020 1:05 AM
221	Think existing site the best route and will avoid excess traffic traffic in an already busy area	11/7/2020 1:01 AM
222	Can't change the position of one of the most iconic and photographed bridge in the north east of Scotland	11/7/2020 12:50 AM
223	Because this is the most sensible place to put the bridge that's why it was put there in the first place. So don't wast any more time or money on feasibility studies just get on with it. It is as simple as that. And please give us somthing to look forward to after this horrible pandemic is over.	11/7/2020 12:04 AM
224	Important to maintain this historic land mark where it is	11/6/2020 11:50 PM
225	Current position is perfect	11/6/2020 11:14 PM
226	There is so much debate on replacing at the current location. But, I feel it's more to do with fear of change. Please don't build a like for like bridge. Please build one with decent access for less able people, ensure their is adequate space allocated for bins and collection.	11/6/2020 10:53 PM
227	In the current position the bridge is nearer to the carpark. Feel it would make the esplanade very busy.	11/6/2020 10:38 PM
228	The current bridge position is part of that very special view from the esplanade and from the road above.	11/6/2020 10:08 PM
229	From all I have spoken to - including shopkeeper , the present position with a similar shape to the old bridge is the definite preference . Might be worth considering, questionnaire in northern Scot	11/6/2020 10:07 PM
230	Something fitting and floodlit not an ugly monstrosity	11/6/2020 10:01 PM
231	We need a bridge	11/6/2020 9:45 PM
232	Leaving the old bridge in situ will maintain the picturesque views of Lossiemouth we have all become accustomed to.	11/6/2020 9:16 PM
233	A bridge from the Esplanade to the East Beach didn't work decades ago and now that there's tidal erosion, more traffic, plus it's the main bus route, it doesn't seem sensible to cause even more congestion in that area. A foot-bridge further up river makes far more sense, particularly when dangerous cross waters closer to the sea are taken into consideration.	11/6/2020 9:08 PM
234	The original bridge is iconic and should be left alone. Repaies maybe required if money available	11/6/2020 8:50 PM
235	This has been way to long	11/6/2020 8:44 PM
236	Parking at the esplanade is always difficult and would be even worse if the new bridge is from there. There is a large car park already at Seatown next to the current bridge. This is a far safer option.	11/6/2020 8:44 PM
237	Would create to much congestion on the other side which is already busy and on a main road	11/6/2020 8:24 PM
238	I'd like to see the existing bridge preserved.	11/6/2020 8:23 PM
239	If the bridge is moved to the esplanade then the lack of parking there could lead to conflict between business and beach goers over parking spaces	11/6/2020 8:11 PM
240	Current site of bridge is close to car park making it more accessible for visitors. East beach bridge is a well recognised iconic feature of Lossie where it is now.	11/6/2020 8:05 PM
241	The parking is easier where the bridge is currently & if the bridge was moved I believe it will	11/6/2020 8:02 PM

	cause congestion which will lead to accidents.	
242	There is not enough parking at the esplanade if the bridge goes there	11/6/2020 8:01 PM
243	Obvious place for new bridge	11/6/2020 7:57 PM
244	I would be concerned that using the esplanade for the site would create major parking problems and increased traffic / pedestrians in what is already a very busy area on nice days. The present site has a large car park nearby. I don't think the station car park is big enough to cope.	11/6/2020 7:56 PM
245	Where the current bridge is located is certainly the best option for me	11/6/2020 7:49 PM
246	Maybe don't replace the bridge as the sand dunes is a good and safe place for birds to live, there has been a few new verities arrived since the bridge closed.	11/6/2020 7:48 PM
247	It is the most obvious choice.	11/6/2020 7:45 PM
248	I'd be happy with a bridge that takes account if engineering issues as well as the aesthetics. Don't spend more money building it in one spot, if there is a more appropriate engineering position.	11/6/2020 7:31 PM
249	Makes more sense to keep it where the current bridge is because of the parking situation in lossie	11/6/2020 7:28 PM
250	Ebb and flow of tides can be strong and treacherous making esplanade location unviable. Promenade unable to cope with any further congestion of people and cars. There is a car park at present position giving all easy access.	11/6/2020 7:27 PM
251	Maybe safer to keep it away from the pubs on the front	11/6/2020 7:17 PM
252	While at it, make the parking outside the shops disabled only and double yellow the other side	11/6/2020 7:17 PM
253	Easy parking where the existing bridge is sited	11/6/2020 7:15 PM
254	The bridge works where it is, isn't intrusive and fitted with the environment. Just repair the damned bridge as it was!	11/6/2020 7:14 PM
255	Has a large impact on the community around with the East Beach being unavailable to anyone. There are a lot of local businesses that rely on tourist coming to Lossiemouth, with this year local businesses need ad much support as possible.	11/6/2020 7:13 PM
256	Just want people to enjoy the lovely beach	11/6/2020 7:11 PM
257	I think its fine where it is, near a car park but away from the main road traffic	11/6/2020 7:09 PM
258	I personally think that a new bridge from the esplanade would be the best option for businesses in that area.But what can we do about the old bridge? Leave it to rot or pay to dismantle.	11/6/2020 7:08 PM
259	Esplanade would require enormous funding...it's is being undercut by the river.	11/6/2020 7:06 PM
260	Leave it where it is! We believe that it should be replaced exactly where it is for several reasons.. Firstly it is an iconic feature of Moray where it stands. It is stunning. easily accessible and parking close by. Secondly to move it would mean the road along the esplanade would need to be either closed off or made one way, the increase in traffic would be huge. Thirdly, it would be catastrophic for the businesses along Clifton Road as people would not be able to stop due to parking congestion. Lastly, the state of the esplanade and the breakwater is hugely concerning and cannot be ignored. If we can. let's keep the bridge where it is for the good of everyone in Lossie please.	11/6/2020 7:06 PM
261	I think from the esplanade will be best for local businesses as long as there is good signage to the existing car parks as it will be a nightmare along the front for parking for locals needing to just nip to the pharmacy or the shops. There may need to be a time restriction on some areas of parking along the seafront.	11/6/2020 6:49 PM
262	I think it would be a better option for the community to thrive and also be beneficial to all businesses in Lossiemouth. Parking will probably be highlighted as an issue however I don't see it being a problem, people will use proper car parks and the street as they do now. Thanks and the best of luck in building the bridge and thanks for making Lossiemouth great again.	11/6/2020 6:49 PM

263	Likely to generate increased income to shops opposite the esplanade	11/6/2020 6:40 PM
264	It’s an iconic view, which the bridge enhances. That it has stood there for so long also proves it’s a practical location.	11/6/2020 6:36 PM
265	As an Auld Lossie Loon I would would prefer the existing span to be maintained BUT of course expenditure must be taken into consideration. The main object is a replacement wherever.	11/6/2020 6:23 PM
266	Wide enough for disabled access and carrying a stretcher/ambulance trolley across.	11/6/2020 6:22 PM
267	There is plenty of parking at the present location. The esplanade would be a nightmare with people trying to park if the bridge was from the esplanade	11/6/2020 6:15 PM
268	Better access , shorter	11/6/2020 6:05 PM
269	I think the effects of traffic should be a big consideration if the bridge is to go from the esplanade	11/6/2020 5:56 PM
270	get it done as soon as.	11/6/2020 5:56 PM
271	From the esplanade would be a lot better	11/6/2020 5:51 PM
272	This bridge is part of our town, it was built in its current position for a reason and should remain so, environmentally it is in the best position and an iconic feature of Lossie. Please do not move our bridge, to move it would cause traffic chaos on Clifton road and there is plenty parking where it is. Thank you	11/6/2020 5:42 PM
273	Look forward to getting across when we have a bridge	11/6/2020 5:37 PM
274	There was previously a bridge from the Esplanade which did not last. It seems to make more sense to build one alongside the current position. Also there would not be enough parking beside the esplanade it is already to busy with people going to the ice cream shops.	11/6/2020 5:30 PM
275	It's an iconic image/view from Prospect Terrace to The Esplanade. It won't be so noticeable if it starts from the Esplanade.	11/6/2020 5:29 PM
276	Leave it where most people associate with it.	11/6/2020 5:27 PM
277	Where is it now is near a car parking area and it’s not too far to walk round to the shops. It would save congestion on the main street and with the ice cream shops there it is always busy, children!, so less traffic	11/6/2020 5:20 PM
278	Could it be moved east down towards the east, and use parking where the old hospital area was situated.	11/6/2020 5:14 PM
279	If you put it at the esplanade and kids jump in when the tide is going out thay will get washed down river very quickly.	11/6/2020 5:13 PM
280	It’s already taken too long. Needs to be done in a timely manner.	11/6/2020 5:07 PM
281	1. The bridge has provided a unique photo opportunity from Prospect Terrace for decades. Along with the Lighthouse it is THE image which defines Lossie. Located from the esplanade it will simply look cluttered and unsightly, obscuring the view of Seatown from Clifton Road also. 2. Clifton Road is already congested at the height of tne tourist season. It will become completely overwhelmed if additional traffic park up to access the bridge from the Esplanade.	11/6/2020 4:57 PM
282	Will avoid people parking on the sea town road and use the car park in the original position.	11/6/2020 4:56 PM
283	Traffic congestion would be unbearable on Clifton Road if the new bridge was from the esplanade.	11/6/2020 4:55 PM
284	So much easier access, closer to toilets, only problem is the parking.	11/6/2020 4:53 PM
285	I think this location will bring more business as people will have to pass the shops etc	11/6/2020 4:47 PM
286	Hopefully will minimise people leaving rubbish in the beach as many won’t walk from Esplanade round to bridge.	11/6/2020 4:46 PM
287	Safer for parking at the east beach there will be too much cars on whe esplanade its bad enough just now dangerous as well too near the sea	11/6/2020 4:42 PM
288	A bridge from the esplanade is a terrible idea. It would cause a nightmare for traffic and parking	11/6/2020 4:38 PM

	congestion and a major hazard for pedestrians crossing the road. Also a bridge from the esplanade is very vulnerable to storm. I remember in the 70s or early 80s when a lot of money was spent on a new breakwater from the old pier up to the dunes and towards the bridge. The new breakwater was completely destroyed in the first bad storm that hit it!	
289	Current position is adjacent to ample parking. If it was built at the esplanade this would put more pressure on the parking for shops/restaurants which is already very busy in summer	11/6/2020 4:38 PM
290	Needs doing as soon as possible.	11/6/2020 4:31 PM
291	Not sure why it was removed from the Esplanade in 1918?	11/6/2020 4:26 PM
292	From the esplanade will cause so many problems with parking. If this is the chosen option, considerations for parking will have to be factored in.	11/6/2020 4:19 PM
293	Be great to have CCTV at bridge, due to a rise in vandalism, rubbish & drinking in Lossiemouth.	11/6/2020 4:16 PM
294	Sooner the better. We need our bridge.	11/6/2020 4:16 PM
295	I'm concerned with both parking and the likely hood of increased rubbish on the beach of the bridge was accessed via the esplanade.	11/6/2020 4:15 PM
296	The bridge should remain in situ, the implications of moving it would be detrimental to the business community, there are also implications for the roads and it is unlikely the existing road could remain as it is along the esplanade. It is an iconic feature of our community and should remain such as it is.	11/6/2020 4:15 PM
297	This position prevents localised overcrowding which could lead to a road safety hazard. It allows folk to enjoy the esplanade while those who want access to the beach can do so from around the corner near to the parking area.	11/6/2020 4:14 PM
298	If the bridge is built from esplanade parking on Clifton Road may well be, at best, problematic.	11/6/2020 4:14 PM
299	Wheelchair friendly	11/6/2020 4:11 PM
300	The bridge has always been a feature and where it currently is brings a lot of people to Lossie for photographic opportunities. Hope they are also going to keep a traditional design and not install an eyesore like the bridge by the Cathedral. The design is not in keeping with the surroundings which are old!	11/6/2020 4:10 PM
301	Best for shops etc	11/6/2020 4:08 PM
302	How about TWO bridges, one at the current location serving Seatown car park, and one into the esplanade to serve the shops…	11/6/2020 4:06 PM
303	The present spot is the safest option . When people are leaving bars after the consumption of alcohol a bridge at the Esplanade would no doubt lead to a tragedy with people accessing the beach late at night whereas with it at the present location the chances of people going to the beach on a whim induced by alcohol would be as low as practicable.	11/6/2020 4:00 PM
304	Where it is is good as nearer to all the parking I think. There would be traffic and parking issues maybe if on the Esplanade. [redacted] and Co, you are doing an amazing job wherever you put it. Well done. From the [redacted] x	11/6/2020 3:59 PM
305	Traffic problems with other option!	11/6/2020 3:55 PM
306	It’s need to be wider than the previous bridge to allow for buggies and dogs	11/6/2020 3:54 PM
307	The esplanade would cause even more traffic and parking problems, being disabled I struggle to get to the chemist etc, this would make it much worse, and unsafe for pedestrians who seem to ignore traffic on a hot day.	11/6/2020 3:53 PM
308	I know the bridge location has changed in the past and cost is a factor but the current bridge position is good, is relatively sheltered side extreme winds and looks gorgeous. Nuff said.	11/6/2020 3:53 PM
309	Convenient car park close by.	11/6/2020 3:51 PM
310	From an economic standpoint, this seems to be the logical way forward. It would ease construction issues and can easily use the existing Car Parking for users.	11/6/2020 3:49 PM
311	I think a bridge from the shop area across would cause congestion as people do not want to	11/6/2020 3:45 PM

	walk from the car parks	
312	Please ensure that the new bridge is wide enough for two pram/wheelchairs to pass on the bridge.	11/6/2020 3:44 PM
313	Such an iconic bridge needs to be replaced as close to original location as possible, thanks	11/6/2020 3:38 PM
314	The esplanade will allow more access to the rest of Lossiemouth rather than being on the edge	11/6/2020 3:37 PM
315	The front would be too congested and visual eyesore. Existing position is the best.	11/6/2020 3:34 PM
316	Concerned about parking	11/6/2020 3:24 PM
317	Waist if a great beach without a bridge !!!	11/6/2020 3:24 PM
318	Parking along the Esplanade is bad enough. Will be much worse if the bridge is there plus the added danger of people crossing the road between parked cars to get to the bridge.	11/6/2020 3:22 PM
319	A bridge from the Esplanade would be closer to my home and therefore would be preferred but I don't feel strongly enough about it, just having a bridge would be really good :)	11/6/2020 3:21 PM
320	Think car parking would be a major problem if you move the bridge to the esplanade	11/6/2020 3:10 PM
321	The current location is iconic, near to car parking and safe, moving it to the esplanade will ruin the view and create traffic chaos and ruin the esplanade ,it will also damage businesses on the esplanade	11/6/2020 2:50 PM
322	Prevents overcrowding on esplanade. Current Car Park works well for those doing water sports from East Beach as well. More protection for bridge from dunes if Northerly storms.	11/6/2020 2:49 PM
323	Keeping it in the present position will keep footfall in other areas of the town rather than just concentrating it around the esplanade.	11/6/2020 2:35 PM
324	Every Seafarer I have spoken to had warned against a Bridge at the Esplanade . The present Bridge has survived over a hundred years. That will not be the case should it be built at the Esplanade because of the force of the waves at times.	11/6/2020 1:56 PM