

Mutford Lock Maintenance and Reserve
Report by Rivers Engineer

Summary: This report sets out the current maintenance issues at Mutford Lock and recommends revised budget allocation and use of reserves to undertake essential maintenance and keep it serviceable both in the short and long term. The following report and recommendations were considered and supported by the Navigation Committee on 3 September 2015.

Recommendation:

With support of the Navigation Committee it is recommended that the Authority agree to the following:

- (i) Expenditure of a £87,082 from the Mutford Lock reserve fund to complete essential maintenance and repairs in the current financial year (2015/16).
- (ii) A revised annual maintenance budget for Mutford Lock of £18,000 to allow for hydraulic control system servicing and routine underwater maintenance, which will be incorporated in the draft 16/17 budget for consultation.
- (iii) The proposed appointment of a consultant in 2016/17 to investigate costed de-watering options for the lock, ahead of future major work. The cost is estimated to be between £5,000 and £10,000, and is proposed to be funded from the ring fenced reserve.

1 Background

- 1.1 Mutford Lock is a bi-directional lock with four pairs of mitre gates operated by a hydraulic system. The lock is heavily used during the summer months with typically around 800 vessel passages each year. The lock provides an important connection between the North Sea and the Broads, and is a popular alternative to navigating through the Port of Great Yarmouth.
- 1.2 Most locks (e.g. a typical canal lock) have a constant and significant head of water across the lock. The water pressure helps push and seal the gates when closed and helps with the movement and sluicing of silt and debris. Mutford Lock however experiences water level variation on both sides with a tidal cycle on Oulton Broad differing from the tidal cycle on Lake Lothing. The difference in water level across the lock is at times very small and therefore good maintenance and operation is essential to ensure the lock gates work and seal effectively when the benefit of a good head of water is not available.

- 1.3 In the last two years there has been a requirement for significant expenditure on Mutford Lock from reserves. Recent expenditure has been reactive rather than proactive; in part due to exceptional climatic events (large tidal surge in December 2013), but also in part due to previous low maintenance investment. Recent expenditure has included the replacement of the hydraulic control system (most of which was reimbursed by a government flood damage grant) and the removal and repair of a lock gate. This work has been previously reported to Navigation Committee most recently in June 2015.
- 1.4 Mutford Lock does have a dedicated reserve account from which such expenditure has been made. Annual contributions of £25,000 have been made to provide a fund for major work likely in the future, and an additional £2,000 is added into the fund each year from rental income.

2 Current Budget

- 2.1 The total annual budget for Mutford Lock is £39,000. In recent years this sum has been divided between contribution to reserves and operation and maintenance costs. The table below shows the typical budget allocation.

Item	Service Provider/Supplier	Budget Cost
Contribution to reserves		£27,000.00
Operation agreement	Sentinel Leisure Trust	£6,956.82
Maintenance agreement	Waveney Norse	£663.88
Available for routine annual maintenance and repair costs	Non specified but typically includes paint, grease, hydraulic maintenance, debris removal etc.	£4,379.30
Total		£39,000.00

- 2.2 After the contribution to reserves £12,000 is available for annual expenditure. Operation of the lock provided by Sentinel Leisure Trust and routine mechanical inspections and greasing provided by Waveney Norse account for most of this sum leaving £4,379 available for routine repair and maintenance costs.
- 2.3 The available budget for repair and maintenance has been spent each year on a number of minor items, such as paint, signage, gear repairs etc. as well as the use of divers to deal with obstructions. The available budget has however not been sufficient to cover a number of other repairs or maintenance issues which are now essential (see Section 3)

3 Immediate Works Requirements

- 3.1 In addition to the emergency works completed earlier this year to remove and reset one of the gates the recent survey and inspection work at the lock has highlighted a need for a range of non-routine maintenance tasks to be completed in the short term. These requirements are listed in the following

table with associated costs. A more detailed description and breakdown of the costs is included in Appendix 1.

Item	Value
Penstock repairs Replace two penstock sluices	£13,817.12
Hydraulic control adjustments Modify gate hydraulics to allow control of operating speed.	£5,981.00
Spare parts Purchase spares for hydraulic and electrical for the gate control system	£1,265.00
Debris removal Removal of silt and debris still remnant from surge	£6,400.00
Gate re-balancing Install buoyancy tanks to balance gates	£15,200.00
Gate mechanism repairs Replace grease pipes, rollers, racks, covers etc.	£8,200.00
Paving repairs Breakout and replace settled concrete paving	£3,000.00
Gauge boards Install new large gauge boards on both sides of lock	£2,000.00
<i>Total of proposed work</i>	£55,863.12
Emergency work completed spring 2015	£31,218.94
<i>Total reserves expenditure 2015/16</i>	£87,082.06

- 3.2 It is proposed that the cost of the maintenance work outlined in the above table be met by expenditure from the ring fenced lock reserve account. Much of this work is best undertaken in the quieter winter months (with the exception of the penstock replacement which is urgent). Whilst this expenditure was flagged up as a necessary item last year, it was not able to be budgeted as a contribution from reserves at that time due to the unknown amount required. To ensure the lock is in good serviceable order before the next summer season, it is recommended that all these items are completed before April 2016, and the Broads Authority is asked to approve this expenditure.

4 Revised Annual Budget Requirement

- 4.1 The following table shows the items which the annual budget is required to cover to proactively maintain the lock in serviceable condition.

Item	Value
Current Lock operation fees	£6,957.00
Mechanical maintenance	£2,000.00
Hydraulic and electrical maintenance	£1,935.00
Debris & Mussel removal and annual check	£5,000.00

Maintenance consumables & minor repairs	£2,108.00
Total	£18,000.00

- 4.2 This proposed budget allows for the existing operation fees and an improved level of mechanic maintenance, as well as provision for typical minor repairs and maintenance items. In addition to this it is proposed that an allowance is specifically made for the maintenance and annual servicing of the hydraulic control system and use of divers for underwater checks and maintenance.
- 4.3 The improved mechanical maintenance contract is suggested as current maintenance is not to the good level originally provided by Waveney District Council and this is reflected in the current low contract cost. The proposed cost in 4.1 is based on initial quotes from the current service provider and other potential providers.
- 4.4 The hydraulic control system is relatively new and like all electromechanical systems has items (e.g. filters, seals, heaters, fuses, pipes motors etc.) that need regular maintenance and servicing. The cost shown above is based on a quote from the system supplier who would provide monthly checks, an annual service and priority repair call out of the system.
- 4.5 With much of the lock structure and parts below water divers are regularly required to undertake maintenance. The use of divers has to date been purely on a reactive basis as problems have presented. The lock gates are vulnerable to disruption from excessive debris, silt and mussel built up. The cost shown in the table above would allow for three to four days with a dive team based on a typical day rate of £1500 to £2000. Rather than reactive work it is suggested that a proactive approach be taken with divers undertaking pre and post season underwater checks of the gates walls and cills and with removal of mussels and debris before problems occur.
- 4.6 Members should note that as previously reported Sentinel Leisure Trust who currently operate the lock on behalf of the Authority have requested a significant increase in the cost of operation from £6,957 to £20,000. This report focuses on the maintenance requirements of the lock and the associated costs which are necessary to keep it serviceable. The cost of the operating contract is being reviewed and will be reported separately with future consideration given to budgeting for any additional cost.

5 Reserve Account and Long Term Requirements

- 5.1 Mutford Lock has a dedicated reserve account. The reserve account as at the end of March 2015 stood at £322,547. Since taking over management of the Lock it has been the aim of the Authority as set out in the Asset Management Strategy to build this reserve account to a total of approximately £500,000.
- 5.2 With the maintenance expenditure of approximately £87,082 outlined in Section 3 and the annual contribution to reserves of £27,000 allocated, the net effect on the reserves budget this year will be a reduction of £60,082.

Therefore by the end of the financial year the reserve account will stand at approximately £262,465.

- 5.3 The proposed annual budget outlined in Section 4 requires an annual maintenance expenditure of £18,000. It is proposed that the contribution to reserves should remain at £27,000; therefore requiring a minimum of 9 further years to reach a reserve balance of £500,000.
- 5.4 The main reason for building up this dedicated reserve is to provide funds in the future for major structural repair work to the lock chamber, the stability of the masonry walls is an ongoing concern, but other elements include the steel piling both within the chamber and to the Broad frontage.
- 5.5 The actual cost of such major work to the masonry walls will be significantly influenced by the condition of the lock walls at the time of repair and the method of dewatering for works access. The key areas of concern are the remaining old masonry parts of the walls adjacent to the gates. Failure of these parts of the structure could compromise the gates and quoins leading to very high repair costs and the requirement for cofferdams to isolate and dewater the area.
- 5.6 Taking a proactive approach to investigating likely repairs and undertaking maintenance work before failure could significantly reduce the cost. It may be that lower cost alternatives to cofferdams for dewatering are feasible and that pre-emptive work can avoid some major aspects of work such as re-building quoins.
- 5.7 It is therefore suggested that past structural reports are revisited and further work is undertaken by a consultant in 2016/17 to provide costed options for de-watering. The consultant fees are likely to be between £5,000 and £10,000. It is however work that will need to be undertaken at some stage, and if undertaken now will provide an improved basis on which to manage the future budget and reserve fund. Members support is requested for this approach, and authorisation for this expenditure from the reserve account will be sought as part of the 2016/17 budget setting.
- 5.8 A survey will also be undertaken in 2016/17 of other land holdings around Mutford Lock which are subject to the Harbour Revision Order. This will include structural surveys of the piling and timber structures along the Oulton Broad frontage. The condition, remaining life and costed options for maintenance or replacement will be included in a subsequent report to the Navigation Committee.

6 Navigation Committee Consultation

- 6.1 The Navigation Committee received this report at its last meeting on 3 September 2015, and support was given for the use of reserves as indicated for the necessary works in this financial year.

6.2 The proposed structural survey work for 2016/17 was also supported, and it was agreed that a further report should be brought to Navigation Committee following the completion of the Harbour Revision Order to consider both the operating costs and the future charging strategy to be adopted.

Background papers: None

Author: Tom Hunter
Date of report: 7 September 2015

Broads Plan Objectives: None

Appendices: Appendix 1 – Immediate Maintenance Requirements

APPENDIX 1 – Immediate Maintenance Requirements

Item	Value
<p>Penstock sluices <i>The penstocks are paddle valves which control water flow in and out of the lock chamber. Two penstocks were found to be badly damaged and in need of replacement.</i></p>	
Remove banks and install new penstocks	£7,200.00
Supply new penstocks (x2)	£4,817.12
Replace penstock anodes	£1,800.00
<p>Hydraulic control changes <i>The hydraulic control system is an effective tool to work the gates; however unlike a manual system it can force the gates over obstructions without the operator aware. This appeared to have happened with the recent gate issues, therefore it is suggested that the operating loads are monitored and modifications made to reduce the speed and give the operator more sensitive control and avoid damage.</i></p>	
Data log and report on hydraulic load for each gate operation	£1,995.00
Install flow control valve to allow gate speed to be adjusted	£3,986.00
<p>Control System Spares <i>It is recommended that some spare parts are held for the hydraulic control system. Keeping these spares would potentially reduce down time in the event of a future breakdown.</i></p>	
Hydraulic spares pack	£1,060.00
Electrical spares pack	£205.00
<p>Debris removal <i>Debris removal has not been a routine task and although some material has been removed from the gate areas there is a significant backlog of debris and silt especially since the surge in 2013. This debris can obstruct the gates and get caught in the quoins (where the gates meet the walls). Mussels have also built up on the gates adding significant additional weight.</i></p>	
Bulk removal with small dredging vessel	£2,800.00
Clear gates/fine removal	£3,600.00
<p>Gate balancing <i>Lock gates need an accurate balance of weight distribution to allow correct alignment and sealing and prevent excessive pressure on bearings. Since the current gates were installed walkways and handrails have been added and mussels have been allowed to build up. Adding a buoyancy tank to each gate would redress the balance and minimise sealing and wear issues.</i></p>	
Buoyancy tanks – supply s/s tanks	£8,000.00
Install tanks	£7,200.00

Item	Value
<p>Gate mechanism repairs <i>Some of the basic mechanical items are now many decades old and have degraded over time. For example, the capstan covers protect the gate winding gearing from the elements but these are now severely corroded and effectively held together by paint. Another example is the racks which push and pull the gates; numerous repairs have been made but two would now benefit from replacement before failure as there could be a significant fabrication time.</i></p>	
New grease pipes	£500.00
New roller	£200.00
Capstan covers	£2,500.00
New rack (x2)	£5,000.00
<p>Paving repairs <i>Settlement of the concrete slab paving along the lock side now presents a trip hazard. Due to the nature of the lock working and operation the lock edge is not protected so it is important that the surrounding paving does not present a hazard. The breaking and recasting of the existing settled slabs will also provide an opportunity to see if there is any loss of material or significant settlement behind the lock walls.</i></p>	
Concrete paving repairs	£3,000.00
<p>Gauge boards <i>There is currently no precise indicator of water level on each side of the lock. New clear gauge boards at each end of the lock would provide this and allow the lock operator also to better advise craft on bridge clearances through Lake Lothing.</i></p>	
Gauge board supply and installation	£2,000.00
Total cost of proposed work	£55,863.12
<p>Emergency work completed spring 2015 <i>Failure of a gate to operate at the start of the season required investigation with divers and subsequent removal of the gate for repair.</i></p>	
Removal, repair and reseating of gate 2 south complete	£31,218.94
Total reserves expenditure 2015/16	£87,082.06