APPENDIX 14

Inflow and Infiltration in the CRD

As documented in the CRD-published discussion paper "*Cost versus Benefit of Reducing Inflow and Infiltration"* inflow and infiltration refers to rainwater and groundwater that enters the sanitary sewer collection system. A certain amount of I&I is unavoidable and is accounted for in routine sewer design. However, when I&I exceeds design allowances, sewer capacity is consumed and usually results in overflows and increased conveyance costs or a reduction in the future population service capacity. The impact of peak flows on wastewater treatment plant (WWTP) performance can also be a problem. Hydraulic capacity must be closely managed to ensure optimal WWTP operations. Major wet weather flow events have significantly different chemistry than normal flows (i.e. dilute flow, low cBOD5/TSS) and can "wash out" biological treatment systems and cause problems for operators during days of peak wet weather flows.

As illustrated in Figure 3, inflow and infiltration into the wastewater collection and conveyance system can be derived from a number of entry points.

Figure 14.1: Sources of inflow and infiltration into the collection and conveyance system (per CRD 2009)

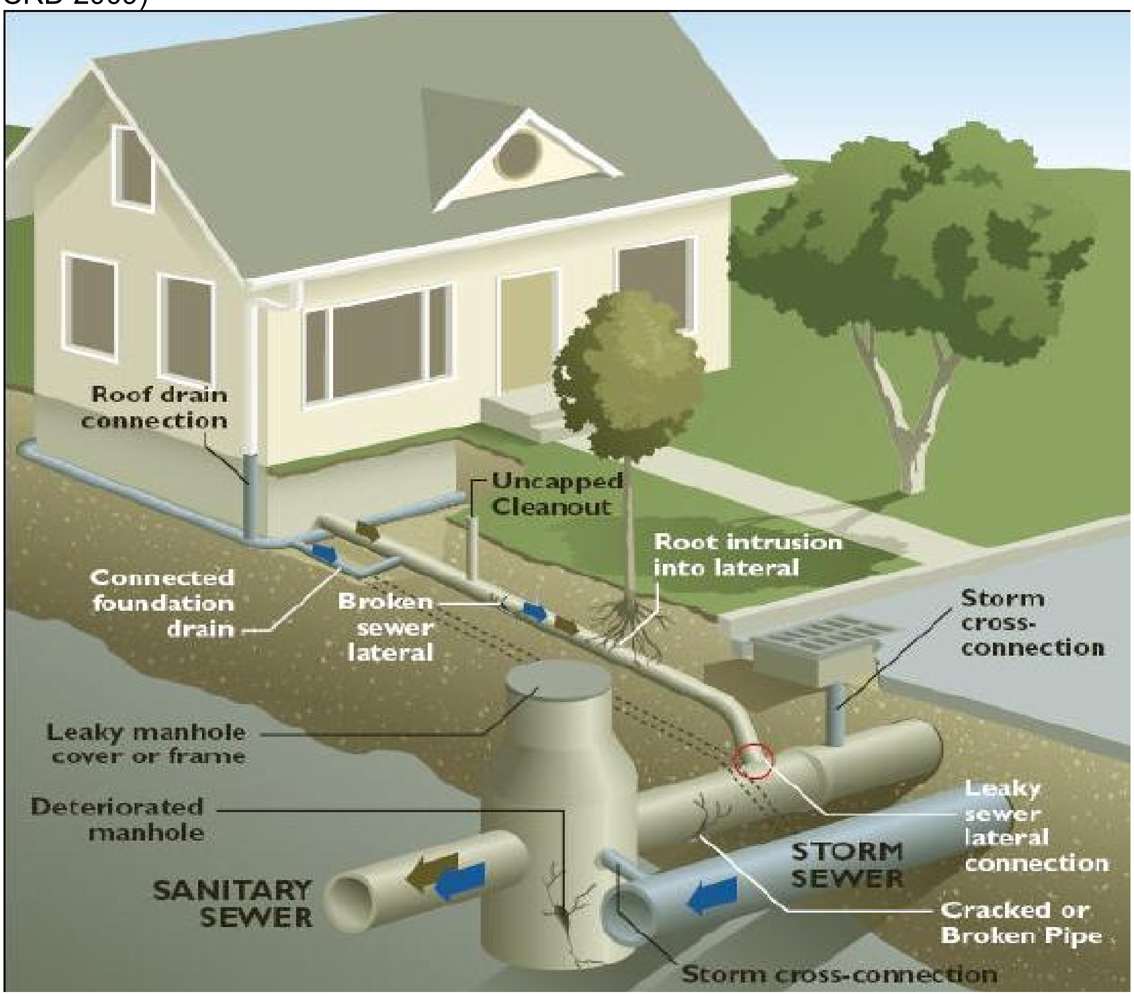
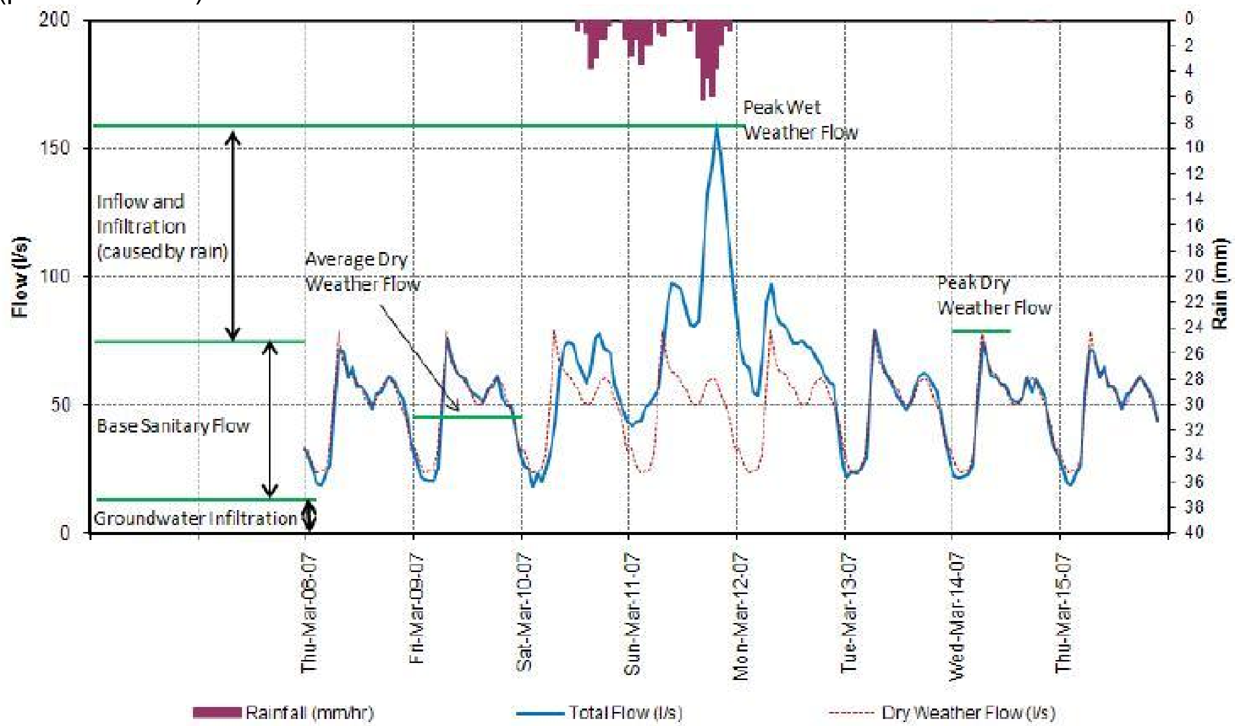


Figure 14.2: Example Hydrograph Showing Flow Definition (not to scale for CRD)
(per CRD 2009)



CRD Goals for Managing I&I

Section 17(1)(a) of Schedule 1 of the Municipal Sewage Regulation (MSR) requires that if infiltration and inflow (I&I) causes daily flows to be greater than 2 times the average dry weather flow (ADWF), the discharger must address "how I&I can be reduced as part of a Liquid Waste Management Plan."

The goal of the I&I program is therefore to comply with this requirement of the MSR by developing and implementing a strategy aimed at reducing the amount of rainwater and groundwater entering the core area's sanitary sewer system from both the publicly owned and privately owned parts of the system in order to reduce the frequency and magnitude of overflows from the system.

CRD Commitments

The CRD and the participating municipalities commit to the following actions to reduce I&I sufficiently to reduce maximum daily wet weather flows to less than four times the average dry weather flow by 2030:

1. Continue flow monitoring in each municipality to further refine priority areas for remediation.

2. Develop, by the end of 2011, comprehensive inflow and infiltration management plans for the Core Area that will:

a. identify and evaluate options and opportunities that promote the minimization of groundwater and rainwater inflow and infiltration into municipal sanitary sewer systems, including inflow and infiltration originating from service laterals (private and public sections of sewer connections)
b. identify needed changes to legislation and legal authority to enable options and strategies
c. identify opportunities for the inspection of private sewers connected to municipal sewers:
   i) as part of the municipal process in evaluating and issuing renovation and building permits for serviced properties; and/or
   ii) at the time of property transfer; and/or
   iii) targeted inspections
d. require the repair or replacement of private sewers that have cross-connections between storm sewers and sanitary sewer or are identified as being in poor condition.

3. Update, by the end of 2011, and enforce sewer use bylaws to prohibit the construction of rainwater and groundwater connections to sanitary sewers.

4. Implement the overflow reduction plans contained in the sanitary sewer overflow management plan, which was submitted to the Ministry of Environment in June 2008. These plans are summarized as follows:

Wastewater Flow Peaking at Clover and Macaulay Points

Most peak flows fall between 2xADWF volumes and 4xADWF at both Clover Point and Macaulay Point during the 4-5 wet weather months (November to February). It is notable that the CRD "throttles" peak flows reaching Clover Point to ensure peaking is manageable. CRD believes if such throttling was not performed then flows could exceed 4xADWF.

Table 14.1: Statistical Flow Data from Clover Point Pump Station
(per CRD 2009)

Flow Range	2006	2007	2008
Number of days flow did not exceed 2xADWF	345	349	362
Number of days flow was between 2xADWF and 4xADWF	20	16	3
Number of days flow exceeded 4xADWF	0	0	0
TOTAL	365	365	365

Table 14.2: Statistical Flow Data from Macaulay Point Pump Station
(per CRD 2009)

Flow Range	2006	2007	2008
Number of days flow did not exceed 2xADWF	357	358	365
Number of days flow was between 2xADWF and 4xADWF	8	7	0
Number of days flow exceeded 4xADWF	0	0	0
TOTAL	365	365	365

CRD estimates that 95% to 99% of wastewater flows at these locations are below 2xADWF. Furthermore, CRD estimates flows between 2xADWF and 4xADWF occur at Clover Point for approximately 90 hours per year (on average). Flows over 4xADWF only occur for a few hours each year and such flows would be composed of a substantial amount of rainwater.

Table 14.2: Clover Point and Macaulay Point Flow Data
(per CRD 2009)

	Clover Point Pump Station	**Macaulay Point Pump Station**
Maximum daily flow (2008)	118,600 m3/day	81,700 m3/day
Minimum daily flow (2008)	40,700 m3/day	37,400 m3/day
Average dry weather flow	52,000 m3/day	45,000 m3/day
Maximum pumping capacity	216,000 m3/day	151,200 m3/day

Both pump stations can handle 3-4 times average dry weather flows (ADWF) however there are times when these flows are exceeded and emergency discharge events occur.