BLACK SLUICE
INTERNAL DRAINAGE BOARD

Structures Committee Meeting

Tuesday, 22nd March 2022 at 2pm

Station Road, Swineshead, Lincolnshire PE20 3PW

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Internal Drainage Board

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Our Ref: IW/DPW/B10_1 Your Ref: Date: 15th March 2022

To all Structures Committee Members

Notice is hereby given that a Meeting of the Structures Committee will be held at the offices of the Board on Tuesday, 22nd March 2022 at 2:00pm at which your attendance is requested.

Ian Warsap
Chief Executive

AGENDA

1. Recording the meeting.

2. To welcome guests and receive apologies for absence.

3. Declarations of Interest.

4. To receive and, if correct, sign the Minutes of the Structures Committee Meeting held on the 24th March 2021 **(pages 1 - 11)**

5. Matters arising.

6. Byelaw Infringements and how can we engage more with our local planning officers **(page 12)**

7. To review the Structures Committee Terms of Reference **(page 13)**

8. To review the Structures Replacement Policy (No. 09) **(pages 14 - 17)**

9. To receive the Structures Report 2022 **(pages 18 - 63)** including:

   (i) Structures Replacement/Contribution Programme **(pages 18 & 19)**
   (ii) Culvert Surveys Report **(pages 19 - 24)**
   (iii) Culverts reported in a poor condition **(pages 25 & 26)**
   (iv) Ewerby, South Kyme, Damford and Trinity College Pumping Station Structural Report Up-Dates **(pages 27 - 63)**

10. To discuss the cost and viability of additional access culverts for the Board's machinery **(pages 64 - 65)**

11. Any Other Business.

BLACK SLUICE INTERNAL DRAINAGE BOARD

MINUTES

of the proceedings of a meeting of the Structures Committee

held remotely on
24th March 2021 at 2pm

Members

Chairman - * Mr J G Fowler

	Mr W Ash	*	Mr V A Barker
*	Mr P Holmes		Mr R Leggott
	Mr P Robinson	*	Cllr P Skinner
*	Cllr M Cooper		

* Member Present

In attendance: Mr I Warsap (Chief Executive)
Mr P Nicholson (Operations Manager)

Due to COVID-19, this meeting was held remotely in accordance with The Local Authorities and Police and Crime Panels (Coronavirus) (Flexibility of Local Authority and Police and Crime Panel Meetings) (England and Wales) Regulations 2020.

1750 RECORDING THE MEETING - Agenda Item 1

Members were informed that the meeting would be recorded.

1751 APOLOGIES FOR ABSENCE - Agenda Item 2

Apologies were received from Mr W Ash, Mr R Leggott and Mr P Robinson.

1752 DECLARATIONS OF INTEREST - Agenda Item 3

There were no declarations of interest.

1753 MINUTES OF THE LAST STRUCTURES COMMITTEE MEETING - Agenda Item 4

Minutes of the last meeting held on the 13th March 2019, copies of which had been circulated, were considered and it was AGREED that they should be signed as a true record.

1754 MATTERS ARISING - Agenda Item 5

(a) RAILWAY CONTRIBUTION - Minute 1413(a)

Mr V Barker questioned if the Solicitor has made any progress with this?

The Chief Executive explained that a solicitor has not been formally appointed to progress this as he has spoken to various people at the Environment Agency (EA), with nobody being able to find anything relating to the agreement in place with British Rail in 1853. Mr V Barker noted that he found the information in a book he borrowed from local farmer, Tom Tunnard. The Chief Executive noted that he will have a further look to see if he can find the information, adding that he is not overly optimistic of success.

1755 REVIEW OF THE STRUCTURES COMMITTEE TERMS OF REFERENCE – Agenda Item 6

The Chairman presented the Structures Committee Terms of Reference, noting the only change being the addition of the 'reporting' paragraph, that is a standard paragraph that has been added to all committee's terms of reference.

All AGREED that the Structures Committee Terms of Reference be RECOMMENDED to the Board for approval.

Cllr M Cooper joined the meeting, apologising for being late due to technical difficulties.

1756 RECEIVE THE MINUTES OF THE BOARD MEETING HELD 26 JUNE 2019 RELATING TO THE MATTERS ARISING OF THE STRUCTURES COMMITTEE MINUTES OF THE 13 MARCH 2019 - Agenda Item 7

The committee received the minutes of the Board meeting held on 26th June 2019 relating to the matters arising of the Structures Committee minutes of the 13th March 2019.

The committee RESOLVED that the minutes should be received.

1757 RECEIVE THE MINUTES OF THE EXECUTIVE MEETING HELD 10 JUNE 2020 RELATING TO THE CANCELLED 2020 STRUCTURES MEETING - Agenda Item 8

The committee received the minutes of the Executive meeting held on 10th June 2020 relating to the cancelled 2020 structures meeting.

The committee RESOLVED that the minutes should be received.

1758 REVIEW OF THE STRUCTURES REPLACEMENT POLICY - Agenda Item 9

The Chief Executive noted the only change being the addition shown in red ink at paragraph 6.8. This has been added to the policy due to a previously encountered problem with the construction of a culvert by a private contractor. This will also be likely to be included with consents.

The Chairman suggested that it perhaps also should clarify that the next stage of construction should not go ahead unless the previous stage has been inspected / approved by the Board.

Mr V Barker questioned how long a contractor may be expected to wait for an inspection from a Board's Officer before being able to move to the next phase of construction?

The Operations Manager noted that, previously, contractors have given very little notice to the Board to carry out the inspection – i.e., 1 days' notice. The ideal situation is for the contractors to provide a start date and expected completion so that the Board are aware in advance and can arrange for an Officer to attend site to inspect at each stage of the works. Mr V Barker responded that he has no objections to this, as long as the contractor understand this from the start. The Chairman added that if this is detailed in the consent, then they will be aware of the process.

The Chairman felt that the policy is understood and working.

All AGREED that the policy be RECOMMENDED to the Board for approval with the addition to paragraph 6.8 that that the next stage of construction should not go ahead unless the previous stage has been inspected / approved by the Board.

1759 TO RECEIVE THE STRUCTURES REPORT 2021 AND APPROVE THE PROPOSED STRUCTURES REPLACEMENT PROGRAMME - Agenda Item 10

The Operations Manager presented the Structures Report 2021, with accompanying photographs displayed on screen for each culvert discussed.

(a) INFORMATION ON INVESTIGATIONS AT EWERBY, SOUTH KYME AND DAMFORD PUMPING STATIONS

These three pumping stations, Ewerby, South Kyme and Damford have experienced issues with high water levels running back from main river outfalls.

The inspections and groundwork investigation works have been completed. The Environment Agency (EA) have been asked to fund the inspections and investigation works (inspections; c£10,000 and investigations c£25,000). The EA have responded that they are willing to pay towards the cost of these investigations. Once the investigations are fully complete, it will give an idea of what works are required to put a revetment in place to stop the water coming through the banks and if there are any issues with the fabric of the pumping station building.

Mr P Holmes noted his concerns that the EA would not fund it due to the pumping stations being property of the Board.

The Operations Manager noted that the EA have been sent all the information and have raised no other comments other than that they would be willing to cover the cost, noting that the water is believed to be coming through the raised banks of the Main Rivers.

Mr V Barker noted that, over 60 years, he has observed that at many of the pumping stations it can be seen where the soil has settled down away from the building.

Mr V Barker suggested that a Board's Officer should observe each pumping station outside and take note of any settlement of the pumping station, so that the Board can identify which have settled and any work that may be required.

The Chairman acknowledged Mr V Barker's point, noting that he thinks, in this case, it is a deeper rooted problem that may not necessarily be visible, due to the high water levels in the EA's drains.

The Chairman confirmed that the current surveys, being completed by Stantec, are investigating saturation levels and water ingress. The Operations Manager added that the next stage will be a proposal around what works are required. Stantec are next due on site in April to collect more data.

(b) TRINITY COLLEGE PUMPING STATION WATER SEEPAGE FROM LONG SKIRTH

It has been reported that water is coming back round the pumping station, during high water levels, this being the first time it has been reported.

The Operations Manager has spoken with Stantec, and as soon as they are available, they will be conducting an inspection, similar to that being completed at Ewerby, South Kyme and Damford. The Operations Manager will continue to report on progress of this.

(c) CULVERTS REPORTED AS IN POOR CONDITION

The Operations Manager noted that it is unusual to have so many culverts in disrepair at the same time, noting that he believes some may have failed more quickly as a result of the high water levels experienced recently.

(i) MORTON FEN – No. 16 – FX1772

This culvert is access to a residential property. The Operations Manager has spoken to the landowner, the next step being to formally write to the landowner explaining the options and offering quotes for repair / replacement. However, the Operations Manager noted that he feels replacement will be the only realistic option.

The culvert has no benefit to the Board and so it is proposed that no contribution is offered. It is being monitored and will be removed as soon as possible if it fails and blocks the watercourse.

Mr V Barker questioned if the age of the culvert is known?

The Operations Manager responded that there is no record of age on the GIS database, noting that it is now a lot easier to record new information on the GIS digital database, adding that it is an Armco pipe so is probably going to be around the 1970's at the earliest.

Mr V Barker suggested that it could have been done as part of a Black Sluice improvement scheme, expressing his concern around this. Mr V Barker referenced drainage grants, that were only paid to the owner of the asset being paid for, suggesting that the grant money was paid to Black Sluice IDB as the owner to improve the watercourses, including putting in culverts. Therefore, expressing his concern about being deemed as owners in order to receive the grant.

The Chief Executive noted that Black Sluice IDB don't own any watercourses and so may have been provided the grant to improve the conveyance of water, but the Board is not the owner, the watercourses are owned by the adjacent landowners.

Mr P Holmes noted that the Board may have done the work, being paid by the owner who received the grant, adding that he can't imagine the Board would have funded the remainder needed for the culvert in addition to the grant.

The Chief Executive added that the Board's GIS system has 'layers' including a 'culverts structures and bridges' layer, noting that the system allows to investigate any asset within the catchment. The Chief Executive believed that less than 5% of the assets state that they belong to the Board; and the few that do will have the associated formal documentation regarding it.

(ii) HACONBY FEN – No. 815 – FX1773

The Operations Manager has spoken to the landowner about this culvert, in addition to some committee members having spoken with the landowner.

The landowner agrees that it needs to be removed if blocking the watercourse and preventing the conveyance of water, however, he does not agree that he has to fund the replacement culvert in order to access his field, feeling that he is paying an 'additional tax' because of the location of his land.

The Operations Manager has explained to the landowner that it is access to his land and therefore an asset of his. The culvert is not required by the Board to maintain its operations.

The landowner has since asked if there can be changes made to the specification. The Operations Manager has advised that changes can be discussed, but must be agreed by the Operations Manager, it being agreed that a different type of pipe is going to be used.

The Chairman confirmed that himself and Mr P Holmes have spoken with the landowner, who is questioning the policy, believing that the culvert should be put in at the cost of the Board as opposed to at the cost of the individual landowner.

However, the Chairman felt that the policy, and in this individual case, it is correct that the landowner should fund the culvert, if he chooses to replace it, due to it being only of benefit to him to access his field and the Board not using it for their operations.

The Operations Manager has provided the landowner with an estimate for replacement of the culvert and he had asked for it to be removed, which the Board have done.

Mr P Holmes noted that the landowner had stated that he had discussed this with landowners within catchments of adjacent IDBs and that they have said they would pay for the replacement culvert. However, Mr P Holmes has spoken with the Chairman of an adjacent Board, who has confirmed this would not be the case and that the Board don't fund replacement culverts, it would be the responsibility of the landowner.

The Chief Executive noted that there are often challenges received in relation to what other IDBs do, but we are acting on behalf of Black Sluice IDB. If the Board were to fund every culvert, it would require a very large budget and therefore a substantial increase in drainage rates to be able to fund this.

The Chairman felt that this culvert is part of the landowner's farm infrastructure and therefore supported the policy and Operations Manager regarding the cost being the landowner's responsibility.

Mr V Barker questioned whether the landowners owns or tenants the land east or west of the culvert, suggesting that he could use one of the culverts either side. The Chairman confirmed that he believes it is the same landowner to both fields either side and that there is a grass track along the drain side that he could use to move between each of the fields if he were to use one of the other access culverts. The Operations Manager has suggested this to the landowner, who believes that the total area of all the fields is too much of an ask for a single access culvert.

(iii) BOSTON WEST – No. 2757 – FX1764

The Operations Manager has spoken to the landowner about this culvert, who does not believe it is his responsibility, the Operations Manager explained that it is access to his land, albeit there is a long term tenancy in place. The Operations Manager has also spoken to the tenant who has stated that he wants the culvert in place.

The Operations Manager also noted that there was a bank slip that the Board attended and repaired, at which point the culvert was identified as in poor condition. The landowner argued that the Board had therefore created the problem and should therefore replace it; despite the fact the culvert had already rotted and no longer fit for purpose or safe. It is currently being monitored and if it fails and blocks the watercourse, the Board will remove it.

The landowner has also argued that it is a passing place for vehicles on the adjacent single track road, although not formally identified as one, therefore suggesting that if the culvert is removed it will create a danger and that Lincolnshire County Council (LCC) should be involved. The Operations Manager will discuss with LCC about this.

The Operations Manager explained to the committee that the culvert does offer some benefit to the Board as it prevents Board's machinery having to track a long distance back and therefore suggests a contribution of £1,000.

All AGREED that a contribution of £1,000 be made in relation to culvert 2757.

(iv) HOLLAND FEN – No. 2754 – FX1775

The Operations Manager explained that this is a concrete Ogee pipe that has cracked, with the landowner initially stating that Board's machinery had hit it and broken it. However, upon inspection by a Board's officer all of the pipes were found to be cracked; which is known as 'hearting'.

The Operations Manager has spoken with the landowner, it not being required by the Board for its operations, it being access to a reservoir.

Mr V Barker noted the soil cover on the pipe, suggesting it may not be enough for the diameter of the pipe, therefore meaning the load bearing and stresses were not correct, and it may have been preventable. The Operations Manager noted that it may be possible, it could have been fit for purpose at the time of installation, but due to the increase in heavy machinery, may no longer be.

Cllr M Cooper agreed with Mr V Barker, suggesting that it looks like a stress fracture due to excess weight that may have been prevented if they had had a concrete slab across the top; which needs to be considered when replaced.

(v) BICKER FEN – No. 1408 – FX1770

The Operations Manager noted that this culvert and culvert 1469, in the next item, are both access to land owned by the same landowner.

This was reported to the Board by a member of the workforce who lives in the area, it was blocking the watercourse and so has been removed.

(vi) BICKER FEN – No. 1469 – FX1769

The Operations Manager noted that this culvert and culvert 1408, in the previous item, are both access to land owned by the same landowner.

This is a concrete block headwall, this culvert was extended by the Board at some time during the 80s, which is the section that has failed, the remainder of the culvert is in good condition. However, the landowner is now saying due to the reduction in running width it isn't big enough for his requirements.

This culvert does provide benefit to the Board as it is an access culvert between Bicker Fen and Swineshead Lowgrounds and so is used by the Board, therefore proposing a contribution of £1,000.

All AGREED that a contribution of £1,000 be made in relation to culvert 1469.

(vii) SMALL DROVE – No. 718 – FX1760

This culvert is under a highway, with Lincolnshire County Council (LCC) acknowledging that this culvert hasn't been repaired to the specification by the Engineer; it being a temporary repair to try and prevent the road from collapsing. The repair therefore isn't adequate and are aware of this. LCC are therefore going to complete more temporary repairs, until they can fit it into their programme for permanent replacement.

Mr V Barker noted that he has been to site and seen this, highlighting that there is a brick garden wall along the drain side, noting that it may be beneficial to put a return pile in the drain side to protect it from running silt. The Operations Manager noted that LCC have suggested this, which will also stabilise the bank.

(viii) QUADRING FEN – No. 50 – FX1761

This culvert is under a highway, with the Lincolnshire County Council (LCC) having done a temporary repair. The concern is the lose stone that has been placed on top of the pipe. LCC are aware of this, confirming that it is only a temporary repair and will complete a permanent replacement as soon as possible.

Mr V Barker noted that he has sent a video of this, showing brown water running through the pipe, suggesting that this could indicate another collapse inside. The video was displayed on screen.

The Operations Manager noted that this could be a possibility, if it is believed to be a detriment to flows then the Board will act upon it.

(d) CULVERT SURVEYS

The Operations Manager drew the committee's attention to the culvert survey panning map, showing what has and hasn't been completed.

The Operations Manager noted the discussion had at the last meeting and about the possibility of looking at getting outside help to conduct the surveys. The Operations Manager noted there have been no surveys carried out by outside staff but has been 201 completed in 2019 and 172 completed in 2020 by the Board's workforce.

There is around 980 left to complete, with the Operations Manager believing that this could be completed with the Board's workforce only, as opposed to getting outside help. A workforce pair can comfortably complete 25 surveys per day, which equates to 40 days / 8 weeks work if it is only the one pair doing them, the ideal being to get it done as soon as possible. If outside surveyors were brought in, they would most probably need to be accompanied by a member of the Board's workforce anyway.

The Chairman felt the expertise and constant quality of surveys is definitely an advantage of the surveys being completed by the Board's workforce, if time allows. The Operations Manager noted that the restrictions are the seasonal difficulties including water levels and vegetation.

The Chief Executive questioned whether the ones that are left are more difficult to inspect than the ones already completed? Also questioning what detriment there would be to other programmed works if completing them by Board's workforce only? The Chief Executive finally suggested that the committee could provide a timeframe that they would like to see the remaining culvert surveys completed by.

The Operations Manager noted that when the culvert surveys commenced there were 4 teams available and a lot completed, but this does take a big resource from other jobs that require doing. Once completed, the information will be able to be developed and a plan completed.

Mr V Barker noted that the committee don't actually get to see the survey results, therefore not knowing how many have been identified as in poor condition or good condition and not knowing how many can be expected to fail in a given time, this will then give an idea of the workload to be expected. Mr V Barker clarified that the committee don't need to know each individual culvert report, but as groups, i.e., those identified as in 'poor condition', 'very poor condition' etc.

The Operations Manager explained that the culverts are rated from 1 – 5, for each aspect of the culvert, i.e., the pipe, headwalls etc. It is also dependant on the person completing the surveys and what is visible on the day of inspection.

Cllr M Cooper noted that most of the culverts aren't the Board's or the Board's responsibility, so is it really beneficial or necessary to be using the workforce's time to inspect them all? The Chairman responded that it is the Board's responsibility to transfer water so therefore the Board need to know where the weak points are in the system to enable water conveyance and gain some 'pre-warning' about where problems may arise. Cllr M Cooper questioned whether it is efficient, questioning whether the culverts that have collapsed and been presented earlier in the meeting were on the radar as in poor condition from their inspection survey, noting that he feels it is a lot of work that may not be providing good value.

The Operations Manager added that they are still working to the original idea of looking at what is within the catchment, classified as assets, the surveys can then help determine if any are full Board responsibility.

Cllr P Skinner added to Cllr M Coopers point, noting that a 'watch list' really needs to be established at the time of the surveys, so that site visits can take place more frequently to monitor so that the Board are able to be proactive as opposed to reactive.

The Chairman agreed, noting that to be proactive, the information needs to be available, adding that a realistic timescale to complete the remaining surveys would perhaps be another two seasons. Further noting that it may be beneficial to focus on the inspections in the Spring to try and avoid inhibiting factors such as high water levels and vegetation growth.

The Chairman expressed his support for getting the surveys and therefore database completed, to enable the committee and Board's Officers to move into the second stage of using the information to be proactive.

The Chief Executive noted that the inspections won't stop once they have all been completed it will continually roll on to enable a proactive approach, suggesting that a report regarding the frequency, inspections and category of what they have been identified as be presented at the next meeting.

Mr V Barker felt that two seasons is very admiral, but not necessarily manageable, noting that management don't want to be tied down by this, noting the committee should be prepared for it to possibly take longer.

The Operations Manager also highlighted that a new system has been developed by the GIS Technician; a digital culvert inspection form that will automatically transfer the information on the inspection sheet into the database. At the moment, the culvert surveys are being carried out on pen and paper and then physically transcribed into the database, which is a lengthy administrative job. Therefore, there may be the possibility of purchasing two tablets in the future for the workforce to complete the inspections on.

(e) STRUCTURES REPLACEMENT PROGRAMME 2021/22

The Operations Manager noted that these are carried over from the previous year. All AGREED the Structures Replacement Programme 2021/22 as below:

No. 635	Swineshead	15m x 0.6m	Armco	£1,000 max contribution
No. 1795	Kirton	12m x 0.6m	Armco	£1,000 max contribution
No. 2880	Kirton	9m x 0.6m	BAT	Potential to give this up

1760 ANY OTHER BUSINESS - Agenda Item 11

(a) LOAD BEARING OF CULVERTS

Mr V Barker referred to twin wall culverts, in relation to depth, soil cover and the heavy machinery crossing them, and about understanding the load bearing of them, and the specification of the pipe. The Operations Manager noted that the specification can be provided, it is highways specification.

(b) GRAFT DRAIN CULVERT

Mr V Barker referred to the last culvert that has been put in on the Graft Drain, expressing his confusion as to why it has been put in when there are a number of other access points and the number of culverts is trying to be reduced. The Operations Manager confirmed that it is part of a scheme and that the landowner requested it.

(c) RISEGATE DRAIN – ELECTRICITY POLES

Mr V Barker referred to the electricity poles on the Risegate Drain verges, noting that the drain owned by the Board should be straight forward to get a wayleave payment from the electricity board. In relation to the other side, the Board would likely need to apply for ownership of the land to be able to claim a wayleave payment for that. Mr V Barker noted the time it takes to move around these poles in Board's machinery and so feels it should be compensated for. The Chief Executive responded that he will look into it.

(d) MAP BOOK

Mr P Holmes noted an old map book of the Black Sluice IDB catchment that he had found, adding that he will have a look at it to see what detail is included and share with the Board's Officer's.

There being no further business the meeting closed at 16:02.

BLACK SLUICE INTERNAL DRAINAGE BOARD

STRUCTURES COMMITTEE - 22nd MARCH 2022

AGENDA ITEM 06

BYELAW INFRINGEMENTS AND HOW CAN WE ENGAGE MORE WITH OUR LOCAL PLANNING OFFICERS

Geographically the Black Sluice Catchment covers four different planning authorities: Boston Borough Council, South Holland District Council, South Kesteven District Council and North Kesteven District Council. They in turn have differing Planning, Strategic Infrastructure or Development officers that deal with all aspects of planning applications and development both large and small.

We have invited Mike Gildersleeves, the Assistant Director of Planning & Strategic Infrastructure for Boston Borough Council, East Lindsey District Council and South Holland District Council to listen to our concerns, in the hope we can develop a better understanding of the Byelaw infringement issues we have to deal with.

We will use current housing estate development scenarios around Boston as examples, i.e., planning approval and/or permitted development obtained for development within the Board's 9m Byelaw distance of a Board maintained watercourse/culvert that introduces mechanical access issues and/or deposition of vegetation and silt.

Mike has met on site with members of our Operations Team who have explained the problems and scenarios we are having to address, and we look forward to hearing any suggestions he may have to help resolve this important issue.

BLACK SLUICE INTERNAL DRAINAGE BOARD

STRUCTURES COMMITTEE – 22nd MARCH 2022

AGENDA ITEM 07

TERMS OF REFERENCE: STRUCTURES COMMITTEE

1. GENERAL

The Committee shall have EIGHT members who will be appointed by the Board.

The Chairperson shall be elected by the committee at the triennial general meeting of the Board, being the first board meeting following an election.

2. MEETINGS OF THE COMMITTEE

The Committee shall meet at least once in every 12-month period and a quorum shall be FOUR members.

No one other than the Committee members shall be entitled to attend Committee Meetings, but any other persons may attend meetings if invited by the Committee.

3. POWERS OF THE COMMITTEE

If a Board replacement structure benefit contribution cannot be agreed between the Officers and an Owner/Occupier the Committee will have final determination as highlighted in section 6.6b(i) & 6.9 of The Structures Replacement Policy.

Delegated powers are given to the Chief Executive and the relevant Structures or Works Committee Chairpeople to reconstruct structures as long as the budgets are not exceeded and the Owner/Occupier pays a contribution towards the cost in line with the guidelines in the Structures Replacement Policy. In all other cases, the power to determine applications is delegated to the Structures Committee, the appropriate Works Committee or the Executive Committee, unless a Board meeting is more timely.

4. RESPONSIBILITIES OF THE COMMITTEE

The responsibilities of the Committee shall include:

a) To operate within the guidelines of the Structures Replacement Policy.

b) To determine all other relevant decisions relating to structures and report these to the Board.

5. REPORTING

Minutes of meetings of the Committee shall be presented to the next meeting of the Board.

The Committee shall review its terms of reference after every triennial general meeting and its own effectiveness and recommend any necessary changes to the Board.

REVIEWED BY THE COMMITTEE: 22 MARCH 2022
APPROVED BY THE BOARD: 30 JUNE 2021

Black Sluice Internal Drainage Board

Policy No: 9

Structures Replacement Policy

Review Dates:

Board Approved	30th June 2021
Reviewed by the Structures Committee	22nd March 2022

1. PURPOSE

This document sets out the policy of the Black Sluice Internal Drainage Board concerning the repair or replacement of structures where the integrity of the structure deteriorates to such an extent that it is unable to convey the necessary flow in the drainage channel, or if it becomes unsafe for either vehicle or pedestrian traffic to cross the watercourse.

In the first instance, if a structure has deteriorated to such an extent that it is holding up the flow of water, then the obstruction shall be removed by the Board.

2. INTRODUCTION

The structures that will be included in this policy include:

a) Clear span bridges constructed to take all types of vehicles.
b) Clear span bridges for pedestrian use only.
c) Culverts constructed to provide access across the watercourse.
d) Culverts constructed for the purpose of maintaining the flow in watercourses where there is instability to the banks.

3. BLACK SLUICE POLICY

This policy is concerned with the replacement of existing structures only.

The Board has a separate policy which addresses applications to place new structures in/over watercourses.

4. REASONS FOR THE POLICY

The policy formalises the baseline conditions above and gives written guidelines for more specific instances. The benefits of the policy are:

- Fairness and uniformity in the Owner/Occupier contributing to the cost of reconstructing sub-standard structures.
- The provision of clear guidelines to the Owners/Occupier.
- Powers are delegated giving a more efficient and timely service.

However, this policy is not intended to cover every eventuality and the Board (in formal meeting) may waive the policy and make a determination on the basis of reasonable fairness to all parties.

5. DELEGATED POWERS

Delegated powers are given to the Chief Executive and the relevant Structures or Works Committee Chairpeople to reconstruct structures as long as the budgets are not exceeded and the Owner/Occupier pays a contribution towards the cost in line with the guidelines in this policy.

In all other cases, the power to determine applications is delegated to the Structures Committee, the appropriate Works Committee or the Executive Committee, unless a Board meeting is more timely.

6. GUIDELINES

Guidelines are given below on the following types of structures:

a) Structures carrying Highways maintained by LCC.
b) Structures used by the Owner/Occupier.
c) Structures used by both the Board and the Owner/Occupier.
d) Structures constructed by the Board to allow free drainage of the land.

6.1 Structures Carrying Highways

It is generally the case that all clear span bridges and culverts carrying LCC highways are owned and maintained by LCC. If replacement is required because the structure is substandard then LCC will be responsible for the total cost of the reconstruction.

6.2 Clear Span Foot Bridges

It is generally the case that all clear span footbridges which carry footpaths over Board maintained watercourses are owned and maintained by LCC. If replacement is required because the structure is substandard, then LCC will be responsible for the total cost of the reconstruction.

6.3 Clear Span Access Bridges

These in general provide access for farm machinery to fields or to individual properties. They are mostly constructed in large watercourses.

If refurbishment or replacement is required because the structure is substandard, then the Owner/Occupier will be responsible for the total cost of the reconstruction.

These in general will not be used by Board's machinery to gain access to the opposite side of the watercourse.

However, if a substandard structure is infrequently used by the Board, and the Owner/Occupier of the structure proposes to refurbish or reconstruct the bridge, the Board may offer a contribution in line with clause 6.6 (b) towards the cost of this work.

6.4 Structures owned by the Board and Used for Access by the Owner/Occupier

These structures are required by the Board as well as the landowner to gain access for maintenance of watercourses.

The cost of any reconstruction of substandard structures in this category will be paid for by the Board and the structure will remain as a structure to be maintained by the Board.

6.5 Structure Used by all Parties

a) These structures are required by the Owner/Occupier to gain access to their land and could be used by the Board for their maintenance activities.

b) If a structure has been inspected and reported as substandard and in need of reconstruction the landowner will be notified in writing.

(i) Provided there is an accepted need for a structure at this location, the Owner/Occupier and Operations Manager will meet. A reconstruction quotation will be offered along with a benefit contribution in relation to the Board's use of the structure as a crossing point.

(ii) After the structure has been reconstructed, it will be deemed that the landowner will be responsible for its future maintenance.

(iii) If a benefit contribution cannot be agreed the Operations Manager will send all the relevant information to the Structures Committee for further review and determination.

c) Before any consideration is given to the reconstruction of the structure, the Owner/Occupier should be approached to ascertain if there is a future need for the structure. Consideration should be given to removing two or more accesses into a field and the provision of one in the future.

d) A culvert shall be constructed with a top width of 6.0 metres. If the Owner/Occupier requests a culvert with a wider top width, then they shall pay for the total extra cost of this work.

e) After the culvert has been replaced, the Owner/Occupier will be responsible for any future maintenance, or reconstruction of the structure.

f) If a structure has been constructed in a Board maintained watercourse, and there is clear evidence that the Board has written to the Owner/Occupier confirming the future maintenance arrangements, then the Owner/Occupier shall be totally responsible for the reconstruction of the structure.

g) If a structure is removed by the Board because it is holding up the flow of water, and has not been replaced by a new structure within a period of five years, then the offer of contribution will no longer be applicable and the Owner/Occupier will be required to pay the full cost of the construction of a new structure at this location.

h) If the Board undertake a watercourse improvement scheme which includes the reconstruction of a structure, the Board will pay the total cost of the reconstruction, but the Owner/Occupier will be required to be responsible for the future maintenance of the structure.

6.6 Culverts Used for Free Drainage

Examples of these lengths of culverts are:-

- Lengths of watercourse culverted instead of undertaking revetment works.
- Lengths of watercourse culverted to allow disposal of excavated soil.

These are the Board's responsibility, and any reconstruction required will be paid for by the Board. Responsibility for the future maintenance of the asset will remain with the Board.

6.7 Redundant Structures

If the Board agrees with the Owner/Occupier that a structure is redundant, the Board will remove the structure and all backfill material and deposit any suitable materials on fields adjacent to the location of the culvert.

If agreed and required, the Board will dispose of the excavated material at an agreed cost with the Owner/Occupier.

6.8 Further Guidance

If the Owner/Occupier is unhappy about the circumstances of a particular structure designation, then this should be referred to the Structures Committee for final determination.

Contractors may be appointed by the Owner/Occupier to complete the works, the Board will set an invert level on site, offer specification suggestions and inspect the works during the construction phase, a set fee of £250.00 + VAT will be offset against any contribution made by the Board.

Inspection's frequencies to be completed by the Board, adequate notification time to be received from the contractor:

- when excavation to invert level and bases for headwalls is complete.
- when the pipe is laid prior to being backfilled, invert level checked and verified.
- when the headwalls are being constructed.

The next stage of construction should not go ahead until the previous stage has been inspected / approved by the Board.

BLACK SLUICE INTERNAL DRAINAGE BOARD

STRUCTURES COMMITTEE - 22nd MARCH 2022

AGENDA ITEM 09

STRUCTURES REPORT 2022

(i) Structures Replacement / Contribution Programme 2022/23

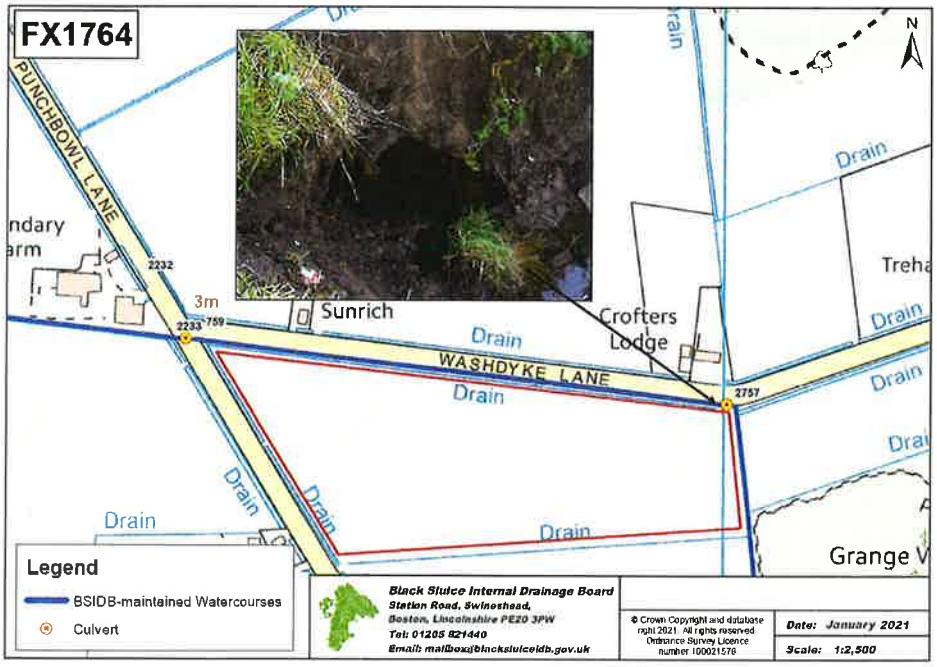
Proposed replacement/contribution towards for 2022/23, none of these completed in 2021/22:

No. 635	Swineshead	15m x 0.6m	Armco	£1k max contribution
No. 1795	Kirton	12m x 0.6m	Armco	£1k max contribution
No. 2880	Kirton	9m x 0.6m	BAT	Potential to give this up
No 1469	Bicker Fen	18m x 1200mm	Armco	£1k max contribution
No 2757	Holland Fen	12m x 600mm	Armco	£1k max contribution

(a) Boston West - No 2757 - FX1764 - 12m x 600mm Armco (Field entrance, close to road)

The condition of this culvert is monitored, LCC have been informed about the landowners concerns and the proximity to the highway. The land is tenanted, and the tenant requires the culvert to be replaced.

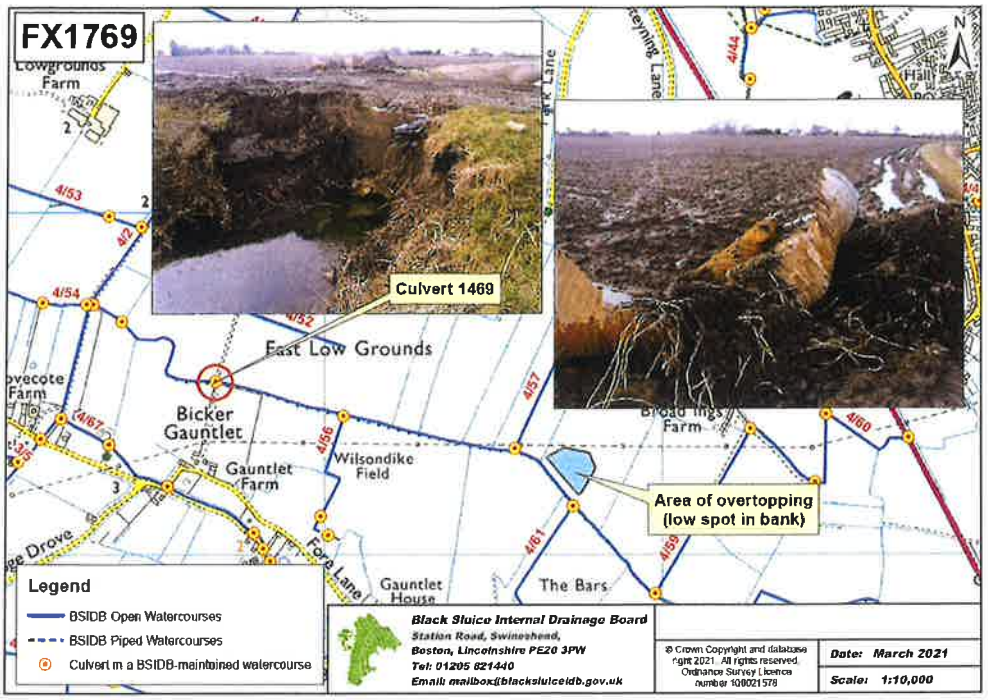
A contribution may be beneficial and offered towards the replacement of this culvert: £1,000 estimate.



(b) Bicker Fen - No 1469 - FX1769 - 18m x 1200mm Armco (Farm track Field entrance)

This culvert has partially collapsed, the blockage removed by the Board. The Operations Manager has discussed with the landowner about potential replacement.

A contribution may be beneficial and offered towards the replacement of this culvert: £1,000 estimate.



(ii) Culvert Surveys Reports

This year Board's Operatives have been using an App on their phones to complete culvert surveys. ArcGIS Survey123 is one of the apps in ArcGIS software. It is a form-centric app for creating, sharing and analysing survey data. It is used to collect data via web or mobile devices. It can be used when disconnected from the Internet.

Survey123 supports logic and validation rules such as default values, calculations, cascading questions, grouping and relevant associations. Such options enable survey authors to create forms with sophisticated logic that will capture the appropriate information relevant to business needs. Surveys created on the web can be downloaded to desktop or mobile device and used in the Survey123 field app. ArcGIS123 can be customised according to the requirements.

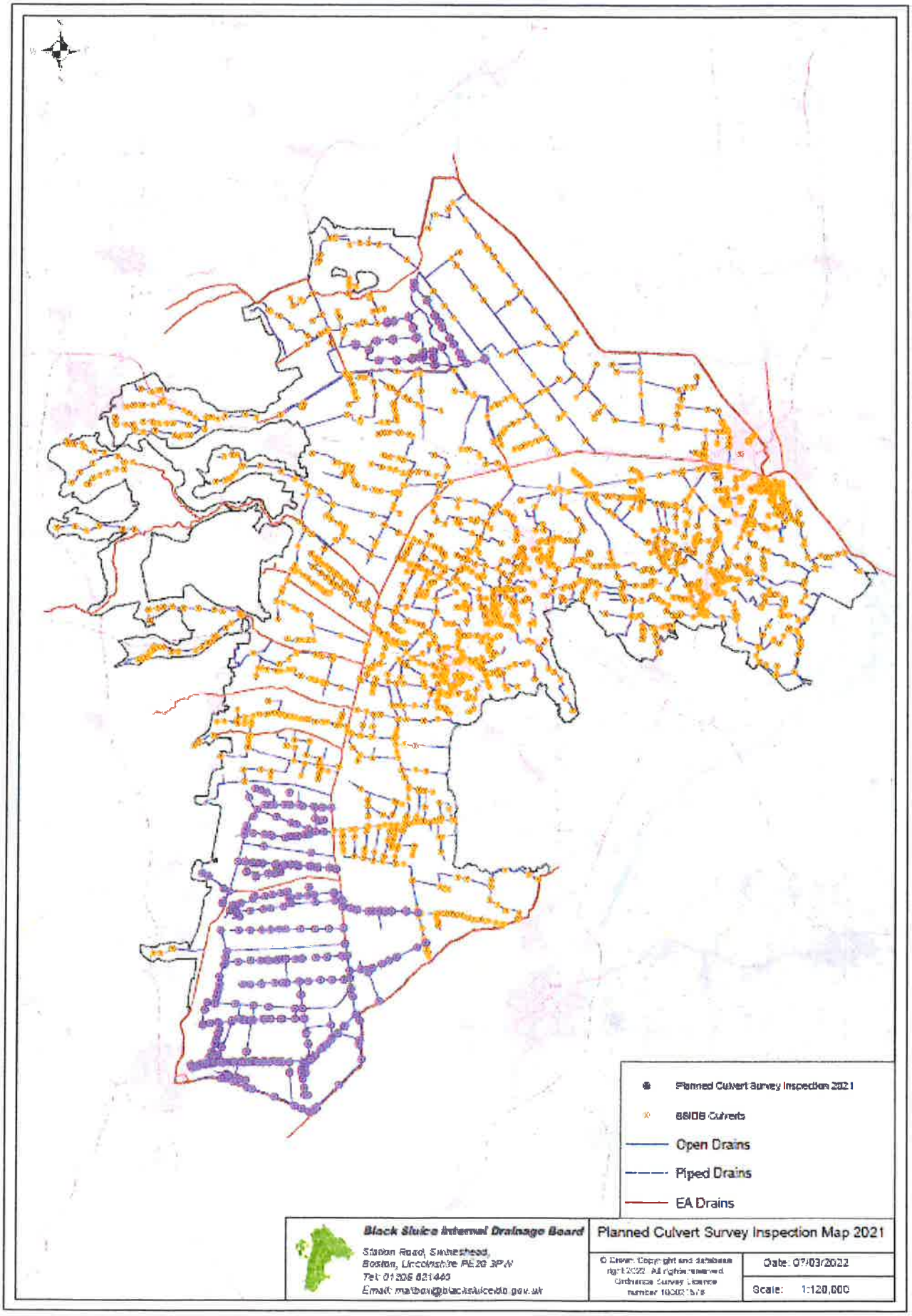
BSIDB Culvert Inspection ArcGIS Survey123 App

Culvert Survey reports
Information on culvert surveys completed in 2021/22

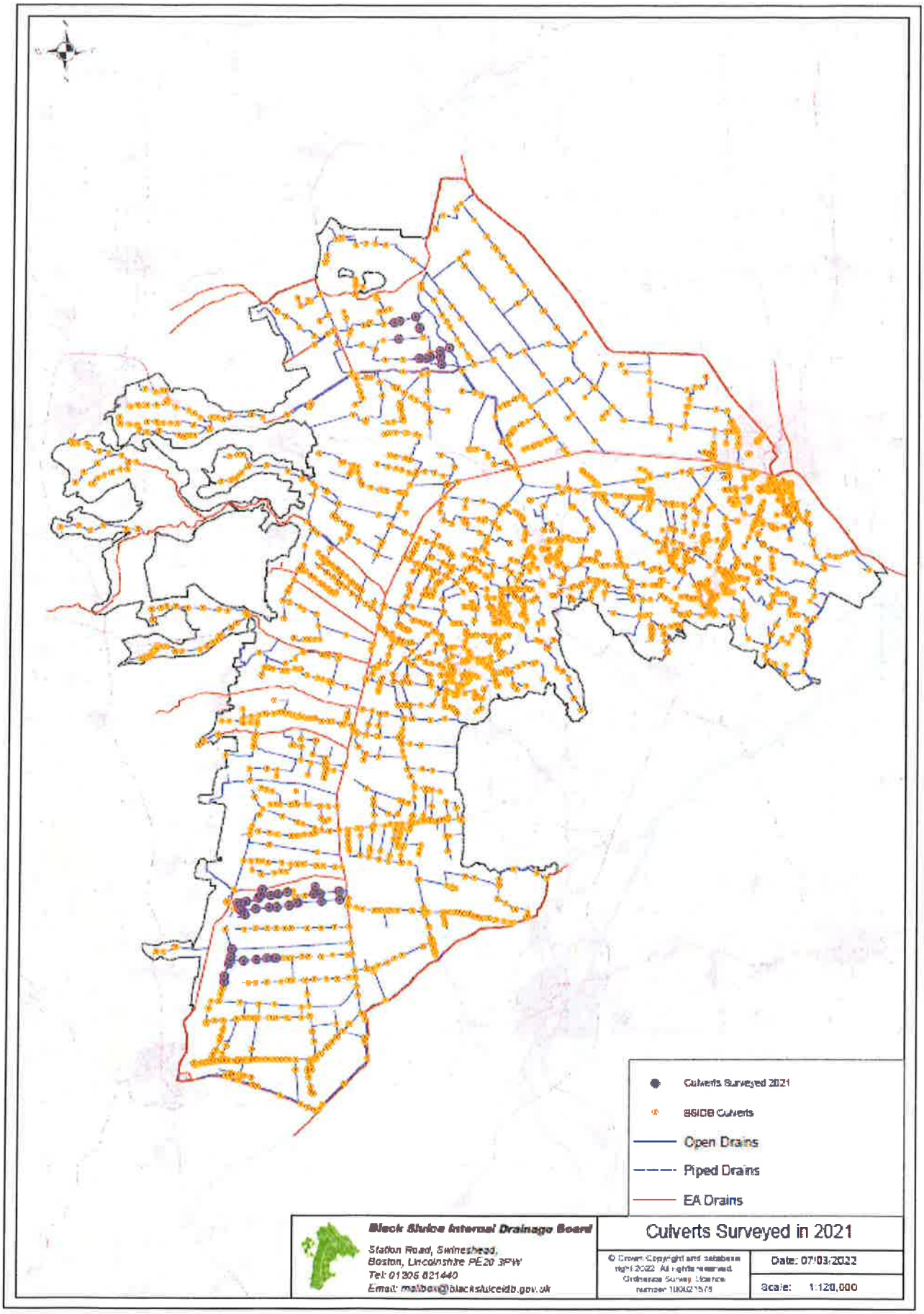
Asset ID	Drain No.	Condition of Pipe	Condition of Head Wall	Condition of Tunnel	Asset Usage	Depth (mm) of Water Channel	Tunnel Material	Length of Tunnel (m)	Width of Tunnel (mm)	Height of Tunnel (mm)	Inspection Type	Inspection Status
1343	25/4	2 Good	2 Good	2 Good	Field Access	1507	Brick_Arch	7000	600	600	Visual	Inspected
726	14/1	1 Very Good	1 Very Good	1 Very Good	Road	1000	Brick_Arch	6	9000	3048	Visual	Inspected
1344	25/4	4 Poor	4 Poor	4 Poor	Field Access	100	Pipe_Arch	6	300	300	Visual	Inspected
2021	14/1	2 Good	2 Good	2 Good	Field Access	1000	<Null>	<Null>	<Null>	<Null>	Visual	Inspected
2022	14/2	2 Good	2 Good	2 Good	Farm Track	300	<Null>	<Null>	1200	1200	Visual	Inspected
1336	25/5	3 Fair	3 Fair	2 Good	Field Access	200	Pipe_Arch	6	600	600	Visual	Inspected
1335	25/5	1 Very Good	1 Very Good	1 Very Good	Field Access	<Null>	Pipe_Arch	8	600	600	Visual	Inspected
1334	25/2	2 Good	2 Good	2 Good	Field Access	<Null>	Pipe_Arch	7	600	600	Visual	Inspected
1337	25/5	2 Good	2 Good	2 Good	Field Access	450	<Null>	7	600	600	Visual	Inspected
1331	25/5	2 Good	2 Good	2 Good	Farm Track	<Null>	Pipe_Arch	13	900	900	Visual	Inspected
1330	25/2	2 Good	2 Good	2 Good	Farm Track	600	Pipe_Arch	14	900	900	Visual	Inspected
1329	25/2	2 Good	2 Good	2 Good	Field Access	<Null>	Pipe_Arch	7	1000	1000	Visual	Inspected
2073	25/2	2 Good	2 Good	2 Good	Field Access	450	Pipe_Arch	10	450	450	Visual	Inspected
1328	25/2	2 Good	2 Good	2 Good	Field Access	300	Pipe_Arch	6	1200	1200	Visual	Inspected
1327	25/2	2 Good	4 Poor	2 Good	Field Access	500	Pipe_Arch	6	1200	1200	Visual	Inspected
1326	25/2	2 Good	2 Good	2 Good	Field Access	600	<Null>	10	1200	1200	Visual	Inspected
1325	25/2	2 Good	2 Good	2 Good	Farm Track	500	Pipe_Arch	12	1200	1200	Visual	Inspected
783	25/1	2 Good	2 Good	2 Good	Farm Track	600	Pipe_Arch	14	900	900	Visual	Inspected
782	25/1	2 Good	2 Good	2 Good	Farm Track	750	Pipe_Arch	11	900	900	Visual	Inspected
781	25/1	2 Good	2 Good	2 Good	Road	300	Brick_Arch	7	1200	1800	Visual	Inspected
2678	25/3	2 Good	2 Good	2 Good	Farm Track	300	Pipe_Arch	7	600	600	Visual	Inspected
1341	25/3	2 Good	2 Good	2 Good	Road	250	Pipe_Arch	11	600	600	Visual	Inspected
764	25/1	2 Good	2 Good	2 Good	Field Access	300	Pipe_Arch	7	900	900	Visual	Inspected
762	25/1	2 Good	2 Good	2 Good	Field Access	300	Pipe_Arch	7	900	900	Visual	Inspected
761	25/1	2 Good	2 Good	2 Good	Field Access	300	Pipe_Arch	6	900	900	Visual	Inspected
760	25/4	2 Good	2 Good	2 Good	Field Access	50	Pipe_Arch	17	600	600	Visual	Inspected
1339	25/4	2 Good	2 Good	2 Good	Field Access	50	Pipe_Arch	8	450	450	Visual	Inspected
1338	25/4	4 Poor	2 Good	3 Fair	Field Access	50	Pipe_Arch	<Null>	450	450	Visual	Inspected
1340	20	3 Fair	4 Poor	5 Very Poor	Field Access	0	Brick_Arch	7	1200	1800	Visual	Inspected
1396	28/33	2 Good	2 Good	2 Good	Road	600	Pipe_Arch	9	900	900	Visual	Inspected
1400	28/33	4 Poor	2 Good	4 Poor	Field Access	300	Pipe_Arch	10	600	600	Visual	Inspected
1399	28/33	4 Poor	2 Good	4 Poor	Farm Track	300	Pipe_Arch	10	600	600	Visual	Inspected
1348	28/23	2 Good	4 Poor	2 Good	Farm Track	100	Brick_Arch	11	600	600	Visual	Inspected
3564	28/33	4 Poor	2 Good	5 Very Poor	Field Access	0	Pipe_Arch	<Null>	150	150	Visual	Inspected
1397	28/33	2 Good	2 Good	2 Good	Field Access	100	Pipe_Arch	25	750	750	Visual	Inspected
1349	28/30	2 Good	2 Good	2 Good	Field Access	150	Pipe_Arch	10	600	600	Visual	Inspected
1351	28/30	2 Good	2 Good	2 Good	Field Access	150	Brick_Arch	6	1200	1800	Visual	Inspected
1352	28/30	2 Good	2 Good	2 Good	Field Access	100	Pipe_Arch	7	900	900	Visual	Inspected

1353	28/30	5 Very Poor	5 Very Poor	5 Very Poor	Drive Way	300	Pipe_Arch	32	750	750	Visual	Inspected
1354	28/30	2 Good	2 Good	2 Good	Drive Way	300	Brick_Arch	7	1500	1800	Visual	Inspected
2998	14/6	1 Very Good	1 Very Good	1 Very Good	<Null>	<Null>	<Null>	4	3000	2000	Visual	Inspected
3000	14/6	1 Very Good	1 Very Good	1 Very Good	<Null>	<Null>	<Null>	12	4000	2000	Visual	Inspected
3007	14/4	1 Very Good	1 Very Good	1 Very Good	Farm Track	300	Pipe_Arch	12	900	900	Visual	Inspected
3006	14/4	2 Good	2 Good	2 Good	Field Access	300	<Null>	<Null>	300	300	Visual	Inspected
3001	14/4	2 Good	2 Good	2 Good	Farm Track	300	Pipe_Arch	12	450	450	Visual	Inspected
3005	14/4	1 Very Good	2 Good	1 Very Good	Field Access	450	Pipe_Arch	12	900	900	Visual	Inspected
2554	14/3	1 Very Good	1 Very Good	1 Very Good	Road	300	Pipe_Arch	18	900	900	Visual	Inspected
2553	14/57	1 Very Good	1 Very Good	1 Very Good	Field Access	300	Pipe_Arch	12	900	900	Visual	Inspected
3002	14/5	2 Good	2 Good	2 Good	Field Access	450	Pipe_Arch	8	900	900	Visual	Inspected
2075	14/2	2 Good	2 Good	2 Good	Field Access	<Null>	<Null>	<Null>	<Null>	<Null>	Visual	Inspected
835	14/2	2 Good	2 Good	2 Good	Field Access	300	Pipe_Arch	12	900	900	Visual	Inspected
2074	14/2	2 Good	2 Good	2 Good	Field Access	<Null>	<Null>	<Null>	<Null>	<Null>	Visual	Inspected
3331	14/1	1 Very Good	1 Very Good	1 Very Good	Road	450	Pipe_Arch	14	900	900	Visual	Inspected

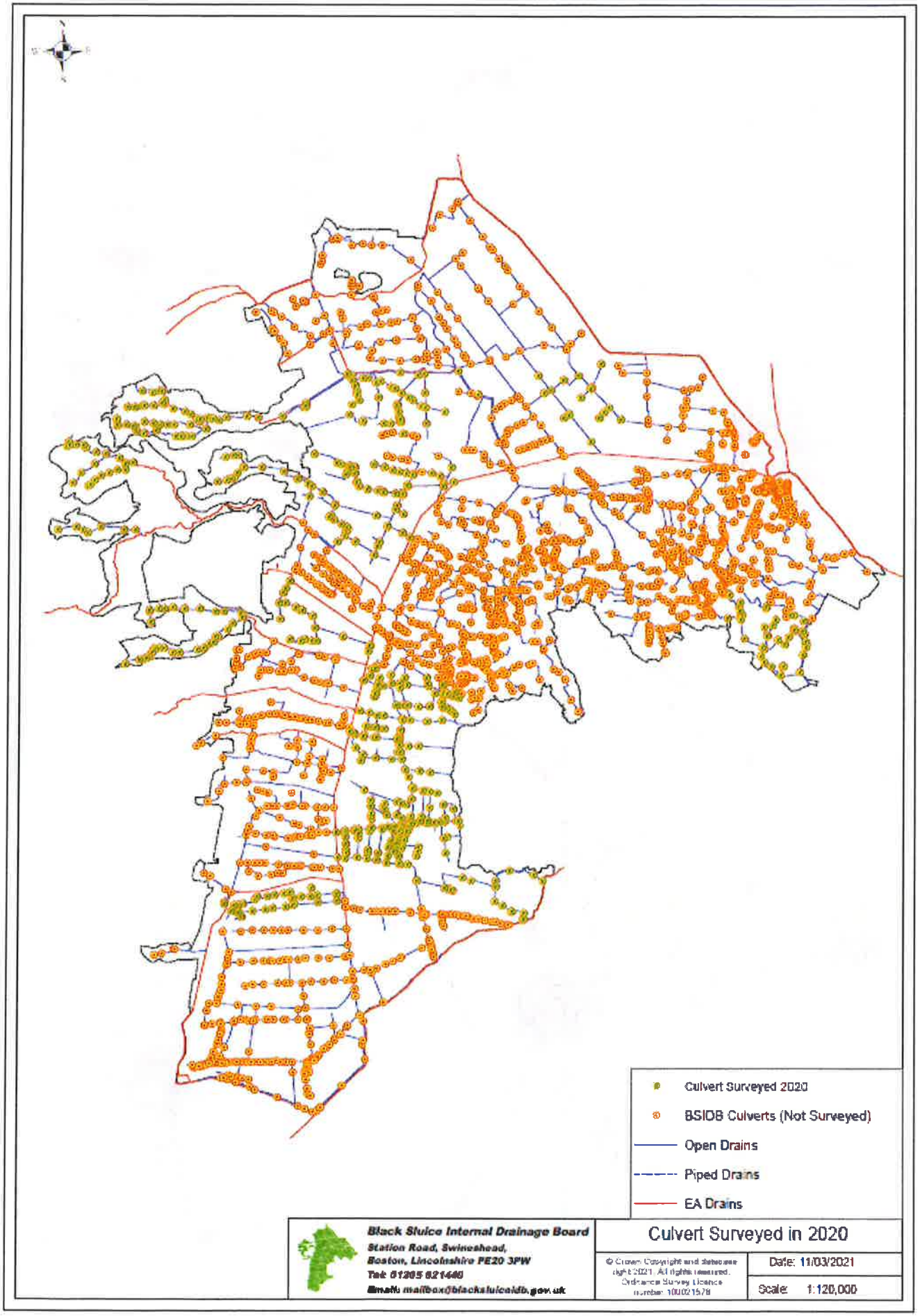
Culvert Survey Planning Map 2021



Culverts surveyed in 2021 = 53



Culverts surveyed in 2020 = 172

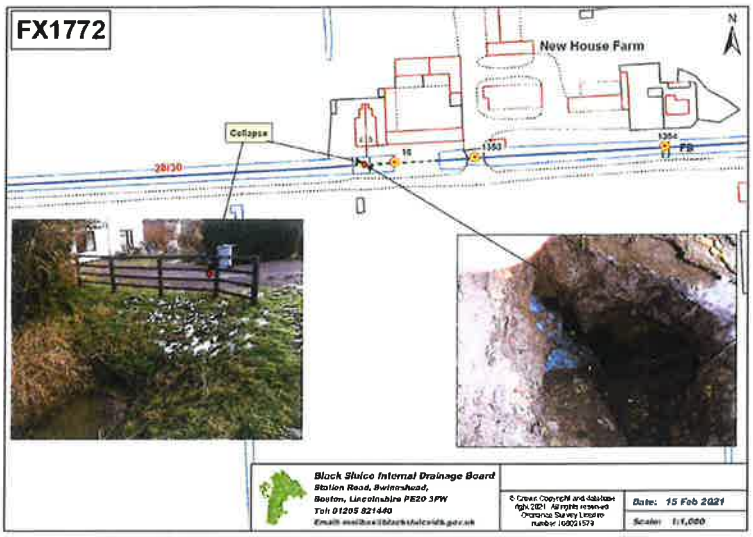


(iii) Culverts reported in a poor condition

The following information was provided at the last meeting and have included as background information for the update that follows.

(a) Morton Fen - No 16 - FX1772 30m x 900mm Armco

Having been notified of this by the landowner regarding a collapsed culvert in a Board maintained watercourse outside No. 4 Morton North Drove, it was investigated by a Board's officer. The culvert lies across the access to the property and extends approx. 30m east presumed to extend under the front garden of the property - collapsed section under driveway causing blockage. The Operations Manager has discussed this with the landowner, options, specification and estimates for repair or replacement to be provided.



Following correspondence on this matter with the landowner the Operations Manager had a site meeting in December 2021 to discuss a way forward with the collapsed culvert at this site. An estimate of £30,000+ was provided to replace the existing 30m x 900mm culvert as a visual inspection of the pipe from both ends shows corrosion along the water line. The partial collapse of the culvert is not currently impeding flows. It was at this meeting that the proposed development of the site was discussed, whereby it was stated that the proposal would have to be approved by the Board following an application.

The landowner has since asked if the Board would consider rerouting the drain around the properties along the line shown below, along with an email (included below).

Fig. 1

'Dear Paul,

As per our conversation on the 10th of February I am writing to highlight an urgent issue we have with a drain in Morton Fen.

The current drain runs in front of three properties where we currently have tenants. The culvert outside 4&5 North Fen is causing great concern and in my opinion is causing a risk to life due to the high risk of the surrounding area potentially collapsing further.

At the site meeting between yourself and Mark Taylor on the 1st of December 2021 you discussed the option of rerouting the ditch behind the farmyard, site which is approximately 360 metres. Can I please ask you to raise this as an urgent issue with the Board?

It seems that the best solution for both parties here would be to reroute as per the attached drawing. This would be cheaper and quicker than repairing in its current position, as if the culvert was to be dug out and replaced this would mean that the public road would have to be shut for the duration of the works, causing unnecessary inconvenience to road users and ourselves accessing fields. As the proximity of the houses and buildings affected and the public highway are so close to the culvert we fear that repair works may cause structural damage going forward.

The top priority however must be the safety of the public and our current tenants. The current condition of the culvert is causing an increased risk each day. With the weather at this time of year the condition is deteriorating daily and it is very close to the public highway as you are aware. I have also attached some photographs for you to share with the board. We have looked into covering the area with metal sheeting to enable the tenant to park his vehicle on the driveway and for access but have been informed that the current structure surrounding the hole is unstable and would not be able to hold this additional weight.

If the Board grant permission for the new ditch a 6 metre grass margin will be installed alongside the ditch to allow access all year round for maintenance. If any work was required in creating the new ditch which could be carried out by ourselves i.e. tree removal or excavator work we would be more than happy to work with the board to do this.

I look forward to hearing back from you very soon.'

The existing watercourse is 208m between the 2 red lines shown in Fig 1, and the proposed reroute is c380m. Existing survey data shows there is only 0.12m fall between the existing upstream and downstream section of this watercourse.

It has been requested that the landowner completes another survey to provide relevant bed levels from around the site, and advised that consideration towards ground conditions/soil type when rerouting should be considered, as there may be issues with stability of the banks.

If the reroute proposal is acceptable, it would then be advised that the existing culvert is suitably filled, suggestion would be foam concrete, but it would also be the responsibility of the applicant to make sure that any existing lateral pipe connections are not blocked, or suitable alternatives provided, which would be located when the survey is completed.

The Board would also require an application for the proposal. At the time of writing this report an application has not been received.

(iv) **Information on investigations at Ewerby, South Kyme & Damford Pumping Stations**

As reported previously during high water levels, water from main river outfalls at 3 of the Board's pumping stations, Ewerby Fen, South Kyme Fen and Damford Grounds is seeping back through the bank, under or through retaining walls at the sites causing unknown damage to the foundation and structure of the pumping station buildings.

A professional survey was commissioned, using Stantec, through consultation with the Environment Agency who have agreed to cover the costs incurred for the inspections, (estimated at c£10,000 including Board's resource) completed in August 2020.

Following completion of the initial site inspections, Stantec were then commissioned to complete ground investigations at each of the 3 sites, the onsite/targeted trial pit excavations to include a report of findings and remedial recommendations, which commenced in February 2021. Stantec engineers returning to the site's w/c 08.03.21. The investigations at these 3 sites have now been completed.

Technical notes for investigations completed are included for Ewerby Fen (pages 28 – 38), South Kyme Fen (pages 39 – 44) and Damford Grounds (pages 45 – 50).

Stantec, site investigation information & costs; Ewerby Fen £5,700, South Kyme Fen £9,800 and Damford £6,550, (estimated total to include Board resource c£25,000).

Trinity College p/s water seepage from Long Skerth

During the latest events, reports were received, that during high water levels, water has also started to seep through the banks of the main river outfall adjacent to Trinity College P/S, Stantec have been informed and having produced a proposal for this site, have now completed a site inspection to attempt to locate the likely leakage path and identify the most appropriate locations for ground investigation work. Inspections were completed for £1,970. The Technical note for the inspections completed are included (pages 51 – 56).

The investigations required at this site being more extensive have been arranged with costs of £14,250, with initial site investigations to start w/c 21.03.22

Information on next stage proposal from Stantec for Ewerby, South Kyme & Damford Pumping Stations

On completion of the ground investigation at these sites, Stantec were asked to provide a proposal for consideration towards a solution to the problem.

There seems to be some misinterpretation of the requirements and they have provided a proposal towards design support as outlined in (pages 57 – 63).

The proposed costs at £17,500 for Phase 1 and budget estimate costs for Phase 2 between £22,000 & £32,000 dependent upon findings in Phase 1, would be another additional c£50,000 on top of the c£50,000 spent. However, there would also be additional costs not specified in their proposal, as a topographic survey for each site would be required as a minimum.

Having themselves provided all of the information proposed for review, it seems as though all that is now required is to move directly to the outline design of the options.

TECHNICAL NOTE

Job Name: Black Sluice

Job No: 48702

Note No: TN005

Date: 07/05/2020

Prepared By: L Truslove (Principal Engineer)

Reviewed By: L Tomlin (Senior Associate)

Approved By: Daniel Sharp (Director)

Subject: **EWERBY PUMPING STATION - GROUND INVESTIGATION**

1. Introduction

Stantec has been commissioned by Black Sluice Internal Drainage Board (IDB) (the Client) to design, monitor and report upon a ground investigation at the site of the Ewerby Pumping Station, near South Kyme, Lincolnshire. The work was commissioned after seepage was observed to be occurring at the pumping station, apparently beneath the flood walls located either side of the pumping station. The purpose of this Technical Note is to summarise the ground conditions recorded during the ground investigation works and to make recommendations for potential remedial measures to mitigate against future seepages.

The pumping station is located approximately 2km southwest of South Kyme, Lincolnshire at approximate national grid reference 515954E, 348362N. The pumping station is situated at the head of the Midfodder Dyke and pumps water up to the higher level Hodge Dyke.

2. Background

The IDB reported water seepage through the embankment on either side of the pumping station at times of record high water levels within the Hodge Dyke during the extreme wet weather of February 2020. Following this Stantec carried out a site visit and produced a technical note (48702 TN001, dated 25th September 2020) summarising the observations made and making recommendations for ground investigation. This Technical Note (TN005) is to be read in conjunction with TN001.

The layout of the pumping station in plan and cross section is shown on IDB drawings made available to Stantec and included in **Appendix A**. The *General Layout and Foundations* drawing, dated August 1953, shows that the pumping station is apparently founded on a combination of steel sheet piles and driven concrete piles with localised mass concrete infill. The *Detail of Floors* drawing, dated October 1953 shows the walls of the north-eastern and south-eastern sides of the pumping station building being founded on a concrete capping beam 3 feet (c. 0.9m) wide and that sits atop precast concrete piles. These capping beams are shown as extending out laterally around 1 foot (c. 0.3m) from the walls of the building.

Drawing 08116-028P *Replacement Flood Wall* (revised 25/03/2010), included in **Appendix A**, shows refurbishment of the south-western side of the pumping station around 2010, which included replacing the existing steps (shown on the 1953 drawings) with a concrete slab and the construction of a new concrete flood wall 0.6m high atop a row of 3m long steel sheet piles. The drawing does not show the substructure of the building and so it is not clear how the end sheet pile of the flood wall interacts with the capping beam beneath the pumping station building wall.

On the south-western side of the pumping station the seepage emerged from beneath the new (2010) concrete slab that abuts the pumping station and the adjacent flood wall (see **Figure 1**).

On the north-eastern side of the pumping station the seepage emerged from the ground at the junction of the annex to the pumping station and the flood wall (see **Figure 2**). The historical drawings supplied by the IDB do not show the construction of the floodwall on the north-eastern side of the

pumping station. Its position (unlike the replaced south-eastern flood wall) appears to have been unchanged since the oldest drawings (dating from the 1950's) which suggest that the wall has not been replaced. It is assumed that the above ground flood wall at this location is the capping beam to a sheet piled wall.

Other observations of note were what appeared to be an animal burrow in the embankment on the southern side of the sheet piled wall on the south-western side of the pumping station (see **Figure 3**) and pipework in the crest of the embankment and a roof gutter downpipe apparently discharging on to the ground on the southern side of the north-eastern wing wall (see **Figure 4**).

Geological mapping indicates that the site is underlain by Tidal Flats Deposits (typically comprising soft silty clay, with layers of peat, sand and basal gravel) which overlie bedrock strata of the Ampthill Clay Formation (typically comprising mudstones that weather to clays near surface).

At the time of the ground investigation site work no obvious changes to the site in general were observed since the previous site visit by a Stantec engineer in August 2020.

3. Ground Investigation

The fieldwork was undertaken by Stantec on the 3rd February 2021 and comprised the sinking of four dynamic sample boreholes, designated WS301 to WS303 inclusive and WS303A and three hand excavated trial pits, designated HP01 to HP03. The rationale for the investigation was to record the composition of the embankment at the site of the seepages to attempt to determine a reason for the seepages and to record the geotechnical properties of the embankment fill and underlying strata to provide data for design of remedial measures

The fieldwork was carried out in general accordance with BS5930 and BS10175. The records of the exploratory holes are presented in **Appendix B**. The as dug positions of the exploratory holes are shown on **Drawings 1 & 2** in **Appendix B**. Scanning for utilities ahead of breaking ground was carried out by the client's representative who decided if and when it was safe to break ground at each exploratory hole location.

At the request of the client representative boreholes WS302 and WS303 were moved from their intended locations because of the presence of utilities in those areas. At the request of the client representative pit HP02 was moved from its intended location at the junction of the wing wall and the building due to the presence of buried cables in the area.

Borehole WS303 was terminated at a depth of 0.75m bgl on encountering a concrete slab possibly overlying an outfall pipe. Upon agreement with the client representative, this location was repositioned and redrilled as WS303A.

Disturbed small and bulk samples of soil samples were recovered from the exploratory holes and in-situ standard penetration testing (SPT) was undertaken at 1m depth intervals in the boreholes. Soil samples were submitted for laboratory geotechnical testing for soil classification purposes for the following:

- Natural Moisture Content.
- Atterberg Limits.
- Chemical testing.

The laboratory test data is presented in **Appendix C**.

4. Encountered Ground Conditions

The ground investigation generally recorded Made Ground overlying Tidal Flat Deposits in line with expectations. The Made Ground can be split into two types; sub-base beneath the concrete slab and embankment fill associated with ground raising around the pumping station.

Sub-Base

Sub-base was encountered beneath the concrete slab within borehole WS301 and hand pit HP01 to a maximum depth of 1.2m below ground level. The near surface of this stratum generally comprised coarse gravel of subangular limestone and sandstone with clay and silt sized particles increasing with depth within HP01. A geotextile separator was recorded at 0.6m depth in HP01. Underlying the geotextile separator, red brown angular gravel of brick and fine to medium sand was encountered to the base of the pit at 1.20m depth. The hand pit could not be excavated beyond this depth due to its inherent instability and was backfilled with arisings.

Embankment Fill

Embankment fill material was identified in boreholes WS301 to WS303A and hand pits HP02 and HP03 extending to a maximum depth of 1.60m bgl. The material was generally recorded as grey brown slightly gravelly clay overlain by slightly gravelly clay topsoil or sub-base (in WS301).

Visual assessment indicates that the material decreased in consistency with depth from firm or soft near surface to soft and very soft towards the base of the deposit.

With the exception of the granular sub-base materials at WS301 and HP01 detailed logging did not record anything (such as fissuring, voids or higher permeability materials) at the site of the seepage that could have been preferential pathways for the passage of water through the bund.

Two Atterberg Limits tests recorded liquid limits of 51% and 52%, plastic limits of 31% and 24% and plasticity index values of 20% and 28% respectively. These values are indicative of a material of high plasticity and medium volume change potential according to BRE Digest 240. A plasticity chart is present as **Figure 5**.

Two SPTs taken in the deposit at 1m bgl recorded N values of 7 and 8 in WS301 and WS303A respectively.

Tidal Flats Deposits

Tidal Flat deposits varied from a very soft dark greyish black organic clay to a very soft greyish brown clay. Locally, the deposit is described as 'sandy' or 'slightly gravelly' and occasionally horizons of fibrous plant material were encountered. A 100mm thick layer of peat was recorded in WS301 at 1.6m depth and a 200mm thick stratum of peat was recorded in WS303A at 1.0m depth.

Atterberg Limits tests recorded liquid and plastic limits of 26% to 120% and 11% to 49% respectively and plasticity index values of 10% to 71%. This indicates the material ranges from intermediate to extremely high plasticity clays and silts of low to high volume change potential according to BRE Digest 240. A plasticity chart is present as **Figure 5**.

Ten SPT N values were recorded in the deposit with a range of 0 to 9 and a general trend of increasing N value with depth. An SPT N vs Depth plot is present as **Figure 6**.

Four samples tested to BRE SD1 (2007) recorded pH values of 7.9 to 8.4 and a water-soluble sulphate levels of 0.06 to 0.58 g/l

Groundwater

The following groundwater strikes were recorded during the site work:

Location	Groundwater Strike Detail	Formation
WS301	2.0m bgl rising to 1.9m bgl after 20 minutes	Tidal Flat Deposits
WS302	4.0m bgl rising to 3.0m bgl after 20 minutes	Tidal Flat Deposits
WS303A	2.0m bgl rising to 1.1m bgl after 20 minutes	Tidal Flat Deposits

The standing groundwater levels in a monitoring well installed in WS301 was recorded on three occasions post site work between 8th March and 6th April 2021 with the well being found to be dry to 2.3m bgl on each occasion.

5. Characteristic Geotechnical Parameters

The following characteristic geotechnical parameters are considered appropriate for formations present on site.

Stratum	Bulk Density γ_b, kN/m^3	Undrained Shear Strength		Drained Shear Strength	
		ϕ_u, °	c_u, kN/m^2	ϕ', °	c', kN/m^2
Embankment Fill	17	0	40 at surface, decreasing linearly to 15 at the base of the deposit	25	0
Tidal Flats Deposits	16	0	15	21	0

Bulk unit weights are based on the description of the materials, their recommended characteristic undrained shear strength and the recommendations of Figures 1 and 2 of BS 8002, 2015.

Undrained friction angles are assumed to be zero.

Undrained shear strengths are based on the visual descriptions of the soils and the SPT data.

Effective angles of friction (ϕ') are based on the measured plasticity index and the recommendations of BS 8002, 2015.

With respect to groundwater levels, it is expected that a hydraulic gradient will exist across the site associated with the flow of groundwater from the elevated Hodge Dyke to the Midfodder Dyke at the lower level. The position of the groundwater beneath the site will obviously vary with the relative elevations of the water levels in the two water bodies and design work will have to take this into account with respect to the limit state under consideration.

6. Discussion

Ground investigation work recorded the embankment fill at the site of the seepages through the embankment to comprise slightly gravelly clay. Detailed logging of the soil did not record anything (such as fissuring, voids or higher permeability materials) at the site of the seepages that could have been preferential pathways for the passage of water through the embankment.

It is considered that the water flow through the embankment adjacent to the south-western side of the pumping station at times of sustained very high water levels in the Hodge Dyke is probably passing between the pumping station building and the adjacent wing wall sheet piles. This is because there is expected (based on the drawing information) to be a small gap between the sheet piles of the wing wall and the foundations of the building. The permeable granular sub-base beneath the slab and the thick sub-base beneath the front edge of the slab provide a preferential pathway for the passage of the water. The position of the seepage at the end of the flood wall adjacent to the building and the relative modernity of the wall, c. 11 years old, is likely to mean that failure of the sheet piles by corrosion or declutching to create holes in the steel wall is less plausible route for the passage of water.

The flow through the embankment on the north-eastern side is also considered likely to be via the same route as the south-westerns side, between the wing wall sheet piles and the building sub-structure. The in-ground pipework on the crest of the embankment at this location (see **Figure 6**) would also form a preferential pathway for water ingress into the embankment and the discharge of roof water on to the embankment will also add water into the ground.

TECHNICAL NOTE

The solution to the seepage problem is to prevent the flow of water through the embankment fill and this may be possible by reducing the permeability of the embankment fill locally. This could be achieved by excavation and replacement with well compacted high plasticity clay fill that would provide a low permeable barrier to the flow of water. The granular sub-base against the south-eastern side of the building and beneath the slab should also be replaced due to the potentially higher permeability of this material. If good compaction of clay is too difficult to achieve in a small space then consideration could be given to filling the void created by removal of the material with a bentonite slurry which would not require compaction. Removal of in-ground pipework, digging out and infilling of animal burrows in the bund and the re-routing of the gutter downpipe to discharge away from the embankment would also assist with reducing water inflow in the embankment.

Figures

Figure 1 - Location of Seepage on the South-Eastern Side of the Pumping Station

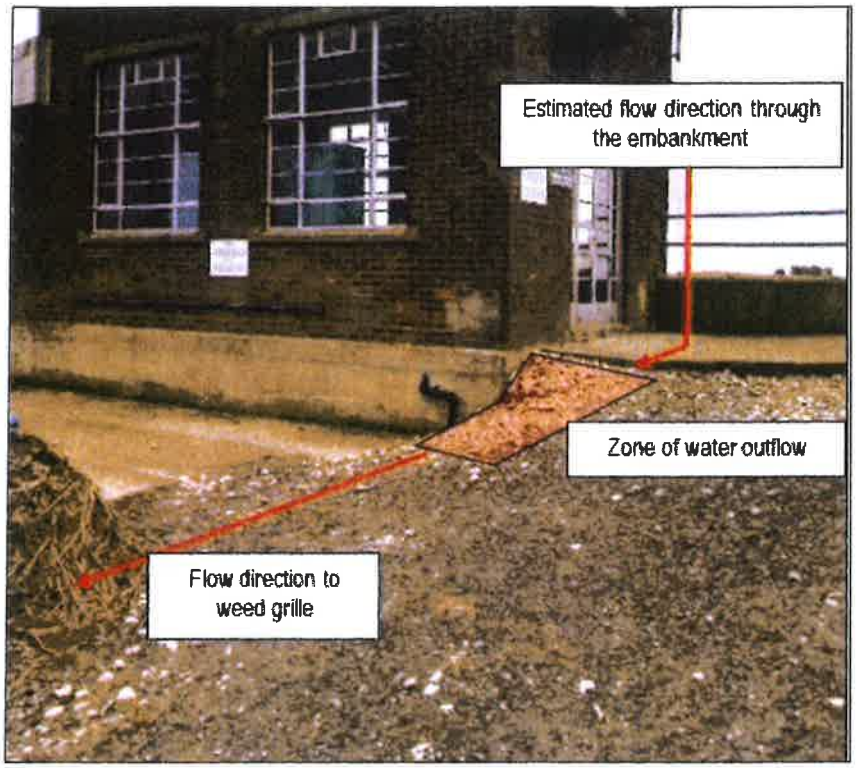
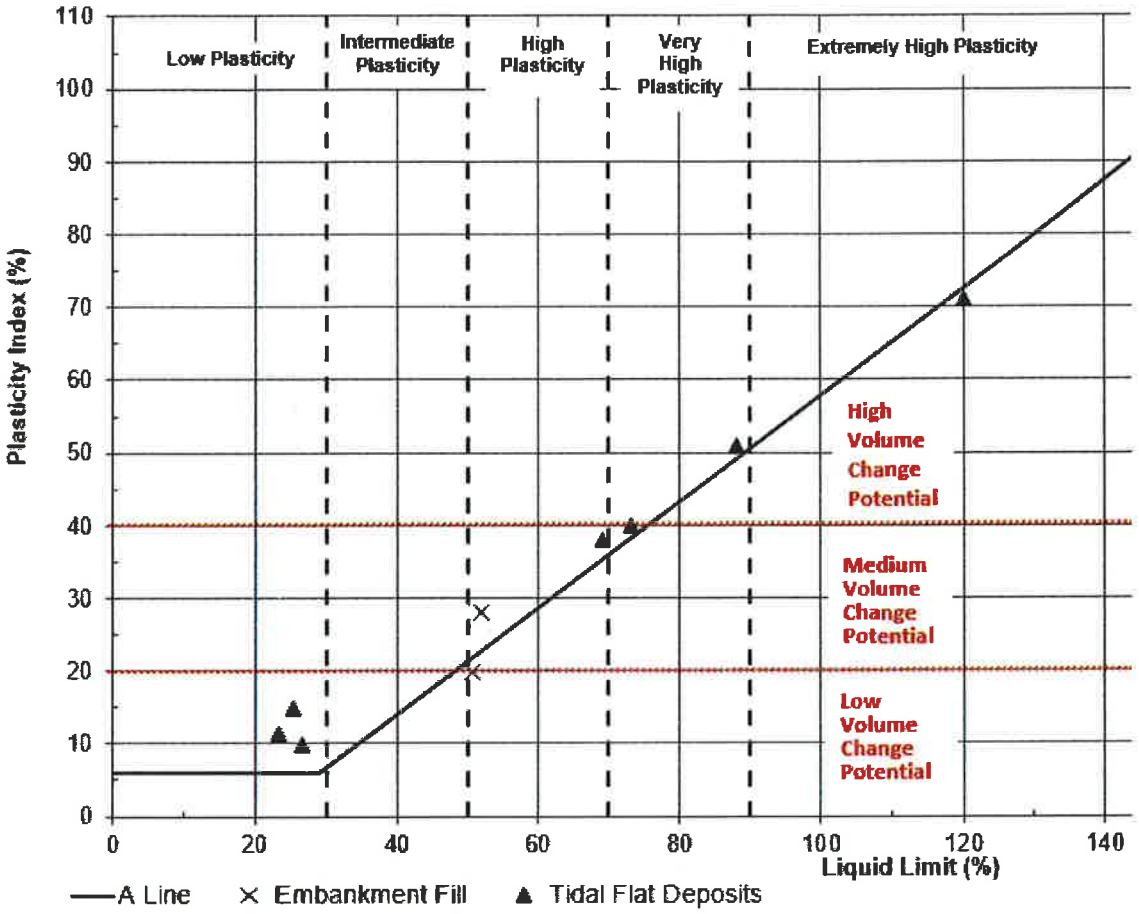


Figure 2 - Location of Seepage on the North-Eastern Side of the Pumping Station

Figure 3 - Possible Animal Burrow on South Face of Embankment on South-Western Side.

Figure 4 - Downpipe Discharging on to Crest of Embankment and Pipework in the Crest of the Embankment on the North-Eastern Side

Figure 5 - Plasticity Chart



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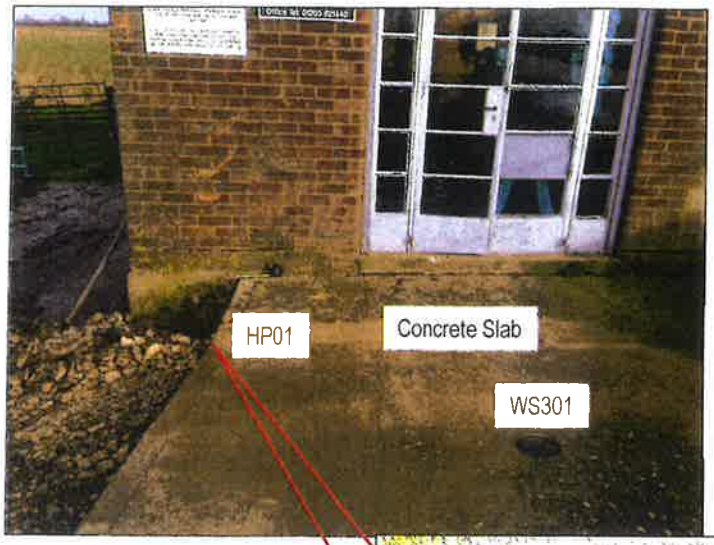
Client/Project:
IDB BLACK SLUICE

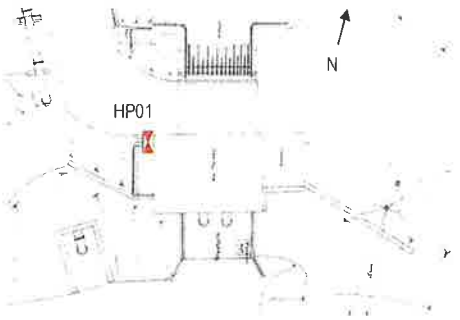
EWERBY PUMPING STATION

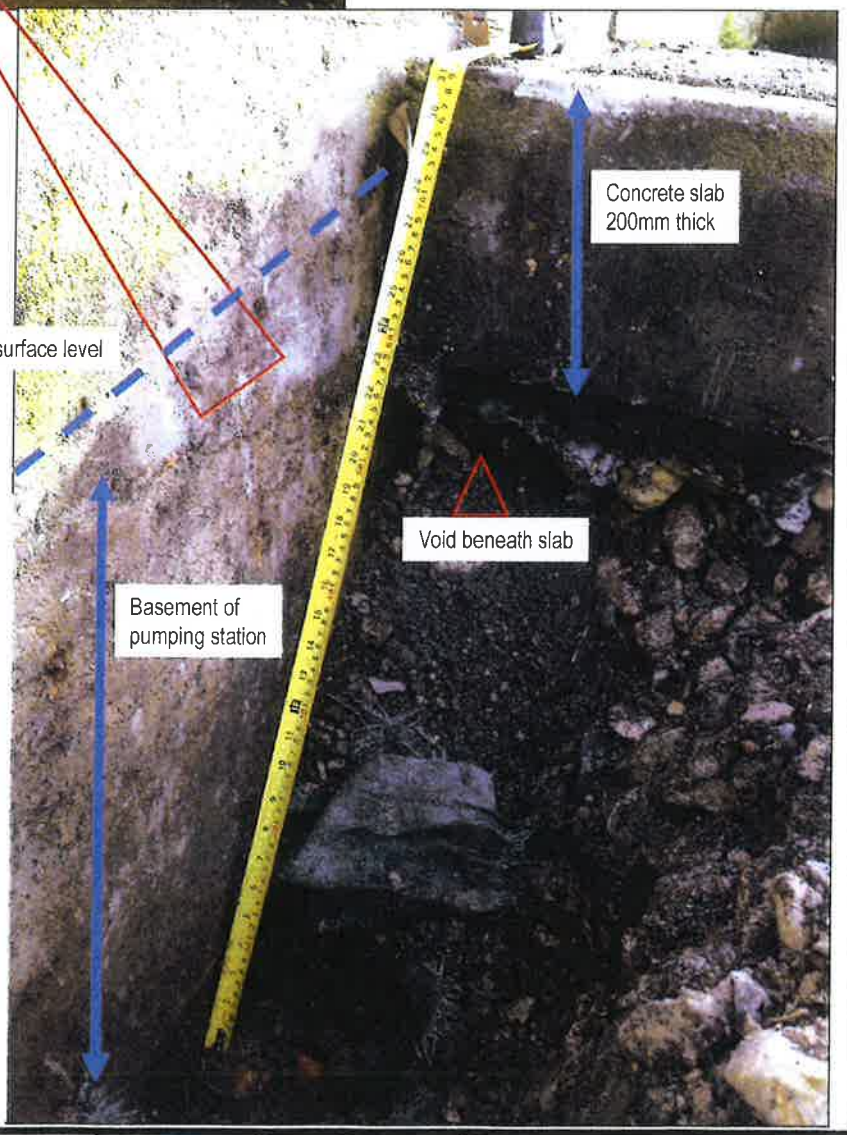
Project No.:
332510194

Title
EXPLORATORY HOLE LOCATION PLAN

Revision:	Date:	Drawing No.
01	05.05.2021	1







See hand pit logs for further details of encountered ground conditions.

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Client/Project:
IDB Black Sluice

Ewerby Pumping Station

Project No.:
332510194

Title
Ewerby Pumping Station – Hand Pit 01

Revision:	Date:	Drawing No
01	21.04.2021	

ORIGINAL SHEET - ISO A4 PORTRAIT

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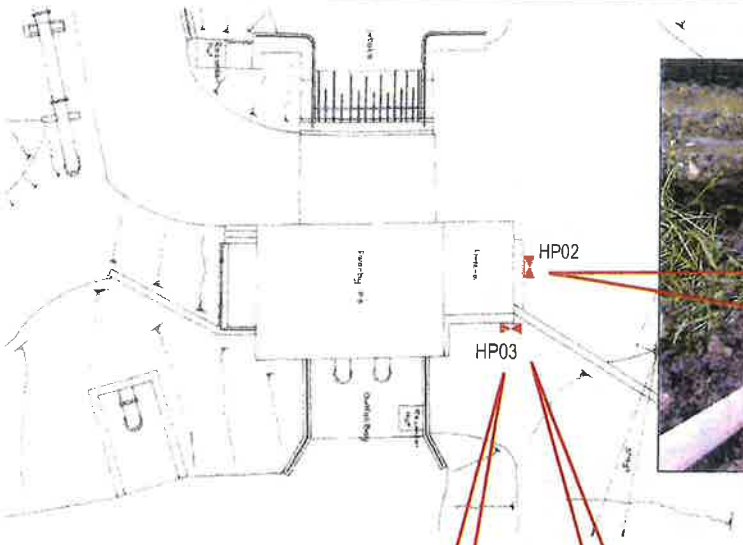
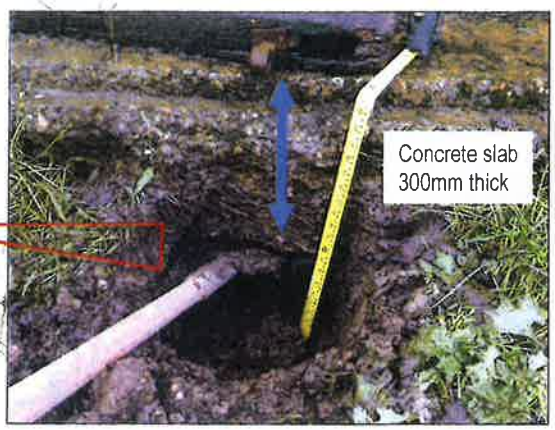
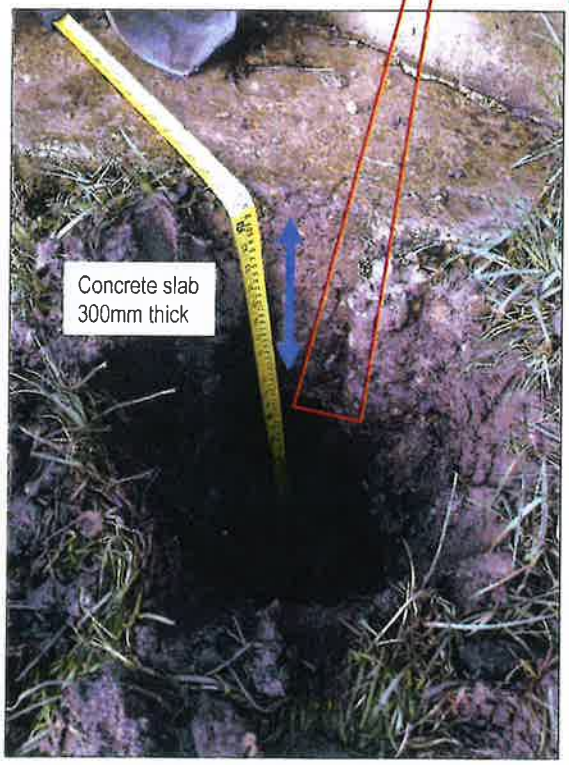
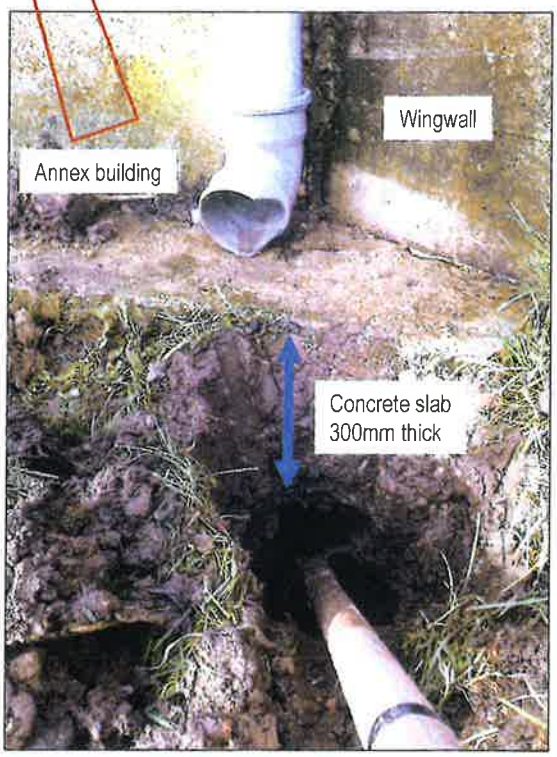




Hand Pit HP02 excavated on the eastern side of the pumping station/annex building. Hand pit terminated upon encountering pile foundation beneath capping beam/slab.



Hand Pit HP03 excavated on the southern (highwater) side of the pumping station/annex building. Hand pit terminated upon encountering pile foundation beneath capping beam/slab.



See hand pit logs for further details of encountered ground conditions.

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Client/Project:
IDB Black Sluice

Ewerby Pumping Station

Project No.
332510194

Title:
Ewerby Pumping Station – Hand Pit 02 & Hand Pit 03

Revision: 01
Date: 21.04.2021
Drawing No.

ORIGINAL SHEET - ISO A4 PORTRAIT

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TECHNICAL NOTE

Job Name: Black Sluice Internal Drainage Board

Job No: 48702

Note No: TN004

Date: 07/05/2020

Prepared By: L Truslove (Principal Engineer)

Reviewed By: L Tomlin (Senior Associate)

Approved By: Daniel Sharp (Director)

Subject: **SOUTH KYME PUMPING STATION - GROUND INVESTIGATION**

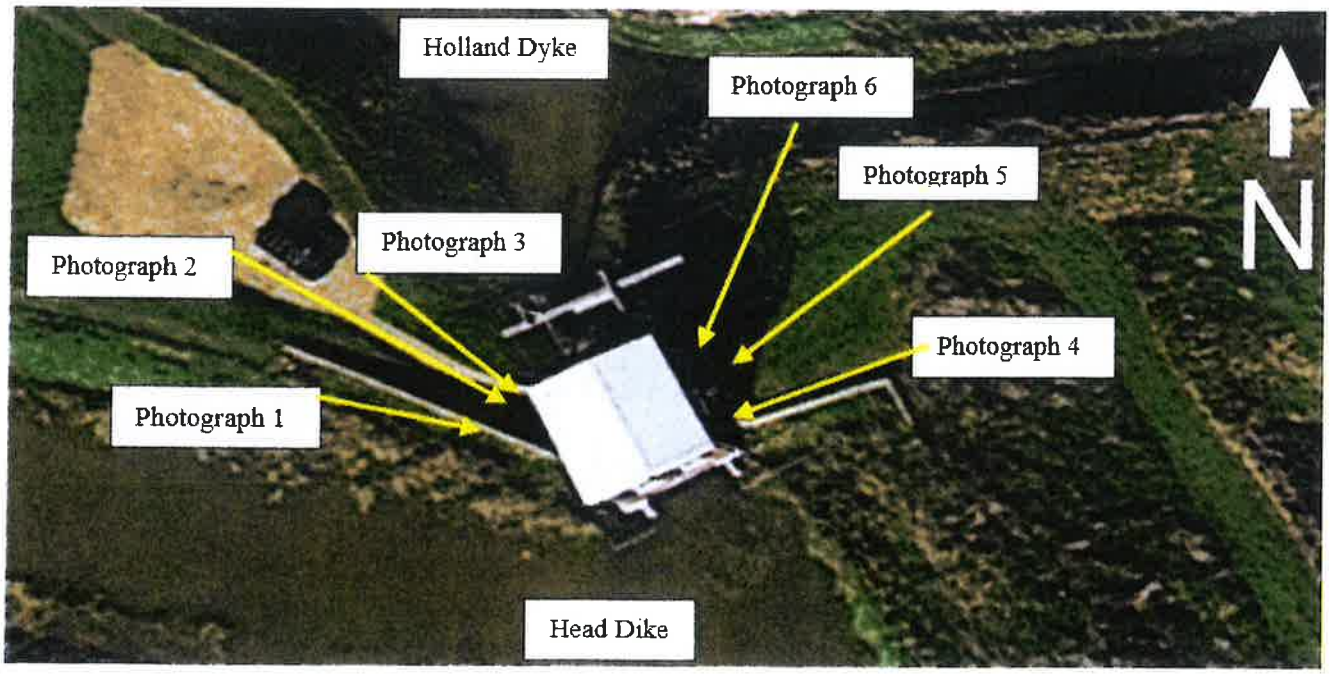
1. Introduction

Stantec has been commissioned by Black Sluice Internal Drainage Board (IDB) (the Client) to design, monitor and report upon a ground investigation at the site of their pumping station located in South Kyme, Lincolnshire. The purpose of this Technical Note is to summarise the ground conditions recorded during the ground investigation works. The work was commissioned after seepage was observed to be occurring at the pumping station through the flood walls located either side of the pumping station and movement of one of the station flood walls.

The pumping station is located approximately 2km southeast of South Kyme, Lincolnshire at approximate national grid reference 520747E, 346902N. The pumping station is situated at the head of Holland Dyke and pumps water up to the higher level Head Dyke.

2. Background

The IDB reported water seepage through the ground and through the flood walls at the site at times of record high water levels within the adjacent waterway during the extreme wet weather of February 2020. Following this, Stantec carried out a site visit and produced a technical note (48702 TN003, dated 25th September 2020) summarising the observations made and making recommendations for ground investigation. This Technical Note (TN004) is to be read in conjunction with TN003. The layout of the pumping station site is shown on 1 below.



A construction drawing shared by the client (see **Appendix A**) shows the substructure of the pumping station. The station is founded on driven precast concrete piles and steel sheet piles. The landings at the top and bottom of the

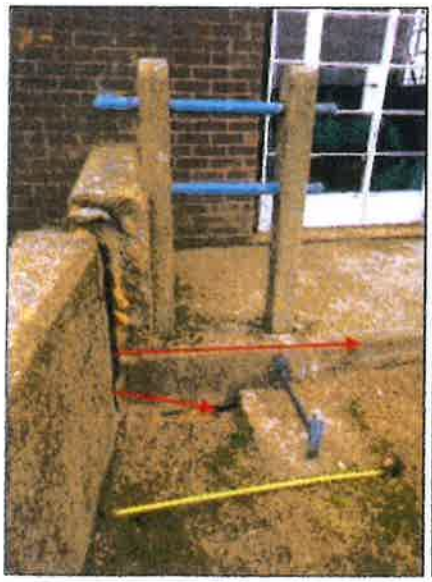
external stairs on the eastern side of the station appear to be extensions of the station floor slabs at these locations, with the steps apparently bearing on the ground beside the station. The drawing does not show how the flood walls either side of the station building are founded, however it seems likely that they would have been bearing on a row interlocking sheet piles as the flood walls at the nearby Ewerby Pumping Station are.

Photographs showing the seepage locations and areas of ground movement are presented below with the locations shown above.

Photograph 1 - Cracking parallel to the flood wall, indicating settlement of the soils southward (right of photo) of the wall.

Photograph 2 - Cracking between the pumping station building and the flood wall. Expanding foam used as a temporary measure to infill the crack.

Photograph 3 - Exposed and displaced foundation slab beneath the pumping station building, indicating settlement of the underlying soils



Photograph 4 - Displaced flood wall and settlement beneath concrete slab.

Photograph 5 - Settlement of soils beneath NE corner of pumping station building.

Photograph 6 - Settlement of the soils beneath the stairway leading into the pumping station building.

Direction of water flow: →

Seepage occurred at two locations on the western side of the pumping station. These were through a narrow gap that had opened up between the concrete flood wall and the substation wall (Photograph 2) and beneath the pumping

station to emerge at the north-western corner of the station (Photograph 3). The ground beneath the slab shown in photograph 3 appears to have sunk to leave a gap between the overlying concrete slab.

On the eastern side of the station the flood wall has moved northwards downslope toward the Head Dyke around up to 200mm and downwards around 100mm. The break in the concrete occurring at the junction of the flood wall and the wall that sits atop the stairs slab (photograph 4). Water poured through the break in the concrete and flowed over the embankment down to the Hodder Dyke with the water also flowing under the stairs (Photographs 4 and 6) via a gap below the slab. It is not clear whether the gap below the slab occurred before the break in the concrete wall or as a result of the movement of the soil behind the wall due to the movement of the wall. Other small ground movements apparently occurred at the north-east corner of the station (photograph 5). It is not clear whether the movement here occurred before or as a result of water flowing down the slope.

Geological mapping indicates that the site is underlain by Tidal Flats Deposits (typically comprising soft silty clay, with layers of peat, sand and basal gravel) which overlie bedrock strata of the Ampthill Clay Formation (typically comprising mudstones that weather to clays near surface).

3. Ground Investigation

The fieldwork was undertaken by Stantec on the 1st February 2021 and comprised the sinking of a single cable percussion borehole, designated BH01 and the sinking of three dynamic sample boreholes, designated WS01 to WS03 inclusive. Boreholes WS02 and WS03 were completed a using hand-held window sampler due to site access restrictions. The fieldwork was carried out in general accordance with BS5930 and BS10175. The records of the exploratory holes are presented in **Appendix B** with an exploratory hole location plan presented as **Figure 1**. It was intended to excavate trial holes adjacent to the flood walls but this was not possible on the day of the investigation due to access difficulties resulting in a lack of time.

Borehole WS03 was terminated at a depth of 0.75m bgl on encountering a buried service, this was agreed with the client representative on site.

Disturbed small and bulk samples of soil were recovered and in-situ standard penetration testing was undertaken at 1m depth intervals in the window sampler borehole, in the cable percussive borehole the SPT testing was alternated with undisturbed thin wall samples (UT100). SPT testing was not completed within the hand-held window sampler boreholes. Soil samples were submitted for laboratory geotechnical testing for soil classification purposes for the following:

- Natural Moisture Content.
- Atterberg Limits.
- Particle size distribution.
- Chemical testing.
- Undrained Triaxials.

The laboratory test data is presented in **Appendix C**.

4. Encountered Ground Conditions

The ground investigation recorded topsoil over tidal flat deposits in line with expectations. Full details are displayed on the borehole logs included in **Appendix B**.

Topsoil

Topsoil was recorded in all exploratory locations generally as soft dark brown, slightly gravelly, sandy clay with rootlets. The sand fraction was recorded as fine grained. This stratum was recorded to depths of between 0.30m and 0.40m.

Tidal Flats Deposits

All exploratory boreholes recorded tidal flats deposits (TFD) immediately beneath the topsoil with the TDF comprising cohesive strata overlying sands. The near surface cohesive strata are described as very soft and soft brown silty, slightly sandy, clay locally slightly gravelly near surface and in some locations the clay is described as 'organic'. A 100mm layer of fibrous peat were recorded in WS01 at 2.6m bgl.

At 4.40m bgl in WS01, 4.8m bgl in WS02 and 5.40m bgl in BH01 the TFD was recorded as loose to medium dense brown fine to coarse sand, with increasing gravel of mudstone and sandstone with depth. The sand extended to the full depth of the investigation (15m bgl) in BH01. Within borehole BH01, blowing sands were recorded from 6.40m to 9.00m depth as a result of groundwater ingress into the borehole. A horizon of firm grey silty clay was encountered between 10.80m and 12.00m bgl in BH01. This deposit comprised both granular and cohesive horizons and has been subdivided as such in this note.

Twelve SPT test were undertaken in the TFD. Within the upper cohesive horizons seven SPT tests undertaken between 1.20m and 5.0m bgl and recorded N values of between 0 and 7, indicating that the material ranged from a very soft to soft consistency.

An undrained triaxial test carried out on a sample recovered from BH01 at 2.5m bgl recorded an undrained shear strength of 21 kN/m^2 which is indicative of a very soft clay. Bulk density of this sample was recorded as 1.67 Mg/m^3. Four SPT tests were undertaken in the sands from 6m to 15.5m depth. These recorded N values of 7, 11, 13, 14 and 39 which are indicative of a range of relative density of loose to dense. The data did not indicate an increase in relative density with depth.

Atterberg Limit tests on the near surface cohesive strata recorded liquid and plastic limits of 62% to 70% and 25% to 31% respectively and plasticity index values of 33% to 42% (mean of %). This indicates the material is a high plasticity clay with a medium to high volume change potential according to BRE Digest 240. A test on the clay stratum at depth (11m bgl) in BH01 recorded liquid and plastic limits of 27% and 15% respectively and plasticity index value of 12% which is indicative of a low plasticity, low volume change materials according to BRE Digest 240.

Groundwater

Groundwater was encountered at a depth of 5.40m rising to 3.14m after 20 minutes of monitoring in borehole BH01. Within borehole WS01, groundwater was encountered at 4.40m rising to 3.00m and in borehole WS02 groundwater was encountered at 4.80m rising to 2.00m after 20 mins of monitoring. The groundwater strikes recorded during the investigation appear to be present within the sand lenses of the Tidal Flat Deposits underlying the more cohesive horizons. The resting water levels appear to be in continuity with the water within the adjacent drains.

On completion of the ground investigation, three groundwater monitoring visits were undertaken from the 8th of March to 6th of April 2021. The results of the groundwater monitoring are presented in the table below.

Table 4.1 Summary of Groundwater Monitoring Data

Installation	Depth to base of installation, m bgl	Groundwater Levels (m bgl)		
		8th March 2021	23rd March 2021	6th April 2021
WS01	5.20	2.58	2.61	2.63
WS02	5.00	2.74	2.79	2.84

5. Characteristic Geotechnical Parameters

This section of the note presents comments on the ground conditions in relation to design of geotechnical elements of the remedial solutions. The recommended characteristic geotechnical parameters for use in design are discussed below and summarised in the following table.

Table 5.1 Summary of Recommended Characteristic Values

Stratum	Bulk Unit Weight kN/m^3	Undrained Shear Strength		Drained Shear Strength		Elastic Modulus, MPa	Poisson's Ratio
		C_u, kN/m^2	Φ_u,°	c', kN/m^2	Φ',°		
Tidal Flat Deposits - Near Surface Cohesive	16	15	0	0	21	2	0.40
Tidal Flat Deposits - Granular	19	-	34	0	34	10	0.30
Tidal Flat Deposits - Deep Cohesive	18	50	0	0	28	4	0.25

Bulk unit weights of the cohesive soils are based on the description of the materials, their recommended characteristic undrained shear strengths and the recommendations of Figures 1 and 2 of BS 8002, 2015.

Bulk unit weights of the granular soils are based on the description of the materials, their consistency and the recommendation of Figures 1 and 2 of BS 8002, 2015.

Undrained shear strength of the cohesive soils are based on the visual descriptions of the soils.

Undrained friction angles of the cohesive soils are assumed to be zero.
Undrained (Φ_u) and effective angles of friction (Φ') for the granular strata are based on the visual description of the materials and the recommendations of BS 8002, 2015.

Effective angles of friction (Φ') for the cohesive soils are based on the visual description of the materials and the mean measured plasticity index and the recommendations of BS 8002, 2015.

For the cohesive and granular soils effective cohesion (c') is assumed to be zero.

Youngs modulus values for the cohesive and granular soils are based on the consistency and soil type and Table 11.7 of Look (2005).

Poisson's ratio values are taken from Look (2005) Table 11.17 and are based on soil type and plasticity.

The recommended characteristic values should be reviewed and selected by the Designer, taking into consideration the limit states and design methods being used, and the process should be documented in the Geotechnical Design Report.

With respect to groundwater levels, it is expected that a hydraulic gradient will exist across the site associated with the flow of groundwater from the elevated Head Dyke to the Holland Dike at the lower level. The position of the groundwater beneath the site will tend to vary with the relative elevations of the water levels in the two water bodies and design work will have to take this into account with respect to the limit state under consideration.

6. Discussion

It is considered that the dislocation of the flood wall from the western side of the pumping station and the settlement and tilting of the flood wall on the eastern side of the pumping station occurred because the sheet piles supporting the concrete walls have moved by tilting and settlement. In consideration of this, the best solution would be to construct new flood walls. The most efficient way to construct new flood walls would most likely to be by the use of sheet piles.

In the case of the seepage beneath the eastern side of the pumping station it will be necessary to block the flow of water through the ground and this may be possible by reducing the permeability of the soil locally. This could be achieved by excavation and replacement with well compacted high plasticity clay fill that would provide a low permeability barrier to the flow of water. If compaction of clay fill would be too difficult to achieve in the restricted space, then consideration could be given to filling the void created by removal of the material with a bentonite slurry which does not require compaction.

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Client/Project:
BLACK SLUICE IDB

SOUTH KYME PUMPING STATION

Project No.:
332510194

Title:
EXPLORATORY HOLE LOCATION PLAN

Revision	Date	Figure No.
01	05.05.2021	1

TECHNICAL NOTE

Job Name: Black Sluice Internal Drainage Board - Damford Pumping Station

Job No: 48702

Note No: TN004

Date: 16/04/2020

Prepared By: L Truslove (Principal Engineer)

Reviewed By: R Puttock (Director)

Approved By: Daniel Sharp (Director)

Subject: **DAMFORD PUMPING STATION - GROUND INVESTIGATION**

1. Introduction

Stantec has been commissioned by Black Sluice Internal Drainage Board (IDB) (the Client) to design, monitor and report upon a ground investigation at the site of the Damford Pumping Station, near South Kyme, Lincolnshire. The work was commissioned after seepage was observed to be occurring at the site through the western bank of the Kyne Eau Waterway. The purpose of this Technical Note is to summarise the ground conditions recorded during the ground investigation works and to make recommendations for potential remedial measures to mitigate against future seepages through the bank.

The pumping station is located approximately 2km northeast of South Kyme, Lincolnshire at approximate national grid reference 519382E, 350680N. The pumping station is situated at the head of the Damford Drain and pumps water from the drain up to the higher level Kyme Eau Waterway.

2. Background

The IDB reported water seepage through the approximately 2m high embankment that forms the western bank of the Kyne Eau Waterway at times of recorded high water levels in the waterway during the extreme wet weather of February 2020. The approximate location of the seepage is shown on **Figure 1** and occurred along the line of a dilapidated fence which runs up the embankment. Following this Stantec carried out a site visit and produced a technical note (48702 TN002, dated 8th September 2020) summarising the observations made and providing recommendations for ground investigation.

It is assumed that this note will be read in conjunction with TN002.

Geological mapping indicates that the site is underlain by Tidal Flat Deposits (typically comprising soft silty clay, with layers of peat, sand and a basal gravel) which overlie bedrock strata of the Ampthill Clay Formation (typically comprising mudstones that weather to clays near surface).

At the time of the ground investigation site work no obvious changes to the Kyne Eau Waterway embankment or the site in general were observed since the previous site visit by a Stantec engineer in August 2020.

3. Ground Investigation

The fieldwork was undertaken by Stantec on 2nd February 2021 and comprised the sinking of five dynamic sample boreholes, designated WS201 to WS205 inclusive. The rationale for the investigation was to record the composition of the embankment at the site of the seepages to attempt to determine a reason for the seepages and to record the geotechnical properties of the embankment fill and underlying strata to provide data for design of remedial measures.

The fieldwork was carried out in general accordance with BS5930: 2015. The records of the exploratory holes are presented in **Appendix A**. The positions of the exploratory holes are shown on **Figure 2**.

Small and bulk disturbed samples were recovered and in-situ standard penetration testing (SPT) was undertaken at 1m depth intervals in the boreholes. Soil samples were submitted for laboratory geotechnical testing for soil classification purposes for the following:

- Natural Moisture Content.

- Atterberg Limits.
- Particle size distribution.
- Chemical testing.

The laboratory test data is presented in **Appendix B**.

5. Encountered Ground Conditions.

The ground investigation recorded embankment fill overlying Tidal Flat Deposits in line with expectations.

Embankment Fill

The boreholes recorded the Kyne Eau Waterway embankment fill to comprise a brown or greyish brown slightly gravelly slightly sandy clay overlain by 0.2 to 0.3m of slightly gravelly clay Topsoil. Boreholes WS201, WS202 and WS203, which were sunk through the crest of the bund, recorded it to be 1.8m, 2.0m and 1.9m thick respectively. Borehole WS204 which was sunk approximately half way up the embankment side slope recorded it to 1.0m thick and borehole WS305 sunk towards the toe of the bund recorded a 0.9m thickness.

Visual assessment indicates that the material decreased in strength with depth from firm or soft near surface to soft or very soft towards the base.

Detailed logging of the soil cores did not record notable fissuring, voids, or higher permeability materials at the site of the seepage that could have provided preferential pathways for the passage of water through the bund.

Atterberg Limits tests recorded liquid and plastic limits of 29% to 55% and 18% to 25% respectively and plasticity index values of 11% to 27%. This indicates the material ranges from low to high plasticity clay of low to medium volume change potential according to BRE Digest 240. The results are presented on the plasticity chart as **Figure 3**.

SPT N values recorded in the upper parts of the fill (at 1m depth) in WS201, WS202 and WS203 respectively were 3, 6 and 0. The N value of 0 was recorded where the SPT apparatus sank under the weight of the rods and hammer for the full 300mm of the depth of the test.

Three particle size distribution tests were carried out on samples of the embankment fill showed a highly consistent material of between 16 to 23% clay, 58 to 63% silt and 18 to 21% sand. Gravel was recorded in just one sample at 1%.

A single sample tested to BRE SD1 (2007) recorded a pH value of 8.3 and a water-soluble sulphate level of 0.03 g/l.

Tidal Flats Deposits

The deposit varies from a very soft dark greyish black organic clay to a very soft greyish brown clay. Locally, the deposit is described as 'sandy' or 'slightly gravelly' and occasionally horizons of fibrous plant material were encountered. A 0.1m thick stratum of peat was recorded in WS205 approximately 2.5m below the crest of the embankment.

Atterberg Limits tests recorded liquid and plastic limits of 35% to 200% and 23% to 95% respectively and plasticity index values of 7% to 105%. This indicates the material ranges from intermediate to extremely high plasticity clays and silts of low to high volume change potential according to BRE Digest 240. The results are also presented on the plasticity chart as **Figure 3**.

Twelve SPT N values were recorded in the deposit with eleven of the tests recording N values of 0 suggesting the material to be in very soft state. One test (from WS202 at 2m bgl) recorded an N value of 4 which is indicative of a very soft to soft consistency.

Two samples tested to BRE SD1 (2007) recorded pH values of 8.1 and 7.8 and a water-soluble sulphate levels of 0.17 and 1.17 g/l.

Groundwater

Groundwater levels were recorded in monitoring wells installed in three of the boreholes on three occasions post site work. The results are summarised below:

Location	Standing Groundwater Levels (m below embankment crest)		
	8th March 2021	22nd March 2021	6th April 2021
WS201	1.67	1.65	1.64
WS202	2.15	2.11	2.07
Location	**Standing Groundwater Levels (m below embankment toe)**		
	8th March 2021	**22nd March 2021**	**6th April 2021**
WS204	0.85	0.89	0.90

At the times of the monitoring the groundwater levels were standing just above or just below the boundary of the embankment fill and underlying Tidal Flat Deposits.

6. Characteristic Geotechnical Parameters

The following characteristic geotechnical parameters are considered appropriate for formations present on site:

Stratum	Bulk Density γ_b, kN/m^3	Undrained Shear Strength		Drained Shear Strength	
		ϕ_u, °	c_u, kN/m^2	ϕ', °	c', kN/m^2
Existing Bund Fill	17	0	40 at surface, decreasing linearly to 15 at the base of the deposit	25	0
Tidal Flats Deposits	16	0	15	21	0

Bulk unit weights are based on the description of the materials, their recommended characteristic undrained shear strength and the recommendations of Figures 1 and 2 of BS 8002, 2015.
Undrained friction angles are assumed to be zero.
Undrained shear strengths are based on the visual descriptions of the soils and the SPT data.
Effective angles of friction (ϕ') are based on the measured plasticity index and the recommendations of BS 8002, 2015. For the embankment fill and Tidal Flat Deposits plasticity index values of 25% and 50% respectively were used.
Effective cohesion (c') is assumed to be zero.

With respect to groundwater levels, it is expected that a hydraulic gradient will exist across the site associated with the flow of groundwater from the elevated Kyme Eau Waterway and to the Damford Drain at the lower level. The position of the groundwater beneath the site will vary with the relative elevations of the water levels in the two water bodies and design work will have to take this into account with respect to the limit state under consideration.

7. Discussion

The ground investigation has recorded that the existing embankment forming the western side of the Kyne Eau Waterway at the Damford Pumping Station is formed of soft sandy very silty clay up to 2m thick overlying very soft clay and silt Tidal Flat Deposits.

The investigation did not record notable fissuring, voids, or higher permeability fill material at the site of the seepage that could have provided preferential pathways for the passage of water through the bund. It is therefore not clear whether the water simply passed through the upstream face of the embankment or whether the discharge pipes that pass through the bund a short distance are in some way assisting water passage into the bund.

It is considered that the seepage in February 2020 occurred because the embankment became saturated by high water levels in the Kyne Eau Waterway and that seepage through the embankment fill reached the surface via the shortest route, which was through the preferential pathway presented by the fence posts, which had either been driven into or placed in holes sunk in the embankment historically. The composition of the embankment fill may also be more permeable than is preferable due to the relatively high silt content and relatively low clay content of the material.

Seepage through the embankment should be avoided because it can lead to internal erosion and slope instability and eventually to failure of the bund. It is therefore considered that some form of remedial measures are undertaken. The

form these measures take will be governed by the IDB's attitude to risk. Potential small-scale remediation could be a 'mend and monitor' approach, taking the form of removal of the fence posts and infilling the post holes with well compacted clay to remove the near surface preferential pathway for water flow, followed by monitoring at times of high water in the Kyme Eau Waterway to check for any further seepage. Larger scale remedial measures could include either replacement of the section of the embankment in which the seepage occurred or the installation of measures to cut off and prevent the flow of water through the existing embankment. These are discussed below:

Bund Replacement

Replacement of a section of embankment would involve excavation and removal of material and replacement with an engineered low permeability clay fill. The material would need to be carefully selected to be of low permeability and preferably of relatively low plasticity to reduce potential internal erosion and shrinkage and swelling of the material during seasonal changes in moisture content which can lead to cracking of the soil due to desiccation. The material should be specified and compacted according to an engineer designed earthworks specification.

The benefits of this solution are that it should be a relatively simple and cheap to construct. The potential downside to such an exercise would be that it would leave a section of the bank open temporarily, thus rendering the bund temporarily unable to hold back raised water levels in the Kyme Eau Waterway. Provided that the bund was reconstructed to the same geometry as the existing then, then the nett long term effect on the stresses and loads on the ground would be negligible thus limiting the risks of significant ground movements or slope instability in the waterway bank.

Seepage Barriers

Measures to impede the flow of water through the existing embankment by creating a low permeability barrier in the existing embankment are a potential solution. These can be formed in several ways, however on a small-scale site the potentially most suitable are likely to be either installation of an interlocking sheet pile wall or installing a low permeability clay core within the existing bund.

Installation of a low permeability clay core to the embankment could be completed by excavating a trench along the embankment crest and filling it with either engineered clay fill or with a bentonite slurry that would be pumped into the trench. This method would require disposal of the spoil and using plant on the embankment crest near the water's edge would present a potential health and safety hazard.

Seepage could be impeded by installing an interlocking sheet pile wall through the crest of the bund. It would be fast to install and the work requires minimal setup because the sheets can be installed via a pile hammer attachment to a conventional tracked excavator. In this instance the sheets should only need to be installed to around 2m below the crest of the bund to restrict groundwater seepages through the bund whilst leaving the flows through the underlying Tidal Flat Deposits almost unaffected. Furthermore, should sections of the bund further along from the present seepage location begin to experience seepages then additional sheet piles could be easily slotted in to extend the wall. Other benefits of this solution are that it does not require excavation nor leave a temporary breach in the wall during construction and there would not be any spoil disposal required.

In terms of simplicity, speed of construction and cost it is considered that of the larger scale potential remedial measures the sheet piled wall would appear to be the most suitable solution for preventing future seepages through the embankment.

Figures

Figure 1 - Site Layout and Seepage Location

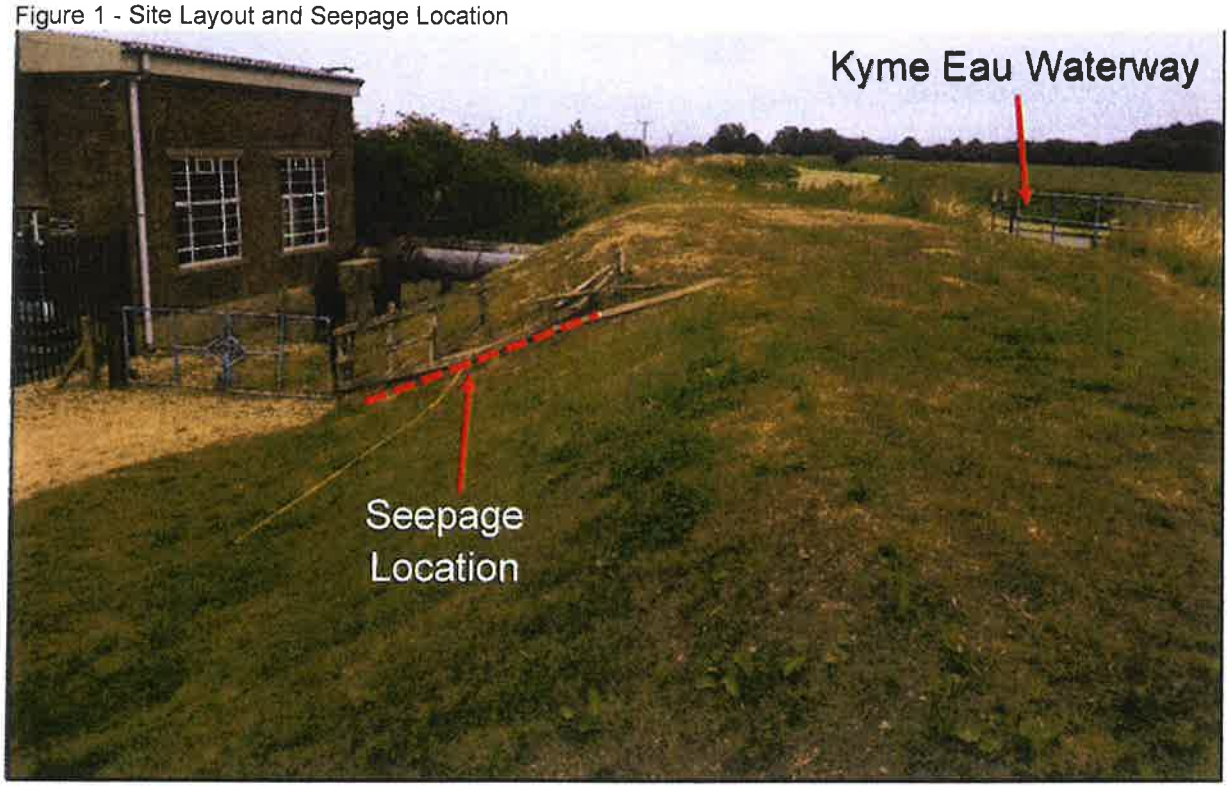


Figure 2 - Exploratory Hole Locations

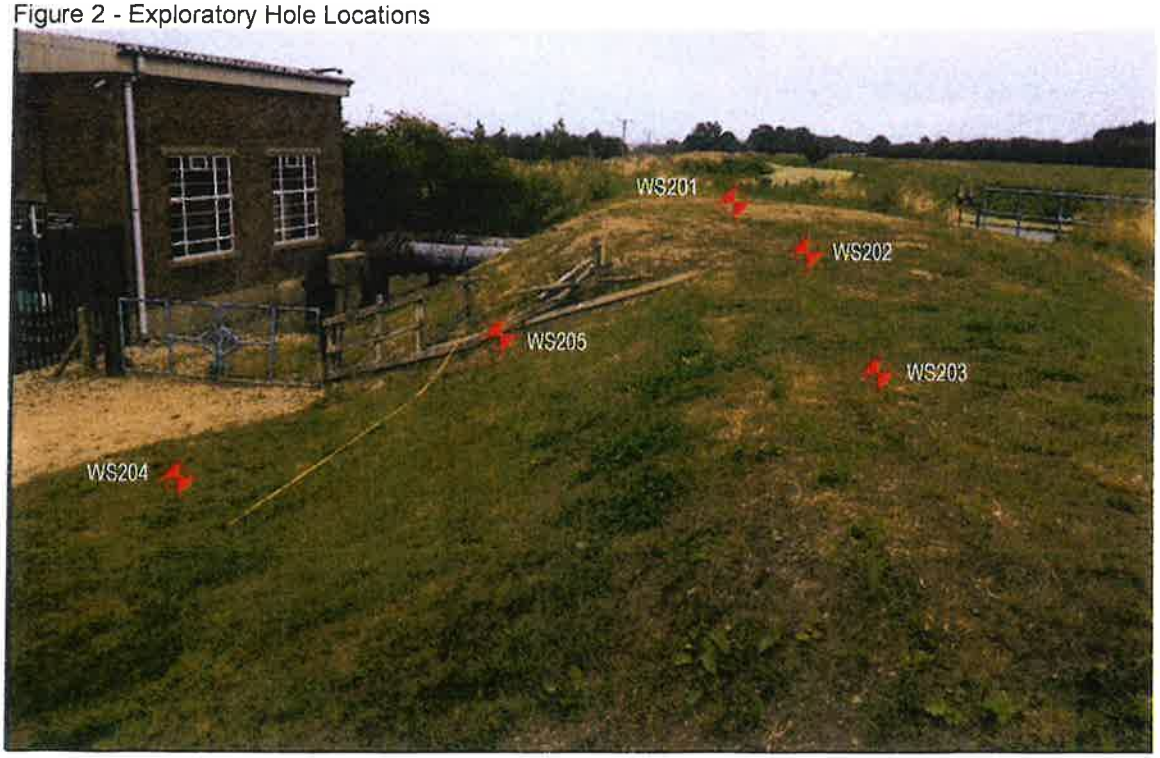
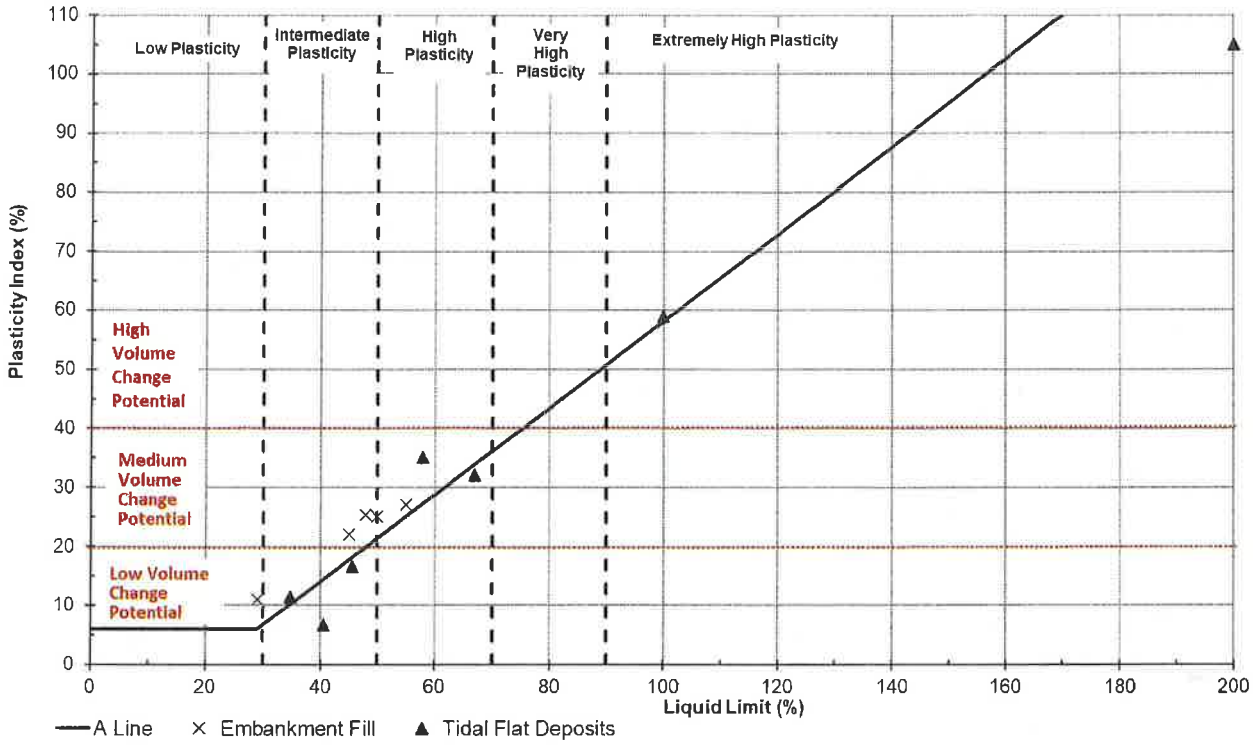


Figure 3 - Plasticity Chart



TECHNICAL NOTE

Job Name:	Trinity College Pumping Station
Job No:	332510682
Note No:	TN001
Date:	27 July 2021
Prepared By:	J Camp
Reviewed By:	L Truslove, D Sharp
Subject:	**TRINITY COLLEGE PUMPING STATION – RECORD OF SITE VISIT**

1. Introduction

1.1 The purpose of this Technical Note is to summarise the observations made during a site visit carried out on the 6th July 2021 to Trinity College Pumping Station, Lincolnshire.

1.2 The pumping station is located approximately 2km west of Amber Hill, Lincolnshire at approximate national grid reference TF 21745 45833 (521745E, 345833N), approximate post code PE20 3PX. The pumping station connects the Head Dike (high level) with a tributary of Hammond Beck (low level). The pumping station is situated atop of an embankment between these two water bodies.

2. Background

2.1 The site visit was carried out in response to reports from Black Sluice IDB of water seepage through the embankment on the western side of the pumping station at times of high-water levels within the Head Dike during the extreme wet weather of January 2021.

2.2 Observations were made by the IDB engineer during January 2021 and are detailed below:

- According to the IDB engineer, during the high-water event, water was observed seeping through the retaining wall and beneath the concrete steps to the west of the pumping station (refer to Photographs 1 and 2).
- In addition, the IDB provided Stantec with a video showing water ingress around the eastern corner of the pumping station (See Photograph 4).

3. Site Observations & Embankment Details

3.1 The site visit was undertaken by a Stantec engineer who was accompanied by an engineer from the Black Sluice IDB. The weather conditions during the visit were bright, clear and dry.

3.2 The site was accessed via a farmhouse access road from Claydike Bank heading westwards. The approach to the site was sufficiently wide to allow for 4x4 vehicular access. A bridge, owned and maintained by the Environment Agency, allowed access over Hammond Beck and to the top of the embankment to access the pumping station.

3.3 During the site visit, the following observations were recorded (relevant photos are included later in this note):

- Settlement of the embankment soils on the western and eastern sides of the pumping station has occurred.
- Settlement of the ground beneath the stairs on the western side of the station has occurred resulting in a void of up to 200mm beneath the bottom of the steps (see Photographs 1 and 2).

- Along the concrete wingwall on the western side of the pumping station, a number of gaps (between 20 and 60mm wide) have opened up between the concrete sections. These have apparently been infilled with resin as a temporary repair (see Photographs 3 and 4).
- In addition to the point above, the wall appears to have rotated northwards by up to approximately 50mm (see Photograph 4).
- On the eastern side of the pump station, the concrete wingwall abutted to the side of the station building appears to have settled approximately 20mm and pulled away from the station by up to 20mm (see Photograph 5).
- Minor cracking of the brickwork of the pumping station building was observed including around the window lintels.

3.4 Due to the cracking observed on the building, it is recommended that a structural inspection is undertaken to assess the building condition and defects, and to consider the need for remedial work. This is not included in Stantec's current commission.

4. Recommendations for Ground Investigations

4.1 It is considered likely that the wingwalls will need replacing and the most suitable solution to cut off seepage is likely to be new steel sheet piled walls. Based on this assumption, the following ground investigation is recommended in order to record the below ground construction and depth of the existing wingwalls and to determine ground conditions and geotechnical data for the design of new walls:

- Check all areas to be disturbed for the presence of buried services.
- Sinking of one cable percussive borehole, to a depth of 20m for sheet pile design with associated standard penetration testing and open drive UT100 tube sampling. The borehole will prove the ground conditions including the depth to a suitable bearing stratum for sheet piles and the geotechnical properties of that stratum.
- Sinking of one windowless sampler borehole to circa 7m depth (ground conditions dependent) on the eastern side of the pumping station with associated standard penetration testing and follow-on dynamic probing (as required) to record the depth to a suitable stratum for sheet piles.
- Two hand excavated pits to attempt to record the depth and below ground construction of the wingwalls and to observe the ground conditions within the embankment at that location.
- A groundwater monitoring piezometer will be installed in the CP borehole to determine the phreatic surface within the embankment for subsequent geotechnical analysis.

The proposed locations are annotated on the aerial photograph at the end of this note.

4.2 Following the completion of the site investigation, better understanding of the potential causes of the ground movements should be determined together with an option appraisal for potential remedial solutions. The findings will be presented in a technical note. Detailed design can then be undertaken once the most cost-effective solution has been selected following consultation with a contactor.

Photograph 1 - West side of pumping station. Settlement of the soils beneath the stairs leading into the pumping station building. Photograph taken looking north. Arrow denotes seepage water flow.

Photograph 2 - A void present beneath the bottom of the concrete steps to the west side of the pumping station as a result of ground settlement. Water has been noted to flow through this void during high water levels. Arrow denotes seepage water flow.

	Photograph 3 - Western side of pumping station. Movement and dislocation of the concrete wingwall sections downwards and to the left of view, and evidence of temporary repairs of cracks in the wall. Tape 1m long for scale.
	Photograph 4 - Western side of pumping station. Settlement of soils on the northern side of the wingwall. Yellow arrows show indicate rotation of the concrete sections towards the north.

Photograph 5 - Eastern side of pumpig station looking north. Wingwall has moved downwards and away from the building to leave a gap through which water flowed. Arrow denotes seepage water flow.

Aerial Photograph (GoogleEarth) showing approximate locations of proposed investigation locations.

Stantec

Your ref:

Our ref: 33251/BlackSluiceIDB/CBH/RR/001GB

2nd February 2022

Black Sluice IDB
Station Road,
Swineshead,
Boston,
Lincolnshire
PE20 3PW

For the Attention of: Mr Paul Nicholson

Dear Mr Nicholson,

RE: Black Sluice IDB – Remedial works design support for Damford, Ewerby and South Kyme pumping station sites.

BACKGROUND

Stantec have been requested by Black Sluice Internal Drainage Board (IDB), the *Client*, to provide design support for the remedial works at Damford, Ewerby and South Kyme pumping station sites across Lincolnshire. This fee proposal has been prepared in response to the email of Mr Paul Nicholson (Black Sluice IDB) – Daniel Sharp (Stantec) dated 14th of October 2021.

Stantec have a detailed knowledge of the issues at the three sites, which have arisen in part, following extreme weather events, and associated high water levels within the land drainage channels adjacent to the pumping stations. The issues include: The seepage of water through the embankment at Damford site; water seepage beneath flood retaining walls and issues with material falling away from the face of the seepage cut-off sheet piles at Ewerby site; and issues associated with settlement of the embankment, including 'shifting' of the retaining wall and presence of void at the South Kyme site.

Stantec prepared a series of Technical Notes following the visual inspection of the site defects in 2020. Further to the recommendations of these initial Technical Notes, Ground Investigations were undertaken in 2021 and associated notes prepared with high-level options for remedial works proposed at each site. Stantec will use the data gathered during these investigations and review the recommendations for remedial works, with the work completed to date feeding into our design, the approach for which is detailed in the 'services' section of this fee proposal below.

Our Water Engineering team in Reading will deliver this project, which will be led by Robert Riddington (Director) and Greg Bowles (Principal Engineer), with continued support from Daniel Sharp and Lawrence Truslove to maintain previous knowledge and site experience.

The preparation of the design will also be supported by Structural Engineering and Geotechnical Engineering disciplines, depending on solution required.

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Reading
Berkshire RG1 8DN

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email: PBA.Reading@stantec.com

Registered Office:
Stantec UK Ltd
Buckingham Court
Kingsmead Business Park
Frederick Place, London Road
High Wycombe HP11 1JU
Registered in England No. 1188070

Please find our below proposal to support you in with the remedial works at the three pumping station sites.

SERVICES

We propose a two-phase approach to provide the design support for the three sites:

Phase 1 – Outline Design:

To commence Phase 1 Stantec will arrange a pre-start meeting with the Client and key stakeholders to confirm the agree the project aims, deliverables, and programme for the works.

Stantec will then review the 2021 Ground Investigation works, report recommendations and historic drawings for the three sites to identify the requirements for further information or data gathering to inform the optioneering process.

As we understand that topographic survey is not available for the sites, we will prepare a survey specification and liaise with three survey providers to obtain quotes. It is assumed that the Client will appoint the topographic survey provider directly. On receipt of the data, we will review the topographic survey to confirm compliance with the survey specification.

To develop the options, we will complete two-day site visit to assess the current condition of areas requiring remedial works and to confirm our design assumptions. The visit will be attended by a Structural Engineer and a Design Engineer.

Following the site visit, we will prepare an outline design Technical Note for each of the sites.

The Technical Notes will include a recommendation for the preferred option(s) based on technical feasibility and a high-level comment on the potential costs for each option. AutoCAD sketches will be prepared to support the recommended options.

If the Client wishes a more detailed cost analysis to be prepared to assist in the determination of the preferred option(s), Stantec can engage with an Early-Contractor Involvement (ECI) partner to deliver this assessment. This would be managed under a separate appointment if required by the Client.

The three Technical Notes will be issued to the Client for review two-weeks in advance of an Options Workshop meeting. The workshop will be completed remotely and will allow the presentation and review of the options for each of the sites and the preferred option to be agreed.

Stantec will then finalise the Technical Notes to allow the agreed preferred options to be taken forward to the Phase 2, detailed design stage.

At this stage we will be able to advise on the proposed approach and fees associated with Phase 2.

Phase 2 – Detailed Design (Budget Estimate):

For Phase 2 we anticipate that we will develop and prepare the detailed design for the each of the three sites.

It is expected that the deliverables will be a set of Construction Issue drawings with relevant details and specification notes. These will allow the appointment of a civil engineering contractor, to be undertaken and managed by the Client.

Design risk assessments will be prepared, and associated hazards, welfare and environmental notes will be included on the drawings. Finally, the Health and Safety files will be prepared and made available to the client to forward to the civil engineering contractor in advance of contract award.

In parallel to the development of the Detailed Design, Stantec will liaise with relevant stakeholders (i.e., the Environment Agency / Lead Local Flood Authority) to confirm the consenting requirements for the remedial works.

Assumptions (Phases 1 and 2):

Assumptions and exclusions are summarised below:

- We have excluded the condition appraisal and proposed recommendations for works to the pumping station building and its foundations.
- We have excluded any costs for further exploratory works and surveys required to complete the design. At this stage it is assumed that the 2021 GI works will provide sufficient information to inform the design at the three sites, but this will be reviewed as part of Phase 1.
- Topographic survey sub-contractors are to be appointed by the Client.
- Utilities and buried service information is to be provided by the Client.
- We have allowed for a 2-day site visit to be attended by a Structural Engineer and Design Engineer.
- A detailed options costs assessment by an ECI partner has been excluded, this can be provided as a separate appointment if required.
- For Phase 1 we have allowed for the attendance at 2No. meetings and 1No. Outline Workshop, we have assumed that these will be completed virtually by Microsoft Teams.
- We will advise on the costs for Phase 2 following confirmation of the preferred options and agreement of consenting requirements.
- We have assumed that the role of Principal Designer will be undertaken by others (see below) - please advise who will take on the role of Principal Designer.
- For budget costing purposes we have assumed that the tender process and appointment of the civil engineering contractor is to be managed and undertaken by the Client.
- No allowance for site supervision or inspections during the implementation phase works is included - Stantec can provide this support under a separate appointment if required.

FEES

A full breakdown of our proposed services and fees associated with the remedial works at Damford, Ewerby and South Kyme sites is included in Schedule B.

For Phase 1 we would recommend allowing a lump sum fee of £17,500 excluding expenses. We would recommend that you make a budget allowance of £750 for travel and accommodation expenses.

We will be able to advise on the lump sum fee for Phase 2 on completion of Phase 1. At this stage we have provided a budget estimate for the detailed design of the three sites in Schedule B.

For the avoidance of doubt, all Fees exclude VAT.

PROGRAMME

A six to seven-month programme is anticipated for the remedial works design project:

- The outline design options Technical Note and workshop are expected to be completed 2 months following appointment – subject to additional survey requirements.
- The detailed design and construction drawings shall be completed 4-5 months following agreement of the Preferred Option at the workshop meeting.

- The programme allowance excludes any statutory consent timescales, which are to be confirmed.

TERMS AND CONDITIONS

Our terms and conditions are enclosed with this letter as Schedule C, and they apply to this fee proposal letter.

CDM REGULATIONS 2015

Clients have specific duties under the Construction (Design & Management) Regulations 2015 (CDM Regulations 2015) that you need to be aware of.

Information and guidance on The Construction (Design and Management) Regulations 2015 can be found by visiting http://www.hse.gov.uk/construction/cdm/2015/responsibilities.htm.

Stantec will undertake the role of the *Designer* in line with the CDM Regulations and will prepare the Health and Safety File on completion of the design. Stantec are able to undertake the role of the Principal Designer under a separate appointment, if required, following completion of the detailed design stage.

ACCEPTANCE

Should you wish to proceed, please confirm your acceptance of the proposal set out in this letter by returning the enclosed 'Acceptance and authorisation to proceed' form at Schedule A signed by a duly authorised signatory of the organisation that will be engaging us and responsible for payment of our invoices. **In any event, your consent for us to start the Services will be deemed as acceptance of this proposal letter and its schedules.**

Yours sincerely,

Robert Riddington
on behalf of Stantec UK Ltd

Enclosures: Schedule A - Acceptance and authorisation to proceed
Schedule B – Services & Fee Summary
Schedule C – Terms and conditions (pdf)

SCHEDULE A
To a Fee proposal letter

ACCEPTANCE AND AUTHORISATION TO PROCEED

Client	Black Sluice IDB
Project	Black Sluice IDB – Remedial works design support for Damford, Ewerby and South Kyme pumping station sites.
Date of the fee proposal letter	02.02.2022
Deliverables & Fee	See Schedule B

Please confirm your acceptance of the proposal set out in this letter and its schedules by returning this form signed by a duly authorised signatory for the **Client.**

Signed on behalf of the Client **with express authority to do so.**	
Signature	
Name of person signing	
Position (director or other officer)	
Date	
Client's name, address and telephone number	
Name of the Client's representative (for giving instructions for the Project)	

Please forward this signed acceptance to Stantec UK Limited to instigate commencement of the services. On receipt of this acceptance, services will commence in accordance with the fee proposal letter and its schedules.

For the attention of: Robert Riddington

Stantec UK Limited
Caversham Bridge House
Waterman Place
Reading RG1 8DN
Tel 0118 950 0761
Stantec.com

SCHEDULE B
To a fee proposal letter

Services & Fee Summary

The following provides a tabulated summary of tasks and fees

Phase 1 – Lump Sum Fee:

The following are shown as lump-sum fee for the works associated for Phase 1.

Task No.	Task Description	Deliverables	Fee (£, excl. VAT)
1	Project Management and Team Liaison	Progress meeting minutes. Monthly financial reporting.	1,800
2	Desk-based review of GI Technical Notes and historic plans for all 3 no. sites.	Email confirming understanding of problems and issues at each site.	1,400
3	Identify need for further surveys to inform design. Preparation of topographic survey specification, liaison with 3 no. survey providers. Review of topographic survey.	Topographic survey specification. Source 3 no. quotes from topographic survey providers.	1,500
4	Site Visit (2-day visit required owing to travel). Incl. attendance by structural engineer. Travel and overnight stay disbursements covered separately.	Email summarising findings of site visit.	3,500
5	Options Appraisal Technical Note (1 no. Technical Note per location) - 3 no. sketches per location (max).	3 no. Options Appraisal Technical Notes.	7,500
6	Options Workshop to review findings of Technical Notes and agree preferred option for each site.	Virtual Workshop and associated minutes.	1,800
		Phase 1 Lump Sum Fee	**17,500**
		Expenses Budget Fee	**750**

Phase 2: Detailed Design – Budget Estimate:

The following are shown as budget estimates and will be confirmed following the conclusion of Phase 1.

Task No.	Task Description	Deliverables	Fee (£, excl. VAT)
7	Project Management and Team Liaison	Progress meeting minutes. Monthly financial reporting.	2,500 – 3,000
8	Detailed design, prepare Construction Issue drawings and associated specification for 3 no. sites.	Construction Issue Drawings (specification to be detailed on drawings).	15,000 – 21,000
9	Consenting support (EA Flood Risk Activity Permit / LLFA)	Prepare permit application documents and undertake EA liaison.	2,500 – 4,000
10	Preparation of H&S File	Health and Safety File.	2,000 – 4,000
		Phase 2: Budget Estimate	**22,000 to 32,000**
		Expenses Budget Estimate	**500**

BLACK SLUICE INTERNAL DRAINAGE BOARD

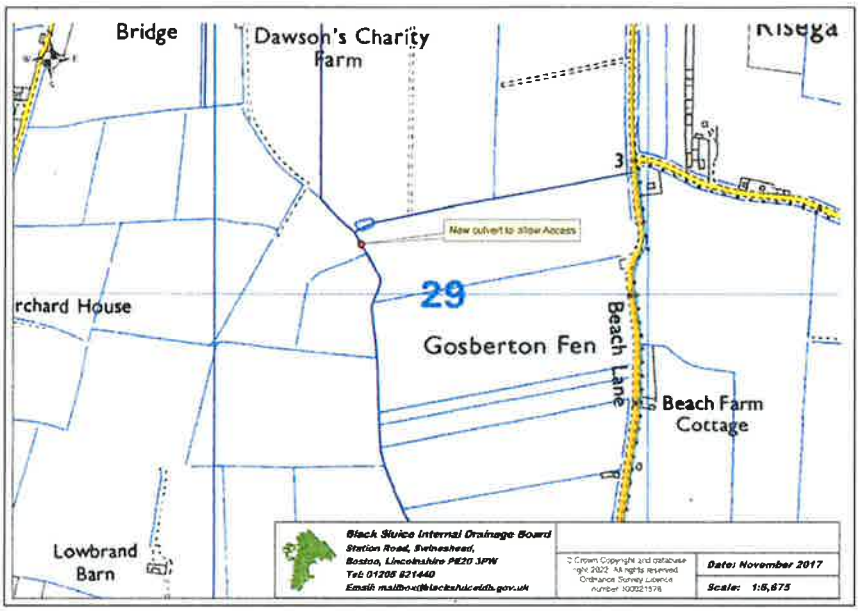
STRUCTURES COMMITTEE - 22nd MARCH 2022

AGENDA ITEM 10

THE COST AND VIABILITY OF ADDITIONAL ACCESS CULVERTS FOR THE BOARD'S MACHINERY

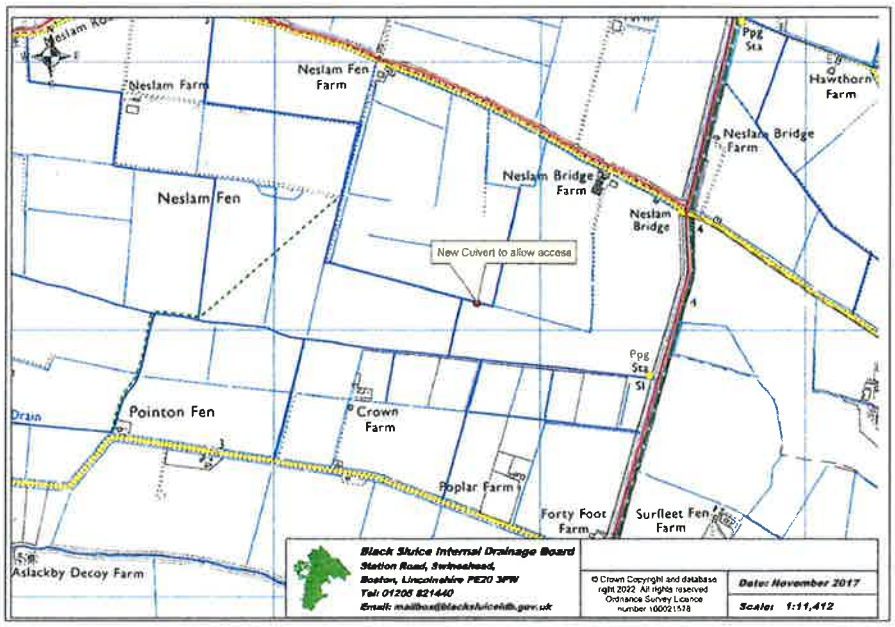
Location 1

Drain number 22/20 to provide improved access for maintenance minimum of 9m x 900mm culvert required, estimate £9,500.



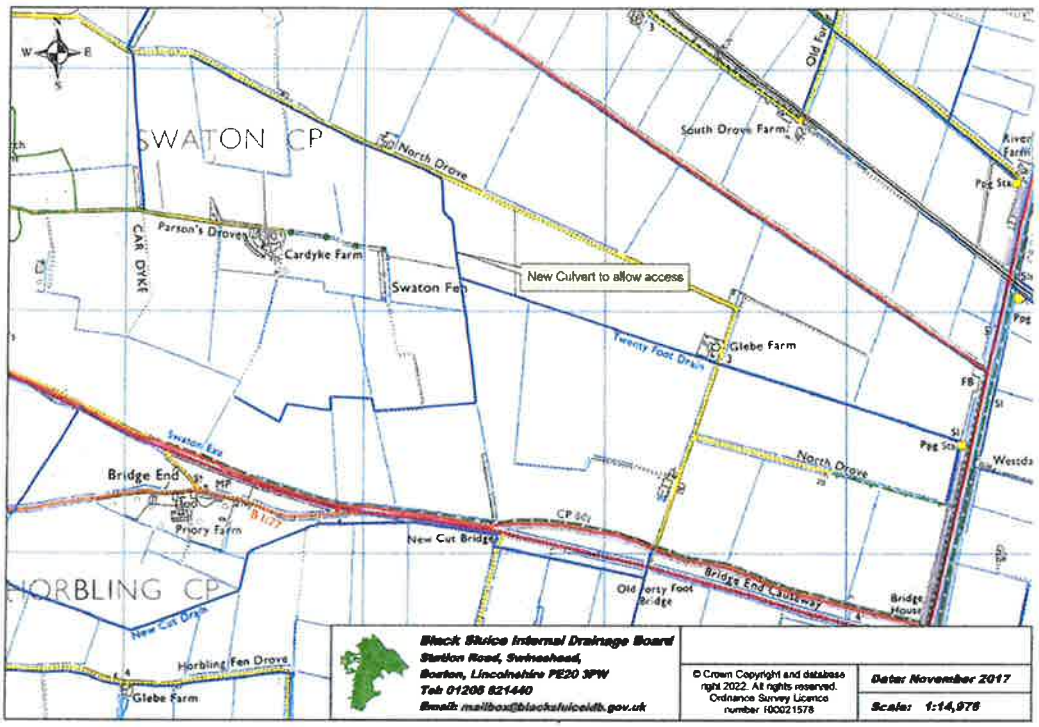
Location 2

Drain number 20/06 to provide improved access for maintenance minimum of 12m x 900mm culvert required, estimate £10,100.



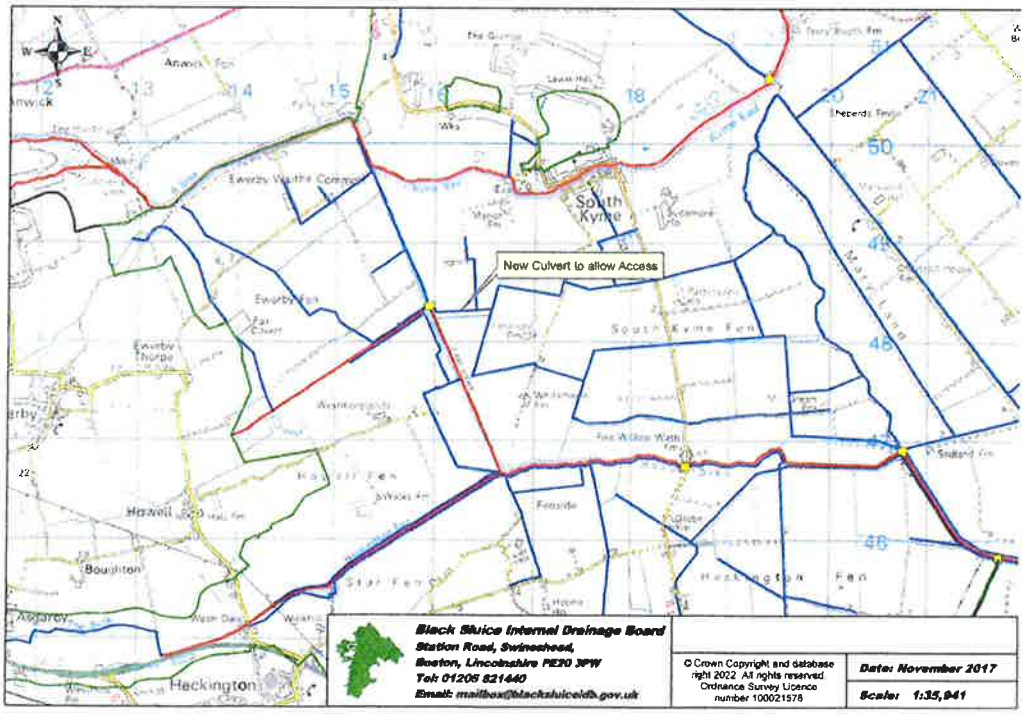
Location 3

Drain number 17/04 to provide improved access for maintenance minimum of 12m x 900mm culvert required, estimate £10,100.



Location 4

Drain number 08/07 to provide improved access for maintenance minimum of 12m x 1200mm culvert required, estimate £15,000.



AGENDA

1. Recording the meeting.
2. To welcome guests and receive apologies for absence.
3. Declarations of Interest.
4. To receive and, if correct, sign the Minutes of the Structures Committee Meeting held on the 24th March 2021 **(pages 1 - 11)**
5. Matters arising.
6. Byelaw Infringements and how can we engage more with our local planning officers **(page 12)**
7. To review the Structures Committee Terms of Reference **(page 13)**
8. To review the Structures Replacement Policy (No. 09) **(pages 14 - 17)**
9. To receive the Structures Report 2022 **(pages 18 - 63)** including:
   (i) Structures Replacement/Contribution Programme **(pages 18 & 19)**
   (ii) Culvert Surveys Report **(pages 19 - 24)**
   (iii) Culverts reported in a poor condition **(pages 25 & 26)**
   (iv) Ewerby, South Kyme, Damford and Trinity College Pumping Station Structural Report Up-Dates **(pages 27 - 63)**
10. To discuss the cost and viability of additional access culverts for the Board's machinery **(pages 64 - 65)**
11. Any Other Business.