Simon Bastone Associates Ltd

Consulting Civil and Structural Engineers

Structural Inspection Report

Structural Inspection Report
on
Various Structures
at
Goss Moor National Nature Reserve
For
Natural England
Part 1

Reference R210348/SI/00

03 June 2021

Bishops Chambers
14 Cathedral Close, Exeter
Devon, EX1 1EZ

t: 01392 671616

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1 DOCUMENT DETAILS

Type of report:	Structural Inspection
Client:	Crystal Edwards Natural England
Instructions:	By e-mail dated 25/03/2021
Date of Site Inspection:	29/04/2021, 30/04/2021 and 27/05/2021
Report prepared by:	Carl Vining BSc (Hons) CEng MIStructE
Project Number:	210348
Document Reference	210348/SI/00
Revision record:	00 – Draft issued

2 INTRODUCTION

2.1 Scope of Investigation

2.1.1 On 25/03/2021 Crystal Edwards of Natural England instructed Simon Bastone Associates Ltd to produce this report.

2.1.2 We have been instructed to carry out a structural inspection and report on 36 structures at Goss Moor National Nature Reserve.

2.1.3 There are a number of built infrastructure features on Goss Moor which include visitor access structures such as foot bridges, culverted vehicle crossings on the multi-use trail network, and historically built features like blockhouses.

2.1.4 These are inspected by Natural England staff every six months to assess stability and safety, and are subjected to a full and thorough visual inspection by an independent surveyor every five years.

2.1.5 Natural England's summary of requirement was:-

2.1.6 To undertake a full visual inspection of structural features on Goss Moor NNR in order to assess stability and safety, and record any defects and recommended repair works.

2.1.7 Detail of Requirement and Specification. This will comprise:

1) A full visual inspection of each feature

2) A report with a summary record of each feature to include:

- A written and photographic record of each feature
- Any defects found are recorded and resulting recommended works noted
- An IOSH risk assessment matrix to evaluate the risk of any defects noted
- The summary for each feature limited to three sides of A4.

2.1.8 This is not a full structural survey and covers the structural elements of the building only (dampness, windows, radon gas, chimney flues, insulation, services and finishes are not covered).

2.1.9 We confirm that we have not been instructed to inspect any other parts of the structure.

2.1.10 Our Client's brief for this investigation is to carry out a visual inspection of the finishes of the structure and report on any relevant defects that could reasonably be observed within the limitations of the investigation outlined below.

2.1.11 We have not been asked to carry out an asbestos survey so we will not report on this item. Specialist consultants will be required for such an inspection

2.1.12 Passing comments may be made about items beyond our brief for added assistance to our Client and any such comments shall not imply that we are extending our brief or that a full inspection has been undertaken.

2.1.13 The word "significant" shall mean significant in relation to what we are reporting about only.

2.2 Limitations of the Investigation

2.2.1 Certain limitations apply to the inspection and this report. These limitations are detailed in my Terms and Conditions of Engagement. Please ensure that these limitations are fully understood before relying on any information contained in this report.

2.2.2 We will inspect as much of surface areas as is practical, but will be under no obligation to inspect those areas of the structure that are covered, unexposed or are not readily accessible. We are therefore unable to report that any such parts of the structure are free from defect.

2.3 Authorisation

2.3.1 The investigation on which this report is based was carried out in response to a verbal instruction from Crystal Edwards of Natural England, the Client, to proceed with the work on 25/03/2021.

2.3.2 The instruction together with our terms and conditions were confirmed in our quotation by email.

2.4 Use of the Report

2.4.1 This report shall be for the private and confidential use of the Client for whom the report is undertaken, and shall not be reproduced or copied in any way in whole or in part or relied upon by third parties for any use without the express written permission of Simon Bastone Associates, the copyright owner. However, the report may be shown to other professional advisors such as Planners, Architects, Solicitors or sources of finance such as banks and building societies that may require knowledge of its recommendations for your benefit. It may not be passed to future purchasers or investors.

2.4.2 Also see our Terms and Conditions of Engagement.

2.5 The Investigation and Weather

2.5.1 The investigation was undertaken by Carl Vining on behalf of Simon Bastone Associates Ltd. on 29/04/2021, 30/04/2021 and 27/05/2021 . The weather at the time of the survey was overcast on the first day and sunny on the other two days.

2.6 Photographs

2.6.1 A photographic record of the structure was taken, which is held in our records, a selection of which are included in this report. Photographs generally relate to the text in the preceding paragraph.

2.7 Descriptions

2.7.1 For the purpose of identification of parts of the structure, north, south, west and east are used.

3 OBSERVATIONS, COMMENTS AND RECOMMENDATIONS FOR THE VARIOUS STRUCTURES

3.1 Culverted track (with rails)

3.1.1 Structure 1 was a 1200 mm diameter concrete culvert with concrete headwalls and galvanised steel railings. The culvert carried a small stream beneath a gravel track.

3.1.2

3.1.3

3.1.4

3.1.5

3.1.6 Some of the railings were rusty. The railings should be prepared and painted with a cold applied zinc rich paint system.

3.1.7

3.1.8

3.1.9

3.1.10 The Northwest baluster was loose. The fixings should be tightened or replaced.

3.1.11

3.1.12 Access to the South side of the culvert was obstructed by trees. These should be felled to prevent the culvert becoming blocked.

3.1.13

Risk Matrix	Severity				
Likelihood	1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
1. Improbable	1	2	3	4	5
2. Remote	2	4	6	8	10
3. Occasional	3	6	**9**	12	15
4. Probable	4	8	12	16	20
5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.2 Culverted track

3.2.1 Structure 2 was a 400 mm concrete culvert with random stone headwalls. The culvert carried a small stream beneath a gravel track.

3.2.2

3.2.3

3.2.4

3.2.5 The North Headwall had partly collapsed. This should be rebuilt.

3.2.6

3.2.7 The South headwall could not be accessed or inspected because of excessive vegetation. This should be cleared and the headwall re-inspected.

Risk Matrix	Severity				
	1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood					
1. Improbable	1	2	3	4	5
2. Remote	2	4	6	8	10
3. Occasional	3	6	**9**	12	15
4. Probable	4	8	12	16	20
5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.2.8

3.3 Culverted track

3.3.1 Structure 3 was a twin walled 900 mm diameter twin walled polyethylene culvert with Blockwork headwalls and a low parapet. The culvert carried a stream under a gravel track.

3.3.2

3.3.3

3.3.4

3.3.5 The South headwall had a severe crack up to 15 mm wide above the crown of the culvert. The headwall was leaning outwards by 40 mm. Scour has probably undermined the foundation of the headwall. The headwall should be rebuilt.

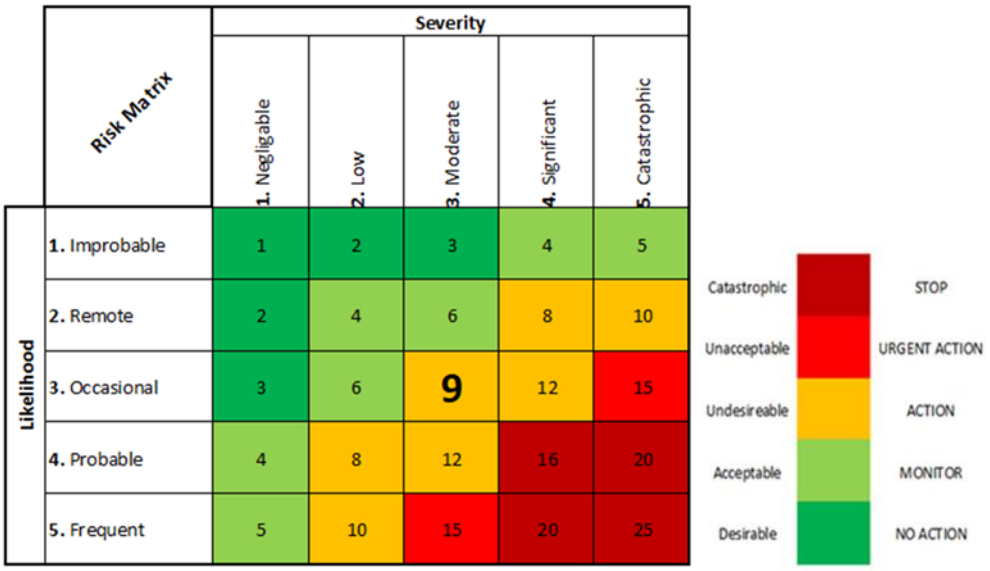
3.3.6

3.3.7

3.3.8 Slight cracking was noted on the North Headwall. This should be repaired.

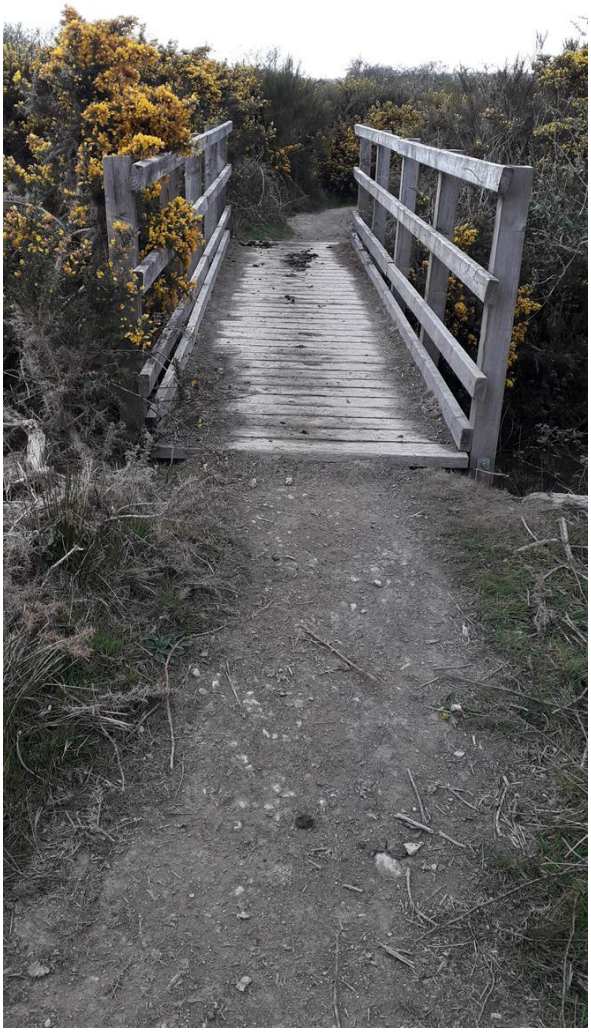
3.3.9

3.3.10


Risk Matrix
Severity
1. Negligable
2. Low
3. Moderate
4. Significant
5. Catastrophic
Likelihood
1. Improbable
2. Remote
3. Occasional
4. Probable
5. Frequent
1 2 3 4 5
2 4 6 8 10
3 6 9 12 15
4 8 12 16 20
5 10 15 20 25
Catastrophic
Unacceptable
Undesireable
Acceptable
Desirable
STOP
URGENT ACTION
ACTION
MONITOR
NO ACTION

3.4 Steel and Timber Footbridge

3.4.1 Structure 4 was a proprietary timber and steelwork footbridge of modern design set onto granite boulder abutments. The bridge had a timber post and rail handrail both sides fixed to steelwork brackets. The bridge spanned a stream.



3.4.2

3.4.3

3.4.4

3.4.5 The handrails were loose. The nuts on most of the fixing bolts were not tight. Nuts should be replaced with galvanised nylock nuts and tightened to secure the handrails.

3.4.6

3.4.7 The handrail was twisted and screw fixings were rusty, with only one screw per fixing. Rusty screws should be replaced with stainless steel suitable for external exposure, and provide a minimum of two screws per fixing.

3.4.8

3.4.9

3.4.10

3.4.11 The kick board was rotten and should be replaced.

3.4.12

3.4.13 The timber deck was covered in mud and could not be inspected. The mud should be removed and the deck inspected for rot.

Risk Matrix		Severity				
		1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood	1. Improbable	1	2	3	4	5
	2. Remote	2	4	6	8	10
	3. Occasional	3	6	**9**	12	15
	4. Probable	4	8	12	16	20
	5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.4.14

3.5 Culverted track/Concrete Bridge

3.5.1 Structure 5 was a triple 600 mm diameter concrete culvert with concrete headwalls and a cast in situ concrete road surface. The culvert carried a stream. Granite boulders bedded in concrete had been placed either side of the roadway to provide vehicle restraint. No defects were noted.

3.5.2

3.5.3

3.5.4

3.5.5 The upstream end of the culvert was clogged with branches. These should be removed.

3.5.6

Likelihood / Severity	1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
1. Improbable	1	2	3	4	5
2. Remote	2	4	6	8	10
3. Occasional	3	6	9	12	15
4. Probable	4	8	12	16	20
5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.6 Culverted track

3.6.1 Structure 6 was a 600 mm diameter culvert beneath a gravel track. One side of the culvert had an old rusty grating.

3.6.2

3.6.3

3.6.4 The ditch either side of the track was very overgrown. The vegetation should be cut back and the culvert re-inspected.

3.6.5

3.6.6

3.6.7

Risk Matrix	Severity				
	1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood					
1. Improbable	1	2	3	4	5
2. Remote	2	4	6	8	10
3. Occasional	3	6	**9**	12	15
4. Probable	4	8	12	16	20
5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.7 Culverted walkway/track

3.7.1 Structure 7 was a 300 mm thick concrete bridge over a stream with Keyclamp railings. No defects were noted.

3.7.2

3.7.3

3.7.4

3.7.5 The handrail could be moved easily which indicates it lacks adequate strength to resist lateral loads. The two bolt fixing detail was suitable for bolting to steelwork rather than concrete. No other defects were noted.

3.7.6

3.7.7

Risk Matrix	Severity				
Likelihood	1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
1. Improbable	1	2	3	4	5
2. Remote	2	4	6	8	10
3. Occasional	3	6	9	12	15
4. Probable	4	8	12	16	20
5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.8 Culverted Track/Bridge

3.8.1 Structure 8 was a cast in situ concrete bridge with concrete wingwalls, abutments and low concrete parapets.

3.8.2

3.8.3

3.8.4

3.8.5

3.8.6

3.8.7 There was some damage to the parapets from farm vehicles. The worst damage was on the West side of the bridge. Damage should be repaired using concrete repair mortar.

3.8.8

3.8.9

3.8.10

Risk Matrix		Severity				
		1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood	1. Improbable	1	2	3	4	5
	2. Remote	2	4	6	8	10
	3. Occasional	3	6	**9**	12	15
	4. Probable	4	8	12	16	20
	5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.9 Culverted Track

3.9.1 Structure 9 was a 600 mm diameter twin walled polyethylene culvert with random stone headwalls and low parapet with paving stone copings.

3.9.2

3.9.3

3.9.4

3.9.5

3.9.6 The copings had been damaged by farm vehicles. Copings should be set onto a strong mortar bed to protect the parapet masonry beneath.

3.9.7

3.9.8

3.9.9 The West side of the culvert was obscured by trees and brambles. This should be cleared and the culvert re-inspected.

3.9.10

Risk Matrix		Severity				
		1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood	1. Improbable	1	2	3	4	5
	2. Remote	2	4	6	8	10
	3. Occasional	3	6	**9**	12	15
	4. Probable	4	8	12	16	20
	5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.10 Culverted Track/Sleeper Bridge

3.10.1 Structure 10 was a timber sleeper bridge 4.5 m long with a timber post and rail balustrade and concrete blockwork abutments. The bridge also had a central midspan concrete blockwork abutment.

3.10.2

3.10.3 The deck was covered in mud and could not be inspected but where visible the timber appeared sound. The mud should be cleared and the sleepers inspected for rot.

3.10.4

3.10.5 Both timber balustrades were in poor condition and should be replaced.

3.10.6

3.10.7 Both sides of the bridge were heavily overgrown. The undergrowth should be cleared and the sided of the bridge re-inspected.

Risk Matrix	Severity				
Likelihood	1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
1. Improbable	1	2	3	4	5
2. Remote	2	4	6	8	10
3. Occasional	3	6	9	12	15
4. Probable	4	8	12	16	20
5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.10.8

3.11 Culverted Track/Bridge

3.11.1 Structure 11 was a 1200 mm diameter twin walled polyethylene culvert with random stone headwalls and a timber post and rail handrail both sides. No defects were noted.

3.11.2

3.11.3

3.11.4

3.11.5

3.11.6

Risk Matrix		Severity				
		1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood	1. Improbable	1	2	3	4	5
	2. Remote	2	4	6	8	10
	3. Occasional	3	6	9	12	15
	4. Probable	4	8	12	16	20
	5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.11.7

3.12 Blockhouse Structures

3.12.1 Structure 12 were a number of blockwork silos with concrete concrete filler joist floors. These structures were associated with sand and gravel extraction from the moor. The structures were generally constructed of 150 mm thick blockwork laid in a cement mortar.

3.12.2

3.12.3

3.12.4

3.12.5

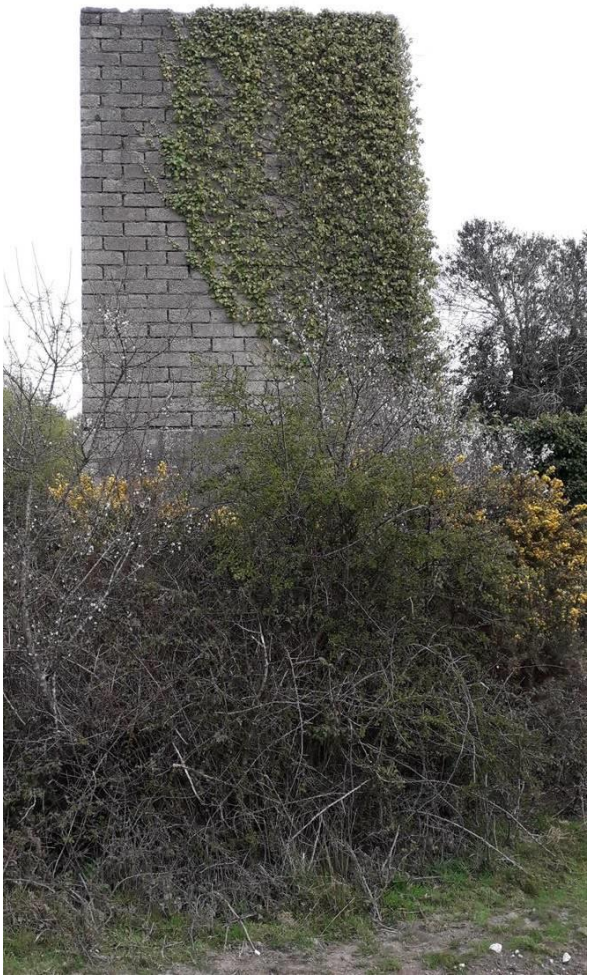
3.12.6

3.12.7

3.12.8 Many of the structure were covered with ivy and other vegetation which will damage the masonry. This should be removed.

3.12.9 The upper parts of the silo walls had lost much of the pointing because of frost damage. Walls affected should be repointed.

3.12.10



3.12.11

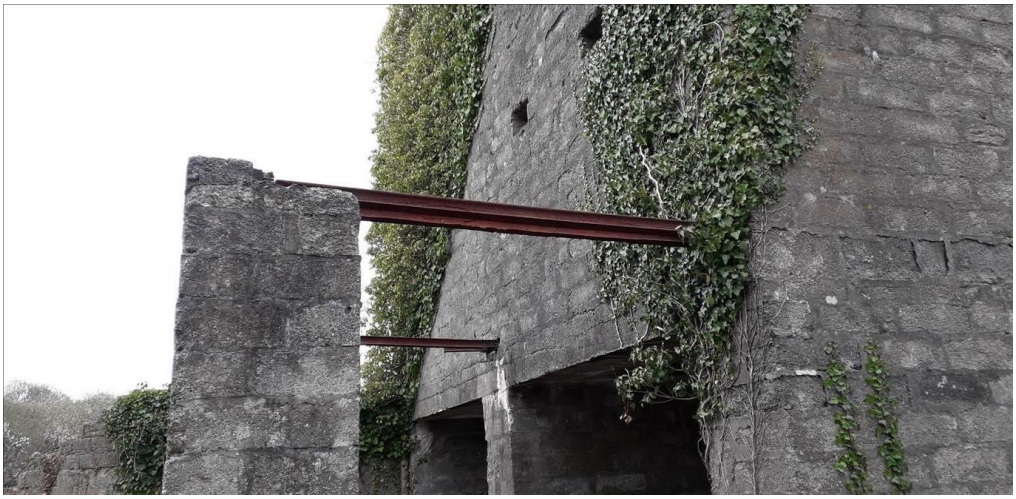
3.12.12 The floor within the silo was constructed of steelwork filler joists encased in concrete. This construction technique was used before reinforced concrete was invented. The steelwork was corroding and spalling the concrete cover on the underside of the slab. This concrete had dropped from the roof and is a potential hazard to the public. Concrete repairs could be undertaken, but the top side of the slab is probably much worse, and water is probably affecting the steelwork from the both the top and bottom. The best course of action is probably to monitor the corrosion and fence off the area as the slab deteriorates.

3.12.13

3.12.14

3.12.15

3.12.16 Many steelwork elements were noted embedded in the walls. The corrosion of theses members will cause damage to the walls as the rust products expand. Where possible steelwork embedded into the walls should be removed and the walls made good.



3.12.17

3.12.18

Risk Matrix		Severity				
		1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood	1. Improbable	1	2	3	4	5
	2. Remote	2	4	6	8	10
	3. Occasional	3	6	**9**	12	15
	4. Probable	4	8	12	16	20
	5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.12.19

3.13 Steel and Timber Footbridge

3.13.1 Structure 13 was a proprietary timber and steelwork footbridge of modern design set onto granite boulder abutments. The bridge had a timber post and rail handrail both sides fixed to steelwork brackets. The bridge spanned a stream.

3.13.2

3.13.3

3.13.4

3.13.5

3.13.6 The handrails were loose. The nuts on most of the fixing bolts were not tight. Nuts and washers were rusty. Nuts and washers should be replaced with galvanised nylock nuts and washers and tightened to secure the handrails.

3.13.7

3.13.8 The handrail screw fixings were rusty, with only one screw per fixing. Rusty screws should be replaced with stainless steel suitable for external exposure, and provide a minimum of two screws per fixing.

3.13.9

3.13.10

Risk Matrix		Severity				
		1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood	1. Improbable	1	2	3	4	5
	2. Remote	2	4	6	8	10
	3. Occasional	3	6	**9**	12	15
	4. Probable	4	8	12	16	20
	5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.13.11

3.14 Timber Bridge

3.14.1 Structure 14 was a timber bridge with a 4 m span with recycled plastic boarding and post and rail handrail both sides. The bridge spans a ditch. No abutments have been constructed. No defects were noted.

3.14.2

3.14.3

3.14.4

3.14.5

3.14.6

3.14.7

3.14.8

Risk Matrix		Severity				
		1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood	1. Improbable	1	2	3	4	5
	2. Remote	2	4	6	8	10
	3. Occasional	3	6	9	12	15
	4. Probable	4	8	12	16	20
	5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.14.9

3.15 Wooden Pond Platform

3.15.1 Structure 15 was a viewing platform with recycled plastic substructure and boards and a timber post and rail handrail. Handrail fixings were rusty. Fixings should be replaced with stainless steel fixings.

3.15.2

3.15.3

3.15.4

3.15.5

3.15.6

Risk Matrix		Severity				
		1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood	1. Improbable	1	2	3	4	5
	2. Remote	2	4	6	8	10
	3. Occasional	3	6	**9**	12	15
	4. Probable	4	8	12	16	20
	5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.16 Plastic Boardwalk

3.16.1 Structure 16 was a 1.2 m wide recycled plastic boardwalk crossing an area of marsh. The construction was square plastic posts driven into the marsh supporting plastic bearers and joists with plastic boards and kick boards. No handrails have been provided.

3.16.2

3.16.3

3.16.4

3.16.5

3.16.6

3.16.7 Some undulation was noted in the boardwalk which may indicate some settlement of the posts.

3.16.8

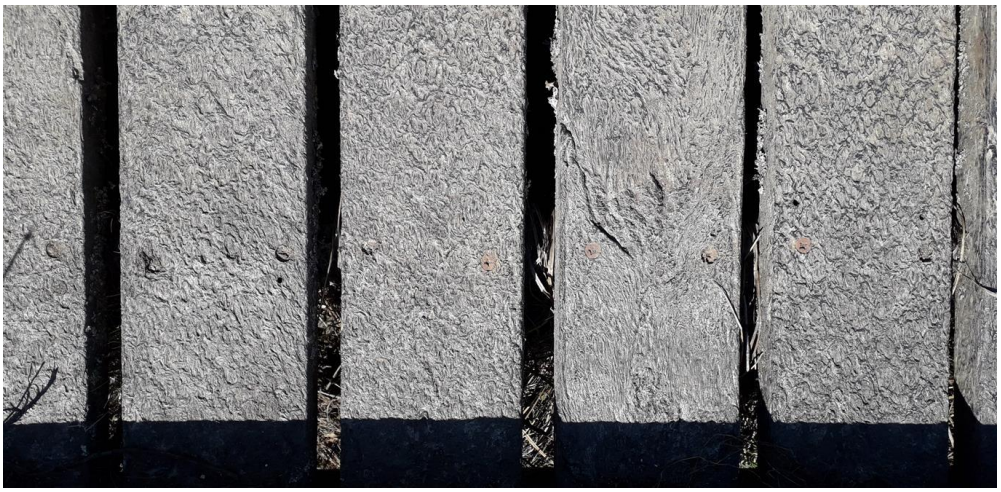
3.16.9 Some kick boards near the South end West side and North end West side were loose and require re-fixing.

3.16.10

3.16.11 A board was loose close to the South end. The board should be re-fixed.

3.16.12

3.16.13 Fixings were rusting and should be replaced by stainless steel fixings.



3.16.14

Risk Matrix		Severity				
		1. Negligable	2. Low	3. Moderate	4. Significant	5. Catastrophic
Likelihood	1. Improbable	1	2	3	4	5
	2. Remote	2	4	6	8	10
	3. Occasional	3	6	**9**	12	15
	4. Probable	4	8	12	16	20
	5. Frequent	5	10	15	20	25

Catastrophic	STOP
Unacceptable	URGENT ACTION
Undesireable	ACTION
Acceptable	MONITOR
Desirable	NO ACTION

3.16.15