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Enhancing Outfalls to Rivers

9.1 Surface water outfalls

RIVER SKERNE

LOCATION – DARLINGTON, CO DURHAM, NZ301160

DATE INSTALLED – AUGUST TO OCTOBER 1995

COST – £15,000 – CROSS CONNECTION SURVEY, £23K - RENEWAL OF 13 HEADWALLS, CONSTRUCTION OF PIPE WORKS AND NEW CHAMBERS

Typical outfall before replacement

Description

Although the water quality of the Skerne has been steadily improving, public perception of the river was one of a polluted watercourse. Along the core reach of the river restoration project there were 13 public surface water outfalls with ugly concrete headwalls marking their points of discharge. Those with grills were cluttered with plastic and other litter. The project provided a unique opportunity to instigate further improvements to water quality and visual amenity.

Initial inspection by Northumbrian Water of surface water drainage areas and some 1125 premises revealed a number of pollution sources from illegal connections of washing machines, dishwashers, showers, baths and toilets. The water company helped property owners to rectify irregularities before issuing certificates of compliance.

Design

The aims of the design for the surface water outfalls were:

- to improve the quality of discharge by reducing silt, oil, petrol and floating solids reaching the river;
- to improve visual amenity by removing concrete headwalls and positioning discharge pipes below river water level;
- to reduce the number of outfalls and make future management and monitoring more efficient and easier.

New underground outfall chambers were designed such that the amount of both silt and floating solids discharged into the river would be reduced. Under low surface water flows, silt settles and is trapped in a sump. A dip plate ensures that any oil, petrol and floating sewage items are also retained in the chamber. These can all be removed using a suction unit at regular intervals and disposed of appropriately. Initially this was planned at a frequency of four times per year. Under high flows some effluent will be carried into the river but will be much diluted.

Inspection of the chambers is via recessed covers, incorporating turf, which lie just above ground level and so are visually unobtrusive. These allow sampling and pollution monitoring when needed.

Angled to discharge below low water level, the outfall pipe lies on a concrete apron which reduces scour during high flows. The outlet is turned to face downstream so that the river draws the discharge. Additionally, an underwater gabion was installed upstream of the outlet to reduce the risk of pipe damage by floating tree branches etc. Direct jetting via the chamber is possible if outlets become silted but they are expected to be self cleansing. The velocity of discharge achievable has been seen to make the river 'boil' after heavy rain.

At the large backwater (*see Technique 2.2*) three outfalls have been combined to run into one inspection chamber linked to a single outfall pipe.

The advantages of discharging to a backwater include:

- introduction of periodic flow into the backwater;
- potential for natural filtration of the discharge;
- ease of staunching 'off-river' should any pollution incident occur.

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Subsequent performance 1995 – 2001

The outfalls appear to be working effectively. The level of maintenance required has not been as frequent as previously envisaged and is now undertaken once a year. No blockages by siltation of the river bed have occured. The outfalls are now virtually invisible.

New outfall chamber under construction

Note: River bank reinstated with soil and toe planting such that no visual evidence of the outfall exists

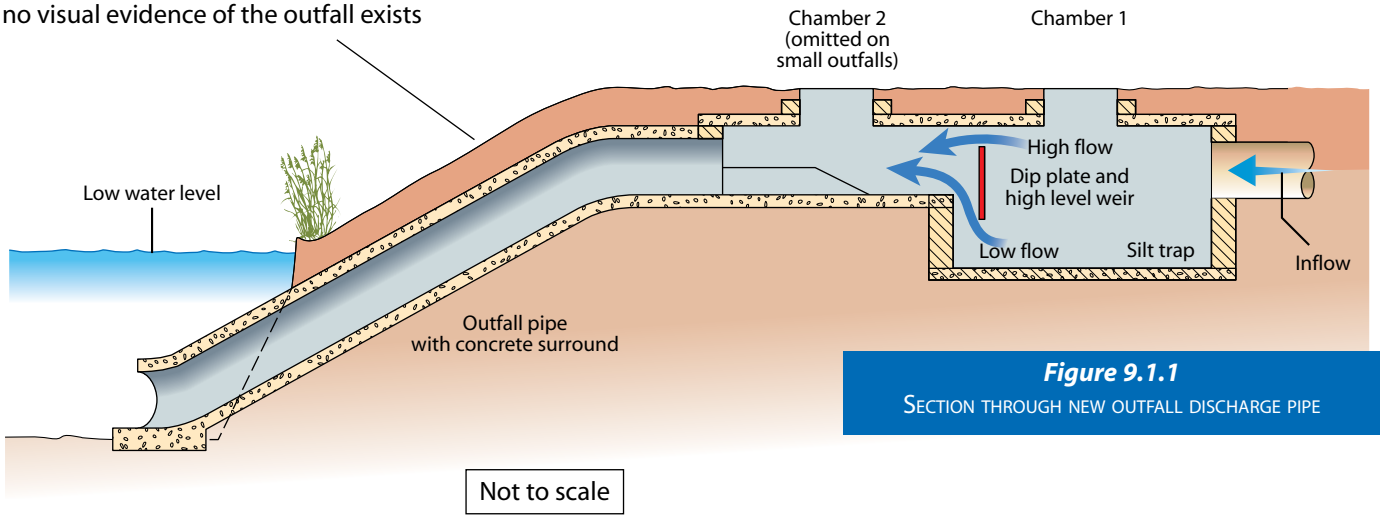

Figure 9.1.1
SECTION THROUGH NEW OUTFALL DISCHARGE PIPE

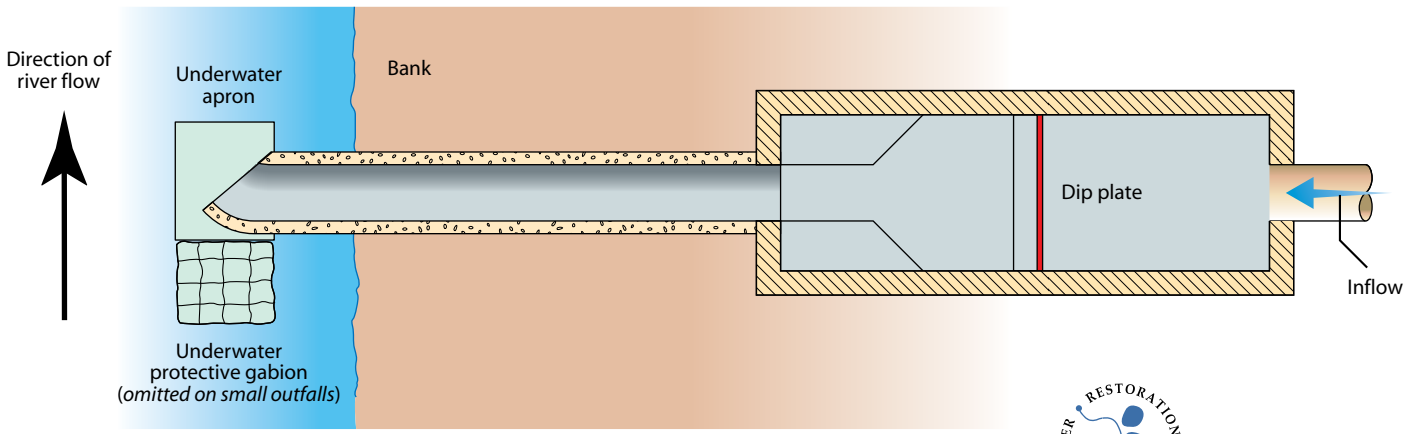

Figure 9.1.2
PLAN OF NEW OUTFALL DISCHARGE PIPE