



Buro Happold

Carnsew Pool Sluicing Briefing Note

**In respect of the hybrid planning application at South Quay & Foundry
Yard, Hayle Harbour
Application Reference PA/08142**

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Introduction

Historical sluicing techniques were employed at Hayle Harbour to assist in the clearance of the channels and quay sides within the harbour. This included the impounding and controlled release of water from both Copperhouse and Carnsew Pools, with the objective of flushing sediment (mainly fine sand) out of the harbour and navigation channel into St Ives Bay. Both pools now lie within Sites of Special Scientific Interest (SSSI).

Since this practice was discontinued in the second half of the 1900s, the harbour has accreted (gradually infilled with sand penetrating from St Ives Bay), indicating that there is a net import of sand into the harbour. Without sluicing and/or dredging, the harbour will continue to accrete. Without the reintroduction of sluicing, then maintenance dredging will continue to be necessary. The re-introduction of sluicing will reduce this requirement.

ING's comprehensive regeneration proposals for Hayle Harbour, as set out in the Outline Planning Application (OPA) Masterplan, included a proposal to reintroduce sluicing from both Copperhouse and Carnsew Pools. The approved Masterplan Permission was the subject of an Environmental Impact Assessment (EIA), which included the assessment of the likely impacts of reintroducing sluicing from both pools. It also considered mitigation to reduce the negative impacts considered to arise from the reintroduction of a full sluicing regime.

The current South Quay planning application now includes the reintroduction of sluicing from Carnsew Pool, which, under the Outline Planning Permission (OPP) was intended to be delivered in a later Phase of development. This briefing note explains the background to this, the proposals that are required to facilitate this, and the indicative operating regime that would be employed.

The works to enable the reintroduction of sluicing will be the subject of a Listed Building Consent application that will be submitted at a later date. It is not considered that it will be necessary to secure a Harbour Revision Order in order to facilitate the reintroduction of sluicing, subject to confirmation of the legal position on this issue.

Historic sluicing infrastructure

Carnsew Pool had two methods of sluicing; from the Carnsew Tunnels, and from the Carnsew Mitre Gate Channel.

Carnsew Tunnels (still visible) were equipped with 4 sluice gates (Penstocks) within a mainly granite masonry structure. These gates are no longer present, but the tunnels still function and allow the pool to fill and empty on the rising and falling tide.

Carnsew Mitre Gate Channel (infilled some years ago) was equipped with a pair timber Mitre Gates within granite channel walls. The gates were orientated to point inwards towards to pool, and were fitted with 4 sluice gates (penstocks) – two within each leaf of the pair of gates. The gates are still in situ, but are in a poor and unusable condition.

Historic sluicing practice – Carnsew Pool

The practice of sluicing had been carried on in Hayle from Carnsew Pool since the first half of the 19th Century. From eye witness accounts from the 1960s and 1970s the practice involved allowing the tide to rise and fill the pool to the extent possible before the tide turned. Filling was possible through both the Tunnels and the Mitre Gate Channel. At that point the Tunnel sluices would manually be closed, and in the case of the Mitre Gates, these would close as the flow in the channel reversed.

At mid tide, approximately 3 hours after high tide, the tunnel sluices and/or the sluices in the Mitre Gates would be opened, and the water stored within the pool would be released. The flushing action of this water was designed to mobilise the sand in the harbour/navigation channel, and carry it out to St Ives Bay.

Assessment of the likely effects and benefits of sluicing

In support of the Outline Masterplan Application, the hydrodynamic and sediment movement characteristics of the harbour were investigated including extensive hydraulic numerical modelling, undertaken by H R Wallingford, under the direction of Buro Happold. This work included development of a baseline model (assessment of the existing position), and then a number of modelling iterations were carried out. These iterations included consideration of the effects of the reintroduction of sluicing from both Carnsew and Copperhouse Pools both under present conditions and with the scheme (including removal of Cocklebank, the marina development, fishermen's harbour etc) in place. In the case of Carnsew, it considered the effects of reinstating sluicing from both the Tunnels and the Mitre Gate Channel.

H R Wallingford's analysis concluded that without sluicing the amount of sediment encroaching into the harbour was estimated to be of the order of 10,000-20,000m³/year. This appears to be corroborated by recent surveys undertaken during the most recent maintenance dredging (between July 2009 and April 2010) when it was estimated that 14,600m³ of sand had been brought into the harbour.

The analysis also considered the likely effectiveness of variations on sluicing, to try and validate/confirm the eye witness accounts of the historic custom and practice. This included consideration of the time of release of water from the pool, and the relative effectiveness of sluicing on neap and spring tides. This work concluded that releasing water 3 hours after high tide was the most effective point in the tidal cycle in moving sediment out of the harbour. It showed that sluicing on spring tides was effective, and resulted in a net reversal of the general movement of sediment into the harbour, taking sand out beyond the bar at the mouth of the navigation channel. However, it showed that there was little or no beneficial effect when sluicing on neap tides.

Original Outline Planning Permission (OPP) proposals for sluicing from Carnsew Pool

The OPP allowed for the restoration of sluice gates to the Carnsew Tunnels, and for the construction of a new sluicing structure in the Carnsew Mitre Gate Sluice Channel, rather than the restoration of Mitre Gates within the channel. It was proposed that both sluices were to be operated by electrical actuation, under the control of the Harbour Master.

The arrangements were to allow for both controlled local operation, as well as controlled remote operation. With either condition, there were proposals for the adoption of warning systems, including lights and audible alarms, and for the provision of warning notices informing the public of the dangers associated with the operation of sluices including the release of water from the pool.

The original (unmitigated) sluicing proposals included for sluicing on all tides, by the release of water from one or both the Carnsew Sluices 3 hours after high tide. There was not intended to be any restriction on the time of year when sluicing could be carried out.

Environmental considerations relating to reintroducing sluicing

In support of the OPA, the potential environmental impacts of the unmitigated sluicing were considered. For Carnsew Pool, this included the potential effects on the filling and emptying of the pool, in particular, the possible effects on aquatic ecology, fisheries and on the inter-tidal habitat used as a feeding area for birds.

Two Chapters in particular; Chapter 9 – Ecology and Chapter 13 – Water Resources and Flood Risk, dealt with the potential impacts of unmitigated sluicing. The assessment concluded that the environmental impacts of unmitigated sluicing were such that mitigation measures were required. The mitigation proposed was as follows:

- Water retention for sluicing will only be undertaken for the few tides either side of peak spring tides.
- Sluicing would be undertaken during the period 15th April to 31st August.
- The decision on whether one or both sluices are used to fill the pool would be made in consultation with the environmental consultees
- The effects of sluicing would be monitored, and modified if deleterious effects on wildfowl are observed.

Proposals for re-introducing sluicing under the Current Application

As part of the Current South Quay application, it is proposed to bring forward the proposals for re-introducing sluicing from Carnsew Pool, which were originally proposed to be implemented during a later phase of the comprehensive development.

These proposals are identical in principle to the intended operational regime proposed under the mitigated sluicing proposals pursuant to the approved Masterplan. The regime would be as follows:

- Sluicing would be undertaken by releasing water 3 hours after high tide.
- Water retention for sluicing will only be undertaken for the few tides either side of peak spring tides.
- Sluicing would be undertaken during the period 15th April to 31st August.
- The decision on whether one or both sluices are used to fill the pool would be made in consultation with the environmental consultees
- The effects of sluicing would be monitored, and modified if deleterious effects on wildfowl are observed.

There are differences in the proposed method of reintroducing sluicing. These are set out below.

- The proposal for the Carnsew Tunnels is identical to that set out in the OPP except that the sluices will be operated by manual rather than electrical means.
- The proposal for the Carnsew Mitre Gate Channel is now to reinstate a set of timber Mitre Gates within the existing channel walls, rather than to replace the sluicing operation with modern culverts/sluices.
- The Mitre Gates will incorporate Penstocks (sluices) which would be operated manually, rather than electrically.
- For both sluices, all operation would be manual and local, and remote operation would not be possible.
- Operation would be under the control of the Harbour Master (or other authorised party).
- Measures for audible and visible warnings will be employed to alert the public to the sluicing arrangements.

In addition, under the Current South Quay application, it is not intended to implement the other harbour related infrastructure measures at this time, e.g. removal of Cocklebank, dredging, marina construction, fishermen's harbour construction, etc.

Ecological impacts of the revised proposed arrangements

This section provides comment on whether the proposed changes to the construction of the tidal sluices at Carnsew will have any different effects on aquatic ecology from those assessed in the OPA Environmental Statement. These comments are provided by Dr Phil Smith (Director, Aquatronics Ltd) and relate to seaweeds, invertebrates and fish, but not birds.

The OPA Environmental Statement stated that:

“There will be minor to moderate adverse impact on invertebrates and algae, and negligible to minor beneficial impacts on fish during the period 15 April to 30 August, due to effective increase in the sub tidal area of the pool (i.e. the high tide level is retained for three hours before water is released for sluicing). These impacts are reversible as the sluicing regime can be amended in the light of monitoring.”

Dr Smith's view is that the sluicing scheme now proposed will have no additional adverse impacts on the ecology of Carnsew or adjacent downstream areas including the harbour.

Timing is an important element to mitigating impacts in Carnsew Pool. The Mitre Gate will be constructed and operational before any works are carried out at the existing weir and tunnels. This will ensure that tidal exchange between the pool and the harbour is unaffected by the refurbishment of the existing tunnels.

The Section 106 agreement provides information on the ecological monitoring required in Carnsew. The invertebrate and plant surveys commenced in summer 2010 and the results will be available from Aquatronics Ltd in August 2011. A baseline fish survey in Carnsew is required and this is likely to be done in Summer 2012.

There are no changes to the proposed dredging of the channel downstream from the Mitre Gate and Dr Smith's assessment of impacts is therefore the same as in the OPA Environmental Statement. The dredging works should be carried out in the cooler months (October to May) and it may be feasible to undertake a fish rescue to remove some of the fish prior to dredging.

When the Environmental Statement was prepared it was planned that the re-introduction of sluicing at Carnsew would be in conjunction with removal of Cocklebank. The current application separates these two components (there is no plan to remove Cocklebank as part of this application), so the severity of impacts in the Hayle estuary complex will be lower. In Dr Smith's view it is beneficial to undertake the construction works for the Carnsew sluices at a separate time from removal of Cocklebank.

Environmental Consultations in respect of sluicing at Carnsew Pool

As part of the assessment of potential environmental impacts of the proposed amended sluicing arrangements at Carnsew Pool, a consultation meeting was held on 13th July 2011 in Truro with representatives from the Environment Agency (EA Fisheries), Cornwall Council (Planning and Maritime Departments), Royal Society for the Protection of Birds (RSPB) and Natural England (NE).

The meeting covered the following:

- The background (historical perspective) of sluicing
- An overview of the OPA Masterplan process:
 - Summary of the studies and investigations undertaken
 - Description of the 'unmitigated' and 'mitigated' sluicing proposals
 - Consideration of the environmental impacts
 - A description of the OPA sluicing engineering works
- Description of the amended sluicing proposals for Carnsew Pool
- Consideration of any additional impacts
- Planning issues

The consultees were informed that Dr Phil Smith was undertaking a review of the potential impacts of the amended sluicing proposals on aquatic ecology, and would be contributing to the preparation of this Briefing Note.

The consultees agreed that the amended sluicing proposals were such that the impacts assessed under the OPA were still valid, and that no additional assessment of impacts was required.