ATKINS

Langstone Harbour Board
Ferry Terminal Inspection
Phase 1

Final Report

August 2010

Plan Design Enable

Langstone Harbour Board

Langstone Harbour Ferry Terminal General Inspection Phase 1 Final Report

09/08/2010

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Glossary of terms

Term	Meaning / definition
ALWC	Accelerated Low Water Corrosion
CP	Cathodic Protection
Dolphin	Piled structure used in coastal engineering for berthing, and for guiding and restraining pontoon movements
EA	Equal Angle
Energy Fender	Type of fender designed to reduce impact forces on vessels and marine structures by absorbing the berthing energy either of a moving vessel or a pontoon (against a dolphin)
Fender Guide	Elements between the energy fender and dolphin to ensure that the pontoon is restrained in position
HDPE	High Density Polyethylene
Pratt truss	Truss configuration with alternating diagonal and vertical members in elevation
RHS	Rectangular Hollow Section
SHS	Square Hollow Section
UB	Universal Beam
UC	Universal Column
Warren truss	Truss configuration with alternating diagonal members in elevation

Executive Summary

Atkins Limited carried out a walk-over, visual inspection of the Hayling and Eastney ferry terminals on the 30th March 2009.

The purpose for the inspection was to identify the current condition of both facilities and determine an appropriate short, medium and long-term maintenance regime/investment plan.

Both facilities appear to comprise mixed arrangements of different eras of investment, having different types of linkspan, dolphins and pontoon. This is unusual and the age of the different components is not known.

The condition of the components varies considerably with some elements, like the linkspans, being in fair condition (except some significant local corrosion at one end of the Hayling linkspan) and some of the dolphin framing steelwork and pontoon deck steelwork in need of repair/replacement in the near-term. Further inspection is required to confirm the condition of some inaccessible elements. Nevertheless, subject to such further inspection, the asset value of both facilities is such that investment in repair and replacement of some items appears to be an appropriate strategy for managing the future serviceability of the facilities, as opposed to complete replacement.

The Hayling terminal has a significant problem with the articulation of the linkspan, in that as the Pontoon moves east-west within the float of the fender guides, the corresponding plan rotation of the linkspan about the abutment (fixed approach) does not have any designed freedom to accommodate the necessary movement. Whilst the bearings have been repaired previously, without provision for this movement, the current bearings/supports appear to have had to displace/wear excessively to accommodate this plan rotation.

The deck steelwork and dolphin framing steelwork on both facilities requires general repair and replacement of some components. The decking and handrails are in poor condition and require repair/replacement, especially in terms of safe control of pedestrian traffic.

The north-west Eastney dolphin appears to be off-vertical and requires monitoring.

The fuel lines on the Hayling facility has not been addressed in this inspection but does require far more robust environmental control in terms of addressing the potential consequences of fuel spillages/leaks.

This report includes a comprehensive photographic record and presents a draft priced, rolling maintenance programme. Mindful of the sizeable cost of some items, a list of short-term works is identified in order to complete inspection and safety items prior to any major investment and repair.

1. Introduction

1.1 General

Langstone Harbour is served by a cross-harbour ferry between terminals located at Hayling Island to the east and Eastney to the west. Both ferry terminals comprise a linkspan which spans between a fixed approach on the landside and a pontoon on the sea-side. The motion of each pontoon is guided by a pair of dolphins, each of which comprises multiple piles driven into the seabed and tied together to act as a group.

A brief description of the structure of each ferry terminal is outlined below. Where appropriate, individual parts of the pontoon, linkspan and supports are referred to by cardinal points, except when identifying bearings and linkspan ends, in which case 'land side' or 'sea-side' is used (e.g. corrosion evident on the bottom chord of the western truss near the land side).

1.1.1 Hayling Terminal

Fixed approach

The fixed approach consists of a mass concrete abutment supporting a bankseat for the land side linkspan bearings.

Linkspan

The linkspan is oriented approximately south (landside) to north (pontoon-side), and spans 28m (approx) between twin pinned bearings on the land side bankseat and twin roller bearings on the pontoon. The steel linkspan consists of two Warren trusses, between which there is plan bracing on the top and bottom chords. The deck is supported by 4 No. longitudinal softwood joists which span between transverse steel members. The key dimensions of the linkspan components as measured on site are as follows:

- Bottom chord – 100x150mm RHS;
- Diagonal members – 70x70mm SHS;
- Plan diagonal bracing – 70x70x 4-5mm EA;
- Transverse joists – 130x76mm UB (flange 6mm thk, web 4mm thk) at 1.7m centres;
- Longitudinal decking joists – 143x50mm.

The linkspan trusses are each constructed in 3 sections, connected with bolted stiffened splices.

Pontoon

The pontoon is oriented approximately east-west and consists of 6 No. concrete-encased foam floats bolted to a steel framed deck – appears to be a 'Walcon' –type system.

Dolphins

Each dolphin comprises 5 No. inter-braced 450x450x15-20mm thick box piles arranged as illustrated in Appendix B. The box piles appear to be concrete-filled (hammer testing). The pontoon is guided between the inner pair piles of each set of 4, with fender guides between the pontoon and the dolphin piles.

1.1.2 Eastney Terminal

Fixed approach

The fixed approach consists of a mass concrete abutment supporting a bankseat for the land side linkspan bearings.

Linkspan

The linkspan is oriented approximately southwest (land side) to northeast (sea side), and spans 35m (approx) between twin rocker bearings on the land side bankseat and twin plastic roller bearings on the pontoon. The steel linkspan consists of two Pratt-girder trusses, between which there is triangulated plan bracing on the top and bottom chords. The deck is supported by 3 No. longitudinal softwood joists which span between transverse steel members. The key dimensions of the linkspan components as measured on site are as follows:

- Bottom chord – 120x120mm SHS;
- Diagonal members – 70x70mm (approx) SHS;
- Vertical members – 70x70mm (approx) SHS;
- Plan diagonal bracing – 70x70mm SHS;
- Transverse joists – 70x70mm SHS at 2.5m (approx) centres;
- Longitudinal decking joists – 100x50mm laid on flat.

The linkspan trusses are each constructed in 3 sections, connected with bolted unstiffened splices.

Pontoon

The pontoon is oriented approximately southeast-northwest and consists of 18 No. hollow steel tanks with steel frame deck.

Dolphins

Each dolphin comprises 3 No. 600Øx12-15mm thick circular piles arranged in a triangular formation as illustrated in Appendix B. The pontoon is guided between the pair of piles closest to the pontoon, with fender guides between the pontoon and the dolphin piles.

1.2 Inspection history

The Hayling and Eastney Ferry Terminals appear to have been constructed in about 1982. This observation is based on the drawing record provided by the Langstone Harbour Board.

Both ferry terminals have been subjected to a regular programme of inspections since 1995. Tabulated below is a summary of the dates and types of these inspections prior to the present one. A detailed summary of the findings of these inspections is presented in Appendix E.

Table 1.1 – Summary of Langstone Ferry Terminal inspection history

Hayling		Eastney	
Date	**Inspection**	**Date**	**Inspection**
Sept 1995	5 yearly full inspection – above and below water	Sept 1995	5 yearly full inspection – above and below water
Oct 1997	Annual inspection – readily accessible areas only	Oct 1997	Annual inspection – readily accessible areas only

Hayling		Eastney	
Date	**Inspection**	**Date**	**Inspection**
Oct 1998	Annual inspection – readily accessible areas only	Oct 1998	Annual inspection – readily accessible areas only
Oct 1999	Annual inspection – readily accessible areas only	Oct 1999	Annual inspection – readily accessible areas only
Jul, Nov 2000	5 yearly full inspection – above and below water	Jul, Nov 2000	5 yearly full inspection – above and below water
Oct 2001	Annual inspection – readily accessible areas only	Oct 2001	Annual inspection – readily accessible areas only
Oct 2002	Annual inspection – readily accessible areas only	Oct 2002	Annual inspection – readily accessible areas only
Jan 2003	Non-destructive testing on dolphins	-	-
Nov 2003	Annual inspection – readily accessible areas only	Nov 2003	Annual inspection – readily accessible areas only
Jan 2005	Annual inspection – readily accessible areas only	Jan 2005	Annual inspection – readily accessible areas only
Mar, Aug 2005	5 yearly full inspection – above and below water	Mar, Aug 2005	5 yearly full inspection – above and below water
Mar 2006	Non-destructive testing on linkspan – weld cracks	-	-
Jul 2006	Linkspan soffit inspection	-	-
Aug 2006	Annual inspection – readily accessible areas only	Aug 2006	Annual inspection – readily accessible areas only
Aug 2007	Annual inspection – readily accessible areas only	Aug 2007	Annual inspection – readily accessible areas only

It is notable that none of the surveys have sought to expose hidden areas for inspection. Based on the information in the above reports, the cracks identified in the 2006 inspection do not appear to have any immediate structural integrity implications.

1.3 Report

1.3.1 Summary

Section 2 of this report summarises the inspection.

Section 3 presents the observations and conclusions arising from the inspection.

Section 4 recommends the future repair and maintenance work required in order to ensure the future serviceability of the landing stages and ferry service.

Appendix A presents the risk assessment for the inspection.

Appendix B provides sketch plans of both ferry terminals, to be read in conjunction with the inspections.

Appendix C presents a rolling maintenance programme (to be continuously updated as work progresses) for the short to medium term, incorporating proposals for the eventual replacement of the ferry terminals in the long term.

Appendix D contains the photographs taken during the inspection which are referred to within the main body of the report.

Appendix E presents a summary of the inspection and maintenance history of the ferry terminals, as condensed from previous inspection reports.

1.3.2 Acknowledgments

Atkins Ltd gratefully acknowledges the assistance provided by Lyall Cairns and colleagues of the Langstone Harbour Board in supporting the inspection, supplying a vessel to facilitate the inspection and providing safety support.

2. Inspection

2.1 General

Those sections of the ferry terminals above the waterline were inspected by Mr I G Smith and Mr M C Chalmers on 30 March 2009. The inspection was carried out on foot in publically accessible areas, and by boat, operated and supplied by the Langstone Harbour Board.

The seabed, the pontoons below waterline, and the parts of the dolphins below low water level were not inspected. The fuel lines and bunkering arrangements were not included as part of this inspection.

The inspection commenced at approximately 0800 hrs BST (0700 hrs GMT) in order to coincide with low water. The inspection was initially conducted by boat in order to view the maximum extent of the dolphins, in addition to the undersides of the linkspans and the exposed abutments. Thereafter, the inspection was conducted primarily from publically accessible parts of the linkspans and pontoons.

Health and safety matters were considered and a risk assessment carried out prior to the inspection, a copy of which is attached in Appendix A.

The remainder of this section summarises the main observations from the inspection. The following terms have been used to describe the condition of the structural elements inspected:

‘Good’	Describes an element visually in its original condition;
‘Fair’	Describes an element not in its original condition, but with defects that are not considered to compromise its capability to carry out its function safely;
‘Poor’	Describes an element with defects which are considered to render its functional capability questionable. Remedial action is required for elements so described.

Additional qualification is given in the text as appropriate.

The term ‘significant’ is used to qualify some phrases, and denotes an element where defects are considered to be of sufficient importance to warrant remedial work, replacement, or special inspection or monitoring.

2.2 Hayling Ferry Terminal

2.2.1 General site photographs

Figure 2.1 – Hayling pontoon and linkspan viewed from the north-east

Figure 2.2 Hayling linkspan and fixed approach viewed from the east

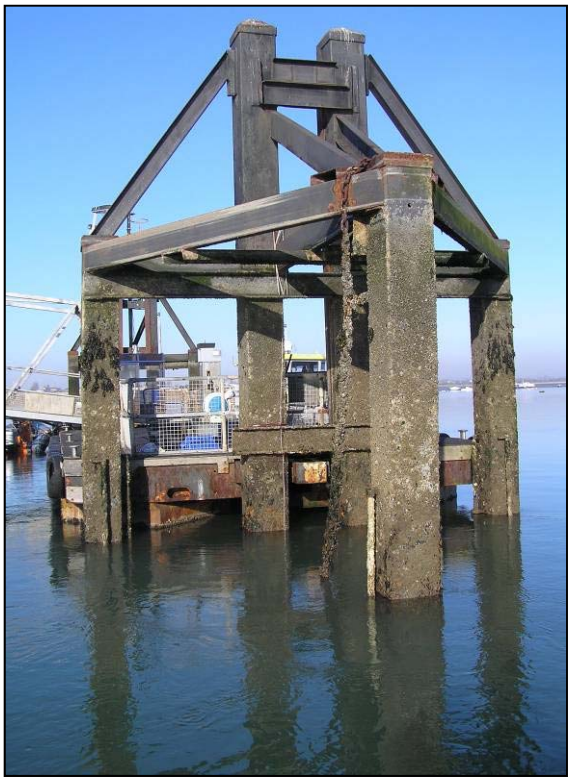


Figure 2.3 East dolphin of Hayling facility

2.2.2 Fixed approach and landside bearings

The railings on the approach are only two-rail and open and do not provide adequate control of pedestrians, particularly children.

There appears to be no obvious sump for the fuel line, although an external vented annulus is apparent.

2.2.3 Dolphins

Both dolphins appear to be in generally fair condition, despite significant corrosion. More detailed assessment is required to determine their condition. The dolphins appear to have been supplemented by the addition of several steel members to their superstructures.

Up to nominally 1cm of marine growth is evident on all piles. There is also evidence of paint blistering on all piles.

An independent mooring chain for the pontoon appears to have been installed on pile H6 (refer to Appendix ‘B’).

Cathodic protection appears to have been installed on piles H6, H7 and H10 (refer to Appendix ‘B’) but its current condition is not known

2.2.4 Linkspan

There is evidence of severe corrosion in several locations along the bottom chords of the linkspan.

The soffit of the western longitudinal chord member near to the bracing member was found to have a thickness of 1-2mm, based on access through the holes in the soffit of the member.

The soffit of the eastern longitudinal chord member was found to have a maximum thickness of 1mm, and the plate was able to be broken through with a hammer.

The bottom flange of the bracing member was found to have a thickness of approximately 3mm at the eastern end and 5mm on the western end.

On the western truss the soffit of the bottom chord has corroded through near to the 1st splice from the shore. The section thickness is approximately 1mm in the vicinity of the hole, and is estimated to be 1-2mm remote from the hole – refer to Figs D.9 to D.14.

There appear to be no obvious guides to control lateral movement of the linkspan at the pontoon end.

A loose board was noted on the linkspan deck near to the pontoon bearing.

The landing ramp from the linkspan onto the pontoon was measured to have a slope of approximately 1:11. There also appears to be a trip hazard at the toe of the ramp.

2.2.5 Pontoon bearings

The linkspan bearings at the pontoon are situated in a recess that is lower than the main pontoon deck level. The roller bearings onto the pontoon are supported on 2 No. bearing beams which appear to be 137x198 UB sections. The bearing beams form the central pair of a set of four beams at the bearing. Parts of the bearing beams and the beams adjacent to them have been severely corroded. The flange and web thicknesses were measured to be approximately 5mm and 3-4mm respectively. The easternmost beam was found to have a web thickness ranging from 0-5mm. The westernmost beam displayed a dogleg in the web of approximately 8mm lateral displacement over its full depth.

2.2.6 Pontoon

Guard-railing on the pontoon was found to be generally loose all around. There also exist several gaps in the railings without temporary barriers – Fig D.29.

The state of repair of the mooring bollards was indeterminate as they are fixed to the pontoon structure below the decking.

The decking was found to have some minor irregularities, sufficient to cause trip hazards – Fig D.29.

2 No. rolled angle sections faced with High Density Polyethylene (HDPE) are used as fender guides with approximate dimensions 8”x8”x0.5”. The guides are joined to the pontoon by intermittent fillet welds. The fender guides are generally in fair condition.

The wear on the fender guides has been measured and is summarised in Table 2.1 below. Note that the transverse fender guides control movement transverse to the centreline of the pontoon, and the longitudinal fender guides control longitudinal movement of the pontoon.

Table 2.1 – Hayling pontoon – fender guide wear and float

Fender guide reference	Total float at fender guides (mm)	Thickness of wear / Original thickness (mm)
H3 (transverse)	130	25 / 100
H4 (transverse)		50 / 100
H8 (transverse)	120	40 / 110
H9 (transverse)		40 / 110
H3 (longitudinal)	120	-
H4 (longitudinal)		-
H8 (longitudinal)		-
H9 (longitudinal)		-

2.2.7 Other

The cabin structure at the western end of the pontoon appears to be in a fair condition despite showing signs of significant corrosion.

Hardwood rubbing strakes have been provided on the ferry but how these interact with the breasting fenders/tyres of the pontoon appears to be irregular, giving rise to potential 'snagging' between the ferry and the breasting face. Additionally, the ferry handrail appears to be low.

A single navigation light has been provided at the Hayling terminal.

2.3 Eastney Ferry Terminal

2.3.1 General site photographs

Figure 2.1 – Eastney linkspan, pontoon and dolphins viewed from the south

Figure 2.2 Eastney linkspan and fixed approach viewed from the east

2.3.2 Fixed approach and landside bearings

A block of concrete appears to have been dislodged and fallen from the upper north-western corner of the fixed approach.

The railings on the approach are only two-rail and open and do not provide adequate control of pedestrians, particularly children.

The eastern and western landside bearings show a curved surface worn approximately 5mm into the top plate. There is also evidence of the top plate having ridden on the baseplate, both front and back.

The weld above the western landside bearing is undercut.

The sliding bearings of the landside flap-plate are worn. There is also evidence of the flap-plate digging into the surface of the approach and requires minor attention to avoid becoming a trip hazard.

2.3.3 Dolphins

All piles appear to be in generally fair condition.

The west dolphin appears visually to be out of plumb, particularly the westernmost pile (Fig E.1).

2.3.4 Linkspan

Linkspan members were found to be in a generally good condition.

On the second node in from the pontoon on the north-western side, there is evidence of maintenance paint overlapping with original painting. There appears to be minor blistering, but no loss of section.

There is evidence of collision damage to the bottom chord of the western truss, near the landside. There is also evidence of collision damage to services brackets along the soffit of the linkspan.

Splice joints use what appear to be Grade 8.8 bolts with lock nuts. Some gaps are present around the joint, and there is evidence of packing plates, considered to be original. No stiffeners have been provided around the splice plates.

A collection of tyres attached loosely to the south-eastern side of the linkspan near to the pontoon end appears to be in use as a berthing fender.

The nature of the services running on the linkspan soffit is not known (e.g. Fig D.83).

2.3.5 Pontoon bearings

The roller bearings on the pontoon have a notional outer diameter of 150mm. Both rollers are showing evidence of distortion. The north-western roller measures 60mm from roller base to the bottom of the internal pin, and <75mm from crown to top of the internal pin. The south-eastern roller measures 40mm from roller base to the bottom of the internal pin, and <80mm from the crown of the roller to the top of the internal pin.

The short access ramp at the pontoon end of the linkspan appears to be excessively steep.

2.3.6 Pontoon

The buoyancy tanks appear generally to be in a fair condition, as far as they were inspectable.

2 No. steel sections faced with High Density Polyethylene (HDPE) are used as fender guides. The guides are bolted to the pontoon and are generally in a fair condition.

The wear on the fender guides has been measured and is summarised in Table 2.2 below. Note that the transverse fender guides control movement transverse to the centreline of the pontoon, and the longitudinal fender guides control longitudinal movement of the pontoon.

Table 2.2 – Eastney pontoon - fender guide wear and float

Fender guide reference	Total float at fender guides (mm)	Thickness of wear / Original thickness (mm)
E2 (transverse)	60	35 / 85
E3 (transverse)		25 / 75
E5 (transverse)	90	20 / 50
E6 (transverse)		15 / 85
E2 (longitudinal)	185	0 / 90
E3 (longitudinal)		35 / 90
E5 (longitudinal)		15 / 100
E6 (longitudinal)		65 / 100

Guard-railing on the pontoon was found to generally loose all around. There also exist several gaps in the guard-railing without temporary barriers.

3. Observations/Conclusions

3.1 General

Both Hayling and Eastney Ferry Terminals can be considered to be in a fair condition overall, with local areas in poor condition and requiring remedial/maintenance measures.

The structural design principles underlying the linkspan and dolphin designs for both Hayling and Eastney are thought to be unsuitable in some respects, particularly the articulation arrangements.

In the case of the dolphins, the secondary members are not adequately connected to individual piles and thus do not act compositely. The overall frames are triangulated to a limited extent at Hayling and are not at all triangulated at Eastney. As the joints between individual members cannot be considered to act as moment connections, the piles do not act as a group in contrast to the more common elevationally-braced configuration. Without such bracing, the dolphins are relatively flexible, permitting, large displacements at the pontoon end of both linkspans and therefore larger plan rotations at the landside bearings, exacerbating bearing wear/damage on the Hayling bearings, in particular.

In the case of the linkspans, it is considered that both Hayling and Eastney are over-restrained at their supports. In particular, the choice of twin pin joints for Hayling at the landside bearings over-restrains linkspan rotation in plan. This restraint (redundancy) potentially results in significant stresses/damage to the bearings as the linkspan and pontoon move under the action of wind, wave and berthing forces.

Additionally, the choice of a torsionally stiff braced rectangular box truss for the linkspan superstructure for both terminals can give rise to torsional moments about the longitudinal axis being transmitted from the pontoon to the landside bearings.

3.2 Hayling

3.2.1 Fixed approach

The fixed approach is in fair condition and the only obvious work identified is to review the adequacy of the railing arrangement in terms of it providing adequate safe control of pedestrians, especially children – refer to Fig 2.2 (Hayling).

3.2.2 Dolphins

The dolphins are in fair condition – Refer to Figures D.20 to D.24. Nevertheless, as noted above, it is recommended that elevational bracing be considered and a new protective treatment applied.

3.2.3 Linkspan

The linkspan is in fair condition except for significant corrosion of the eastern bottom chord – Refer to Figures D.9 to D.12, especially noting D.11. This chord appears to have suffered from internal corrosion possibly caused by a hole, permitting ingress of salt water over some time past.. The chord needs to be replaced or supplemented.

To investigate this matter before implementing any work on site, it will be necessary to carry out a thickness survey of the chord and bracing members to ensure that the full extent of the problem has been adequately determined. This will also enable the significance of the defects shown on Figure D.14 to be determined.

Additionally, an assessment of the chord forces for the reduced thicknesses given in Section 2.2.4 indicates that the necessary minimum thickness of material throughout the chord is less than 1mm, indicating that whilst this matter should not be left unduly, there is time to draw up a cost-effective scheme that includes a revised bearing articulation arrangement, as noted in Section 3.2.4, below. Nevertheless, the torsional movement in plan, noted in Section 3.1 above, results in additional forces in this chord which would be indeterminate except for the fact that either wear or damage to the bearing support appears to have provided sufficient freedom to accommodate such movement at present.

3.2.4 Linkspan bearings

As discussed above, torsional and plan movement of the linkspan as a consequence of movement of the Pontoon between dolphin restraints has caused wear and damage to the linkspan bearings to the extent that they can accommodate such movement. Figures D.1 to D.3 show the bearings in question.

The bearings need to be replaced and the linkspan articulation amended to address this matter.

3.2.5 Pontoon bearings

The pontoon bearings are clearly ineffective and need to be replaced, ideally, using a more robust and appropriate detail – Refer to Figure D.6. Such detail would adopt either steel roller bearings or non-mechanical bearings.

3.2.6 Pontoon

The Pontoon tanks appear to be in fair condition but this needs to be confirmed by special inspection, with the decking removed (in part). There was only limited access to the steelwork but it appears that this will all need to be replaced. This is not uncommon because the damp, confined space between the tanks and the decking tends to promote corrosion. The likely outcome from the special inspection is that the deck steelwork and decking will need to be replaced; the former because of its condition and the latter because it appears to be close to the end of its service life and is unlikely to withstand being removed and replaced. The key decision from the special inspection is to ensure that the tanks have sufficient reliable life left in them to warrant the investment in the deck refurbishment. The general condition of the deck structure can be seen in part from Figures D.4 to D.7.

Repair the decking and associated steelwork, as necessary (based on the outcome of the proposed special inspection).

Replace / re-fix mooring bollards.

Repair / replace handrailng.

3.3 Eastney

3.3.1 Fixed approach

The fixed approach is in fair condition and the only obvious work identified is to review the adequacy of the railing arrangement in terms of it providing adequate safe control of pedestrians, especially children – Refer to Figure 2.2 (Eastney).

3.3.2 Dolphins

The dolphins are in fair condition – Refer to Figures D.38 and D.41 to D.52. However, the thickness of the piles needs to be determined to make sure that they are adequate. Additionally, as noted above, it is appropriate to consider elevational bracing to make the system more robust and reduce the plan torsional movement demand at the fixed support end of the linkspan. Mindful that the north-west dolphin appears to be out of plumb, it should be monitored for movement over time, since the installation of bracing could well prevent further damage. Any change to the dolphin stiffness would also need to include consideration of the pontoon/pile fender guides.

A new protective treatment needs to be applied.

3.3.3 Linkspan

The use of tyres attached to the pontoon end of the linkspan as a fender is unacceptable as the linkspan will not have been designed for berthing loads

.

3.3.4 Linkspan bearings

The bearings at the pontoon end of the linkspan display show significant wear, which has led to the circular holes in the plastic rollers becoming elongated. Furthermore, there appears to be differential wear of approximately 20mm between the rollers, with evidence of increased wear on the north-eastern roller.

A consequence of this wear is that the pins are no longer concentric with the rollers, and the roller bearings will present increased resistance to rolling, hindering their intended operation. The differential vertical movement between the two bearings will give rise to significant torsional moments about the longitudinal axis of the linkspan which will transmit uneven loads through the linkspan to the abutment bearings. The differential movement may also give rise to differential rolling resistance, leading to plan moments being transmitted to the landside rocker bearings.

Repair/replace transverse guide bearing – Refer to Figure D.81,

3.3.5 Pontoon

The pontoon tanks appear to be in fair condition but this needs to be confirmed by special inspection, with the decking removed (in part). There was only limited access to the steelwork but it appears that whilst this may need to be replaced, it might well be in better condition than for the Hayling pontoon. The key decision from the special inspection is to ensure that the tanks are not damaged or deteriorated to an extent where investment in the deck refurbishment is not warranted.

Repair the deck steelwork/decking, as necessary. Replace / re-fix mooring bollards.

Repair/replace handrailing.

4. Recommendations

4.1 General

The terminals are in generally fair condition overall but with some significant elements in poor condition and requiring repair/replacement. Nevertheless, subject to confirming the condition of the deck steelwork and the pontoon tanks, the cost of the necessary repairs is considered to be sufficiently within the asset value of the combined facilities that a repair and maintenance management strategy is possible.

This statement is based on Section C1.1 of Appendix 'C; i.e. the anticipated overall cost of bringing the terminals into a maintainable condition is approximately £218,500 over nominally 5 years, representing 15% to 25% of the asset value of the facilities in their original condition.

However, this sum is approaching the 25% threshold noted in Section C1.1 and thus it is also appropriate to consider mitigating the expenditure by postponing/omitting less urgent work. This will need to be the subject of discussion since it will involve deletion of some of the more costly items like the fuel bunkering arrangements.

The estimated work remains provisional until all the remaining special inspections have been completed.

4.2 Recommended work

4.2.1 General

The details of the recommended repair and maintenance actions are contained in the maintenance schedule in Appendix 'C', which should be read in conjunction with Sections 2 and 3 of this report. The schedule is organised into the following general categories of work:

- Special inspections/surveys
- Assessments of specific items
- Minor and major works

Those items marked with a hash in the maintenance schedule (#) are highlighted for action within the short term to ensure that inspection and measurements items are addressed in a timely manner to ensure that investment in the facilities is warranted.

A graphical summary showing the locations of the items referred to in the maintenance schedule is included with the schedule.

Appendix A
Brief and Site Safety Risk Assessment

LANGSTONE FERRY
General Inspection – 30th March 2009
Itinerary and Safety Risk Assessment

Introduction:
Atkins Limited are to undertake a walkover survey of the Hayling and Eastney Landing Stages on the 30th March 2009. The following notes introduce the itinerary for the day and from this assess likely risks that may arise during the inspection.

Contact Details:

Atkins (HQ)	01372 726140 (Ask for Mike Sillett)
Ian G Smith	07 713 644 674 (M)
	01372 752929
	01372 452 093 (H)
Mutahar Chalmers	07930983774

Data/Itinerary:
Tides (Clock Times):

- Low Water 07.46

Arrive at Hayling @ 07.45 and carryout inspection as following table.

Time (approx)	Place	Notes
08.00	Hayling	Inspect Dolphins and Link-span Soffit from workboat
08.30	Eastney	Inspect Dolphins and Link-span Soffit from workboat
09.00	Eastney	Inspect external elevations of Pontoon and Link-span from workboat General views (Photos) from workboat
10.00	Hayling	Inspect external elevations of Pontoon and Link-span from workboat General views (Photos) from workboat
11.00	Hayling	Release workboat
11.00	Hayling	Inspect top of Pontoon and Link-span, and abutment
12.00	Eastney	Inspect top of Pontoon and Link-span, and abutment
13.00	Eastney	View Link-span articulation at top of the tide
13.30	Hayling	View Link-span articulation at top of the tide
14.00	Hayling	Complete inspection

Risk Assessment Ref Safety:

The work will be carried out either from the workboat under the authority of the crew or on foot in public areas only. Hence, no special headwear or footwear is required.

The following matters arose from the Risk Assessment:

- Working at height
- Working over water
- Sharp edges (corroded steelwork)
- Power and fuel services

The first two are addressed by wearing life jackets, the third by wearing gloves, and the power and fuel issues will be avoided by keeping away from these.

The following personal protective equipment will be worn:

- High visibility coats/bibs
- Safety helmets when working below overhead public areas (essentially below the Fixed Approach and Brow)
- Gloves when removing debris, rust and the like
- Life jackets complying with EN 396 (150 Newton minimum buoyancy), or equivalent when in the boat (being supplied by the Harbour Company)

The visit will be carried out from open public access areas and so there are no special risk/safety issues, except:

- Access by boat (Pontoon side-shell, Dolphins and underside of Brow)

Medical safety will be as follows:

- No food will be consumed during the visit
- First Aid Standard travelling medical kit; contents as per HSE First Aid at Work – Your Questions Answered
- Emergency 999
- Following the sitework, anyone experiencing flu-like symptoms should seek medical advice and suggest possible Leptospirosis

The following tools will be used:

- Lump hammer
- Chisel
- Tape
- Camera
- Torch
- Goggles
- Hard hat – only when removing debris below the Link-span

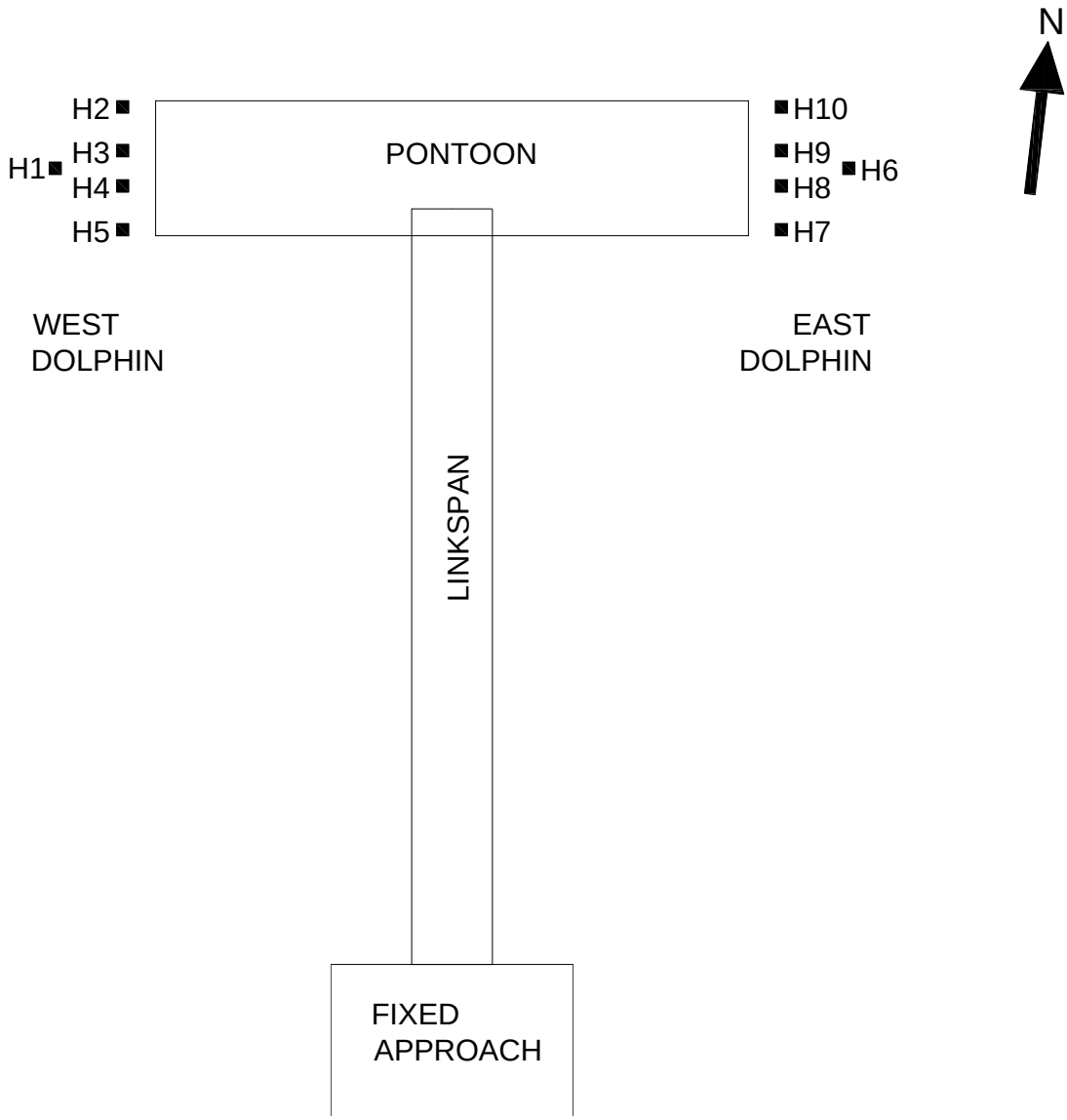
All the above details to be discussed between all present at the various times.

Ian G Smith
30-03-09

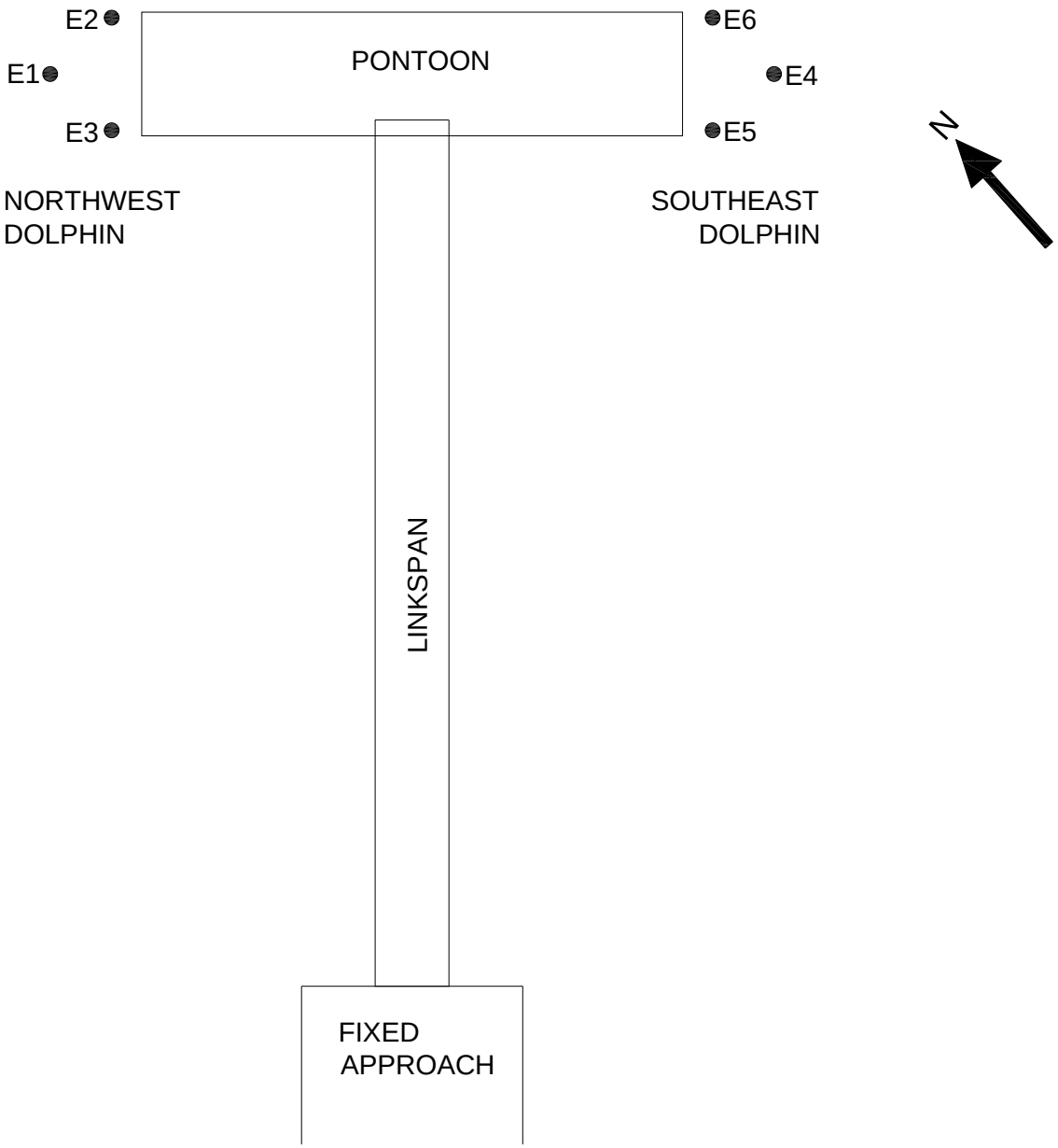
Appendix B

Sketch plans of Hayling and Eastney ferry terminals

HAYLING FERRY TERMINAL – INDICATIVE LAYOUT



EASTNEY FERRY TERMINAL – INDICATIVE LAYOUT



Appendix C
Draft maintenance programme

C.1 Rolling Maintenance Programme:

C.1.1 Introduction:

The following rolling maintenance programme is draft and will be continuously up-dated as the recommended works progress through:

- Further near-term (0 to 3 years) investigative work, through to;
- Medium-term (3 to 10 years) mitigation/repair/partial replacement works on some items, through to;
- Eventual complete replacement of the whole facility in the longer-term (10 to 20 years).

Its purpose is to provide:

- Scope for near-term (0 to 3 years) inspection, assessment, urgent/prudent remedial/repair works related to immediate safety and reliable continued function of the facility
- Scope for medium-term repair/enhancement works related to the safe and cost-effective operation of the facility
- Long-term investment plan of cost-effective when/how/what to provide in the future

The near-term works inform the detail of the medium-term works and they both inform the long-term works.

The anticipated works are based on maintaining the existing facility over the medium-term future (up to 10 years) and with a look-ahead beyond this in order to set a frame work for the eventual replacement of the two facilities in the long-term (10 to 20 years).

Works listed in the programme are applicable to both the Hayling and the Eastney Landing Stages, unless specifically noted.

At this stage, without complete knowledge of the condition of the dolphins and pontoons, whilst there are clear problems with some of the main components, it appears that maintenance, rather than complete replacement of these components should be cost-effective. This statement is based on an assumed asset value of a replacement facility for each location of some £0.5M to £1.0M (Based on budget pricing of £2000/m^2 of plan area of the facilities plus a notional allowance for the dolphins) and that medium–term investment of up to 25% of such value is worthwhile if it secures at least some 10 years life before either further work or replacement. The proposed repair/maintenance works are based on this approach.

With reference to the table overleaf, the cost of proposed works for 2010 presented in the Maintenance Programme has been based on carrying out interim and break-down repairs in the early stages in order that as much as possible of the more expensive work that would potentially be required can be deferred over a longer time frame, or even avoided.

C.2 Maintenance Programme:

Item	Activity	Expenditure (£)					Comments
		2010/11	2011/12	2012/13	2013/14	2014/15	
1.0 Inspection/Assessment							
1.1 #	**Hayling:** Inspect integrity of fuel supply	2,000	-	-	-	-	Include integrity of supply source, fuel lines, terminal, bunding, etc
1.2	**Eastney:** Monitor plan location of Dolphins	1,000	1,000	-	-	-	Repeated GPS Surveys
1.3	Determine condition of decking beams and Determine system for re-fixing Pontoon decking	4,000	-	-	-	-	Need to remove decking in parts. Focus is on avoiding trip hazards.
1.4	Carry out assessment of longitudinal strength and overturning stability of Pontoon.	5,000	-	-	-	-	Combine with Item 1.3
1.5	Assess Dolphins	1,000	-	2,000	-	-	Generic only. Also consider information arising from Item 1.2. Further assessment may be required but this would only arise if concerns arose from Item 1.2
1.6 #	**Eastney:** Special inspection of cracked welds noted in the 2006 inspections	3,000					
1.7 #	Check navigation lighting	Incl	-	-	-	-	
1.8 #	Develop annual inspection/maintenance regime	1,000	-	3,000	-	-	Set up in 2010 and supplement/complete in 2012

Item	Activity	Expenditure (£)					Comments
		2010/11	2011/12	2012/13	2013/14	2014/15	
1.9	Inspection of Pontoon Tanks	4,000	-	-	-	-	Carry out with Item 1.3. On Eastney side, aim to carry out external metal thickness measurements, nominally at waterline
1.10	Measure thickness of corroded chord and bracing members on Linkspan.	1,500					
1.11	**Eastney:** Assess fatigue integrity of bottom chord splices.	1,000	-	-	-	-	It is not clear that bolts are adequately detailed to avoid bolt fatigue on the Eastney Linkspan. Not expected to be a problem but, if it is, cheapest options are either to amend detail, demonstrate redundancy within the 4-bolt group or to supplement splices and leave existing detail as-is.
1.12	**Eastney:** Amend berthing arrangements to avoid vessels impacting Linkspan.	1,000	-	-	-	-	This is an operational procedure to enable a positive physical barrier to be designed and installed at a future date, when the deck strengthening has been carried out – See Item 3.1. Cost is for a meeting with Ferry Operator.
2.0 Minor Works							
2.1	**Hayling:** Remove and replace Linkspan support at abutment Supplement/replace bottom chord elements of Linkspan (abutment end) Temporary/permanent repairs to Linkspan bearings on an ad hoc basis pending eventual replacement of all bearings	25,000	-	-	-	-	Remove and replace end of Linkspan. Remove and establish new abutment bearing shelf. Loss of section due to corrosion. Consider replacing whole of end bay. In the interim, try to address lack of articulation in plan and try to introduce torsional freedom to address torsional stiffness of the Linkspans.

Item	Activity	Expenditure (£)					Comments
		2010/11	2011/12	2012/13	2013/14	2014/15	
2.2 #	Inspect/supplement/replace chain/cable restraints to Pontoon	3,000	-	-	-	-	Inspect existing and maintain, supplement or replace. Aim to hook up existing arrangement to avoid need for divers. These provide a degree of redundancy against potential Dolphin failure.
2.3	Re-fix/Replace/Supplement hand-railing on Pontoons and approaches	8,000	-	-	-	-	Interim only - Install local anchorage below/within deck and replace fixing. This work follows Item 1.3. Eventually combine with Item 3.1. Consider more rails and mesh infill.
2.4	Re-fix decking to avoid trip hazards	8,000	-	-	-	-	Interim only. This work follows Item 1.3. Eventually combine with Item 3.1.
2.5	Temporary repairs/ improvements to Fender Guide Rubbing Strips (i.e. between Pontoon and Dolphins) on an ad hoc basis pending eventual replacement of all fenders. Include breasting Fenders (See Item 3.3).	5,000	-	-	-	-	Reinstate by carrying out temporary repairs until replaced – See Item 3.7 Consider 'D' fenders in place of tyres (See 3.3)
2.6	**Eastney:** Supplement Pontoon/Linkspan to reduce slope of hinge plate at Pontoon end	-	4,000	-	-	-	Reduce height difference or use a longer plate.
2.7	Investigate and reinstate integrity of mooring bollards	-	5,000	-	-	-	Initially, only address critical bollards. Allow local deck strengthening and new bollard. Combine with Item 3.1.

Item	Activity	Expenditure (£)					Comments
		2010/11	2011/12	2012/13	2013/14	2014/15	
2.8	Install sacrificial anode cathodic protection system	-	8,000	-	-	-	Eastney Pontoon and all Dolphins This is to reduce corrosion rate and also to also to address potential accelerated low water corrosion (ALWC).
2.9	**Hayling:** Improve fuel bunding arrangements	-	-	25,000	-	-	Provide collection on Pontoon and new lines. Then pump, and oily water interceptor onshore plus drainage of water (including licence) and chamber to collect and enable recovery of fuel oil).
2.10	**Eastney:** Minor weld repairs to abutment end of Linkspan.	-	-	-	3,000	-	Minor welding and stiffening (notional allowance at this stage only)
2.11	Strengthen deck beams on Pontoon beneath Linkspan	5,000	-	-	-	-	Related to Item 1.3
2.12	Maintenance painting to Dolphins		15.000				
3.0 Major Works							
3.1	Re-establish global integrity of Pontoon with new deck structure and including handrails and bollards	-	18,000	18,000	-	-	Replace whole of deck beams system; e.g. 203x203x60 UC's and re-deck.
3.2	Upgrade fender guides with energy fendering	-	8,000	8,000	-	-	Replace with arch (trapezoidal) fenders. These are open section, high energy absorbing fenders and reduce the reaction onto the dolphin piles.
3.3	**Eastney:** Provide appropriate fendering	-	-	6,000	-	-	Steel bracket plus fender. Alternatively, install a pile but this could cost some £15000 (try to combine with

Item	Activity	Expenditure (£)					Comments
		2010/11	2011/12	2012/13	2013/14	2014/15	
	bracket (or similar) to avoid vessels impacting Linkspan.						other piling works in the area).
3.4	**Eastney:** Strengthen /provide bracing to Dolphins	-	-	-	8,000*	8,000*	*PROVISIONAL Depends on outcome of monitoring (Item 1.2). Intention is to avoid but, if necessary, provide steel elevational bracing between the piles.
3.5	**Eastney:** Supplement bottom chord splice integrity	-	-	PROVISIONAL			Anticipated as being only the Eastney Linkspan. Aim to avoid any works by successful outcome of assessment under Item 1.11. However, strengthening might be required to address potential fatigue of bolts in splices, since it is not clear that the bolts are adequately detailed to avoid fatigue.
3.6	Provide new breasting fenders	-	-	TBC			Provide continuous flat profile breasting face
3.7	Erect shelters on the Pontoons	-	TBC	-	-	-	PROVISIONAL
4.0 Routine Maintenance							
4.1	To be determined in conjunction with other works	?	?	?	?	?	To include routine inspections, maintenance painting, CP sacrificial anode replacement, etc.
4.2	**Routine inspections:** • Inspect bottom chord bolts for tightness	-	-	-	-	TBC	To be developed in due course.

Item	Activity	Expenditure (£)					Comments
		2010/11	2011/12	2012/13	2013/14	2014/15	
5.0 Total Cost of Repair/Maintenance Programme (Exclude provisional items)							
5.1	**Totals (Excl Provisional Items)**	78,500	59,000	62,000**	11,000	8,000	** It is anticipated that some of these costs will be avoided as the work in 2010 and 2011 develops. If not it is also probable that cost can be deferred until subsequent years.

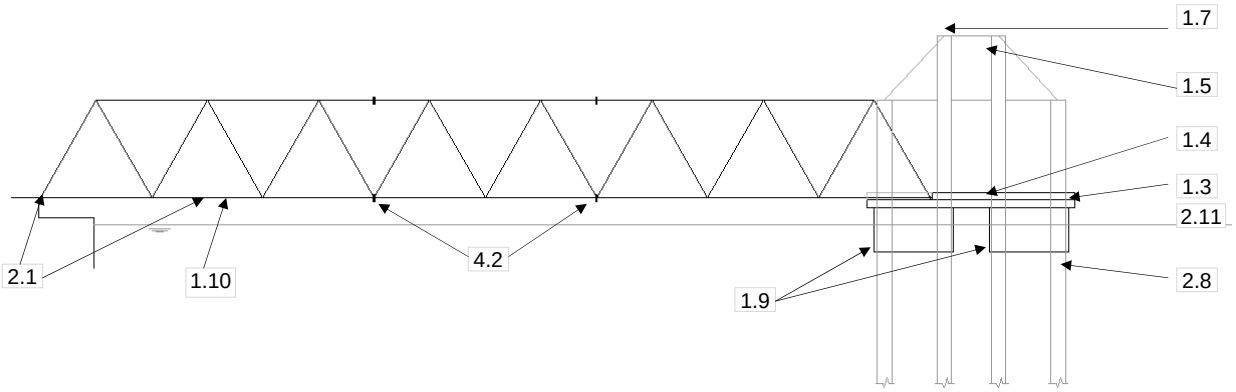
Notes:

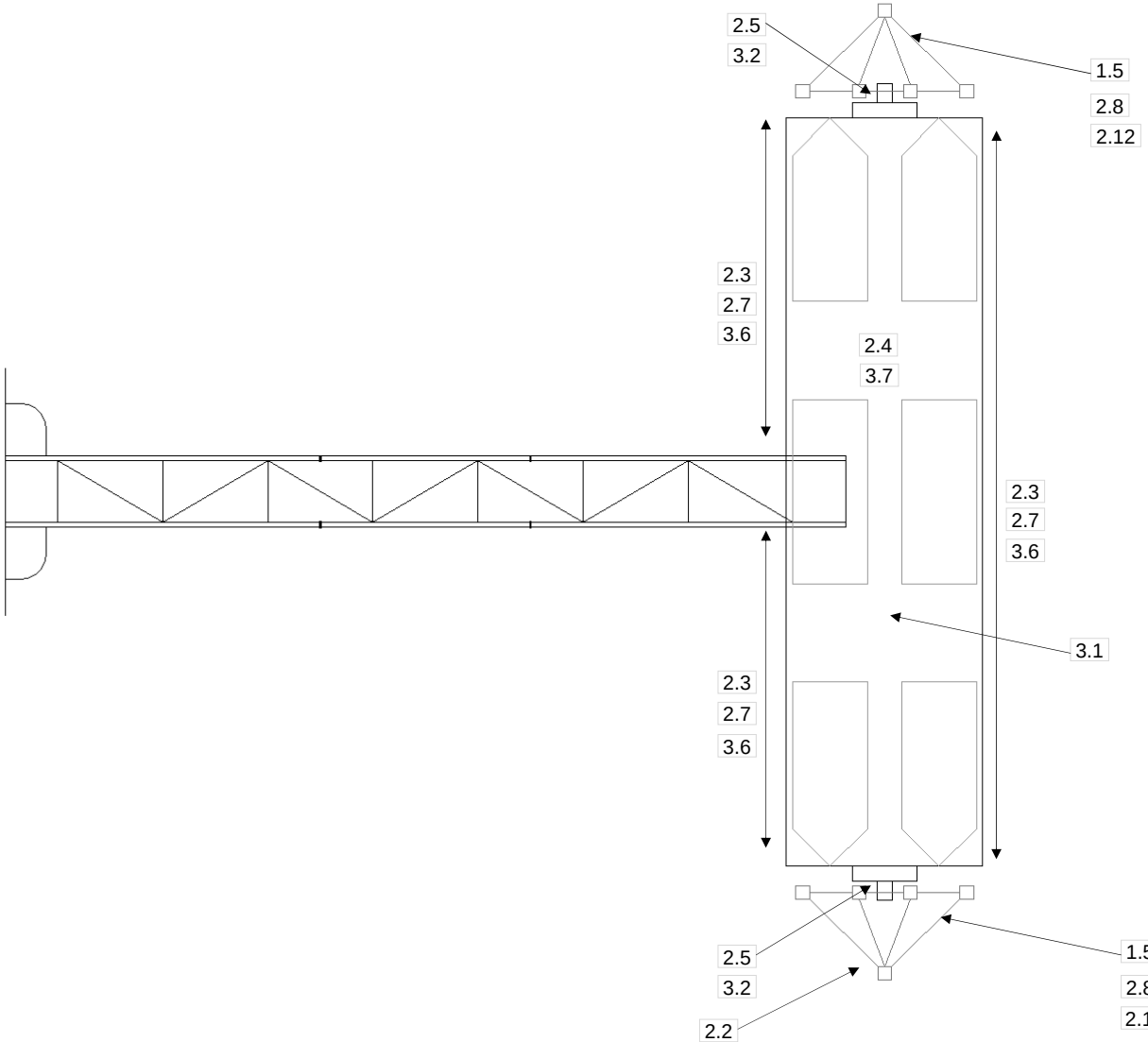
1. Consultancy fees are included in the figures and represent nominally 15 to 25% of sum unless it is clearly a design/assessment activity
2. Costs exclude meetings and expenses
3. Costs exclude Langstone Harbour Board's management costs
4. Routine maintenance and maintenance painting not included at this stage

There is naturally overlap of some items; i.e. where some operations can be usefully carried out at the same time, especially where common access is required. Thus, as this programme is developed, some activities can be usefully combined into single contracts and associated costs reduced.

C.3 Hayling Ferry Terminal – Maintenance Programme Schematic

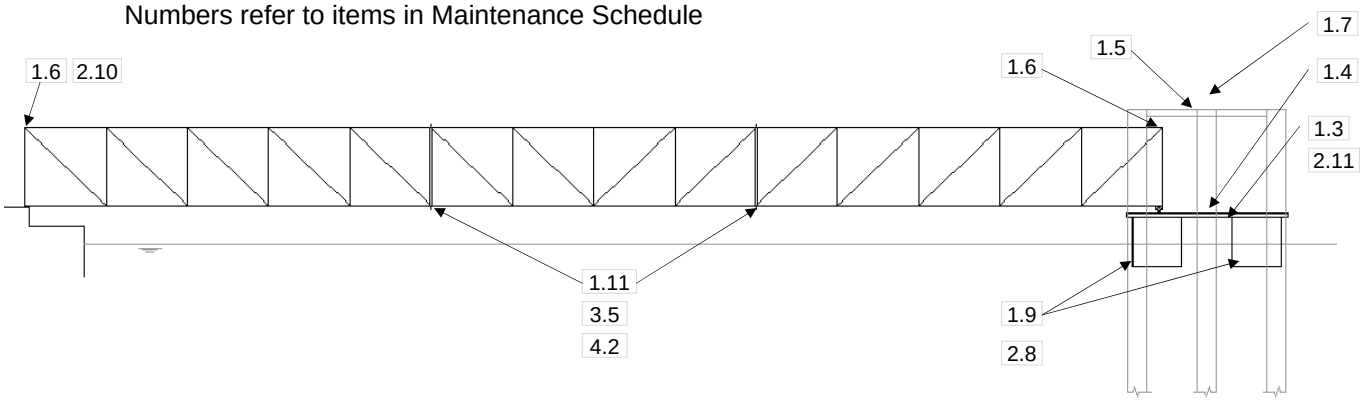
Numbers refer to items in Maintenance Schedule

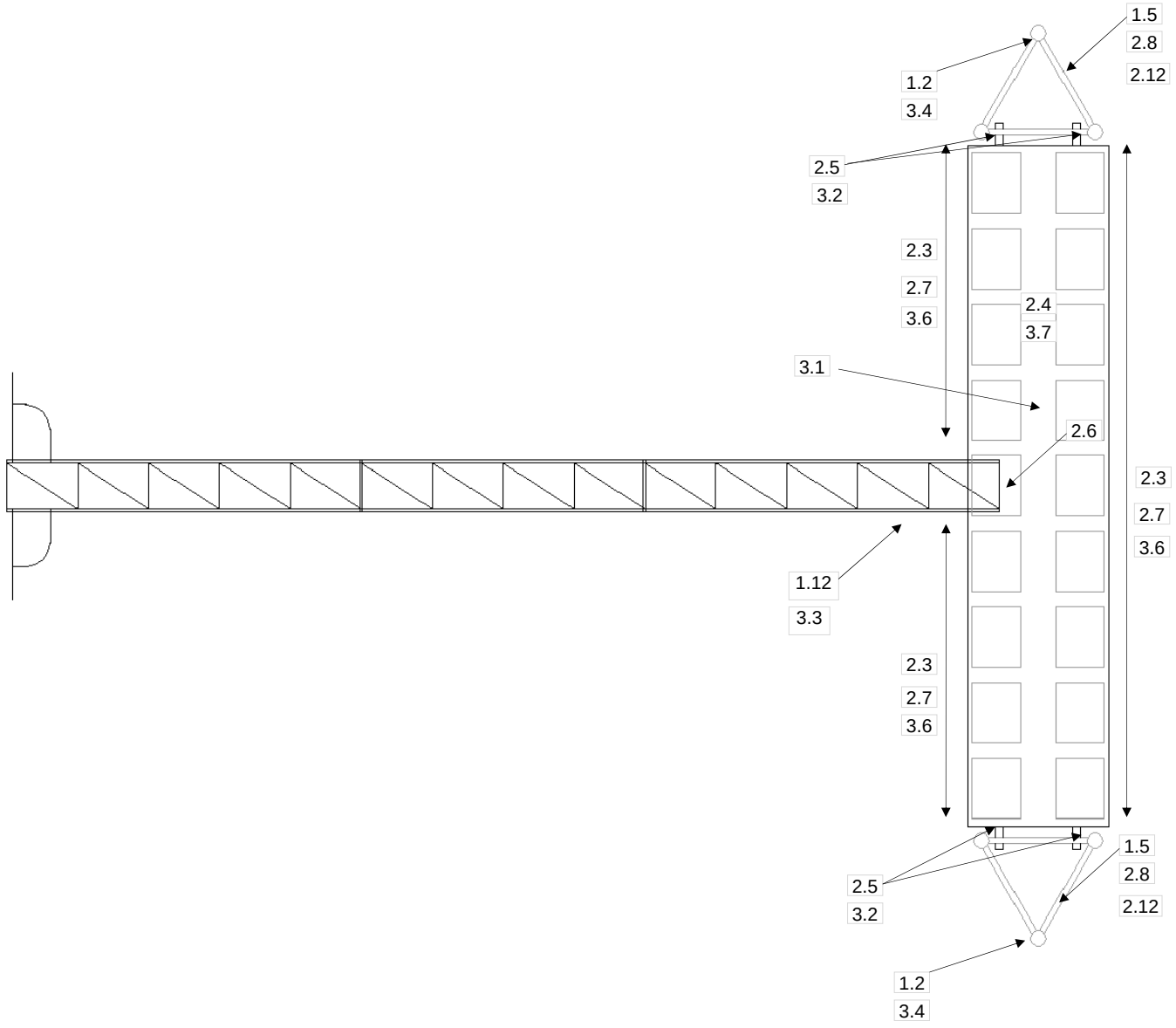




C.4 Eastney Ferry Terminal – Maintenance Programme Schematic

Numbers refer to items in Maintenance Schedule





Appendix D
Photographs

Appendix E
Inspection history

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
Sept/Oct 1995	5 yearly (PCC; STS; MLSW)	Pontoon • Above water – good condition; • Sub deck steelwork – coach bolt fixings sheared off; • Generally steelwork in good condition, but in one place, superficial paint blistering noted, also slight rusting of bolt heads elsewhere; • Handrail – loose deck fixing; • Freeboard N=0.80 NW=0.85 S=0.85 SE=0.80; pontoon riding evenly. Dolphins • Piles, cross-members of both dolphins almost free of paint – painting recommended; • Schlegal rubbing strips showing considerable wear – replacement recommended. Approach • Generally good condition, but large cavity noted under bridge bearing slab. Filling with concrete recommended. Bridge and decking • Paint in generally good condition, but some chipped areas should be made good; • At 3 jointing sections, all bolts are rusting. Painting recommended; • Non-slip surface on flap, where the bridge lands on the pontoon, is badly blistered and plate rusting. Bridge bearings • Landward – satisfactory; seaward – roller securing pin has moved such that flat face doesn't engage with ledge. Seabed • Seabed debris at both ends of pontoon. Soundings indicate build-up of seabed since installation. Cathodic protection • Diver reported pontoon steelwork in good condition, but only some anodes showing wastage (10-20% loss) therefore good for 5+ years. Those Navigation lights • N dolphin light functioning, but S dolphin light broken.	Pontoon • Above water – generally good condition, but deep channels at each end near dolphins show paint deterioration (despite being painted last year); • Sub-deck steelwork – generally in good condition, but one area showed paint breakdown; • Below water – diver reported pontoon is in excellent condition, apart from: o All through bolts fixing steel sub-frame to concrete floats are loose, and 5 no. do not have washer plates; no evidence of relative movement between sub-frame and floats, thus no action recommended, but review recommended at next inspection. 25mm estimated freedom of play; o Some foam filling has been eroded or gouged out from underside of landward float at eastern end of pontoon. Foam surface in the hole is loose and friable. Replacement recommended. • Freeboard N=0.90 NE=0.90 S=1.00 SW=1.05. Dolphins • Steelwork generally in good condition, although piles showing a lot of rusting. Holes drilled and welded up in 8 no. piles nearest ends of pontoon showed 20mm thickness unrusted steel – considered adequate for years to come. • Thickness of steel in splash zone should be investigated in five years' time. Approach • Surface settlement evident in several places. Considered to be caused by leakage of fines from granular fill behind mass concrete sea walls. Bridge and decking • Steelwork above deck in good condition; • Steelwork below deck: paintwork to the underside of the bottom boom is breaking down in places and showing occasional areas of lamination. Bridge bearings • Pontoon end (after repairs this year) bearings are satisfactory, but new works should be painted with bituminous coat until next major painting; • Landward end bearings are satisfactory, but split pin is missing on LHS, facing pontoon. Seabed • Lots of debris on seabed. Cathodic protection • N/A to Hayling. Navigation lights • Both functioning.	

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
23 Oct 1997	Annual (PCC)	Pontoon • Structure and decking found to be in serviceable condition; • Length of rubbing strake is split, needs to be replaced; • Freeboard at all four corners of pontoon = 0.85m – deemed no change. Dolphins • Rubbing strips on locating assemblies are very worn; one piece missing. Replacement scheduled this financial year. Bridge • Generally good condition; • Some chalking of coating, and minor rusting noted on soffit of the bottom booms; • Flap at seaward end corroded – needs to be recoated with non-slip paint. Approach • No deterioration noted; • Joints between RC road slabs open – bitumen sealing recommended.	Pontoon • Pontoon structure and deck in generally good condition; • Coating breakdown noted on pontoon's locating steelwork at both ends and bridge well area; • 1 no rubbing strip missing from eastern end location assembly; • Freeboard at all four corners of pontoon = 1.0m – deemed no change. Dolphins • Piles and connecting steelwork in generally serviceable condition; • Minor areas of rusting present on new steelwork, though no immediate action is considered necessary; Bridge • Steelwork and decking in generally good condition; • Some coating breakdown on steelwork is apparent, particularly on soffit of bottom booms; • Split pin to retain one bearing pin at landward end missing. Approach • Generally good condition with no deterioration from previous inspection.	Examination limited to readily accessible areas
20 Oct 1998	Annual (PCC)	Pontoon • Repairs already ordered (see memo 16/09/1998); • SE rubbing strake (Schlegal) is missing and should be replaced; • Signs of coating breaking down on pontoon locating steelwork at both ends, and in bridge well area; corrosion progressing. Recoating of steelwork to these areas should be considered; • Rollers to bridge supports should be greased. • Freeboard at all four corners of pontoon = 0.85m – deemed no change. Dolphins • Rubbing strips on locating assemblies are very worn. Bridge • Flap at shore side of bridge showing signs of local corrosion under non-slip surface coating – should however last 1 year; • Bridge support base plates have lost some paint coatings around edges. However no extensive corrosion in evidence; • Flat at seaward end is corroded and restoration works have already been ordered; • Anti-vandal paint appears to have been removed by weather, replacement should be considered; • Bolts at bridge splice positions should be wire-brushed and coated with zinc-rich paint. Approach • In general no deterioration noted; • Sealing of joints between concrete road slabs still required; • Small area of bituminous surface coating to concrete slabs wearing through close to bridge.	Pontoon • Repairs already ordered (see memo 16/09/1998); • Coating breakdown noted on pontoon locating steelwork at both ends, and in bridge well area; • Boarding beginning to deteriorate at its ends; entire boarded area should be lifted in phases to examine and replace bearers as necessary; • Freeboard at all four corners of pontoon = 1.0m – deemed no change. Dolphins • Dolphin coating has been removed around tidal zone and is in need of cleaning down and recoating. Bridge • Split pin to retain one of shoreside bearing pins is missing; • Steelwork and decking in generally good condition; • However, coating breakdown to steelwork in evidence to underside of bottom booms and cross-members below decking; boarding should be removed, and steelwork rusting to be thoroughly cleaned, and recoated with new corrosion protection system. Approach • Generally good condition; • Small depression in evidence adjacent to edge of western side, 600x300x75mm deep. Consider infilling to avoid trip hazard; • MH corner adjacent to harbourmaster's office does not fit snug to frame, causing further trip hazard. Frame to be reset or cover replaced.	Examination limited to readily accessible areas

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
30 Sept 1999	Annual (PCC)	Pontoon • Steelwork to pontoons visible round perimeters showing signs of surface corrosion – consideration should be given to recoating works; • Freeboard at all four corners of pontoon = 0.85m on average – deemed no change. Dolphins • Rubbing strips on locating assemblies are very worn. Bridge • Flap at shore side of bridge still showing signs of local corrosion under non-slip surface coating. Flap should be thoroughly cleaned of corrosion and recoated with anti-slip surfacing; • Bridge support base plates have lost some paint coatings around edges. However no extensive corrosion in evidence; • Anti-vandal paint appears to have been removed by weather, replacement should be considered; • Bolts at bridge splice positions should be wire-brushed and coated with zinc-rich paint. Approach • In general no deterioration noted; • Sealing of joints between concrete road slabs still required; • Small area of bituminous surface coating to concrete slabs wearing through close to bridge.	Pontoon • SE rubbing strake to locating steelwork is hanging from 1 bolt; 2nd bolt should be installed to hold fixture in place; • SW rubbing strake to locating steelwork is worn through, split and in need of replacement; • Location mounts and pins on pontoon to bridge can be inspected for deterioration while decking removed for repainting works; • Steelwork to pontoons visible round perimeters showing signs of surface corrosion – consideration should be given to recoating works; • Freeboard at all four corners of pontoon = 1.0m approximately – deemed no change. Dolphins • Rubbing strips on locating assemblies are very worn. Bridge • No comments. Approach • No comments.	Examination limited to readily accessible areas

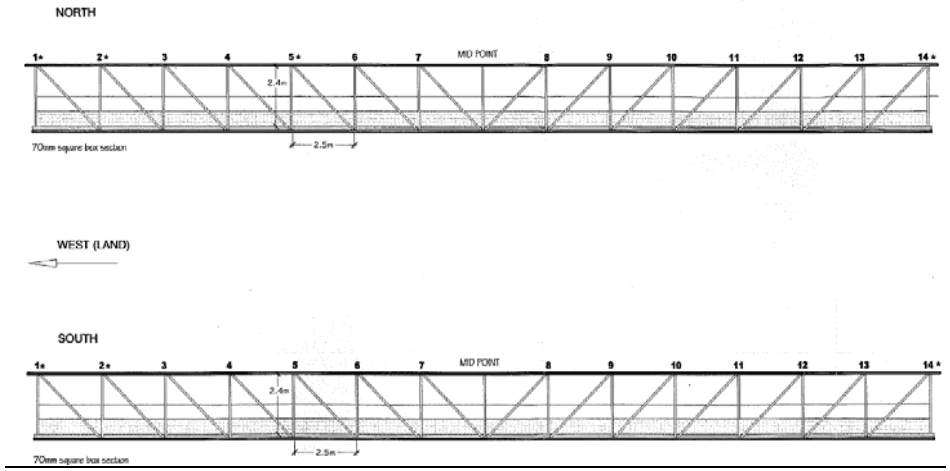
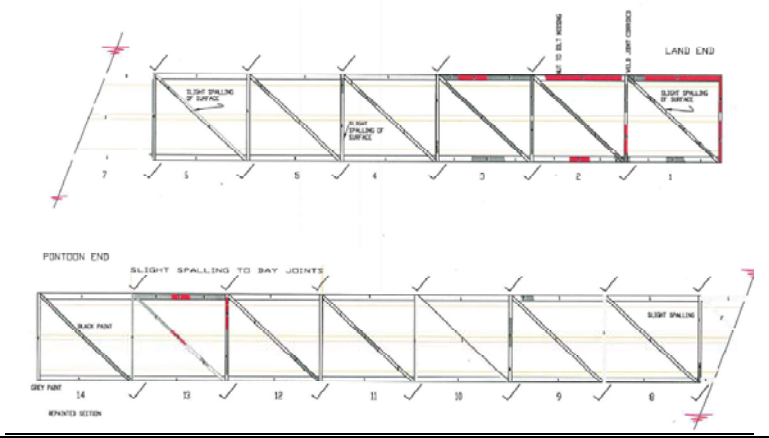
Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
14 Nov 2000 *19 Jul 2000*	Annual (PCC) *5 yearly (STS)*	Pontoon • Excessive longitudinal movement of pontoon taking place, resulting in sideways movement being transferred into brow hinge detail; • N brow holding plate bent over, and excessive wear thus being placed on pontoon system; • Consideration should be given to reducing amount of "float" between piles and pontoon. This could be achieved by spacing rubbing strips away from present locations using steel channels welded to existing supports; • No apparent listing of pontoon; • Access brow is being used to fender off Hayling Island Ferry – not designed for purpose, practice should cease immediately; • Pontoon has light debris on seabed at each end. Dolphins • See above. Bridge • Flap at shore side of bridge still showing signs of local corrosion under non-slip surface coating. Flap should be thoroughly cleaned of corrosion and recoated with anti-slip surfacing; • Bridge support base plates have lost some paint coatings around edges. However no extensive corrosion in evidence; • Anti-vandal paint appears to have been removed by weather, replacement should be considered; • Bolts at bridge splice positions should be wire-brushed and coated with zinc-rich paint. Approach • In general no deterioration noted; • Sealing of joints between concrete road slabs still required; • Small area of bituminous surface coating to concrete slabs still wearing through close to bridge.	Pontoon • Consideration should be given to reducing the "float" between pontoon and piles; • Void in underside of floats (reported by diver) has now been repaired; • Location mounts and pins on Hayling pontoon to bridge can be inspected for deterioration while decking removed for repainting works; • Pontoon has light debris on seabed at each end. Dolphins • E rubbing strips on piles in centre of pontoon width are damaged, 1 no missing, 1 no hanging off. Must be reattached to prevent metal-on-metal contact at low tide; • All piles reported as corroded but sound; Bridge • Recoating works to bottom booms ordered. Approach • Slight depression in tarmac surface (W side adjacent handrailing).	Examination of readily accessible areas, plus diver inspection

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
30 Oct 2001	Annual (PCC)	Pontoon • Excessive longitudinal movement of pontoon taking place, resulting in sideways movement being transferred into brow hinge detail; • N brow holding plate bent over, and excessive wear thus being placed on pontoon system; • Consideration should be given to reducing amount of "float" between piles and pontoon. This could be achieved by spacing rubbing strips away from present locations using steel channels welded to existing supports; • No apparent listing of pontoon; Dolphins • Tops of dolphin piles corroding; should be blast cleaned and given generous coat of corrosion protection. Bridge • Flap at shore side of bridge still showing signs of local corrosion under non-slip surface coating. Flap to be thoroughly cleaned of corrosion and recoated with anti-slip surfacing – works ordered; • Bridge support base plates have lost some paint coatings around edges – works ordered; • Anti-vandal paint agreed not to be replaced • Bolts at bridge splice positions wire-brushed and coated with zinc-rich paint – works ordered. Approach • In general no deterioration noted; • Sealing of joints between concrete road slabs still required; • Small area of bituminous surface coating to concrete slabs still wearing through close to bridge.	Pontoon • E end S rubbing strip to pontoon is missing; • W end S rubbing strip to pontoon is missing; • Consideration should be given to reducing amount of "float" between piles and pontoon; • Bridge flap plate at pontoon end has surface corrosion; • Edge steelwork to pontoon needs blast cleaning and corrosion protection; • Steelwork around bridge well showing signs of corrosion. Dolphins • No comments. Bridge • No comments. Approach • Slight depression in tarmac surface (W side adjacent handrailing).	Examination limited to readily accessible areas
11 Oct 2002	Annual (PCC)	Pontoon • No apparent listing. Dolphins • Tops of dolphin piles corroding – need blast cleaning and corrosion protection. Bridge • No comments. Approach • In general no deterioration of approach noted; • Sealing of joints between concrete road slabs still required; • Small area of bituminous surface coating to concrete slabs still wearing through close to bridge.	Pontoon • Bridge flap plate at pontoon end has surface corrosion; • Edge steelwork to pontoon needs blast cleaning and corrosion protection; • Steelwork around bridge well showing signs of corrosion. Dolphins • Heavy corrosion and perforation evident to high-level steel channel between dolphin piles. Evidently in this condition for some time. Consideration should be given to providing additional member to distribute lateral forces between piles. Bridge • End capping plates to bottom booms of bridge corroded through at pontoon end – need replacing to prevent water entering hollow sections. Approach • Slight depression in tarmac surface (W side adjacent handrailing).	Examination limited to readily accessible areas

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
13-14 Jan 2003	Ultrasonic thickness tests on Hayling dolphins (Interserve)	N/A	General On average, corrosion pitting, loss of section and surface irregularities have reduced steel thickness of piles by additional 3mm – 5mm. In several locations, no reading possible due to poor condition of steel. Western dolphin • Generally fair condition. Substantial pitting/loss of plate thickness has occurred throughout; • General increase in section loss in bottom 2m of piles; • Piles W2 and W4 have large corrosion holes on W side, at seabed level. Holes 400mm wide x 200mm high. Defects continue below seabed level thus full extent could not be determined. • Welded corners of piles showing corrosion wastage. Pile W4 missing 0.75m of weld starting at 2.85m from seabed. Defect forms tapered split (6mm wide max). Eastern dolphin • Generally similar to W dolphin. No corrosion holes on any of the piles. Pitting, loss of section and surface irregularities present, similar in severity to W dolphin; • Pile E1 has substantial loss of section at base on W face – residual steel thickness 6.4mm (but taking into account pitting will be less); • Welded corners showing signs of corrosion wastage, similar generally to W dolphin. However no total weld loss identified. Conclusions • Cathodic protection (e.g. sacrificial anode) should be installed; • Holes in piles W2 and W4 should be fully investigated. If possible, these defects, plus area of missing weld, should be repaired; • All piles to be filled with suitable grout; • Engineer to review this report and make provision for construction of new dolphins accordingly.	
11 Nov 2003	Annual (PCC)	Pontoon • No apparent listing of pontoon. Dolphins • Tops of dolphin piles corroding – need blast cleaning and corrosion protection. Bridge • Corrosion protection system to bottom boom of bridge damaged on N side, close to pontoon (assumed by craft landing at pontoon); • Bridge does not land centrally in well on pontoon, hard up against stops provided. Uncertain as to whether cause is free play at dolphins or collision. No evidence of damage at land bearings. Approach • In general no deterioration of approach noted; • Sealing of joints between concrete road slabs still required; • Small area of bituminous surface coating to concrete slabs still wearing through close to bridge.	Pontoon • Bridge flap plate at pontoon end has surface corrosion; • Bridge is being nudged by craft landing at pontoon – bridge is up against lateral restraints provided to bridge well. Damage is likely if this practice persists. Dolphins • Heavy corrosion and perforation evident to high-level steel channel between dolphin piles. Evidently in this condition for some time. Consideration should be given to providing additional member to distribute lateral forces between piles. Bridge • End capping plates to bottom booms of bridge corroded through at pontoon end – need replacing to prevent water entering hollow sections. Approach • Slight depression in tarmac surface (W side adjacent handrailing).	Examination limited to readily accessible areas

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
6 Jan 2005	Annual (PCC)	Pontoon • No apparent listing of pontoon; • Painting of steelwork surfaces still required under bridge on pontoon structure. Dolphins • Tops of dolphin piles corroding – need blast cleaning and corrosion protection, including crosshead members. Support frames to cables up to dolphins need attention/corrosion protection at both ends of the frames. Bridge • Corrosion protection system to bottom boom of bridge damaged on N side, close to pontoon (assumed by craft landing at pontoon). Further chipping and abrasion has occurred to bottom boom since last inspection, and corrosion is already taking place on side wall/soffit of bottom boom; • Bridge does not land centrally in well on pontoon, hard up against stops provided. Uncertain as to whether cause is free play at dolphins or collision. No evidence of damage at land bearings; • Flap plate at pontoon end of bridge in need of shot blasting and application of new anti-slip corrosion protection system; • Bridge bearings at pontoon end need greasing – they creak as connection moves. Approach • In general no deterioration of approach noted; • Sealing of joints between concrete road slabs still required; • Small area of bituminous surface coating to concrete slabs still wearing through close to bridge; • Bolts and nuts attaching the ramp plate are in need of cleaning and corrosion protection.	Pontoon • Bridge flap plate at pontoon end has surface corrosion; • Bridge is being nudged by craft landing at pontoon – bridge is up against lateral restraints provided to bridge well. Damage is likely if this practice persists. Dolphins • Heavy corrosion and perforation evident to high-level steel channel between dolphin piles. Evidently in this condition for some time. Consideration should be given to providing additional member to distribute lateral forces between piles; • Schlegal bearing at SE dolphin is rotating on one bolt only. Bridge • End capping plates to bottom booms of bridge corroded through at pontoon end – need replacing to prevent water entering hollow sections. Approach • Slight depression in tarmac surface (W side adjacent handrailing).	Examination limited to readily accessible areas

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
4 Aug 2005	Annual (PCC)	Pontoon • No apparent listing of pontoon; • Painting of steel surfaces still required under bridge on pontoon structure, and under pontoon N and S; • Schlegal bearings at SE and NW positions at junction with inside of dolphin piles are wearing (NE missing). Dolphins • Tops of dolphin piles corroding – need blast cleaning and corrosion protection, including crosshead members. Support frames to cables up to dolphins need attention/corrosion protection at both ends of the frames. Bridge • Corrosion protection system to bottom boom of bridge damaged on N side, close to pontoon (assumed by craft landing at pontoon). Further chipping and abrasion has occurred to bottom boom since last inspection, and corrosion is already taking place on side wall/soffit of bottom boom, and is now becoming severe; • Corrosion is also evident on bottom booms in other locations along lengths; • Evident from number of stones resting on top of bottom booms that bridge is subject to aerial bombardment from beach; • Bridge does not land centrally in well on pontoon, hard up against stops provided. Uncertain as to whether cause is free play at dolphins or collision. No evidence of damage at land bearings though position of plates over semi-circ. Bearings indicate pontoon end of bridge has moved N; • Bearings at pontoon end are of roller and plate type; • Both bearings reported to "jump" in turbulent sea conditions. This may indicate rollers are seized and have developed flat spot, or roller is no longer in contact and bearing support plates are sliding on pontoon bearing plate. Evident that lubrication is required on plates on which rollers run; • N bearing intact, with head of roller pin against wall of bottom boom, free play existing between head of pin and safety stop (angle section on wall of bottom boom); • S bearing roller pin moved away from side wall of bottom boom, to be up against safety stop. Movement so great that safety stop bent out of position. Bearing support plates of bridge appear to be in contact with pontoon bearing plate. Believed that roller pin is being ratcheted out of the bearing by continual impact of berthing vessels against S side of bridge, adjacent to pontoon; • Fender piles recommended to prevent vessels from impacting bridge; • Flap plate at pontoon end of bridge in need of shot blasting and application of new anti-slip corrosion protection system; • Bridge bearings, pontoon end need greasing, creak as connection moves; • Inboard bolts to splice connections on bridge need corrosion protection; • Weld on S upright to bridge bottom boom appears to have crack opening along perimeter. Approach • In general no deterioration of approach noted; • Sealing of joints between concrete road slabs still required; • Small area of bituminous surface coating to concrete slabs still wearing through close to bridge; • Bolts and nuts attaching the ramp plate are in need of cleaning and corrosion protection.	Pontoon • Bridge flap plate at pontoon end has surface corrosion; • Bridge is being nudged by craft landing at pontoon – bridge is up against lateral restraints provided to bridge well. Damage is likely if this practice persists; • Steelwork in bridge recess needs preparation and application of corrosion protection system. Dolphins • Heavy corrosion and perforation evident to high-level steel channel between dolphin piles. Evidently in this condition for some time. Consideration should be given to providing additional member to distribute lateral forces between piles; • Steelwork to dolphins above high water level needs cleaning and application of corrosion protection system; • Schlegal bearing at SE dolphin is now missing. Schlegal on SW corner on inside of dolphin pile is rotating as one bolt is loose (due to corrosion of web). Bridge • End capping plates to bottom booms of bridge corroded through at pontoon end – need replacing to prevent water entering hollow sections; • Wall of bottom boom at W side of bridge at pontoon bearing is buckling due to loss of section. Perforation of side wall has also taken place behind cabinet of W side. Plating and welding required to stiffen and replace. Also need corrosion protection system; • Outer edges of bearing rings at land end of bridge are corroding – careful cleaning and installation of corrosion protection system recommended; • Bearings and bearing plates at pontoon end are in need of lubrication; • Cross members on underside of bridge close to pontoon need cleaning and installation of corrosion protection system. Approach • Slight depression in tarmac surface (W side adjacent handrailing).	Examination limited to readily accessible areas

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
16-17 Mar 2005	5 yearly *underwater* (STS)	Pontoon • No comments. Dolphins • No comments.	Pontoon • Underside of every Styrofoam block is eroded to a max depth on some floats of 500mm; • Crack observed in N-S supporting beam to the W of walkway;. Dolphins • Small hole in W end N pile;	
6 Mar 2006	Eastney bridge inspection – weld cracks (CEL)	General Purpose of inspection to inspect minor cracking to weld joints on linkspan which were noted during maintenance. 7 joints selected for testing. A number of cracks were recorded, between 20-30mm in length. Bridge • S1 – 25, 25 and 20mm weld toe cracks; • N1 – 25 and 25mm weld toe cracks; • N14 – 30mm weld toe crack; • S14 – 25mm weld toe crack; • No defects found at other locations. Conclusions • Exposed location of bridge means wind-driven salts can penetrate galvanised coating over time, and cause steel to corrode; • Pontoon susceptible to collision from docking vessels, and forces normal to bridge length are imparted on regular basis; • Defects recorded are minor, but should be monitored bi-annually to determine any increase in fault extent; • Below deck survey is recommended; • Causes of cracking uncertain, but may be because of poor weld penetration, fatigue or stress.		
14 Jul 2006	Eastney bridge inspection - underside (CEL)	General Purpose of inspection to inspect underside of linkspan bridge. Approach • Soffit of bridge is generally in a fair condition; • No cracking evident to any weld joints, however minor surface corrosion was evident on several; • Salt deposits are widespread – chemical action of salts is degrading/compromising protective galvanised layer; • 3 levels of corrosion noted: 1) Salt, no corrosion; 2) Salt, surface corrosion; 3) Total galvanisation breakdown, significant corrosion. • Level 3 areas expected to deteriorate to levels which would render structure dangerous given inaction over time; • Depth of section loss undetermined, but upper section of bridge above land end bearing to become structurally unstable in 5-10 years; • Testing recommended prior to repair specification; bridge may require stiffening plates/new sections dependent on test results; • Cleaning, preparation and recoating will suffice to slow future corrosion rate.		

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
3 Aug 2006	Annual (PCC)	Pontoon • Visually, slight listing of pontoon to W noted (though could be due to strong N to NE wind); • Schlegal bearing fixing bolt at SE attaching to fin plate on support tube is moving laterally in oversize hole. Re-drill and increase size of bolt. Dolphins • Support frames to cables up to dolphins need attention/corrosion protection at both ends of the frames. Bridge • Further chipping and abrasion has occurred to bottom boom since last inspection, and corrosion is already taking place on side wall/soffit of bottom booms, and is now becoming severe; • Corrosion is evident on cross-members between the bottom booms beneath bridge deck; • Corrosion is more in evidence at the land end of the bridge; • Chipping has also occurred to the superstructure; • Evident from number of stones resting on top of bottom booms that bridge is subject to aerial bombardment from beach; • Bridge does not land centrally in well on pontoon, hard up against stops provided. Uncertain as to whether cause is free play at dolphins or collision. No evidence of damage at land bearings though position of plates over semi-circ. Bearings indicate pontoon end of bridge has moved N; • Rollers at pontoon end have been replaced since last report, and appear to be working satisfactorily. Bridge at pontoon end was close to N stop; • Fender piles recommended to prevent vessels from impacting bridge; • Weld on S upright to bridge bottom boom appears to have crack opening along perimeter. Approach • In general no deterioration of approach noted; • Sealing of joints between concrete road slabs still required; • Small area of bituminous surface coating to concrete slabs still wearing through close to bridge;	Pontoon • Bridge being nudged by vessels landing at pontoon – bridge up against lateral restraints provided to bridge well; • Schelgal at SE corner is worn; • Schlegal support steelwork corroding, must be cleaned prior to application of corrosion protection system; • Steelwork in bridge recess needs preparation and application of a corrosion protection system; • Sliding plates to bridge flap are in some cases rusted through, needing replacement. Dolphins • Steelwork to dolphins above high water level needs cleaning and application of corrosion protection system. Bridge • Inside circlip to E pin attaching bridge to bearing ring at land end appears to be corroding, should be replaced. With NE wind blowing, bridge moved backwards and forwards along its length, resulting in pin moving in bearing; • Bearings and base plate in need of lubrication – may be that bearings are transmitting horizontal forces along length of bridge before the rotate, indicating that they are binding. Consideration to replacement should be given. Approach • Slight depression in tarmac surface (W side adjacent handrailing).	Examination limited to readily accessible areas

Date	Inspection (Inspector)	Findings		Comments
		Eastney	**Hayling**	
28 Aug 2007	Annual (PCC)	Pontoon • Pontoon appears to be in good condition overall. Dolphins • No comments. Bridge • W bearing onto shore: o Minor laminations noted within top surface of bearing plate on N side. Slight rust pitting noted on face of bearing plate on N side; o Corrosion noted to web and bottom flange of transverse beam, spanning N and S side bearing plates; o Minor rusting noted to underside of approach ramp. • E bearing onto pontoon: o Generally bearings appear in good condition; o Some rusting noted along beam spanning between bearings. • Bottom chord of truss on S elevation: o Pitting evident along top flange adjacent to shore side bearing; • Bottom chord of truss on N elevation: o Minor pitting evident to top flange adjacent shore side bearing; o Significant corrosion incl. laminating and pitting evident on W half of bottom flange section; o Some corrosion noted to deck support brackets attached to inside face of bottom chord. • Bottom chord bracing to bridge truss: o Corrosion evident to diagonal and horizontal bracing members. Rusting seems most prominent to members on W half of bridge; o Less significant rusting observed to bottom chord bracing along E half of bridge. • Vertical bridge truss members, N and S elevations: o All appear to be in generally good condition. • Top chord members and horizontal bracing: o No damage of note observed at this time. Approach • No comments.	Pontoon • Pontoon appears to be in good condition overall. Dolphins • No comments. Bridge • S bearing onto shore: o No notable defects observed. • N bearing onto pontoon: o Corrosion to the top flange and webs of beams to rear of bearing was noted. • Bottom chord of truss on W elevation: o Some rust staining to outside face of web evident; o Minor rusting along bottom flange evident. • Bottom chord of truss on E elevation: o Rusting evident to bottom flange, particularly along midspan section of bridge between two truss splice connections; o Significant laminations to end and stiffening plates on splice connections observed. • Bottom chord bracing to bridge truss: o General rusting noted to bottom chord bracing members; o Impact damage evident to the horizontal bracing member located on S side of midspan splice connection; o Significant laminations to end and stiffening plates on splice connections observed. • Vertical bridge truss members, N and S elevations: o All appear to be in generally good condition. • Top chord members and horizontal bracing: o No damage of note observed at this time. Approach • No comments.	Examination limited to readily accessible areas
		Discussion Pontoon and linkspan are in a generally good condition. Significant corrosion noted to bottom chord members and cross-bracing. NW section of bottom chord members appear to be most affected, may have lost significant cross sectional area. Longitudinal chord members are box sections which can corrode from the inside. NDT recommended to determine thickness of sections. Most serious rusting is on N side bottom chord, near to the shore. Here, stress in chord member is vertical shear, thus carried by webs of box section, which are not significantly affected by corrosion. Thus integrity of bridge not thought compromised by observed corrosion at this time.	Discussion As for Eastney, corrosion relatively widespread to bottom chord members and bracing. Rusting not thought as advanced as at Eastney, could be left untreated. Monitoring should be carried out to determine level of deterioration at subsequent inspection. Rusting to splice connections should be addressed now. Based on presence of external rusting to box section bottom chord members, NDT recommended to determine whether corrosion occurring from within. Impact damage noted to I section bracing beam spanning between bottom chord members. Distortion to members not thought to have a major impact on structural performance of bridge.	

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