THE UPGRADING OF SEWER PUMP STATION NO 1 LAURIETON

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ABSTRACT

Sewer Pump Station (SPS) No1, Laurieton is the largest and most critical pump station in the Camden Haven area with a volume of 220KL. Through it passes over 85% of all waste water treated at the Camden Haven treatment plant. Due to a combination of increasing population and ageing infrastructure, the pump station was unable to successfully deal with the peak flows experienced during major rain events. A major driving force to the upgrade was the close proximity of the Camden Haven River and its many connected water ways. Any surcharge in the sewer system experienced during large rain events would result in the closing of the river, causing major financial loses to local Oyster Industry. The upgrade works were thus required to meet a EPA pollution reduction deadline, by which time the Pump Station had to be able to deal with a 1 in 5 year rain event. During the construction numerous challenges were faced, including a strict time limit to design and build, adverse ground conditions, the necessity for a semi-permanent bypass system while the station was off line, and serious environmental risks due to the close proximity of the Camden Haven River.

1.0 INTRODUCTION

The Camden Haven region, part of the Port Macquarie Hastings Council (PMHC) is a unique catchment to manage, with all residential development within close proximity to waterways, a significant amount of flood-prone properties and North Brother Mountain generating high volume storm run-off.

A long term, broad project has been in place since approximately 2008 to upgrade the Camden Haven sewerage scheme. Part of this long term project was refurbishment/upgrade of the Sewer Pump Station (SPS) No 1. The existing SPS No 1 was unable to deal with major rain events, negatively impacting the environment and local oyster industry. The upgrade works were required to meet a EPA pollution reduction deadline, requiring that PMHC address the issue within a strict time frame and ensure that the pump station would be capable of dealing with a 1 in 5 year rain event. Works on the upgrade to SPS No 1 commenced in March 2014.

The upgrade required the isolation and bypassing of the existing pump station for the duration of the project and its conversion into a triplex installation (one duty, two standby for dry weather flow, and two duty and one standby for wet weather flow) with a dedicated stand-by generator permanently based on site. Electrical switchboards were to be renewed, a new discharge valve pit and manifold to be constructed, all internal pipe work was to be renewed and significant internal well reconfiguration.

This paper will outline the construction process of the SPS No 1 upgrade and the challenges faced as part of the ongoing upgrade works to the Camden Haven sewerage system.

2.0 DISCUSSION

Due to the critical nature of SPS No 1 from both an environmental and operational perspective, the necessary works were undertaken in-house using day labour and were not outsourced to contract.

This allowed PMHC the opportunity to control the project from start to finish ensuring that from an operational perspective the new installation would meet all necessary requirements.

2.1 By-passing SPS No 1

Due to the strict time constraints, construction of the necessary bypass system began prior to the pump station design being finalised. Setting up of the bypass involved the conversion of the receiving manhole into a temporary well and the installation of two diesel pumps (a 300mm and backup 200mm) to divert flow around the well. To isolate the pump station it was necessary to construct a 3.2m deep valve pit to house a new stop valve to be cut into the existing 600mm AC main.

The two diesel pumps were operated on a float system with real time level monitoring. The bypass had to be able to deal with both dry and wet weather flows with the intention of meeting the requirements of a 1 in 5 year rain event. Thus allowing PMHC to meet the requirement of the PRP deadline so as to allow more time to complete the necessary works.

Figures 1 & 2: ***The receiving manhole was cut off above pipe level using a diamond rope saw. Six screw piles sunk to a depth of 6 metres were used to take the weight of the above concreate chamber which formed the temporary well.***

Figure 3: ***Using the new well and the existing retic system as storage, the diesel pumps were capable of diverting the flow around the well, pumping at a maximum rate of 170 L/sec.***

Due to the close proximity of the Camden Haven river, the construction of the new intake valve pit posed many challenges. A 4 x 4 metre shoring box, 300mm slotted piece of PVC pipe and a small submersible pump were used to dig to a required depth of 4.7 metres - well below the water level of the river that flowed past the site less the 50 metres away. Two excavators (Figure 4) were used to dig down to the bottom of the pipe level, then a large vacuum truck was brought in to remove the final 1.5 metres of thick mangrove mud. Once the required depth was reached, screw piles were sunk down to rock and a 500mm concrete plug poured to take the weight of the pit to be constructed around the newly cut in stop valve (Figure 5).

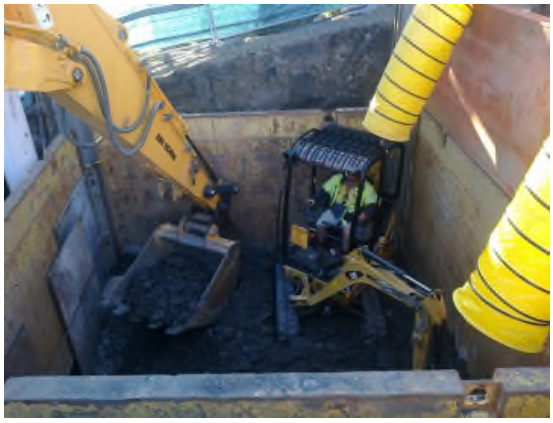

Figure 4: ***Excavators digging pit***

Figure 5: ***New Valve pit***

2.2 Refurbishing the Pump Station

Once the bypass was in place and deemed capable of handling flow, work began on refurbishment of the existing pump station. Originally commissioned by the department of public works as a dry well/wet well in 1976, the pump station had since been converted into a submersible pump, wet well by PMHC in the early 1990's.

The existing well was divided into three sections by a large dividing wall down the centre and another smaller dividing wall separating the flow on the intake side. Due to this design the pump station was unable to operate efficiently. The upgrade required the removal of two thirds of the centre wall and the complete removal of the other dividing wall and existing benching.

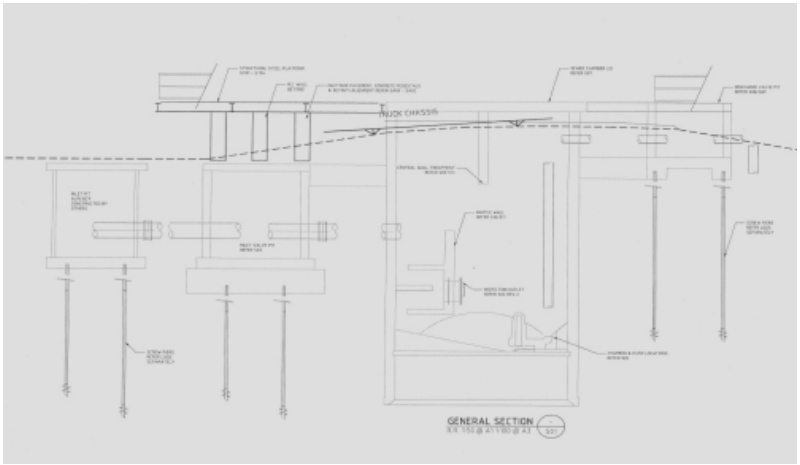

Figure 6: ***Elevation of the new pump station with temporary well for bypass on far left and discharge valve pit on right.***

Design for the new well was completed once the bypass was running and a local engineer was engaged to work with the PMHC team to design the construction plans.

To allow access the concrete lid was removed completely by cutting it off in sections using a track saw and a diamond rope saw. All existing pipe work, ladders and platforms were then removed and the process of removing 30 tonnes of concrete from inside the well began.

To undertake the works safely a trailer mounted crane with work basket was required on site for the duration of the project. This allowed safe access to the well and the ability to work at any height within the 8 metre deep chamber.

Concrete cutting experts were contracted to remove the dividing walls in seven sections, and a rock breaker lowered into the well to remove the benching. As the concrete was being removed a new discharge valve pit was built, through which passed the three discharge lines (Figures 7 & 8). These lines then connect into a newly built manifold before reconnecting into the existing rising main.

Figure 7:

Figure 8:

Once the significant and complex task of removing the concrete was completed all exposed steel reinforcements had to be treated and sealed with epoxy and a concreate beam poured on the underside of the remaining centre wall. New benching was then poured using shotcrete and a new baffles system built.

The new baffle system, necessary to create laminar flow from the inlet, was attached using 20mm deformed steel bar, chemically anchored to the existing well walls. The construction process for the baffles required five separate concrete pours, with sufficient curing time between each, and the installation of a stainless steel access hatch.

Due to time constraints much of the construction work was carried out on ‘the fly’ with construction plans quite often only finalised days before they were needed to continue work.

Once all concrete works within the well were complete and new pipe work and discharge bends installed, a ring wall was formed and poured to raise the height of the existing well walls by half a metre. This process required ninety 20mm ‘L’ bars to be chemically anchored into the top of the chamber wall to a depth of 400mm. A 300mm thick lid was then formed and poured over the well and discharge valve pit. (Figure 9)

Figure 9: ***Forming the lid over the well and discharge valve pit***

The new electrical box and dedicated stand-by generator were mounted on a manufactured steel platform suspended on two concrete walls and nine concrete columns on the intake side of the well.

Once works were complete the pump station was coated in a durable epoxy coating to ensure the longevity of the installation.

2.3 Completed and Ongoing Works.

PMHC also completed Stage 1C of the Dunbogan flood access roadworks (Tip Road to Sewer Treatment Plant (STP) from The Boulevarde), and invited tenders for Stages 1A and 1B service relocations (eastern end of Dunbogan Bridge, Diamond Head Road to Tip Road intersection with The Boulevarde) in March/April 2015. This included the new sewer rising main to the Camden Haven STP within these works.

The remaining rising main link from Camden Haven SPS No 1 to the Dunbogan bridge is identified in the 2015/16 capital works program and is scheduled for completion in the 2015/16 financial year. Completion of this final link will mean the rising main from Camden Haven SPS No1 to the Dunbogan sewerage treatment plant will have been upgraded to 450mm diameter for its full length.

PMHC has been committed to a long-term works program in the Camden Haven area for some time and has completed the following since 2008/2009:

- Augmentation of the Camden Haven STP
- Duplicate carrier main Lake Street Laurieton
- New 450mm diameter rising main crossing the Dunbogan bridge including access walkway
- Raising of Camden Haven SPS#11
- Completion of full SCADA capability for the Camden Haven scheme
- Relining existing Laurieton carrier main
- New rising main from Camden Haven SPS#22
- Refurbishment/upgrade of Camden Haven SPS#1, and

- Completion of upgrade of Camden Haven SPS#1 rising main, pump station to STP (450 diameter).

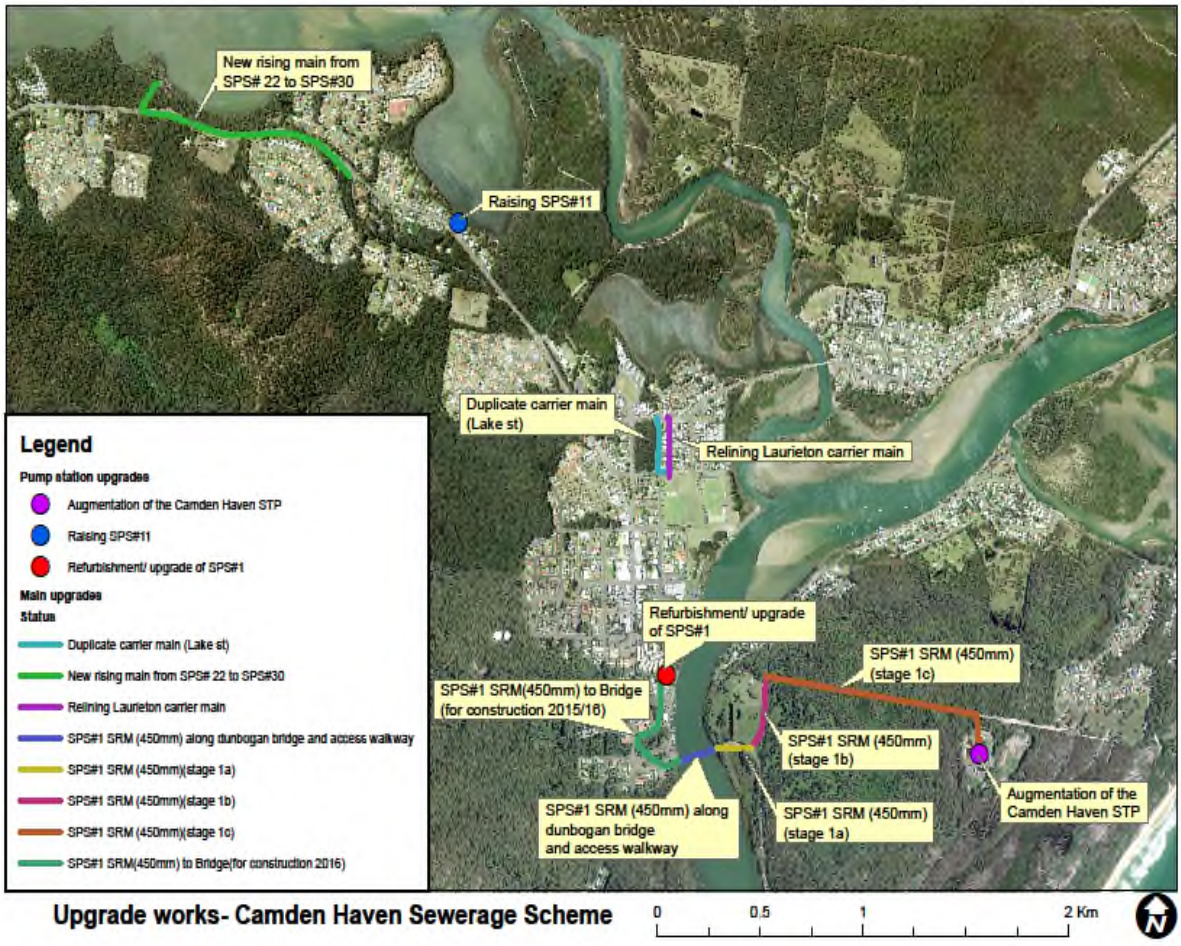

Figure 10: ***Upgrade works – Camden Haven Sewerage Scheme***

3.0 CONCLUSION

Refurbishment/upgrade of the Sewer Pump Station No 1 Laurieton was successfully completed by PMHC in May 2015 providing the council and community with a first rate pump station. At the time of writing this paper, SPS No 1 has succeeded in dealing with all rain events and avoiding any sewer surcharges. The completion of the in house works have allowed PMHC staff to gain valuable experience in major construction works and the intimate knowledge of the system provides an operational advantage moving into the future.

PMHC continues to explore opportunities to improve the Camden Haven sewerage system. This includes continuing to identify specific projects for inclusion in the forward works program, relining of existing gravity mains within the system, ongoing infiltration investigations, and general upgrades including switchboards, pumps and other works.

4.0 ACKNOWLEDGEMENTS

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