

**The Greater Dublin Strategic Drainage Study**  
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 Session 4 – Case Studies Paper 9

**Introduction to the Project**

The Greater Dublin Strategic Drainage Study is to provide the planning for the future drainage, sewerage and sewage treatment infrastructure for Ireland’s capital city up to the middle of the 21<sup>st</sup> century. The project covers the seven local authorities that make up the Greater Dublin Area, which are:

- Dublin City Council, the lead Client Council;
- South Dublin County Council;
- Dun Laoghaire County Council;
- Fingal County Council;
- Kildare County Council;
- Meath County Council, and;
- Wicklow County Council



**Figure 1 GDSDS Study Area**

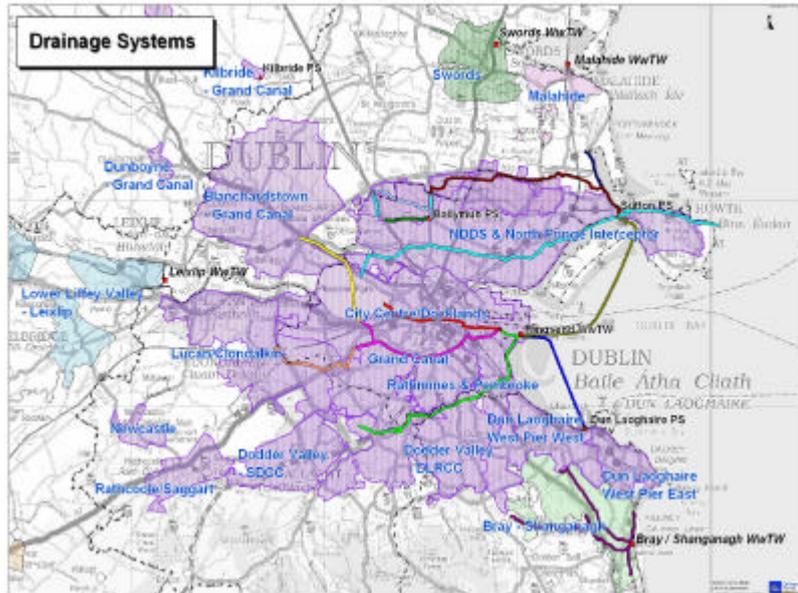
As well as strategic infrastructure planning, the Study includes drainage management aspects such as recommendations for regional policies and Regional Drainage Geographical Information Systems (RDGIS).

**Existing Drainage Systems**

The history of Dublin’s formal sewerage goes back to 1800, with the construction of sewers in the principal streets to drain rainwater into the River Liffey. Major system construction started in 1881 serving the Rathmines and Pembroke areas. The Centre City Main Drainage Scheme followed around 1900 with the City Quays sewers, being interceptor sewers laid either side of the River Liffey, gravitating flows eastwards to the Main Pumping Station and Primary Treatment Plant at Ringsend in Dublin Bay. The North Dublin system followed in the late 1950’s to serve the then rapidly developing area north of the City. Again this system directed sewage in an easterly direction to a sea outfall off the Nose of Howth.

South Dublin and Dun Laoghaire were serviced by the Dodder Valley sewer in the early 1970's, still directing sewage eastwards to the Ringsend Treatment Plant via a submarine pipeline. The most recent major sewerage scheme was the Grand Canal system, built in the 1980's to serve the new industrial development areas to the west of the City, and relieve the overloaded south city

sewers. Through the City, the Grand Canal system comprises a two-compartment tunnel, passing both foul and storm flows. The foul flows gravitate to the Main Lift Pumping Station, which lifts flows into Ringsend Treatment Plant, while the storm flows gravitate to Dublin Bay.



**Figure 2 Dublin Existing Drainage Systems**

The Ringsend Treatment Plant and Main Lift Pumping Station have recently been upgraded from 950,000 population to 1.65 million, with the sewage from North Dublin also transferred to Ringsend via submarine pipeline.

The history of the storm systems is similar to the UK, with the older central areas, such as City Centre, Docklands and Dun Laoghaire being combined or partially separate, and with separate systems serving post 1960's developments. The Study includes all the major rivers, except for the Liffey and Dodder, with their associated surface water systems.

**Drivers for the Study**

For the past decade Ireland has been the “Tiger Economy” of Europe, resulting in huge increases in population, inevitably concentrating on the Dublin Region. Many high-tech companies have set up, such as Intel and Hewlett Packard, supported by returning Irish and incoming foreign workers, and Dublin has transformed into a modern European capital. The inevitable consequence has been intense pressure on development, one symptom being the rapid rise in house prices to reach levels similar to those of London.

Faced with economic and political pressure to approve widespread development, the Councils did not have the tools to fully understand the capability of their collection and treatment systems. Everyone knew that the last major review had been in the 1970's, some individual studies had been done, but the widespread belief was that the system was nearing capacity. Modelling and GIS technology had greatly improved in recent years, so it was therefore timely to review the whole Region and set the strategy for the next 30 years – hence the Study.

## Conduct of the Study

In June 2001 the Study started by the Dublin Drainage Consultancy, which is the joint venture between Hyder Consulting, and Dublin based firms, PH McCarthy & Partners and MC O'Sullivan (in association with HR Wallingford). The Consultancy includes specialists from Wallingford Software for GIS advice, University of East Anglia for Climate Change aspects, University College Dublin for coastal water quality modelling and Dublin-based town planners, Brady Shipman Martin.

The Consultancy Team is over 90 staff, comprising managers, specialists, modellers, and technicians and survey supervisors. Around 50% of the team are modellers. Monthly staffing numbers vary between 44 and 62, averaging around 50. The budgeted staff input was 358 man months, being 30 man years – hence the large team.

The Client's Team is 6 permanent staff, comprising Study Manager, drainage engineers, GIS and survey staff from Dublin City Council, and 6 part-time representatives from the other Councils. As well as monitoring the Study, their input has been pivotal in data collection, comments, reviews and approvals, workshops, etc.

The Study area comprises over 50 foul and storm catchments, varying from dense city centre development to rural streams and rivers. As in most cities, foul drainage is a mixture of separate and combined systems with overflows to watercourses. The storm systems include separate drains, watercourses and major rivers. Foul, combined and storm systems are all being represented by InfoWorks models, the detail of the models depending on the availability of asset information and their importance to future development.

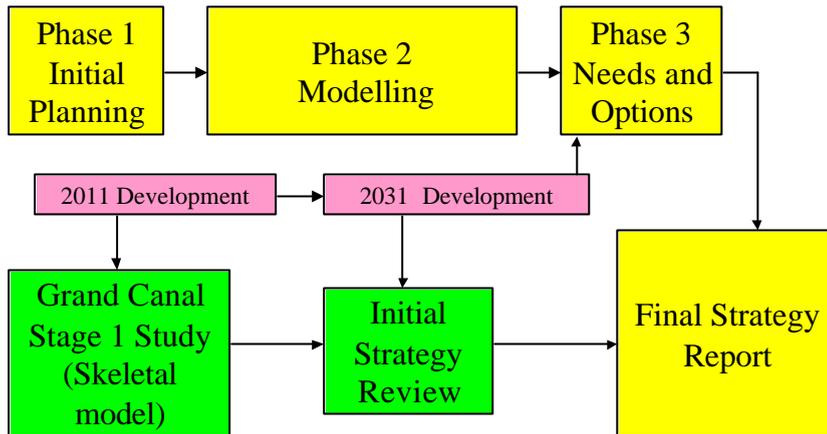
The hydraulic models have been built from existing SUS25 databases, with a further 25,000 assets being digitised from record drawings, mostly carried out in-house. Asset surveys by specialist contractors have provided information on ancillary structures and pumping stations. Information on the main rivers has been provided by topographical surveys of the channels, combined with LIDAR aerial survey of the flood plains.

The Consultancy has arranged and supervised site surveys to the value of €3.5 million, involving 12 contracts. The specialist surveys include installation of over 480 flow monitors and 270 rain gauges, survey of over 4100 assets and topographical survey of some 74 km of rivers and streams.

All modelling and survey information is held in the Study GIS, which incorporates digital mapping, ortho-rectified aerial photography, digital terrain mapping, and system information. Reporting and drawing production is also based on the GIS using MapInfo software. The Study GIS comprises some 150,000 nodes, and is the best source of asset information for the Dublin Region, and which we hope will be used as the basis for a Regional Drainage GIS.

## Methodology for the Study

The Study uses the conventional phased approach of initial planning, followed by hydraulic modelling, and optioneering, all leading to the overall strategy output.



**Figure 3 Flow Diagram for Overall Methodology**

Reflecting the importance of development as a driver for the Study, the Client required that a short-term study of the Grand Canal system be carried out, to obtain an initial review of capacity availability for this main system serving the ongoing development areas to the west and northwest of the City. This study was completed in September 2002, and confirmed that the existing system was performing adequately, but that both trunk sewers were suffering from significant inflow and infiltration. The overall system would be at capacity around the future timeframe of 2011. The Consultancy initiated the concept of an Initial Strategy Review, bringing together the members' widespread knowledge of the sewerage and treatment systems with the results of the Grand Canal study. This initial review of possible strategy options was issued in April 2003, and has provoked many useful comments and concepts, which are being explored as we progress with the main phased Study work.

### Particular Aspects of the Study

#### *Standardisation*

With over 50 catchments, and 40 to 50 modellers working for four companies in seven offices, the need for a standardised approach was essential. We therefore produced standard documents for:

- Survey Works, based on industry standard documents, but with new specifications to cover data collection to suit input to InfoWorks, especially from the topographical surveys of the rivers;
- Digitising of Assets, to ensure all data was entered, flagged, QA checked, etc, for subsequent model build and the Study GIS
- Phase 1 Initial Planning, comprising review of catchment maps, drainage systems, operational information – producing Client comments for inclusion in later modelling
- Phase 2 Modelling for Foul/Combined Catchments, comprising model build, verification and hydraulic assessment of existing performance
- Phase 2 Modelling for Stormwater Catchments, including river and storm system aspects of model build, verification and assessment, such as channel and flood plain modelling under InfoWorks CS, and model application for flood plain mapping.
- Phase 3 Optioneering, comprising upgrading to address future development scenarios, and influences from climate change and SuDS.

*Population and Land Use Predictions*

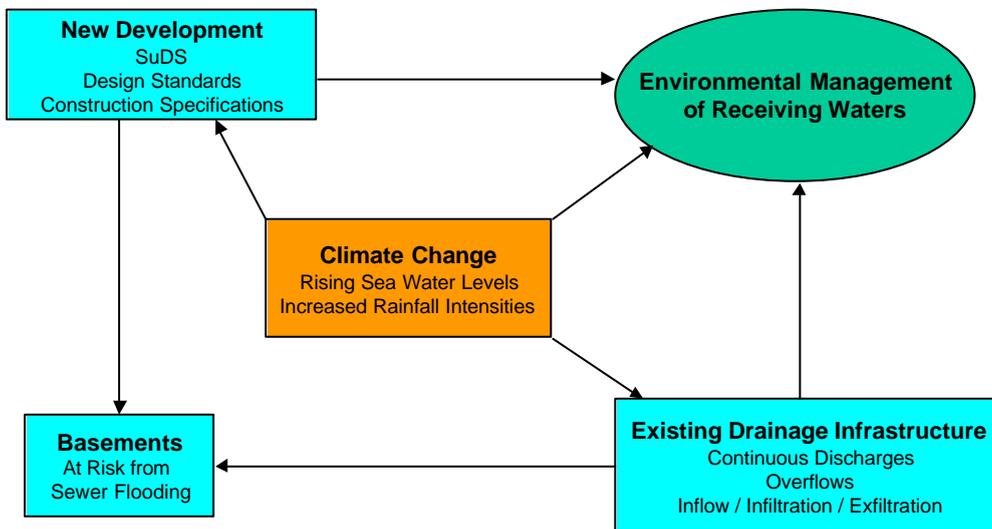
The Study requires that strategies be prepared for 2011 and 2031 planning scenarios. The Councils prepare their Development Plans on a 5-year horizon, so we were only able to obtain confident planning information for the 2011 scenario. For 2031 we could only obtain planning information at a national level, with various growth scenarios for Ireland, and possible scenarios for continuing development of the Dublin region or emphasis on growth away from Dublin.

The Study predictions were much longer-term than any made by the planners, so we therefore had to carry out a major planning analysis to produce the information, which has since been adopted by other studies in the Region.

All population and land use information for existing (2002 census) and 2011 and 2031 development scenarios has been centralised onto MapInfo tabfiles with associated spreadsheets, for use by the catchment owners in their Phase 2 and 3 modelling work.

*Regional Policies*

The Study is also providing management support to the Councils in the form of Regional Policies for the operation and maintenance of their drainage assets. The policies involve management of new development, guidance for developers and design, construction and maintenance standards. Environmental policies include management of continuous and intermittent discharges, with Sustainable Urban Drainage Systems (SuDS) as an especially important element. The policies also cover asset records, sewer rehabilitation and inflow and infiltration. Specific policies are being developed for inclusion of climate change effects, as well as the management of the many basements, which are a feature of Dublin housing stock.



**Figure 4 Interaction of Regional Policies**

The technical aspects of the policies, such as increased rainfall intensities and sea level rise due to climate change, are being incorporated into the Phase 3 optioneering work.

In recognition of the importance of GIS, the Study is also making recommendations for the extent and format of a new Regional Drainage GIS. This GIS will provide the platform for the inclusion of asset records, hydraulic models, development information and asset management, as well as integration with other GIS for the Dublin Region. We hope that the Study GIS, and refinement work that the Client’s Team is currently carrying out will form the basis for the regional system.

## Conclusions from the Study

The Study is ongoing and therefore the overall strategy for the Dublin Region is not yet finalised. However there are several aspects which worthy of discussion and application to other studies, such as:

### *Consultant - Client Liaison*

The Client's approach in having a counterpart team, knowledgeable in local drainage, InfoWorks modelling, GIS and survey work has proved invaluable to the success of the Study. This close liaison means that the Client understands the Consultant's difficulties and frustrations, and is able to expedite matters where possible.

### *Standardised Documents*

As well as ensuring the modellers use similar approaches, the results are appropriate to the strategic nature of the Study, and reduced the temptation to investigate in too much detail. Involving the knowledgeable Client in preparation of these documents ensures that they are aware of forthcoming results, and minimises surprises and possible disappointments.

### *Initial Strategy Approach*

The Consultant has been able to use extensive local knowledge to progress the strategy work early in the Study, rather than following the conventional linear approach of Phases 1, 2 and 3. This approach has allowing the maximum time for discussions and review of possible strategies for the Region, thus minimising the possibilities of adverse reactions and reworking at the end of the Study.

### *Integrated Policy and Modelling Approach*

Including the preparation of Regional Policies within the Study has enabled modelling results to promote policies. For example high levels of inflow and infiltration found by modelling work is adding emphasis to the need for improved drainage construction practices.

### *Data Collection*

Obtaining existing information from the Client Councils was a lengthy process. Much time would have been saved if standard information, such as maps and asset records, had been collected before the Study started.

The decision to use survey supervision staff was effective, as we had to employ many different contractors, of varying size and expertise, in order to carry out the large amount of survey work required.

### *Overall Situation*

The GSDSDS is a very large single Study, involving a large team for both the Consultants and the Client. It represents to opportunity for complete update of all drainage information for the Dublin Region, as well as providing the road map for the next 30 to 50 year's drainage and treatment facilities.

The use of leading edge technology and associated data management systems is ensuring that all existing information, hydraulic models, strategy proposals, etc are assembled in an integrated fashion, and hence readily available for future use.