

**AYRSHIRE JOINT STRUCTURE PLAN AND TRANSPORTATION COMMITTEE  
2 JUNE 2006**

---

**Assessment of the Impact of Development - Meadowhead & Stevenston Drainage  
Catchments**

---

PURPOSE OF REPORT

- 1 To advise the Committee of the findings of an assessment of the impact future development could have on the Meadowhead & Stevenston drainage catchments, the study was commissioned by Scottish Water on behalf of the Joint Committee.

BACKGROUND

- 2 Atkins was commissioned to undertake an assessment of the impact future development would have on the main drainage systems within Ayrshire. The work was undertaken to support the Structure Plan and was carried out during the latter period of 2005. The aims of the study were to:
  - quantify the hydraulic impact future housing development planned for the catchments would have on the Meadowhead & Stevenston drainage systems; and
  - to develop a strategic improvement strategy in order to maintain the existing sewer system performance and mitigate any deterioration which may occur following the connection of future development.

CATCHMENTS CHARACTERISTICS

- 3 The analysis that was undertaken covered the Meadowhead & Stevenston catchments. Drainage flows in both areas are conveyed via a combination of gravity and pumped systems.

Meadowhead Catchment

- 4 The Meadowhead catchment is extensive and comprises of most of the central Ayrshire. It includes the larger towns of Ayr, Kilmarnock, Prestwick , Irvine &

Troon and smaller communities such as Barassie, Springside, Dreghorn, Darvel, Newmilns, Hurlford, Galston, Mossblown, Tarbolton, Monkton, Symington, Drybridge and Gatehead. These communities account for 60% of the Ayrshire population. Drainage to the east of Meadowhead is by gravity flow, via the Irvine Valley Trunk Sewer to the Gatehead tanks at Kilmarnock. The Irvine Valley Trunk Sewer is under capacity at present with numerous CSO overflows discharging to the River Irvine. Downstream of Kilmarnock the discharge is via the Gatehead tanks to Meadowhead treatment works. The towns of South Ayrshire and Irvine (new town part) discharge to Meadowhead via a series of pumping stations. CSO's along this stretch are also known to discharge significant amounts of combined sewage.

### Stevenston Catchment

- 5 The Stevenston catchment is situated to the north west of Irvine. The catchment covers Beith, Dalry, Kilbirnie, Kilwinning, Stevenston, West Kilbride, Ardossan & Saltcoats. This catchment provides drainage for a further 20% of the population. The main trunk sewer in this catchment is the Garnock Valley Trunk Sewer.
- 6 The Meadowhead catchment covers some 7400ha whilst the Stevenston catchment covers 1600ha. Scottish Water and SEPA perceive the CSO discharges that occur within both the Meadowhead and Stevenston Catchments as the main drivers for capital investment. In the Meadowhead catchment there are 126 CSO's whilst in the Stevenston catchment there are 41. Many of these general discharges/overflows are to local water courses or the River Irvine.

### METHODOLOGY

- 7 The work undertaken by the consultants was broken down into a series of discrete work packages and was able to draw on development data provided by the Ayrshire Councils and hydraulic modelling previously undertaken to assess the impact of CSO discharges in the Meadowhead and Stevenston catchments on the water quality of bathing beaches along the Ayrshire coast. 2004 base hydraulic models were used for both catchments. These models were revised in the light of potential future development within the catchment areas. Runs were undertaken to model the potential impact of flooding on the system and CSO spill frequency and volume.

### KEY FINDINGS OF HYDRAULIC MODELLING

- 8 The model predicted, after screening for erroneous flood volume data, no significant pattern of increased flooding. Where increases in flooding were detected these were upstream and were considered relatively localised. However the model did predict significant increases in total annual spill volumes from CSO's across both the Meadowhead and Stevenston catchments. Generally, and not surprisingly, the CSO's predicted to worsen were those located along the downstream trunk sewers or at terminal pumping stations. The results indicated that some form of sewer

improvement strategy was required to mitigate the impact of future development on the performance of the sewer system. It should be noted that the mitigation measures which were subsequently proposed only sought to identify solutions in terms of maintaining existing sewer performance as a result of future development. It did not seek to quantify the catchment deficiencies in terms of Scottish Water or SEPA regulatory requirements. This approach allows the proportion of the cost directly attributable to the future development to be attributed.

- 9 Within the Meadowhead catchment the modelling that was undertaken suggested that, as a consequence of future development total annual spill frequency of all overflows would increase from 4,323 times per year to 4,656 times per year, an increase of 8%. The volume of spill would increase by 15%. Ninety of the 124 CSO's in the Meadowhead catchment would spill more than they currently do. Spills from 54 CSO's would be greater than 25m<sup>3</sup>. For the Stevenston catchment it was predicted annual spill frequency would increase from 1,139 times to 1,150, an increase of 1%. Spill volume would increase by 6%. Spills would be greatest at the Saltcoats TPS and Holmes Road CSO, both would see volume of spillage increase by 10,000m<sup>3</sup>. However, whilst the modelling suggested increases in volume of spill, the frequency of spill did not significantly increase as a consequence of development. The Formula A assessment (generally more than 10 spills per annum from an individual CSO) predicted proposed development would have little impact on the performance of the CSO's. In the Meadowhead catchment 41 CSO's currently fail the Formula A threshold, with the added developments the model simulations suggest only one additional CSO would fail. Similarly in the Stevenston catchment only one CSO at West Kilbride would fail. Judged against these criteria, Formula A, the impact of development was not significant.

## SOLUTIONS & OPTIONS

- 10 As outlined above the strategic options considered in the report sought to address the impact of future development and do not address other sewerage deficiencies or other regulatory drivers. Based on the findings above two options were tested.

### Option 1

- 11 The first option involved the construction of storage at each CSO where spill volumes were greater than 25 m<sup>3</sup>. Where spill volumes were less than 25m<sup>3</sup> it was considered that this is achieved by providing attenuation solutions at or near the planned development. Under this option total storage of **105,000 m<sup>3</sup>** would require to be constructed. Of the 124 CSO's within the Meadowhead catchment 74 would require storage of less than 25 m<sup>3</sup>, 34 would require no storage. 12 locations would however require storage in excess of 1000m<sup>3</sup>. The largest provision being at Gatehead tanks, Kilmarnock, Meadowhead treatment works, Irvine, Ayr Pumping Station, Scott Ellis Tanks, Kilmarnock and in the vicinity of St Andrews caravan park, Prestwick. In the Stevenston catchment total storage volume of 6000 m<sup>3</sup>

would be required, 14 of the 42 CSO's would require more than 25 m<sup>3</sup> of storage, 12 less than 25 m<sup>3</sup> and 15 no storage at all. The largest storage provision would be at West Kilbride and Saltcoats. The costs associated with the construction of these tanks would be **£68.4 m** for the Meadowhead Catchment and **£3.7 m** for the Stevenston catchment.

## Option 2

- 12 The second option considered the construction of large interceptor sewers (225 to 375mm) to accommodate CSO spills. In the case of the Meadowhead catchment the construction of the interceptor sewers would reduce a need for storage capacity particularly in the catchment to the North & East of Meadowhead. However CSO's to the south of Meadowhead cannot cost-effectively be linked with interceptor sewers and the requirement for storage or increased pumping capacity would remain. Under this option **72,000m<sup>3</sup>** of storage and **34,500m** of inceptor sewer would be required. This option was costed at £56.1m and includes the construction of 21 storm tanks and 35 km of interceptor sewer. Additional costs to increase treatment capacity at Meadowhead of £8.4m would also be required, giving a total cost of **£64.5 m**. Within the Stevenston catchment the construction of interceptor sewers was considered, however, no cost effective options were viable and a localised solution at Holmes road costing **£45k** was tested, the costs of storage would be as in Option1.

## CONCLUSIONS

- 13 As is noted above the construction costs for both options are similar. However the study concluded in favour of the construction of storm capacity tanks in preference to the construction of the interceptor sewers. The recommendation to use the CSO storage option was because of uncertainty surrounding the cost of modifications necessary to the Meadowhead WwTW that would be necessary if the interceptor sewer option was taken forward. The consultants however concluded that if the true extent of the cost of works at the Meadowhead WWTW could be determined the strategic interceptor sewer should be reconsidered. The report also emphasised the need to consider the investment necessary to support development alongside other sewerage deficiencies, rather than isolation. The costs to the development industry presented in the report would be reduced as a consequence if work were carried out in conjunction with CSO improvement projects necessary to meet Scottish Waters's regulatory requirements. Whilst the costs are significant this must also be seen within the context of the development investment that will be supported. The Structure Plan provisions, 37,000 homes over 20 years, will have a development value of £5bn at current prices.

RECOMMENDATIONS

6 The Committee are asked to note the content of this report.

Ian Johnson  
Manager  
Ayrshire Joint Structure Plan and Transportation

Person to Contact: John Esslemont - 01292 673766