Contents

1 Background

This report provides the additional information as requested by Greater Wellington Regional Council (GW) from Capacity Infrastructure Services Limited (Capacity) on behalf of Wellington City Council (WCC) in relation to an application to discharge stormwater and occasionally discharge contaminated stormwater into the Coastal Marine Area (CMA) and land adjacent to the CMA via existing stormwater outlets between Horokiwi and Owhiro Bay.

The reference for this application is WGN 090219 [27418] and [27419]. It was lodged on 19 December 2008 as per Section 124(1) of the Resource Management Act 1991. GW subsequently requested additional information as per Section 92(1) of the RMA. Capacity provided this information 14 July 2009 and has since received a request for clarification of some of those information request responses.

Following is that clarification.

2 Reponses to questions

2.1 Question 1

In the response to question 2 you have stated that '**significant culverts in Wellington city are inspected annually and gravel and silt removed**'. *Can you please advise me which culverts these are?*

2.1.1 Question 1 response

Appendix A contains a list of those culverts.

2.2 Question 2

Also in response to question 2 you have stated that '**WCC has budgeted for foreseeable renewal and upgrade needs of wastewater and stormwater network**'. *Can you please provide me with a list of those foreseeable works and upgrades?*

2.2.1 Question 2 response

Appendix B contains a list of these works separated into wastewater and stormwater activities with renewals and upgrades shown separately. Where planning or investigation work has been undertaken locations are also provided.

Where this information is not available the budget figures only are provided. Additional information is available in the stormwater and wastewater Asset Management Plans which have been provided also in hard copy and on the CD provided.

2.3 Question 3

We acknowledge that a range of works have been undertaken over the last 15 years to eliminate and mitigate the effects of the stormwater discharges. However, Question 3 was looking at what mitigation measures could be proposed to treat the stormwater discharges in the future.

> You have stated that the design of baffled sumps enables the trapping of floatables, litter and gross sediments. Are these baffled sumps installed on all stormwater outfalls? Can you please provide a diagram/picture of what these sumps look like and explain how they work?
>
> In addition, you have stated that the *'investigation programme on the 14 constructed overflow locations will lead to some overflows structures being identified as unnecessary and potentially scheduled for removal, and others as requiring further investigation which could in turn lead to additional works programmes'.* How long do you think it will be before sufficient data has been collected during the investigations programme and this information will be used to make decisions on what will happen to particular constructed

overflows take? For instance, will it take 1 year or 5 years of data etc before some of the measures listed in your answer to question 4 could be implemented?

You have stated that *'in an ideal environment the only remedy employed to deal with the effects of discharges is to prevent them from occurring, or alternatively, discharges would be treated prior to reaching the CMA or waterways*'. Why has the installation of treatment devices on these outfalls (or in critical points in the upstream catchment) been disregarded?

2.3.1 Question 3 response

Appendix C indicates the design of the baffles used in roadside sumps to capture floatables, litter and gross sediments. From the 1960's all new or renewed Council sumps had to be "baffled" to remove coarse sediments, litter and debris. Approximately 90% of Councils sumps are baffled-there are no specific areas which have baffled sumps.

The sumps are largely positioned in places alongside kerb channels where any surface run-off from a particular area could flow into them. Primarily the surface run-off will carry any litter and sediment accumulated along the flow path. The sump grate is capable of capturing certain sizes of litter; however, any litter and sediments smaller than the sump grate openings will enter the sump chamber. Heavy sediments will accumulate at the bottom of the sump and will be removed by suction when cleaned out by the WCC contractors along with any trapped floatables.

Sumps are routinely cleaned out on a weekly and monthly basis by WCC contractor CitiOps as per the Wellington City Council's sump inspections programme. In some areas (CBD) sump-tops are cleared daily and the sump-boxes inspected and cleared once or two times a month (routine programme). In addition sump-boxes are cleared reactively if a request for service is made to empty them. WCC (CitiOps) also maintain a list of critical sumps which are cleaned during/immediately after each major rain event. These are critical sumps as they have the potential to cause hazardous flooding to property and/or roads.

The 3 year monitoring programme initiated in July 2008 for the constructed overflow points will lead to developing of an overflow mitigation plan. The mitigation plan will be developed by the end of the monitoring programme with a view to sealing off some of the overflow structures which have not shown any sign of overflow during the period. At this stage we envisage 1 year of monitoring data will be sufficient for certain overflow points before follow-up investigations are undertaken to develop a plan to seal off an overflow structure. Further catchment analysis could take 2 to 3 years for larger catchments and in certain cases this might require an aid of a hydraulic model.

We will be in a better position to suggest alternative options to mitigate discharges once the proposed monitoring programme has been implemented. The outcome of the monitoring programme should be able to establish the extent of the issues.

With regard to 'treatment devices' being fitted on 'outfalls' or 'at critical points upstream' we are of the opinion that there are a number of logistical obstacles within Wellington catchments that reduce the effectiveness of such devices. The restriction of wet weather flows via accumulated debris is likely to affect rainwater flow paths and may well further complicate efforts to mitigate flood risk. In some locations there are space restrictions. Catch pit inserts have been considered in Wellington and disregarded for a couple of reasons; firstly the majority of sumps are baffled and secondly inserting these devices into the sumps will reduce the hydraulic capacity of the sump. If for whatever reason the device isn't cleaned out the risk off flooding to roads and surrounding properties increases.

Retrofits of current kerb and channel sumps to stormwater mains are considered on a case by case basis. Currently we are investigating rain-gardens or swales along Waterloo Quay instead of traditional kerb and channel. It must be appreciated that in many urban situations in Wellington there is neither space nor the grade for onsite stormwater devices to be introduced in a retrofit situation.

Currently there is little national or regional guidance on expected standards of performance for such devices and without further investigation of cost, performance and the expected level

of service in this area they will remain as viable options to be considered for specific locations and issues on a case by case basis rather than a citywide solution.

Additional information which is likely to be collected via the proposed monitoring programme will assist with assessments as to what type of upstream treatment devices or source prevention will be more fruitful for Wellington's variable conditions.

2.4 Question 4

In question 5 you have stated that '**follow up investigations are carried out to determine the cases where it is apparent that it is not solely a heavy rain triggered event***'. Are the results of these follow up investigations reported to GW?*

2.4.1 Question 4 response

No, the results of follow up investigations are not reported to GW. Overflow events are reported as per the relevant consent conditions.

2.5 Question 5

In regards to Question 6 you have stated that in the case of Houghton Bay leachate from the old landfill may be contributing to unsightly discharges. The orange coloured precipitate is scoured from the leaping weir located further up the catchment during the first flush of storm events, and is suspended in the discharge and deposited on the beach giving the ponded area at the end of the outfall its orange colour. I have been informed that Johan Simeonov, Commercial Manager, CitiOperations (johan.simeonov@wcc.govt.nz) has been doing some work on the discharge from the closed landfill and he may be able to provide some assistance with the issues that have been occurring with the leaping weir and why the landfall leachate is discharging to the outfall. Please could you follow this matter up and provide some comment to me.

2.5.1 Question 5 response

The infiltration of rain and subsurface water into the landfill along with the biochemical breakdown of fill materials is producing 'Leachate'. This leachate is then discharged through natural migration, into the groundwater and through infiltration into the stormwater collection system running beneath the Landfill, and sometimes onto Houghton Bay beach above the high water mark.

The investigation in 1990 led to the construction of a dry weather diversion system. The purpose of this diversion was to divert all leachate contaminated dry weather flow from the stormwater system into the adjacent sewerage network. The construction was carried out in 1992, approx. 150m upstream from the outfall.

Since then Capacity has undertaken a full-length CCTV inspection of the stormwater pipe line situated beneath the old Landfill. In the process of this inspection a number of damaged pipe sections and manholes were detected and have been repaired. Review of the CCTV record along with historical reports the three main issues have been identified and the following mitigation measures proposed.

Issue	*Mitigation*
1. Leachate pollution on the beach	*Water blasting of the encrustations from the inside of the stormwater pipe, supported by regular inspections to ensure the diversion structure is operating effectively and to check for further encrustation/sediment build-up within the pipe work*
2. Wastewater overflows at Pump Station 36 Houghton Bay and Pump Station 37 Island Bay in wet weather	*Placing an actuated valve in a new manhole to close the diversion of stormwater to the wastewater system during heavy rainfall*
3. Contamination of the stormwater by wastewater (as indicated by routine monitoring in faecal Coliform levels).	*Identifying and correcting faults in the wastewater system (SPE)*

The water blasting has been tentatively programmed for this summer to avoid high flows in the culvert. The work methodology is currently being prepared, which will ensure that any flushed materials are captured and disposed of appropriately.

Design investigations for installation of an actuated valve to minimise diverting stormwater to the sewer is expected to begin next year (in July 2010).

Further to this repair work carried out along the stormwater/ leachate pipeline, new manholes have been installed to facilitate a planned programmed of removing the encrustations of the inside of the pipelines. Potentially one of these new manholes could be converted into a passive vent to assist in the removal of leachate odours.

We have also engaged the fortnightly beaches and streams sampling contractor to routinely monitor the stormwater outlet and the silt build-up in the jumping weir sewer pit.

2.6 Question 6

In terms of question 8 has there have been any progress on decisions to close any of the constructed overflows?

2.6.1 Question 6 response

Yes, there has been progress in assessing the performance of constructed overflows and the potential for closing of redundant devices. Where the overflow monitoring programme has led to investigation works and consequential upgrade or renewal the overflow device has been earmarked for additional monitoring to ensure that the works have been successful and have not resulted in additional problems in that catchment or downstream.

When this position of confidence can be determined to a high level of certainty the constructed overflow will be removed or sealed. Currently there are nine monitored sites that have provided sufficient information to commence this approach to managing the overflows.

No	Manhole Reference	Location	Number of overflows recorded since 1 July 08 - 30 June 09
1	G40-034	386 Broadway	0
2	K29-056	Rintoul St	0
3	L28-012	192 Tasman St	0
4	M34-048	Moxham St	0
5	N29-020	76 Tasman St	0
6	O26-022	3 Brooklyn Rd	0
7	Q31-041	Chaffers St	0
8	V30-058	188 Thorndon Quay	0
9	W30-043	248 Thorndon Quay	0

As more information is made available from the monitoring programme as to ARI triggers and any subsequent overflow events, assessments will be done to evaluate the effect of removing a device from the network. Following this process constructed overflows will be removed if there is no negative flow on effect for public health.

The timeframe for managing the overflows is not fixed and will continue to be dependant on assessment of the performance data that comes to hand from the monitoring programme or via maintenance cycles.

2.7 Question 7

Thanks for providing me with catchment maps in Appendix 3 as requested under Question 9. Are you able to provide me with maps showing the individual stormwater outfalls locations and pump stations on them? In addition, am I able to obtain a large map showing all of the stormwater catchments for the Wellington area together?

2.7.1 Question 7 response

On the provided CD there is a large map file that contains the stormwater catchments for Wellington.

2.8 Question 8

In relation to question 13, at the very least you should be able to pull out the dry weather flows from the existing data-set so that the wet-weather metal concentrations can be seen. Please perform this assessment and also provide me with the raw data for the monitoring period

2.8.1 Question 8 response

Appendix D provides this information. There is also a copy of the Microsoft Excel spreadsheet on the provided disc.

2.9 Question 9

In terms of question 14, do any of the stormwater outfalls have screens on the outfalls to stop rubbish exiting the sumps?

2.9.1 Question 9 response

This question appears to repeat information requested in question three in regards to technology being disregarded and the use of baffles. Stormwater discharges per se do not have screens designed to catch material however the larger outfall at Lyall Bay has screens to prevent unauthorised access (or children) which can collect materials which are then removed.

2.10 Question 10

Can you please confirm for me if the Owhiro Stream and Island Bay culvert sampling points are tidally influenced

2.10.1 Question 10 response

We can confirm that the Owhiro Stream and Island Bay culvert sampling points are not tidally influenced.

2.11 Question 11

In regards to question 20, is GW kept up to date with the findings of any sanitary surveys/investigations that are currently undertaken? For instance, what is done by Capacity to keep parties informed during the investigation process and ensure issues are resolved as soon as practicable, especially if it sometimes takes a year to find the source of a fault?

2.11.1 Question 11 response

In a similar fashion to question four WCC does not routinely advise or update GW on the findings of any sanitary surveys or investigations beyond any requirements of resource consent conditions or Regional Plan requirements. Where sanitary surveys or investigations require access or work to be completed on private property WCC communicates with those property owners affected as per the requirements of the relevant legislation or council policy.

Appendix A – Culvert inspection and clearing programme

Year	Name of culvert	Period cleared
2004/05	Miramar Culvert	Feb – Mar 2005
	Aro Street Culvert	February 2005
	Walter Street Culvert	June 2005
2005/06	Para Street Culvert/ Miramar Culvert	Aug – Oct 2005
2006/07	Kilbirnie Crescent	May – June 2007
	Miramar Culvert	May – June 2007
2007/08	Hutt Road Culvert	Feb- Mar 2008
	Miramar Culvert	Aug – Oct 2007
	Kilbirnie Crescent	Aug -Oct 2007

In addition to the above clearing programme, culverts listed below are inspected annually and cleared as appropriate.

1 *Molesworth Street Culvert*
2 *Bunny Street Culvert*
3 *Bowen Street Culvert*
4 *Balance Street Culvert*
5 *Waring Taylor Culvert*
6 *Johnston Street Culvert*
7 *Brandon St/ Panama St Culverts*
8 *Hunter St/ Grey Street Culverts*
9 *Willeston Street Culvert*
10 *Harris Street Old Culvert*
11 *Harris Street New Culvert*
12 *Te Aro Culvert*
13 *Taranaki Street Culvert*
14 *Tory Street Culvert*
15 *Cambridge Tce Culvert*
16 *Kent Tce West Culvert*
17 *Kent Tce East Culvert*
18 *Oriental Pde West Culvert*
19 *Oriental Pde/ Hay Street Culvert*
20 *Oriental Pde/ Grass Street Culvert*
21 *Sar Street Culvert*
22 *Thorndon Quay Culvert*
23 *Davis Street/ Aotea Quay Culvert*
24 *Burnham Street Culvert*
25 *Duff Drive Culvert*
26 *Airport South side Culvert*
27 *Airport North side Culvert*
28 *Cochrane Street Culvert*
29 *Tirangi Road Culvert*
30 *Apu Crescent Culvert*
31 *Freyberg Street Culvert*
32 *Sutherland Road Culvert*
33 *Houghton Bay Culvert*
34 *Brighton Street Culvert*
35 *Island Bay (The Parade) New Culvert*
36 *Island Bay (The Parade) Old Culvert*
37 *Tyne Street Culvert*
38 *Miramar Culvert*
39 *Calabar Road*
40 *Bridge Street Culvert*
41 *Kemp Street Culvert*
42 *Tacy Street Culvert*
43 *Kilbirnie Cres Culvert*
44 *Evans Bay Culvert*
45 *Cog Park Culvert*
46 *Kio Bay Culvert*
47 *Ohiro Road Culvert*
48 *Karori Culverts*
49 *Ngaio Culverts*
50 *Khandallah Culverts*
51 *Johnsonville Culvert*
52 *Broderick Road Culvert*
53 *Newlands Culvert*
54 *Churton 1 Culverts*
55 *Churton 2 Culverts*
56 *Grenada North Culverts*
57 *Tawa 1 Culverts*
58 *Tawa 2 Culverts*
59 *Linden Culverts*
60 *Hutt Road 1 Culverts*
61 *Hutt Road 2 Culverts*
62 *Newlands off-ramp Culvert*
63 *Motorway Culverts*

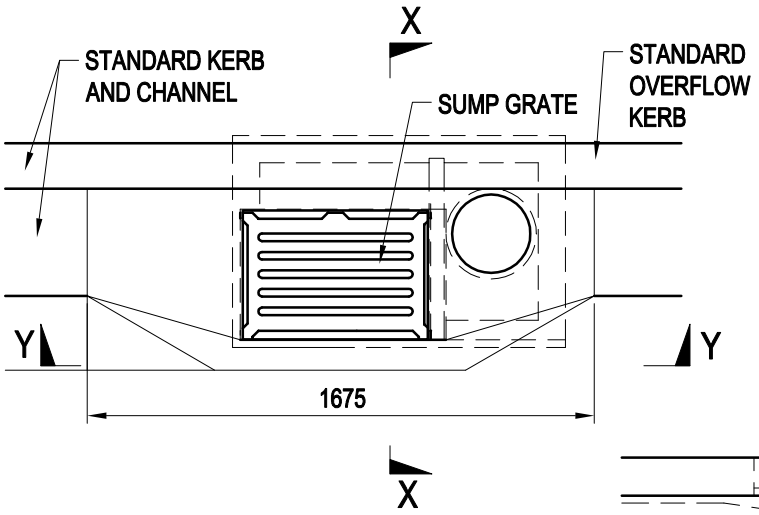
Appendix B – Stormwater and wastewater forecasted upgrade and renewal programme.

Wastewater upgrades and renewals					
Location / event	Target year	2010/11	2011/12	2012/13	2014/15
Moa Point inlet pump station upgrade	2010/11				
Moa Point pilot UV treatment	2010/11	$200,000			
Complete Moa Point UV treatment (subject to consent application)	2013/14			$3.0m	$3.0m
Network upgrades projects with renewals			$182,000	$182,000	$182,000
Wastewater network renewals	Ongoing	$7.39m	$7.45m	$7.5m	$7.5m
Sewage pollution generated maintenance (unplanned); Interceptor flow monitoring; critical drains inspection programme; pump station maintenance; pollution detection	Ongoing	$1.9m	$1.9m	$1.9m	$1.9m
Wastewater operations planned maintenance	Ongoing	$2.1m	$2.06m	$2.08m	$2.08m

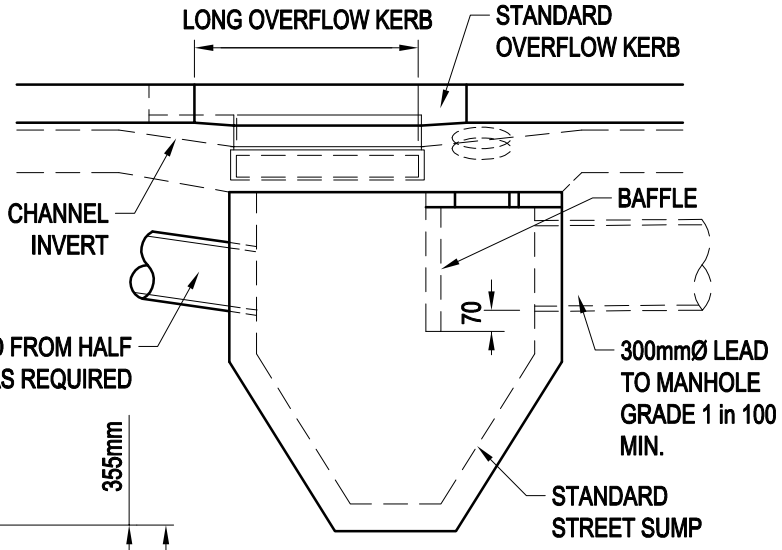
Stormwater upgrades and renewals					
Location / event	Target year	2011/12	2012/13	2013/14	2014/15
Stormwater unplanned maintenance	Ongoing	$1.69m	$1.71m	$1.71m	$1.62m
Stormwater critical drains inspection programme	Ongoing	$522,000	$525,500	$525,600	$528,000
CBD grit trap construction	2010/11 2011/12	$51,500	$51,500		
Kilbirnie stormwater pumping station	2009/10 2010/11	$1.3m			
Localised flood protection programme	Ongoing	$310,000	$310,000	$310,000	$310,000
Stormwater network renewals	Ongoing	$3.47m	$3.56m	$3.64m	$3.73m

Additional details regarding planning strategies and prioritisation frameworks are contained within the stormwater and wastewater Asset Management Plans which have been provided alongside this response in hard copy.

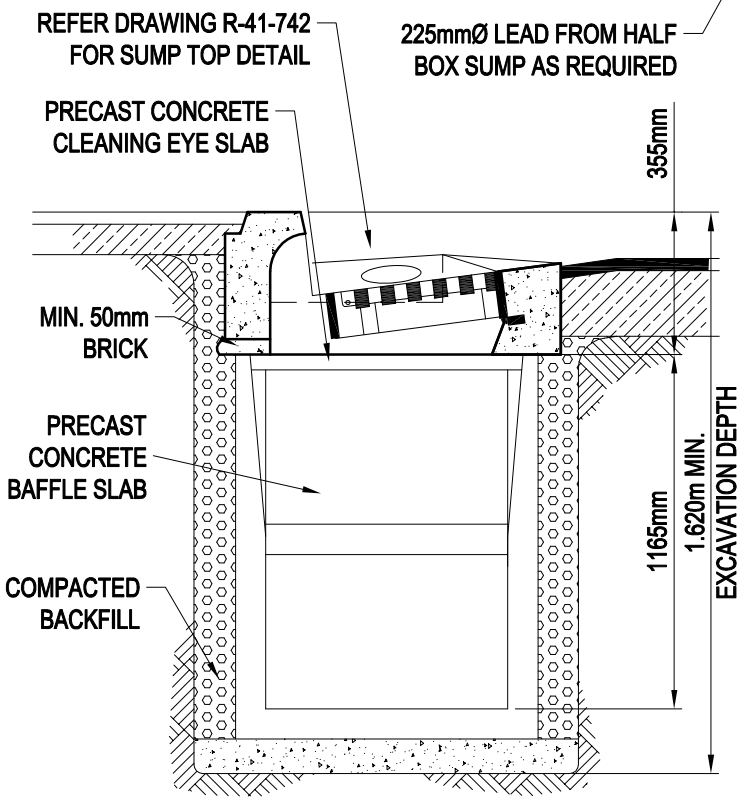
Appendix C – Sump baffle design specification



PLAN VIEW



SECTION Y-Y



SECTION X-X

SCALE 1:25

Absolutely Positively Wellington

FULL SUMP AND SECTIONS

PLAN NO. R-41-740

ASSET CATEGORY: SUMPS AND LEADS

APPROVED BY: D. SINGH

DATE: 14 DEC. 2007

Rainfall at GWRC Site (mm)	Site	Date	As, mg/L	BOD (Total), mg/L	Cd, mg/L	CN, mg/L	COD (Total), mg/L	Cr, mg/L	Cu, mg/L	Enterococci, /100mL	Faecal Coliforms, /100mL	Fe, mg/L	Hg, mg/L	Mn, mg/L	Ni, mg/L	Oil & Grease, mg/L	Pb, mg/L	pH	Phosphorus (Total), mg/L	TKN, mg/L	Total Suspended Solids, mg/L	Zn, mg/L
0	Evans Bay Culvert	4/12/2002	0.02	2	0.001	0.001	250	0.01	0.01	120	150	0.4	0.00011	0.01	0.01	10	0.002	8.2	0.13	0.33	170	0.02
0		1/06/2003	0.05	2	0.003	0.001	346	0.03	0.03	200	800	1	0.00008	0.03	0.03	10	0.005	8	0.13	0.5	36	0.05
0		3/12/2003	0.05	2	0.003	0.001	1420	0.03	0.03	1300	3200	1	0.00008	0.03	0.03	10	0.005	8.1	0.1	8.2	3	0.17
0		1/06/2004																				
0		3/12/2004	0.05	2	0.003	0.002	75	0.03	0.03	190	1000	1	0.0008	0.03	0.03	10	0.005	7.9	0.19	0.7	16	0.05
0.2		3/06/2005	0.05	2	0.003	0.001	75	0.03	0.03	180	92	1	0.0008	0.03	0.03	10	0.005	8	0.07	0.3	35	0.05
0.2		3/12/2005	0.05	2	0.003	0.003	75	0.03	0.03	700	1600	1	0.0009	0.03	0.03	10	0.005	8.1	0.07	0.2	7	0.05
0		3/06/2006	0.05	6	0.003	0.001	75	0.03	0.03	700	600	3	0.0008	0.06	0.03	10	0.019	8	0.51	2.2	93	0.16
0		3/12/2006	0.05	1	0.003	0.01	75	0.03	0.03	2400	3500	1	0.001	0.03	0.03	0	0.007	8	0.131	0.8	59	0.05
0.8		3/06/2007	0.004	1	0.001	0.01	75	0.002	0.028	68	240	0.2	0.001	0.007	0.004	6	0.011	7.9	0.05	0.8	33	0.02
0		11/12/2007	0.05	1	0.003	0.01	110	0.03	0.03	36	56	0.1	0.001	0.03	0.03	6	0.005	8.1	0.05	0.9	14	0.05
0		10/06/2008	0.05	1	0.003	0.005	75	0.03	0.03	2300	1100	1	0.001	0.03	0.03	6	0.005	8	0.061	0.8	38	0.05
12.8		9/12/2008	0.05	4	0.003	0.005	75	0.03	0.03	7700	11000	1	0.001	0.03	0.03	5	0.005	7.4	0.08	9	8	0.112
2.8		26/06/2009	0.003	2	0.001	0.005	75	0.001	0.01	16	8	0.3	0.001	0.019	0.005	6	0.005	7.9	0.012	0.8	55	0.035
0	Island Bay Beach East	4/12/2002	0.02	2	0.001	0.001	300	0.01	0.01	4	28	0.4	0.00008	0.01	0.01	10	0.002	8.2	0.02	0.04	91	0.02
0		1/06/2003	0.05	2	0.003	0.001	526	0.03	0.03	16	12	1	0.00008	0.03	0.03	10	0.005	8	0.11	1	55	0.05
0		3/12/2003	0.05	2	0.003	0.001	1180	0.03	0.03	120	280	1	0.00008	0.03	0.03	10	0.005	7.9	0.03	0.5	22	0.05
0		1/06/2004																				
0		3/12/2004	0.05	2	0.003	0.001	75	0.03	0.03	4	4	1	0.0008	0.04	0.03	10	0.005	8.3	0.07	0.5	34	0.05
0.2		3/06/2005	0.05	2	0.003	0.001	75	0.03	0.03	4	8	1	0.0008	0.03	0.03	10	0.005	8.1	0.05	0.1	51	0.05
0.2		3/12/2005	0.05	2	0.003	0.001	75	0.03	0.03	6900	5400	1	0.0008	0.03	0.03	10	0.005	8.4	0.03	0.3	3	0.05
0		3/06/2006	0.05	4	0.003	0.001	75	0.03	0.03	1200	4	1	0.0008	0.03	0.03	56	0.005	8	0.09	0.5	11	0.05
0		3/12/2006	0.05	4	0.003	0.01	75	0.03	0.036	2200	6700	1	0.001	0.03	0.03	6	0.015	7.7	0.211	1.4	10	0.227
0.8		3/06/2007	0.003	1	0.001	0.01	75	0.002	0.069	2200	9600	0.6	0.001	0.026	0.015	7	0.013	7.8	0.039	1.5	13	0.067
0		11/12/2007	0.05	1	0.003	0.01	75	0.03	0.03	8	12	0.1	0.001	0.03	0.03	7	0.005	8	0.05	0.8	62	0.05
0		10/06/2008	0.05	8	0.003	0.005	75	0.03	0.03	24	24	1	0.001	0.03	0.03	12	0.005	7.9	0.347	2.8	42	0.05
12.8		9/12/2008	0.05	4	0.003	0.005	92	0.03	0.03	800	620	1	0.001	0.03	0.03	6	0.005	8.2	0.038	0.9	16	0.05
2.8		26/06/2009	0.004	15	0.001	0.005	75	0.002	0.031	16	16	0.7	0.001	0.018	0.002	6	0.005	8	0.86	4.8	16	0.138
0	Overseas Terminal	4/12/2002	0.02	5	0.001	0.013	70	0.02	0.05	4700	4700	1.4	0.00008	0.07	0.03	10	0.023	7.7	0.13	1.23	78	0.1
0		1/06/2003	0.02	2	0.001	0.001	66	0.01	0.01	8000	6000	0.04	0.00008	0.02	0.01	10	0.002	7.7	0.12	0.5	7	0.07
0		3/12/2003	0.05	2	0.003	0.001	1590	0.03	0.03	110	3300	1	0.00008	0.03	0.03	10	0.005	8.1	0.03	0.5	20	0.24
0		1/06/2004																				
0		3/12/2004	0.05	2	0.003	0.007	75	0.03	0.03	350	4100	1	0.0008	0.03	0.04	10	0.005	7.6	0.07	0.6	6	0.05
0.2		3/06/2005	0.05	2	0.003	0.001	75	0.03	0.03	160	1700	1	0.0008	0.03	0.03	10	0.005	7.9	0.13	0.3	39	0.05
0.2		3/12/2005	0.05	2	0.003	0.001	75	0.03	0.03	6900	5400	1	0.0008	0.03	0.03	10	0.005	8.4	0.03	0.3	3	0.05
0		3/06/2006	0.05	4	0.003	0.001	75	0.03	0.03	1200	4	1	0.0008	0.03	0.03	56	0.005	8	0.09	0.5	11	0.05
0		3/12/2006	0.05	4	0.003	0.01	75	0.03	0.036	2200	6700	1	0.001	0.03	0.03	6	0.015	7.7	0.211	1.4	10	0.227
0.8		3/06/2007	0.003	1	0.001	0.01	75	0.002	0.069	2200	9600	0.6	0.001	0.026	0.015	7	0.013	7.8	0.039	1.5	13	0.067
0		11/12/2007	0.05	11	0.003	0.02	75	0.03	0.03	4	4	0.7	0.001	0.046	0.03	5	0.007	7.6	0.573	0.8	12	0.078
0		10/06/2008	0.05	1	0.003	0.005	75	0.03	0.03	270	2100	2.6	0.001	0.044	0.03	5	0.006	7.9	0.17	0.8	68	0.05
12.8		9/12/2008	0.05	6	0.003	0.005	75	0.03	0.03	5900	3800	1	0.001	0.03	0.03	7	0.005	7.2	0.158	1.5	13	0.196
2.8		26/06/2009	0.004	5	0.001	0.007	75	0.003	0.032	600	5400	1	0.001	0.04	0.005	6	0.008	7.6	0.141	0.8	23	0.162
0	Waring Taylor Street Culvert	4/12/2002	0.02	2	0.001	0.001	320	0.01	0.01	24	60	0.8	0.00008	0.02	0.01	10	0.007	7.8	0.11	0.42	60	0.1
0		1/06/2003	0.05	2	0.003	0.001	567	0.03	0.03	300	700	1	0.00008	0.03	0.03	0.08	0.005	7.6	0.08	0.5	3	0.05
0		3/12/2003	0.05	2	0.003	0.001	1000	0.03	0.03	60	100	1	0.00008	0.03	0.03	10	0.005	8.1	0.02	0.5	22	0.05
0		1/06/2004																				
0		3/12/2004	0.05	2	0.003	0.002	75	0.03	0.03	40	100	1	0.0008	0.03	0.03	10	0.005	7.6	0.07	0.6	6	0.05
0.2		3/06/2005	0.05	2	0.003	0.001	75	0.03	0.03	220	6300	1	0.0008	0.03	0.03	10	0.005	8	0.06	0.3	44	0.05
0.2		3/12/2005	0.05	2	0.003	0.001	75	0.03	0.03	2500	4400	1	0.0008	0.03	0.03	12	0.005	8.1	0.03	0.2	3	0.05
0		3/06/2006	0.05	3	0.003	0.001	75	0.03	0.03	270	480	1	0.0008	0.03	0.03	13	0.005	8	0.07	0.3	12	0.05
0		3/12/2006	0.05	1	0.003	0.01	80	0.03	0.03	100	680	1	0.001	0.03	0.03	5	0.005	8	0.087	1.1	61	0.05
0.8		3/06/2007																				
0		11/12/2007	0.05	1	0.003	0.01	75	0.03	0.03	880	520	0.1	0.001	0.03	0.03	5	0.005	7.9	0.051	0.8	9	0.05
0		10/06/2008	0.05	1	0.003	0.005	75	0.03	0.03	32	20	1	0.001	0.03	0.03	13	0.005	8.1	0.05	0.8	57	0.05
12.8		9/12/2008	0.05	2	0.003	0.005	93	0.03	0.03	6100	96000	1	0.001	0.03	0.03	6	0.005	8.2	0.077	1.1	21	0.05
2.8		26/06/2009	0.003	1	0.001	0.005	75	0.001	0.01	350	2300	0.1	0.001	0.005	0.005	6	0.005	7.8	0.05	0.8	61	0.02
0	Houghton Bay Beach	3/12/2004	0.05	6	0.003			0.03	0.03	4	4	3	0.0008	0.07	0.03	10	0.005	7.4	0.44	1	44	0.05
0.2		3/06/2005	0.05	7	0.003			0.03	0.03	4	4	2	0.0008	0.13	0.03	10	0.005	7.8	0.11	4.3	24	0.05
0.2		3/12/2005	0.05	10	0.003			0.03	0.03	64	4	74	0.00017	0.47	0.03	10	0.03	7.8	1.4	4.1	267	0.24
0		3/06/2006	0.05	9	0.003			0.03	0.03	88	72	15	0.0008	0.3	0.03	10	0.014	7.3	0.77	7.5	152	0.11
0		3/12/2006	0.05	1	0.0003	0.01	184	0.03	0.252	12	8	1.1	0.001	0.03	0.03	30	0.217	8	0.118	0.8	91	0.193
0.8		3/06/2007	0.002	2	0.001	0.01	75	0.002	0.036	18000	240000	0.7	0.001	0.049	0.003	5	0.013	7.8	0.052	0.8	38	0.026
0		11/12/2007	0.05	4	0.003	0.06	75	0.03	0.03	4	4	7.5	0.001	0.415	0.03	5	0.005	8	0.096	28.9	21	0.05
0		10/06/2008	0.05	1	0.003	0.005	75	0.03	0.03	16	16	1	0.001	0.048	0.03	5	0.005	7.8	0.074	0.8	6	0.05
12.8		9/12/2008	0.05	1	0.003	0.005	75	0.03	0.03	880	620	1	0.001	0.03	0.03	4	0.005	8.1	0.034	2.7	55	0.05
2.8		26/06/2009	0.002	3	0.001	0.069	75	0.002	0.03	8	8	8.3	0.001	0.45	0.001	6	0.005	7.8	0.046	22.3	27	0.048
0	Island Bay Beach West @ Reef St Rec	11/12/2007	0.05	1	0.003	0.01	75	0.03	0.03	4	4	0.1	0.001	0.03	0.03	5	0.005	8	0.05	0.8	81	0.05
0		10/06/2008	0.05	1	0.003	0.005	75	0.03	0.03	130	240	1	0.001	0.03	0.03	6	0.005	8.1	0.067	0.8	102	0.05
12.8		9/12/2008	0.05	4	0.003	0.005	75	0.03	0.03	710	470	1.2	0.001	0.05	0.03	5	0.01	7.5	0.15	1.3	27	0.124
2.8		26/06/2009	0.003	1	0.001	0.023	75	0.001	0.01	32	100	0.2	0.001	0.006	0.005	5	0.005	7.8	0.05	0.8	66	0.02