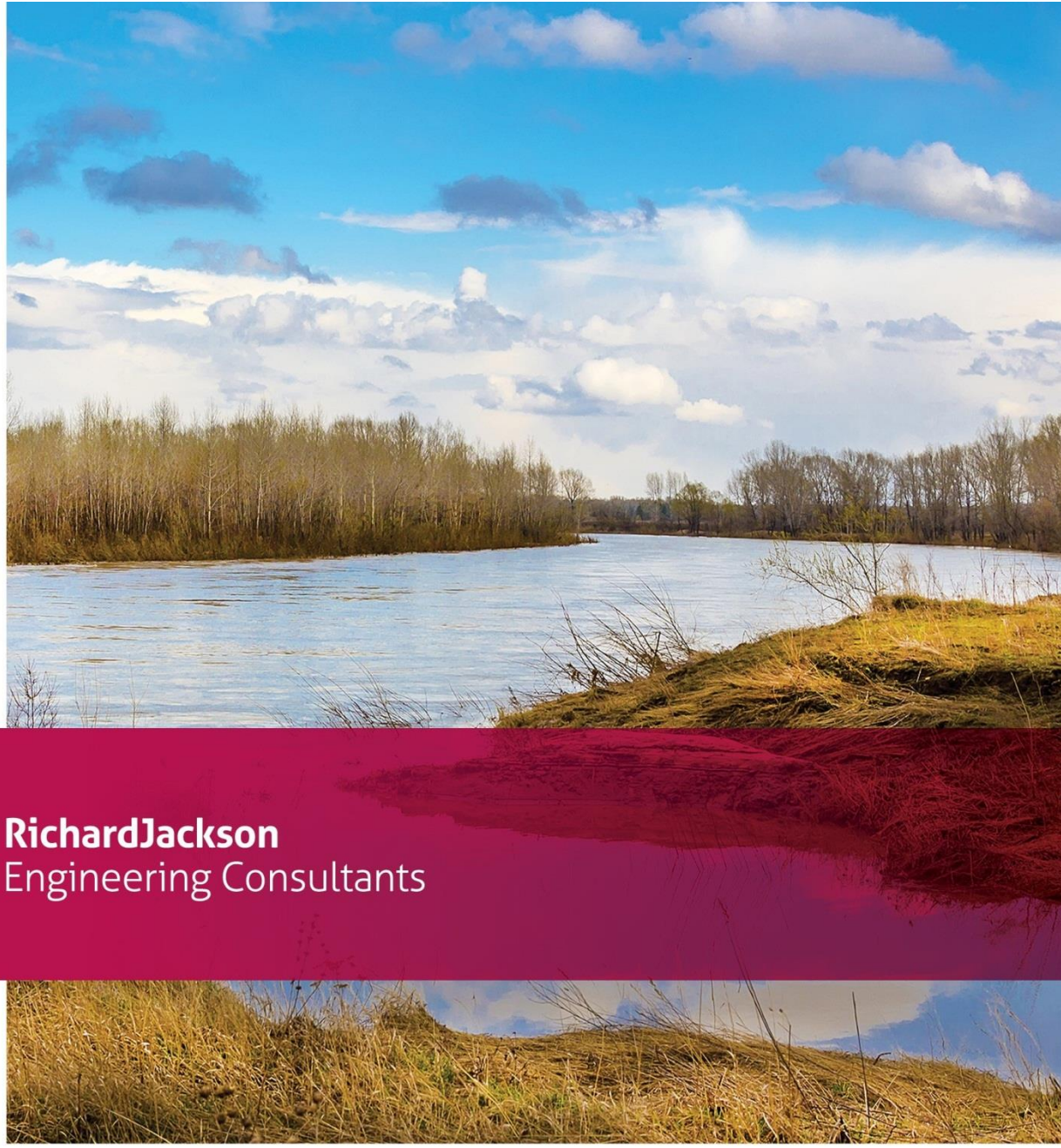


RichardJackson
Engineering Consultants

DOLPHINS – VISUAL STRUCTURAL INSPECTION

Brightlingsea Harbour

Brightlingsea Town Council

April 2021

Project no: 61257

RichardJackson
Engineering Consultants

Document Review Sheet: -

Document prepared by: - *John Wankowski IEng MIED* on behalf of Richard Jackson Ltd

Date: - ..01.. / ..04.. / 2021

Document checked by: - *Michael Sturdivant BEng (Hons) FGS AMRINA* on behalf of Richard Jackson Ltd

Date: - ..08.. / ..04.. / 2021

Document Approved by: - *Richard Laycock BEng (Hons) CEng MICE* on behalf of Richard Jackson Ltd

Date: - ..08.. / ..04.. / 2021

Document Status

DRAFT ☐ FINAL ☐

Revision Status

Issue	Date	Description	Prepared	Checked	Approved

RichardJackson
Engineering Consultants

Contents:-

Appendix A

Photographs

Appendix B

Correspondence with Brightlingsea Museum - Photos reproduced with kind permission

Appendix C

61257 – SK01: Sketch of Brightlingsea Dolphins

1. Introduction

1.1. We received written instructions from Brightlingsea Town Council on 29 March 2021 to make a structural inspection of the 3no. mooring Dolphins located in the Brightlingsea Harbour. This was made on 1st April 2021.

1.2. The subject of the inspection was an assessment of the general structural condition of the 3 No. individual Dolphins.

1.3. This Report gives the results of our inspection, discusses these results and gives any recommendations for further action.

1.4. The Dolphins are historic harbour mooring structures, anecdotally erected during World War II for military use, somewhere between 1940 & 1942.

1.5. It is understood that they were last commercially used during the 1960s and have since then fallen into disuse.

1.6. Anecdotally, there has been no scheduled or recorded maintenance of any of the Dolphin structures within the last 40 years.

2. Limitations

2.1. A structural inspection is an enquiry into the structural condition of the item at the point of inspection. It is a specialist survey, concerned only with structural matters and not with wider, non-structural matters.

2.2. This report has been prepared for the benefit of Brightlingsea Town Council

2.3. We are obliged to state that we have not inspected foundations or other parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to say that any such part of the Dolphins are free from defect.

3. Structure

3.1. With reference to the hand sketch in Appendix C, the following observations are made.

3.2. There are 3 No. structures, their heights vary to match the slope of the harbour tidal flat and keep the top of the structures level. In this report all measurements on each structure is relative to the local ground level of the mud. For clarity the Dolphin closest to the shore is referred to as No. 1 (2.8m tall), and the tallest furthest from the shore is referred to as No. 3. (4.2m tall).

3.3. The Dolphins are formed from trussed steel Equal Angle (EA) and Parallel Flange Channel (PFC) members.

3.4. Below the high tide line, the main vertical corner members were measured to be approximately 6" x 6" EA (152mm x 152mm) with a section thickness of 12.5mm (following the removal of marine growth and corrosion).

3.5. The diagonal bracing members were 3.5" x 3.5" EA (89mm x 89mm), with a section thickness of 9mm (following removal of the marine growth and corrosion).

3.6. The horizontal members were 5.5" x 2.5" PFC (140mm x 64mm) (following removal of the marine growth and corrosion).

3.7. The plated joints are a mixture of riveted and bolted connections (where possible to differentiate). The measured thickness of the plate at the mud line on No.3 Dolphin was 12mm.

3.8. On the northern side the Dolphins have hardwood timber members bolted to the face of the structures to form rubbing plates nominally 6" x 4" (152mm x 102mm).

3.9. The Dolphins are designed to have a vertical face on the northern side to accept vessels. The other faces are sloped for structural efficiency.

3.10. At the point of inspection the tide was out completely exposing the mud surrounding No.3.

3.11. The foundations were not visible.

4. Condition

4.1. The lower sections of the Dolphins were heavily encrusted with marine growth (barnacles & oysters).

4.2. At an approximate height of 1.3m above the tidal flat on Dolphin No. 3, seaweed indicated the high tide line. Above this point marine growth was limited or not present. Dolphins No. 2 & 1 exhibited marine growth to similar relative level to the tide line height as No. 3. It should be noted that the majority of No. 1 is above the approximate high tide line.

4.3. On all 3 No. moorings, above the high tide line, the steel members were heavily corroded. Some individual members had completely dissolved and others exhibited large holes.

4.4. Hammer testing was undertaken upon various members. Below the high tide line following removal of the marine growth the steel was preserved. The marine growth of barnacles particularly on No. 3 was very thick and uniform and had in places completely encased the members below the high tide line (an approximate height of 1.3m).

4.5. Above the tide line all members examined had no sectional thickness remaining; striking with a 500g hammer resulted in complete local disintegration of the member.

4.6. Without accurate record drawings it is not possible to be certain about the original section thicknesses. From historic literature it may be possible to estimate the original member thickness and calculate the loss of structural capacity.

4.7. It was noted with the use of a plumb-bob that No. 3 is not vertical and leans outwards to the north, resulting in the top being >50mm beyond the toe at the mud line. It was not possible to work out if the cant is caused by localised damage to the members below the mud-line or symptomatic of failure of the foundation.

5. Discussion

5.1. The corrosion of the steel members above the high tide line is such that, the rust and hardwood rubbing timbers are holding the Dolphins together. These structures are in a dangerous condition, and the Council as their owners are liable for the risks that they present under the Buildings Act 1984.

5.2. It would be highly unlikely that any marine insurer would accept the liability of the Dolphins as mooring points in their current condition.

The current structural condition of Dolphins presents a risk of serious injury to individuals if they were to climb or interact with them.

5.3. The deterioration of the structures is so widespread that repair is unlikely to be feasible. The structure would have to be completely removed and replaced from just above the mud-Without inspection or testing of the foundation it is not possible to comment upon the condition. If new structure was mounted upon the existing foundation it would be at risk of failure. It is recommended that they be treated as suspect.

6. Conclusion

6.1 Given that repair is unfeasible, the only credible option is complete removal of the dolphins to well below the mud-line, to ensure any persons or boats would not be at risk of injury or damage due to the remaining vertical members.

Appendix A

Photographs

Appendix B

Correspondence with Brightlingsea Museum - Photos reproduced with kind permission

Appendix C

61257 – SK01: Sketch of Brightlingsea Dolphins

RichardJackson
Engineering Consultants

Appendix A

Photographs

Fig 1. – Dolphins

Fig 2 – Dolphin 1

Fig 3 – Dolphin 2

Fig 4 – Dolphin 3

Fig 5 & 6 – Results of hammer testing on Dolphin 1

Fig 7 - Typical condition of joints on Dolphin 1 above high tide line

Dolphin 2

Fig 8 – Upper section of Dolphin 2 (note extreme loss of section)

Fig 9 - Dolphin 2 above high tide line

Fig 10 – Dolphin 2

Fig 11 – Dolphin 2 below high tide line

Fig 12 – Dolphin 2

Fig 13 – Dolphin 2

Fig 14 – Dolphin 3

Fig 15 – Dolphin 3 above high tide line note deterioration of connections

Fig 16 – Dolphin 3 typical condition of hardwood timber rubbing rail

Fig 17 – Dolphin 3 at high tide line

Fig 18 – Dolphin 3 typical condition note hole in diagonal bracing member

Fig 19 – Dolphin 3 at high tide mark interior bracing

Fig 20 – Dolphin 3 typical condition of members at high tide line

Fig 21 – Dolphin 3 loss of section of timber rubbing rail and poor condition of connection bolt

Fig 22 – Dolphin 3 condition of member under marine growth

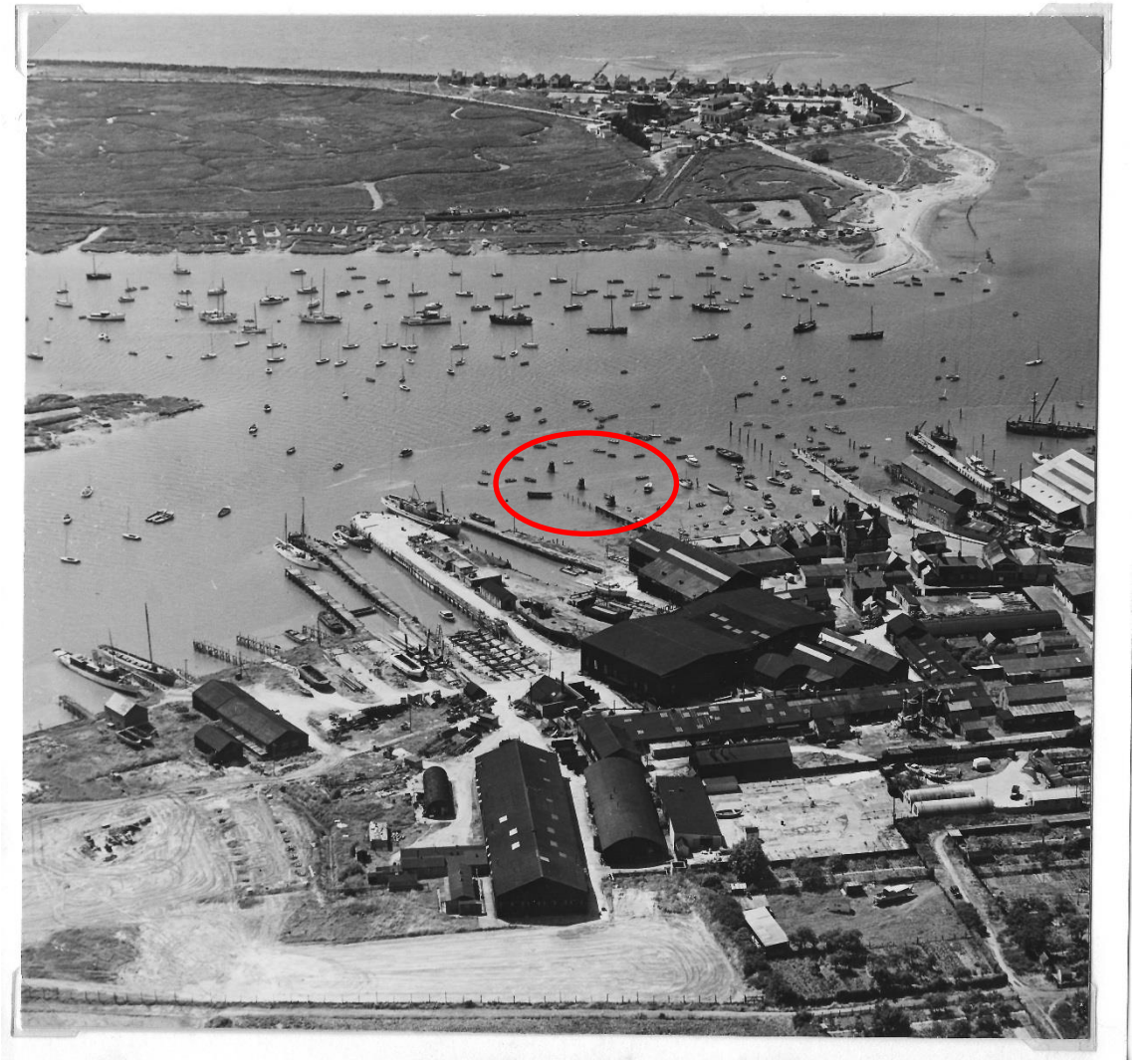
Fig 23 - Dolphin 3 above high tide line

Fig 24 – Dolphin 3 typical marine growth below tide line

Fig 25 - Dolphin 3 at mud line following removal of marine growth

Appendix B

Correspondence with Brightlingsea Museum - Photos reproduced with kind permission



Brighlingsea 1953 – Dolphin structures circled

Brightlingsea 1995

RichardJackson
Engineering Consultants

Appendix C

61257 – SK01: Sketch of Brightlingsea Dolphins

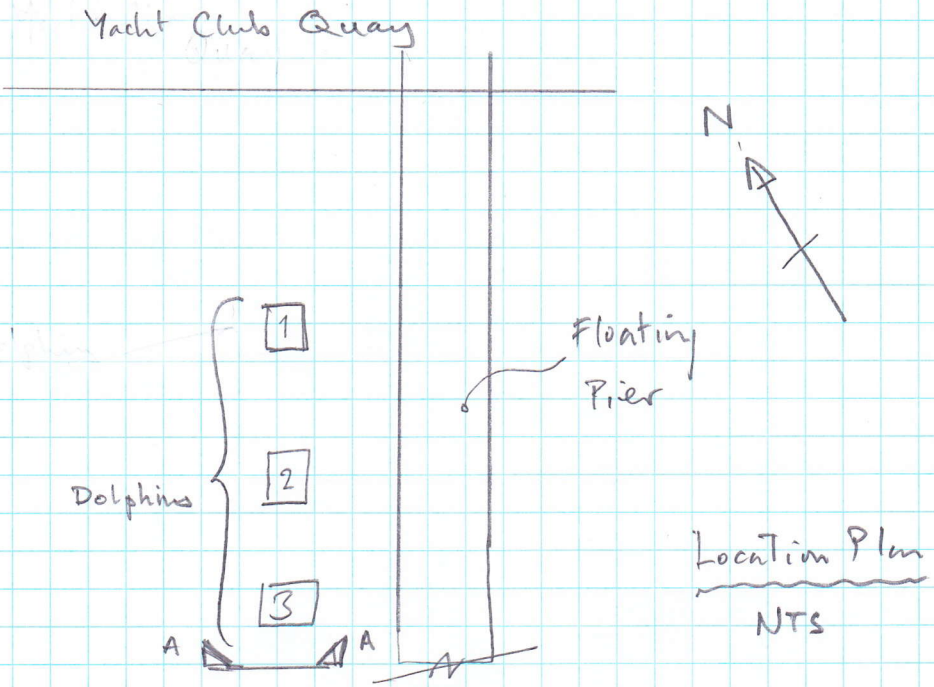
RichardJackson
Engineering Consultants
www.rjuk.com

Bristol: ☐
Cambridge: ☐
Colchester: ☐
London: ☐
Norwich: ☐

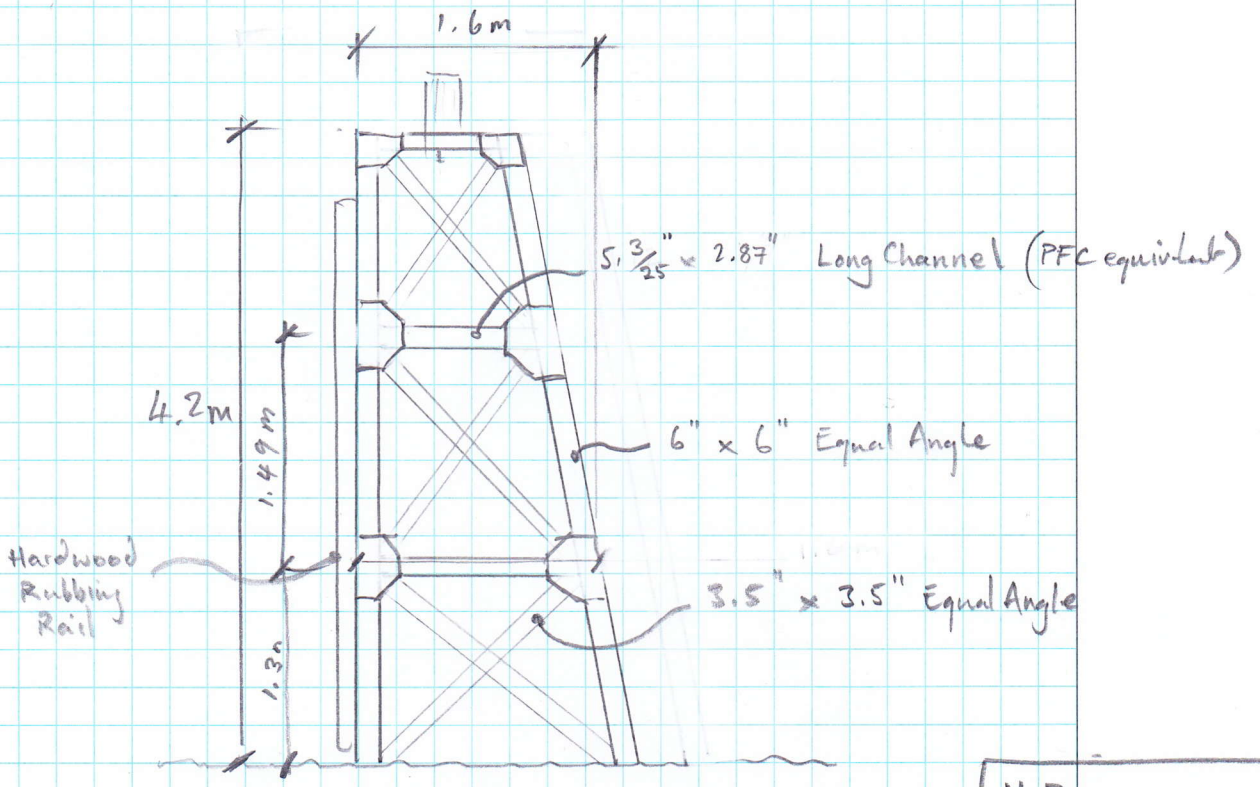
CONTRACT: Brightlingsea Dolphins
ELEMENT:

REF: 61257
SHEET:
DATE:

Appendix B - SK01



Location Plan
NTS



Dolphin 3 - Section A-A
1:5

N.B.
Steel Sections are historic and highly weathered sizes are approximate as compared to Dorman Section Tables

Colchester
01206 228800

London
020 7448 9910

Norwich
01603 230240

Cambridge
01223 314794

Bristol
01172 020070

www.rj.uk.com