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To Each Member
of the Environment & Engineering
Strategic Policy Committee

Progress Report on Extreme Event Pluvial Flooding 24th October 2011

Report No. 338/2011 to the November Dublin City Council meeting gave an interim report on the extreme pluvial flooding event which affected the East Coast of Ireland and Dublin City on 24th October 2011. This report and accompanying presentation was considered by the Council at the Monthly Meeting held on 7th November 2011 (Report 338/2011 is appended as Appendix 1 of this report). It was agreed that Emergency Motions 1, 2, 3 (Amended), 8 and Motion 64 from the North Central Area Committee be referred to the Environment and Engineering Strategic Policy Committee for further consideration at a meeting of the SPC scheduled for 15th December 2011. This report is intended to :

- Brief the SPC on progress since Meeting of City Council on 7th November 2011.
- Brief SPC on meetings with OPW in relation to Capital Funding for Flood Relief Schemes
- Address motions referred by Council to SPC.

Introduction.

This report is to be read as a follow up report to the report No. 338/2011 made to the City Council Meeting on 7th November 2011 covering Dublin Flood Risk and interim report on extreme pluvial flooding event affecting the East Coast and Dublin City on 24th October 2011.

The cause of the flooding on 23rd and 24th November was extreme pluvial rainfall which exceeded the capacity of the Drainage system and in turn gave rise to fluvial flooding, which was particularly evident in the River Dodder and in the smaller Dublin Rivers especially in the Camac, Poddle, Wad, Bradog, Zoo Stream.

River Catchments do not align with political boundaries and most Dublin Rivers originate in other Local Authority Areas.

For this reason flood risk reduction schemes require generally full catchment studies before significant capital works can be constructed.

Any significant Capital works must have full regard to EU procurement (Consultants and Contractors), Statutory and Legal Requirements, National Regulations and Environmental compliance as well as meeting National funding requirements. Existing Local Authority staff resources are also significant (see reference in report 338/2011) and additional staff will retire before end February 2012 which will impact on Capital works programmes. All schemes must comply with Environmental Legislation and a full EIA is required for many requiring submission to An Bord Pleanála. For this reason the following timescales are referred to in the report:

- **Short Term works** – Works likely to be constructed in 0- 3 years (Subject to funding)

- **Medium Term works** – Works likely to be constructed in 3-7 years (Subject to Funding).
- **Long Term works** – Works likely to be constructed in 5-11 years (Subject to funding).

Progress and activity since 24th October 2011. Strategic issues.

1. Dublin Flood Initiative – Flood Resilient City Project

As outlined to Dublin City Council an EU funded Project Flood Resilient Cities is addressing how to adapt to extreme events. Dublin City Council as part of this project is examining the best strategy to protect against the threat of Pluvial flooding. This is the risk of flooding due to extreme event rainfall of an intensity which exceeds the capacity of the drainage system and in many cases results in overland flows of rainwater with consequent risk of flooding. The Dublin City study is due for completion in mid 2012 and will report on :

- Areas at particular risk of Pluvial Flooding
- Code of practice for new development to mitigate this risk
- Code of practice for making existing development more flood resilient.

In advance of completion of this study an interim report was commissioned and this interim report and accompanying presentation will brief the SPC in advance of completion of the study in 2012. It is expected that this interim Report will issue in January 2012.

In this regard a model has been developed in Scotland by the Scottish Flood Forum that has enabled over 200 Community Flood Groups to plan and prepare for flood events.

Recently the Flood Resilient City Office (FRCO) in conjunction with the Central Area Office invited the Scottish Flood Forum to meet with residents in the East Wall area with a view to establishing a Community Resilience Group to deal with floods. This type of model provides individuals and communities with an effective and efficient means of protecting properties from floods by:

- Establishing local area flood watch systems
- Establishing awareness of factors contributing to flood risks.
- Developing local community flood action
- Minimizing the danger of flooding within the local area.
- Assisting at times of flooding and supporting people who have experienced flooding to ensure effective support is available to assist recovery.
- Meeting regularly to ensure that flood preventive methods are being maintained and monitored.
- Monitoring and reporting to the City Council those areas which are at risk of flooding through lack of maintenance or repair.
- Raising the awareness of personal and collective actions to limit the occurrences of flooding.
- Engaging with the City Council and other organisations to reduce the risk of flooding.
- Developing a local community flood awareness training programme
- Promoting flood protection equipment and materials to prevent further flooding to property

- Arranging free surveys of properties and giving specific advice on the most appropriate means of flood protection.
- Providing advice on the type of protection and suitability of products that will minimize the risk of flooding to properties.
- Making recommendations on minor repairs to properties that may prevent entry of water.
- Facilitating substantial reductions in the cost of flood defence products such as flood gates through bulk buying.

The City Council will explore the possibility of establishing Flood Resilience Groups in the recently flooded areas as the most appropriate means of facilitating the protection of homes and businesses from flood events.

2. Catchment Flood Risk Assessment and Management Studies (CFRAMS)

The SPC has received briefings on works currently underway as part of the Catchment Flood Risk Assessment and Management Studies (CFRAMS). These studies are a key component of Ireland's response to the EU Floods Directive. The studies will:

- Identify areas at risk of flooding
- Propose strategies and works (where possible) to mitigate this risk.
- Identify flood capital projects
- Progress these to construction (Including meeting all relevant Statutory, legal and procurement requirements).

To date the flood protection scheme on the River Tolka has been completed and there were no flooding issues associated with the River Tolka on 24th October despite it having the fifth highest recorded flow on record.

The River Dodder CFRAM Study is at an advanced stage and will report in 2012 on flood risk and proposed schemes to address risks where possible. Following a meeting held with OPW to consider the flooding on 24th October the OPW are prepared as part of the River Liffey CFRAMS, which is at an early stage and due to report in December 2015 (earliest), to bring forward a study of the Camac River and the Poddle River in order to identify potential improvement schemes. Both these rivers experienced significant flooding and both involve works in more than one Local Authority. Officials are working to see what needs to be examined as part of studies on both rivers and a further report will issue in the new year.

The OPW have responsibility for co-ordinating flood works by central Government Agencies and have agreed to discuss with Department of Environment, Community and Local Government (DECLG) how to address schemes which may not fall under OPW remit but which might be eligible for funding under DECLG Water Services Investment Programme (WSIP). This particularly refers to flooding associated with underground "rivers" many of which are fully culverted. In particular flooding associated with River Swan, River Bradog, River Naniken and the Clontarf drainage area have been referred to OPW to determine eligibility for capital funding from the appropriate Government Department.

3. Support from Department of Social Protection

A high level Inter Departmental and Inter Agency Working Group has been set up to review the October flood event. Dublin City Council has provided that Committee with full details of all known flooding locations. This information was provided to the Department of Social Protection (DSP) Community Welfare Officers (CWO's) in order that those affected might have direct access to support and funding provided by the State. Dublin City Area offices have also ensured that the Community welfare Officers are made aware of requests for assistance. Please note that eligibility criteria are attached to this scheme for assistance.

4. Major Emergency Plan

The flooding on 23/24 October affected the East Region and included Wicklow, South Dublin County, Dublin City and Monaghan in particular. Dun Laoghaire, Kildare and Fingal were less severely impacted. In accordance with National Framework for Emergency Management HSE, Garda Síochána and Local Authorities worked together in accordance with the Plan and in the case of South Dublin and Dublin City the formal declaration of a major Emergency was made. However, the three Principal Response Agencies were working together before, during and after this declaration. The Major Emergency Plan is published on the City Council website and addresses the strategic response of the three Principal Response Agencies only. Operational responses are in accordance with the operational plans of Principal Emergency services. Meetings have taken place with Garda and HSE to review at Strategic level the Major Emergency Plan response. In addition an intra Departmental workshop is taking place on 13th December to review operational level responses to pluvial flood risk. Both of these are intended to identify actions for the City and Local Communities and will be reported to future meeting of SPC.

5. Advance forecasting of Pluvial Flooding by MET EIREANN

Ireland has a National Weather Forecasting service provided by MET Eireann. Weather warnings are provided to the public through RTE which is the National Public Service Broadcaster. It is not possible in advance to predict when, where and to what extent flooding will occur. MET Eireann, in a post event analysis, have stated that:

The limits on the available forecasting/ modelling systems do not permit the fine detail on the locations of the intense bursts of heavy rain that actually fell on 24 October in Dublin to be predicted by MET Eireann.

The primary computer model used by Met Éireann for shorter-term forecasts (within 48hrs) is the HirLAM model, developed and maintained by a consortium of ten European Met Services. The HirLAM model at Met Éireann runs on a grid of 10km spacing; that is, the atmospheric calculations performed by the model are at points 10km apart. Thus the model cannot provide any fine detail below 10km; indeed the nature of weather models is that the effective ability to resolve detail in the weather is greater than the 10km grid spacing; 20km would be more realistic. Further, when forecasting for extreme events, while forecasters can identify that an event is likely to produce extreme rain, the complexity of the processes that can occur in the interaction between atmosphere, land (particularly hilly land) and sea is considerable and can result in specific phenomenon occurring which affect the impact of the predicted event.

It appears that in the period between 16.00 hrs and 22.00 hours on Monday 24 October 2011, when the worst of the rain ceased, cumulative amounts of typically between 60 and 90 mm of rain fell, indicating an average rainfall intensity of 15mm per hour sustained for between a four and six hour period.

Rainfall of 60 to 90 mm over a four to six hour period is a very unusual occurrence.

Most rainfall events in Ireland will give typically 5mm-10mm of rain in total, perhaps up to 20mm for the heavier events.

6. Progress and activity since 24th October 2011. Operational issues.

Much of Dublin City Council's resources have been put into flood investigations.

In most cases these investigations have confirmed that the drainage network was overloaded and often surcharged with resultant flooding.

In addition the following works and investigation works have been carried out or are about to be put in place.

- Removal of Damaged Wall at and provision of sandbags at Gandon Close, Harolds Cross
- Screen works at Gandon Hall
- Repositioning of screen at Ravensdale.
- New Gullies and Surface Water Connection at Carnlough Road, Cabra.
- New Combined Sewer at Annamoe Road, Cabra, to relieve the 375mm Sewer on Cabra Road.
- Provision of sandbags at LadysLane
- Gully work at West Road, East Wall
- CCTV surveys have been carried out a number of locations as a condition survey on various sewers at locations including:
 - Strandville Avenue, East Wall
 - West Road, East Wall
 - Foxfield Grove, Raheny
 - Cremore Crescent, Glasnevin.
- Naniken and Blackbanks streams are currently in the process of having CCTV surveys carried out.
- CCTV of Wolfe Tone Quay
- Siphon works at Brookwood Avenue
- Villa Park Gardens. Installation of pressure plate.
- Protocol reviewed and put in place for tidal gates on River Dodder
- Extensive investigate works at various flooding locations.

7. Flooding Reports

The urban drainage system of culverts, pipes and road drainage gullies has been constructed over the last 200 + years. Drainage networks will all flow full in a 1-5 year rainfall event. In a more extreme event these will be surcharged up to road level where no more flow can enter through road gullies. In a 10-30 year rainfall event and events higher than these severe road flooding and property flooding will result. During the extreme event on 24th several thousand reports of minor road flooding were reported and the current figures stand at 1,008 reports of property flooding and 318 reports of significant road flooding. On the night in question there was a two weekly hightide with a level of 2.13m Malin recorded at Alexandra Basin at virtually the same time as the peak river flow. This raised the estuary levels of the river and caused local surcharging with discharges to them from the drainage network. No tidal flooding was reported.

8. Response priorities

The response to flooding by Local Authorities has, in general, two strategic priorities namely:

- Rescue of those at risk – Lead by Dublin Fire Brigade.
- Maximising capacity of Drainage System to accept floodwaters – Lead By Drainage Division.

All other actions are in support of those two primary objectives. As advised to City Council it is hazardous to enter floodwaters and the City Council are conscious of their obligations as employers under Health & Safety.

9. Overview

In general the open rivers in the city have flood defences, which can accommodate approximately all 1 in 25 year flood events. The Tolka river and the Lower Tidal region of the River Dodder on completion of the works currently under construction and planned for 2012 can now cope with 100 year river events and 200 year tidal events.

Capacity of the City's Drainage network:-

- (1) Each storm is unique and brings with it slightly different flooding threats to any previous event or any computer modelled event.
- (2) During these storms significant amounts of silt/debris, etc. get into the drainage network which reduces its capacity to operate at maximum efficiency.
- (3) The drainage network is designed broadly to International best practice, however some of it is very old. It is taking both foul and surface water sewage within the Canal areas which has reduced the possibilities for its upgrading.

River Dodder Flooding.

The peak flow in the Dodder at Orwell Bridge weir was estimated by the EPA at $213\text{m}^3/\text{s}$ which is around 80% of that of Hurricane Charlie. The peak flow in the Dundrum Slang at the Frankfort river gauge was however estimated above that of Hurricane Charlie. The Dundrum Slang joins the main Dodder below the Orwell weir and therefore from previous events the flow in the tidal region of the Dodder is estimated at greater than $250\text{m}^3/\text{s}$.

The three tidal flood gates located at Londonbridge Road, Lansdowne Village and Newbridge Avenue were closed at approximately 10PM on the evening of 24th October. The two demountable flood barriers located on the Aviva Stadium side of the river were erected approximately half an hour later.

There was a delay in closing the tidal flood gates as difficulties were encountered in retrieving the locking pins which were stored in a kiosk adjacent to the Aviva Stadium. The Drainage Division has reviewed its protocol for closure of these gates and will in future be closing the gates on foot of both tidal and pluvial adverse weather forecasts subject to staff availability.

Between Newbridge and the Railwaybridge water got into the swimming pool in Marian College and the residential building which normally has 6 inhabitants. The school was not flooded. In Canon Place all of the lower apartments estimated at 12 were flooded together with No.1 Herbert Road. 15 residential buildings on Railway Cottages were also reported flooded to a low level. Flood water got out onto Lansdowne Road from the pedestrian way beside the railway bridge and travelled into the AVIVA stadium car park and grounds.

Between the Railway Bridge and Ballsbridge floodwater is reported as getting into the ground floors of the sweepstakes site, which was recognised in the Planning Permission as a flood plain and flooded approximately 130 of these some to a depth of 2.5m to 3m. The car parks of the three apartment blocks on Ballsbridge Park were flooded to estimate depths of 1.2m. Herbert Cottages, 26 residential dwellings were reported flooded to a significant depth.

Ballsbridge Avenue, 18 residential dwellings were reported flooded to a significant depth, Dodder View Cottages, 43 residential dwellings were reported flooded to a significant depth. Beatty's Avenue, 8 residential dwellings were reported flooded to a significant depth. Granite Place, No.7 was reported as flooded. There was significant road flooding in this area with over 200 vehicles reported as being severely damaged. There are to date no reports of river flooding on the Estate Cottages side.

From Ballsbridge to Donnybrook bridge, flood waters got onto Anglesea Road and into the RDS entrance flooding around 15% of the main RDS building. Flood waters came out of the river over the floodwall north of the Licensed Vintners. 54 residential dwellings along Anglesea Road as well as Dunluce and Somerset and the cricket club pavilion were flooded. A 25m section of grounds wall at the edge of the Licensed Vintners land and at the rear of the Hazeldene development collapsed where flood waters were reported to reach 1.5m in depth. The non-residential basement/ground floor of the LVA was also flooded. The Church of Ireland near the junction of Anglesea Road and Simmonscourt Road was also flooded. On the opposite side of the river the Leinster Rugby Ground, Bective Rangers Grounds, Old Wesley Ground and Bective Tennis Courts were all flooded with various buildings including a large ESB sub-station surrounded by flood waters. Again in this area there was significant vehicle damage.

Between Donnybrook and Clonskeagh bridges. 4,6,8 Eglington Road flooded back gardens to houses, water may have made its way out to Brookvale Road. Road and footpath flooding in Simmonscourt Terrace.

Between Clonskeagh Bridge and Dundrum Road bridge. Clonskeagh Public House flooded. Strand Terrace No.1,4,5,6 and 7 reported flooded.

Between Classon's Bridge and Orwell Bridge. The Dropping Well Public House was reported as flooded and four houses on Dartry Cottages, No. 5,4,3 and 2.

This gives a current estimated total of 192 Dwellings and 136 other buildings/non-residential ground floors flooded from the river during this event.

Camac River

There are no reports of building flooding in the tidal region of the Camac River below Bowbridge to date from the 24th October event.

Between Bow Bridge and the Bridge at Kearn's Place Bowbridge Dock and Bowbridge House Apartments are reported as flooding. The carparks of 60 apartments downstream of Faulkner's Terrace in Mount Brown. 3 houses on Faulkner's Terrace probably from road flooding. Building upstream of No.1 Faulkner's Terrace. Carpark below St.John's Well Way apartments. Old Cammock Bridge Apartment Block carpark.

Between Kearn's Place Bridge and South Circular Road. 11 dwellings on Kearn's Place were reported flooded. 12 apartments just upstream of Kearn's Place. Motor Repair Shop downstream of Millbrook Terrace. 28 dwellings on Millbrook Terrace, Lady's Lane and Carrickfoyle Terrace. Reports of 2 buildings flooded on Rowsertown Lane are not confirmed as yet.

Between SCR and Turvey Avenue. 13 dwellings, No.1 to 25 Emmet Road reported as flooded from river.

Three dwellings on Tyrconnell Street to be confirmed. There was also considerable vehicular damage reported due to this flooding event. 64 residential dwellings reported as flooded to date.

River Poddle

The flow of water from the Tymon Stream splits upstream of the housing development at Kimmage Manor into 2 sections:

- River Poddle
- Lakelands overflow.

On October 24th, the bulk of the flow in the River Poddle coming from South Dublin County Council flowed directly into the City Council area. River screens were blocked with debris carried down during the flood at the Lakelands overflow. The river burst its banks resulting in the flow making its way overland. In turn the screen at Gandon Hall became blocked by debris brought down during the floods giving extensive downstream flooding.

Flooding took place at the following locations:

- Between Sundrive Road and Kimmage Road West (boundary). 12 riverside apartments adjacent to Poddle Park were flooded.
- Russian Orthodox Church on Mount Argus Road.
- 17 apartments and one dwelling on Mount Argus Road.
- Flower shop on Harold's Cross Road.
- One factory adjacent to Gandon Close. Gandon Close car park.
- 13 dwellings on Harold's Cross Road.
- 21 dwellings on St. Clare's Avenue.
- 12 dwellings on Greenmount Avenue.
- 13 apartments on Boyle Court.
- 11 dwellings on Limekiln Lane.
- Four houses on Parnell Road with one fatality.

This gives a total of 113 dwellings to date. A large amount of vehicular damage was also reported.

Options for flow management and attenuation in the catchment will have to be examined. South Dublin is examining extra storage in Tymon Park to reduce the significant flooding in their area which will also benefit the city.

The design of river screens is currently being examined and minor alterations have been made to the Gandon Hall screen. The operation of all screens and the installation of screens that allow for overtopping, is currently being examined.

East Wall Road Area

Extensive flooding occurred in the East Wall area. Among the areas badly affected were:

- Seaview Avenue
- St. Muras Terrace
- Hawthorn Terrace
- Oxford Terrace
- Church Road

- St. Mary's Road
- Irvine Terrace
- Bessborough Avenue
- Shamrock Cottages
- Strandville Avenue
- East Road

The volume and intensity of the rainfall caused the drainage infrastructure in the area to surcharge causing widespread flooding at the above areas.

River Swan / Ballsbridge / Pearse St. / Sandymount areas.

Extensive flooding, including basement flooding took place in local areas covering

- Lansdowne Road
- Pearse Square
- Grosvenor Place
- Effra Road area
- Ringsend
- Ballsbridge
- Havelock Square
- Sandymount, St. John's Road

Surcharging sewers caused by pluvial rain caused serious road and basement flooding in the Pearse Square area. The Swan River, which is culverted, has been referred to OPW as a candidate scheme for central funding.

Santry River

The basements at seven business premises opposite the Catholic Church in Raheny were flooded on the 24th October from the river. In addition a number of business premises in the shopping centre beside the church were also flooded. The OPW have agreed to consider application for a minor works scheme to increase the flood protection of these properties and others along the Santry.

Wad River

Reports of flooding included:

- 10 dwellings on Clanmoyle Road
- 4 on Collins Avenue East,
- 12 dwellings on Castle Court/Auburn and one underground carpark were flooded.
- Severe road flooding on Collins Park provided 13 under floor water and one near miss.
- Elm Mount Avenue 3 under floor and 1 near miss.
- St. Kevin's soccer club,
- Larkhills west of M1 was flooded.

This gives a current total 26 dwellings with a very large number of under floor flooding and near misses.

A €20m scheme is being developed with the OPW to alleviate this flooding. The Clanmoyle portion of this is due to start construction subject to finance and planning permission.

Naniken River

Reports of flooding included:

- 5 dwellings on Maryfield Crescent.
- 5 dwellings on Brookwood Rise.
- Maryfield Crescent suffered severe road and garden flooding.

Glendhu Park.

The two swales at Glendhu Park and Park Road appear to have operated well for the 60-90 minute thunder storm event they were designed for, however the event of the 24th October was of much longer duration than this.

6 dwellings on Glendhu park were flooded to a low level compared to 8 in August 2008 to a deeper level. There was severe road flooding elsewhere in this sub-catchment. Plans are in train to extend the swale in Glendhu park to cater for such an event in the future. It is not recommended to reduce the storage capacity of the swale in Park Road at this time.

Carnlough, Dingle and Drumcliffe Roads, Cabra West.

29 dwellings reported flooding on Dingle Road (11 in August 2008), 8 on Drumcliffe Drive (5 in August 2008) and one on Carnlough Road (6 in August 2008). Works carried out by Drainage division, Designed by Flood Defence Unit and availability of sandbags to residents significantly reduced house flooding on Carnlough Road.

Two flood retention swales and associated pipework, planned for construction at Drumcliffe Road and Killala Road in 2012, will further reduce the risk of house flooding to these properties. Planning for these was passed by the City Council on 7th November 2011.

Leix, Offaly, Imaal Roads Cabra East.

Reports of flooding included:

- 10 dwellings on Leix Road, the same number as in August 2008.
- 19 dwellings were reported as flooded on Cuala Road (one in August 2008).
- 6 dwellings on Offaly Road (1 in August 2008).
- 2 dwellings on Imaal Road (none in August 2008).

The drainage network in this area is mainly combined so the construction of flood retention swales is not an option.

A small diversion from one combined drainage sub-catchment is currently under construction from the New Cabra Road to the junction of Annamoe Terrace and Annamoe Drive. This will slightly alleviate flooding in the area.

Ballygall Crescent and Fairways, Finglas.

Reports of flooding included:

- Approximately 7 houses were flooded in Ballygall Crescent.

- 4 in Fairways Estate on 24th October. This compares with 20 in total in August 2008.

Improvements to the drainage network in the area and downstream are probably accountable for this reduction.

A large flood retention pond which will contain 2,300 cubic metres of flood water in such event is being developed with Parks and Landscape Services Division of DCC. Four possible locations for this are currently being analysed . With budgetary and planning constraints construction is currently programmed for 2013.

Total Buildings reported in river and pluvial flooded areas are 640 to date.

Following the flooding which took place on 24/10/2011 a number of queries have been received with regard to the City Council's gully cleaning programme and the use of sandbags as a flood prevention measure throughout the city.

10. Gully Cleaning.

Dublin City Council radically revised its gully cleaning programme in 2004. A new database was introduced which records the date and location of every single gully cleaning operation. All of the city's 54,000 gullies are cleaned on average once per annum. Gullies on the main thoroughfares are cleaned more frequently, in some cases once every six to eight weeks. In addition, during adverse weather conditions and in particular on receipt of severe weather forecasts, normal gully cleaning work is suspended and the crews travel to areas which have historically flooded in the past to deal with any visible flooding and also carry out precautionary gully cleaning.

Current resources include one Supervising Inspector and ten General Operatives , four Gully Sucker heavy duty machines, five light duty vans which are used for manual gully cleaning and two jetting machines. Two days a week the crews commence work at 4am which facilitates gully cleaning in traffic sensitive areas.

This gully cleaning programme has proved to be very successful in dealing with varying amounts of rain right up to the close on 60 mm of rain that fell on 2/10/2011.

<p>The events of the 24/10/2011 and in particular the quantity of rain that fell in the short space from 4 to 8pm of time meant that the drainage network filled, became surcharged and didn't allow further flows into the drainage system.</p>

The evidence of this could be seen by the number of manhole covers which were lifted from their frames under the pressure of water from underneath. The sheer volume of rainwater falling on paved areas swept all debris including leaves into the roadways and in turn into the gullies. These gullies acted in a similar manner to drain holes in sinks that became blocked after a period of time by the debris. In turn the flow of water rushed past these blocked gullies and causing further flooding problems downstream. The flows into the network were so high that any easing of the road flooding could only come about when the flows in the sewers fell. The successful deployment of Drainage Division staff on the night to cope with such surcharging sewers only became successful after the drop in flows in the main sewers. With a total number of 54,000 gullies to be maintained and with such volumes of rainfall, it is not possible for Dublin City Council to clear debris from the grating of each individual gully.

11. Dublin City Council's Sandbag Policy

The City Council does not provide or distribute sandbags to individual premises at risk of flooding. The prime responsibility for the protection of such premises rests with the owners of those properties.

The primary role of the City Council during pluvial events is to manage the drainage network in order to minimise the extent of flooding to the general public. The supply and distribution of sandbags would present a considerable impediment to this task. In addition the inevitable increase in telephone requests for sandbags to emergency call centres would seriously interfere with the ability of those centres to cope with major flooding events.

The use of sandbags has become established in the public's mind as an effective flood protection measure. This is reflected in demands for the City Council to make sandbags available to householders and businesses at risk of flooding.

The Council maintains strategic stocks of sandbags at a small number of locations. These amount to around 9,000 at various locations including Clontarf, Sandymount, Glendhu Park, and the drainage depots at Marrowbone Lane and Bannow Road. The stocks at these sites are maintained for strategic purposes and play a useful role in areas when dealing with flood events which have sufficient advance warning.

General advice to property owners on dealing with floods is provided by the OPW in booklet format and on the website www.flooding.ie. The OPW advice recommends property owners at risk of flooding to have a supply of sandbags close at hand. The advice notes also acknowledge that sandbags can be difficult to deploy during flood events and can also pose health risks if contaminated with sewage.

A major report on of the serious pluvial flooding that occurred in the UK in 2007, known as The Pitt Review, concluded the following with regard to the role of sandbags as a means of protecting individual properties during flood events:

- *While it is clear that sandbags have a useful role in certain types of floods when used strategically, their benefits are less clear when they are used by householders to protect individual properties. This weakness is further heightened by their relative inefficiency when compared with alternative dedicated flood defence products that have been developed in recent years, such as floodgates and airbrick covers.*
- *Extensive evidence of public over-reliance on sandbags which often proved of little value in protecting against flooding.*
- *Many householders and business owners put time and energy into obtaining and installing sandbags which would have been better spent on other activity such as moving possessions to safety and deploying door boards.*
- *Sandbags can be effective when it is marginal, as to whether water enters a house or not, but in relation to large volumes of water they are largely ineffective, contrary to public perception.*

To supply sandbags to all properties at risk of flood during sudden rainfall events would require a level of resources that is much greater than is currently available to the City Council. Even if such resources were provided the deployment of sandbags in sufficient time

to prevent significant flooding of properties, particularly during monster rainfall events, would be logistically impossible. During a flood event, invariably the transport network is very busy, which means that DCC crews have great difficulty in reaching certain areas to deploy pumps, close flood gates, or deliver sandbags. If there is little notification that an event will occur, delivering sandbags would not be possible.

The provision of sandbag stores at specific locations around the City that could be accessed locally by residents on foot of flood warnings would require considerable investment by the City Council to manage and maintain. The unpredictable nature of flood warnings which can average 4-5 a year would result in sandbags being deployed more often than required, leading to the unnecessary expense of maintaining the required stock of bags at each location. The transportation and placement of sandbags from local containers would still require a considerable effort by local residents and they would be unlikely to be in position in time to prevent flooding to most properties subject to sudden rainfall events. Furthermore, if sandbags were deployed at certain locations, there is no guarantee that the people who need them will get them. During a flood, panic generally sets in, and those who are not in risk of flood could easily exhaust the supply of bags at the expense of those in need.

Owners of properties that are at risk of flooding are encouraged to keep where possible, their own stock of empty sandbags together with sufficient stocks of sand to fill bags at times of potential flooding. Preferably owners should invest in the provision of suitable proprietary flood gates and covers to protect openings such as doors, windows and vents. Dublin City Council does not have financial provision in the 2012 budget for purchase of any additional sandbags.

12. Basements

The 2005 Greater Dublin Strategic Drainage Study highlighted a number of issues with regard to basements and their flooding risks. Throughout the city many properties have basements with connections to old sewers and culverts. When these sewers become surcharged the flows often enter basements as these basements are built below the surcharge levels. These basements can be protected by backflows from surcharged by the installation of small pumping stations or anti flooding devices. There was extensive basement flooding throughout the city on 24/10/2011.

13. Limited City Council Resources

Dublin City Council has a very limited Engineering Staff resource to respond to requests for meetings. Existing engineering resources are prioritised to meet operational and legislative requirements.

While every effort is being made to address the flood investigations required it will not be possible to divert limited resources to multiple individual meetings.

The SPC report will be provided to Area Committees at which Engineering Staff will attend in order to provide the maximum response capability consistent with limited resources..

Seamus Lyons
Assistant City Manager

Central Area - Reported Flood Locations

Abbey Street Upper	Capel Street	Dunne Street	James's Street North	Portland Street North
Abbey Street Lower	Camlough Road	Dutch Dams Boardwalks, City Centre	Jone's Road ,D 3	Quarry Road
Annaly Road	Castleforbes Road	Eden Quay	Killarney Street,	Rathdown Road
Annamoe road	Cathal Brugha Street	Erne Street Upper	King Street North	Ratoath road/River road
Ashington Avenue	Charleville Avenue	Essex Street East	Kings Avenue, Ballybough	Ravensdale Road, Eastwall
Ashington Close	Charleville Road	Finn street, Arbour Hill	Lagan Road, Industrial Estate	Richmond Cottages
Ashington Dale	Church Place	First Avenue	Leinster Avenue	Saint Brigid's Avenue, North Strand
Ashington Grove	Church Road , East Wall	Fitzgibbon Court	Leix Road, Cabra	Saint James Avenue, Clonliffe Road
Bachelors walk	Churchgate Avenue, Clontarf	Galmoy Road	Lotts Lane	Saint Marys Road North, East Wall
Ballybough House	City Quay	George's Place, Off Hardwick Place	Lucan Road, Chaplitzod	Sean MacDermott Street
Ballybough Court	Clare Park Villas	Glasnevin Hill	Mary Street Little, Smithfield	Seaview Avenue, East Wall
Ballybough Road	Clonliffe Road, Drumcondra	Glendhu Park	Mayor Street Upper	Seville Place, Oriel Street Jcn
Bayview Avenue, Ballybough	Coburg Place	Grafton St	Millmount Avenue, Drumcondra	Shamrock Cottages North Strand
Belvidere Road, Ballybough	Coleraine Street	Granville Place North Strand	Mountjoy Street Middle	Shandon Road, Phibsborough
Beresford Place	College Green	Great Western Square	Navan Road	Sherrard Street Lower
Bessborough Avenue, North Strand	Connaught Parade	Greek Street	Naphin Road	Sir John Rogersons Quay
Blackhall Place	Constitution Hill	Griffith Avenue	New Cabra Road	St. Mura Terrace @ bottom of Strangford Road East
Blackhorse Avenue	Conyngham Road	Hanover Quay	North Circular Road	Strandville Avenue, North Strand
Blackhorse Avenue, Martin's Grove	Conyngham Road	Hawthorn Terrace, East Wall	North Strand	Strangford Gardens, East Wall
Blessington Street	Crescent Gardens	Hibernian Avenue	North Wall Quay	Thor Place, Arbour Hill
Blythe Avenue	Ballybough, Sackville Avenue,	Holles Row	Northbrook Avenue Lower, North Strand	Villa Park Gardens , Navan Rd
Bolton Street	Cuala Road, Cabra	Hollybank Road Drumcondra	O'Connell Street Lower	Villa Park Road, Navan Road
Botanic Avenue	Dawson Street	Home Farm Road	Offaly Road, Cabra	West Road, East Wall
Botanic Avenue at Mannix Road	Dingle Rd Cabra West	Imaal Road	Old Cabra Road	Whitworth Road
Broadstone	Dominick Court	Imaal Road	Oriel St Upper	William Street North, Rendu Apartments
Broombridge Industrial Estate	Dominick Street Lower	Infirmary Road @ Parkgate	Oxford Terrace, East Wall	Wolfe Tone Quay
Broombridge Road	Doreen House Blackhorse Avenue	Irvine Terrace East Wall	Parkgate Street	
Buckingham Street Lower	Dowth Avenue	Island Key Apartments East Wall	Phibsborough Road, Saint Peters Court	
Cabra Road	Drumcliffe Drive	Islandbridge	Portland Place	

Total 142 Locations

North Central Area - Reported Flood Locations

Addison Avenue Fairview	Celtic Park Road	Foxfield Grove	Maryfield Crecent, Artane	Seafield Avenue, Clontarf
Addison Road, Fairview	Chestnut Court	Foxfield Park	Maypark, Malahide Rd	Seafield Road
All Saints Road, Raheny	Church Avenue, Grace Park Road, Drumcondra	Glin Road	Maywood Grove	Shanard Road
Annesley Bridge Road, Fairview	Clanmoyle Road	Grace Park Terrace	Middle Third, Killester	Shantalla Rd Beaumont
Ardbeg Park	Clontarf Road	Grange Park Crescent	Mount Prospect Avenue, Clontarf	Slademoore Drive, Artane
Ardlea Road, Artane	Collins Ave West/Malahide Rd Junction	Grange Park Rise	Newtown Cottages, Malahide Road,	Snowdrop Walk
Ardmore Park	Collins Avenue East	Grange Park Road	Philipsburgh Avenue, Fairview	Swords Road @ Whitehall Church
Ayrfield Court	Collins Park	Griffith Avenue Junction with Swords Road	Primrose Grove, Damdale	The Hole In The Wall Road
Beechbrook Grove	Conquer Hill, Clontarf	Griffith Walk	Raheny Cottages	Thornville Avenue
Belcamp Avenue	Coolock Village	Hampstead Avenue	Raheny Village, RHS Howth Road @ Fast Fit	Thornville Drive
Belton Park Avenue	Courtlands, Griffith Ave	Hazelwood Drive , Artane	Richmond Road	Thornville Road
Belton Park Gardens	Crestfield Rd	Hazelwood Park, Junction Ardlea Road, Artane	Riverside Park, Clonshaugh	Tonleegs Road, Raheny
Blackheath Grove/Blackheath Park, Clontarf	East Wall Rd Dublin 3	Howth Road	Saint Aiden's Park Avenue	Vernon Avenue, Clontarf
Briarfield Road	Elm Mount Avenue	Iveragh Road, Whitehall	Saint Annes Park James Larkin Rd Dublin 3	Vernon Avenue, Clontarf
Brookwood Avenue, Raheny	Elm Mount Road, Donnycarny	Kilbarrack Rd, under bridge	Saint Brendan's Avenue, Artane	Vernon Gardens, Clontarf
Brookwood Rise	Ennafort Park	Kilbarrack Road	Saint David's Wood, Malahide Road.	Vernon Heath/ Vernon Ave
Calderwood Avenue,	Fairview	Kilmore Road	Saint John's Court	Vernon Park, Clontarf
Carndonagh Park, Donaghmede	Fairview Ave	Kincora Rd/Kincora Court Clontarf	Saint Johns Court, Artane	Victoria Road Clontarf
Carndonagh Road	Fairview Green, Marino	Kincora Road at Vernon Ave	Saint Lawrence Road, Clontarf	
Casino Road near Croydon Park end	Fairview Passage, Fairview	Marino Crescent	Saint Lawrence Road, St Lawrence's Court	
Castle Ave Clontarf	Fairview Strand	Marino Mart, Fairview	Saint Margarets Ave	
Castlekevin Road	Foxfield Green	Maryfield Avenue, Artane	Santry Village opp comet pub	

Total 107 Locations

North West Area - Reported Flood Locations		
Addison Avenue Fairview	Dunsink Park	Knowth Court, Ballymun
Balbutcher Lane	Dunsink Road, Finglas West	McKee Road
Ballygall Crescent, Finglas	Fairlawn Road	McKelvey Avenue, Finglas East
Ballygall Parade, Finglas	Fairways Avenue	Old Finglas Road, Facefield
Ballygall Road East	Fairways Green	Poppintree Terrace
Ballymun Rd/Mobhi Rd intersection	Ferndale Avenue, Finglas	Rathvilly Park, Finglas
Ballymun Road	Finglas Place	Saint Canice's Road
Barry Avenue, Finglas	Finglas Road, @ Bottom of the Hill Pub	Sandyhill Gardens
Carrigallen Park, Finglas	Glasanaon Road	Sandyhill Way Ballymun
Casement Close	Glasaree Road	Santry Cross
Casemount Drive, Finglas	Glasilawn Road, Glasnevin	Santry Cross Apartments, Ballymun
Clonmore Court, Ballymun Road	Glasnevin Avenue	Seamus Ennis Road
Clune Road	Glasnevin Drive @ corner of Glasnevin Park	Silloge Gardens Ballymun
Collins Drive	Griffith Avenue	Tolka Cottages
Coultry Gardens	Griffith Avenue Ext between Ballygall Road East	Tolka Valley Road, Finglas South @ Lakeglan Estate
Deanstown Park	Griffith Road	Valeview Drive
Deanstown Road	Grove Park Road, Finglas	Wadelai Green,
Drogheda Mall, Main Street Finglas	Jamestown Rd, Finglas	Wellmount Crescent, Finglas
Druid Court Ballymun	Kippure park	Wellmount Rd, Finglas
Dunsink Drive	Knowth Court, Ballymun	Westpark Drive, Finglas

Total 60 Locations

South Central Area - Reported Flood Locations

Balfe Avenue	Darvitt Rd/Kilworth Rd Junction	John McCormack Avenue, Walkinstown	O'Donoghue Street, Inchicore	Slievebloom Park, Walkinstown
Balfe Road East, Walkinstown	Decies Road, Ballyfermot	John Street South	Old Kilmainham	Slievenamon Road, Drimnagh
Blarney Park Kimmage	Derry Drive	KCR	Cranmore Road, Ballyfermot	South Circular Road
Bluebell Avenue	Donnellan Avenue	Kearns Place, Kilmainham	Parkmore Drive, Terenure	Spa Road Inchicore
Bow Lane West	Dowland Road, Walkinstown	Kenilworth Park, Kimmage Road	Parnell Road, Harold's cross	Stanford Green, Walkinstown
Bunting Road	Dunard road	Kildare Road, Crumlin	Poddle Park Rd	Summer Street South, Summer Street Flats
Camac Crescent Apartments	Elmdale Drive, Ballyfermot	Kilmainham Orchard Apartment	Poddle Park, Kimmage	Sundrive Road, - Stanaway & Clogher Road
Camickfoyle Terrace, Kilmainham	Emmet Rd Inchicore	Kimmage Manor	Havensdale Park	Sundrive Road, Kimmage
Ceannt Fort Kilmainham	Faulkners Terrace, Kilmainham	Kimmage Road Lower	Reuben Street, Dolphins Barn	The Cloisters, Terenure
Cedar Court, Terenure	Fortfield Road, Terenure	Kimmage Road West	Rialto Cottages	The Tramyard, Spa Road, Eurospar
Claddagh Green, Ballyfermot	Gallymore Road, Slievenamon Road Suir Bridge	Kylemore Road, Ballyfermot	Ring Terrace, Inchicore	Thomas Moore Road, Walkinstown
Clanbrassill Street	Grattan Court Inchicore, Inchicore Terrace South	Labre Park	Riverside Apartments, Kimmage	Turvey Avenue, Inchicore
Clareville Road, Harold's Cross	Greenlea road, terenure	Lady's Lane Kilmainham	Rowserstown Lane, The Old Mill	Tyrconnell Park
Clogher Road	Greenmount Avenue, Harold's Cross	Lakelands Park Terenure	Saint John's Well Way Apartments, Kilmainham	Tyrconnell Road
Clonard Court, Kimmage	Greenmount Lane Harold's Cross	Le Fanu Road	Saint Agnes Road, Crumlin.	Tyrconnell Street, Inchicore
Clonard Road	Harold's Cross Road	Limelkin Lane, Harold's Cross	Saint Albans Road	Victoria Quay
Cloyne Rd, Kimmage	Harty Avenue, Walkinstown	Limelkin Road	Saint Clare's Avenue	Walkinstown Crescent
Con Colbert Road	Hazel Park Kimmage Cul de Sac	Millbrook Terrace	Saint John's Road West	Walkinstown Green
Crotty Avenue, Walkinstown	Herberton Bridge/Dolphin Road.	Mount Angus Road	Saint Laurence's Road	Walkinstown Road
Crumlin Road	Huband Road	Mount Tallant Avenue, Terenure	Saint Patrick's Terrace, Inchicore	Windmill Avenue Crumlin
Curlew Road	Iveagh Gardens	Mourne Road, Drimnagh, (at bottom of Mourne Road, between Errigal Road and Dromard Road	Saint Vincent Street West, Inchicore	Windmill Road, Crumlin
Dartmouth Square West	John Dillon Street - Powers Square	Myra Close	Sarsfield Road, Ballyfermot	

Total 109 Locations

South East Area - Reported Flood Locations

Allisbury Park	Celestine ave, Irishtown	Granite place	Merrion Road	Saint John's Road East, Sandymount
Allisbury Road	Chaeleville Road	Grantham Street	Military Road, Rathmines	Saint Stephen's Green
Anglesea Road @ Stillorgan Road	Charlemont Mall	Greenwich Court, Rathmines Road Lower	Military Road, The Park Apartments, Rathmines	Sandymount Avenue, Dart Station
Arnott Street	Charleston Road	Grosvenor Place	Morehampton Road	Serpentine Avenue
Baggot Street Lower	Chelmsford Avenue	Gullistan Cottages, Rathmines	Mount Drummond Ave @ Harolds Cross Bridge	Shelbourne Road
Ballsbridge	Chelmsford Road Ranelagh	Harolds Cross Road	Newbridge Avenue	Simmons Court Terrace, Donnybrook
Ballsbridge Avenue	Claremont Park, Sandymount	Havelock Square	Newgrove Avenue, Sandymount	South Lotts
Ballsbridge Court	Claremont Road	Herbert Cottages	O'Connell Gardens	Stella Gardens
Ballsbridge Park	Clarence Place Great	Herbert Park Ballsbridge End	Ovoca Road	Strand Terrace
Ballsbridge, Sweepstakes Site	Clonskeagh Road	Herbert Road	Palmerstown Villas, Rathmines	Suffolk Street
Barrow Street	Clyde Lane, Ballsbridge Park Lodge	Highfield Grove	Park Ave Sandymount	Sydney parade Avenue, Sandymount
Bath Ave Gardens	Clyde Road	Highfield Road, Rathgar	Park Avenue Sandymount	Tara Street
Bath Avenue @ Grand Canal St	Creighton Street	Hope Street	Pearse Grove	Thorncliffe Street, Whelan House, Ringsend
Beattys Avenue	Cuffe Street	Howard Street	Pearse House	Townsend Street
Beaver Row, Donnybrook	Cullenswood Road, Ranelagh	Irishtown Road	Pearse Square	Trinity Street
Beech Hill Road	Dartmouth Square West	Keegan's Cottages	Pearse Street	Trillickville Road, Sandymount
Beechwood Avenue, Lower	Dartry Cottages, Dodder Walk	Kenilworth Square	Pembroke Cottages, Ringsend	Wellington Lane ,
Beechwood Avenue, Lower	Dermot O'Hurley Avenue	Lansdowne Rd & Shelbourne Rd Jnct	Pembroke Lane	Wellington Quay
Belgrave Square, Rathmines	Derrynane Gardens	Leeson Park, Ranelagh	Raglan Road	Wexford Street
Belgrave Villas, Ranelagh	Dodder View Cottage, Ballsbridge	Leinster Road, Rathmines	Railway Cottages	Willfield Park
Belmont Gardens, Donnybrook	Erfa Road, Rathgar	Leinster Square, Rathmines	Ranelagh Road	Willowfield, Sandymount
Boyle Court, Harolds Cross	Eglington Road, Jefferson House, Donnybrook	Lombard Street	Ranelagh Triangle	Wilton Place
Bremen Road, Ringsend	Elgin Road, Ballsbridge	Macken Street	Rathgar Road, Rathgar	Windmill Lane
Brighton Square	Flemmings Place	Magennis Place	Rathmines Road Lower	Zion Rd, Rathgar
Brookvale Court, Donnybrook	Garville Lane	Malone Gardens	Redmond's Hill, Aungler Street D8	
Burlington Road, Ballsbridge	Gifford Road	Margaret Place	Richmond Place, Rathmines	
Cannon place	Gordon Street	Maxwell Road, Rathgar Road	Richmond Road, Fairview	
Castle Court	Grand Canal Street Upper, Ballsbridge	Merlyn Park	Saint Ailben's Park, Sandymount	

Total 108 Locations

Areas raised by Councillor in questions received by Drainage Division.

Ardlea Road, Artane, D 5
Ardmore Drive, Artane, D 5
Ardmore Park, Artane, D 5
Ashington Rise, Navan Road, D 7
Ballybough Road, Ballybough, D 3
Ballygall Crescent, Finglas, D 11
Ballygall Parade, Finglas, D 7
Bath Avenue, Sandymount, D 4
Bayview Avenue, North Strand, D 3
Bessborough Avenue, North Strand, D 3
Blackheath Park, Clontarf, D 3
Cabra Road, Cabra, D 7
Carndonagh Road, Donaghmede, D 13
Carrickfoyle Terrace, Kilmainham, D 8
Charleville Road, Rathmines, D 6
Chelmsford Road, Ranelagh, D 6
Chelmsford Road, Ranelagh, D 6.
Clanmoyle Road, Donnycarney, D 5
Cloverhill Road, Ballyfermot, D 10
Collins Avenue, D 5
Coultry Road, Ballymun, D 9
Crumlin Road, Crumlin, D 12
Cuala Road, Cabra, D 7
Effra Rd, Rathmines, D 6
Elm Mount Avenue, Beaumont, D 5
Fairways Estate, Finglas, D 11
Faulkner's Terrace, Kilmainham, D 8
Foxfield Green, Raheny, D 5
Foxfield Grove, Raheny, D 5
Foxfield Grove, Raheny, D 5
Gandon Hall, Gardiner Street, D 1
Glasilawn Road, Glasnevin, D 11
Glendhu Park, Ashtown, D 7
Grosvenor Place, Rathmines, D 6
Havelock Square, Sandymount, D 4
Imaal Road, Cabra, D 7
Johnstown Gardens, Finglas, D 11
Kearn's Place, Kilmainham, D 8
Kincora Avenue, Clontarf, D 5
Kincora Court, Clontarf, D 3
Kincora Road, Clontarf, D 3
Kylemore Road, Ballyfermot, D 10
Lady's Lane, Kilmainham, D 8
Lansdowne Road, Ballsbridge, D 4
Leix Road, Cabra, D 7
Millbrook Terrace, Kilmainham, D 8
Swan Place, Rathmines, D 6
Thornville Avenue, Kilbarrack, D 5.
Tyrconnell Street, Inchicore, D 8
Villa Park Gardens, Navan Road, D 7

