

Appendix 2-2
Outline of DPWH Survey
Additional Collecting Data

1. Design Rainfall

The design rainfall used was based on available rainfall intensity-duration-frequency (RIDF) from PAGASA shown in Figure 1 across three (3) rainfall stations in Metro Manila.

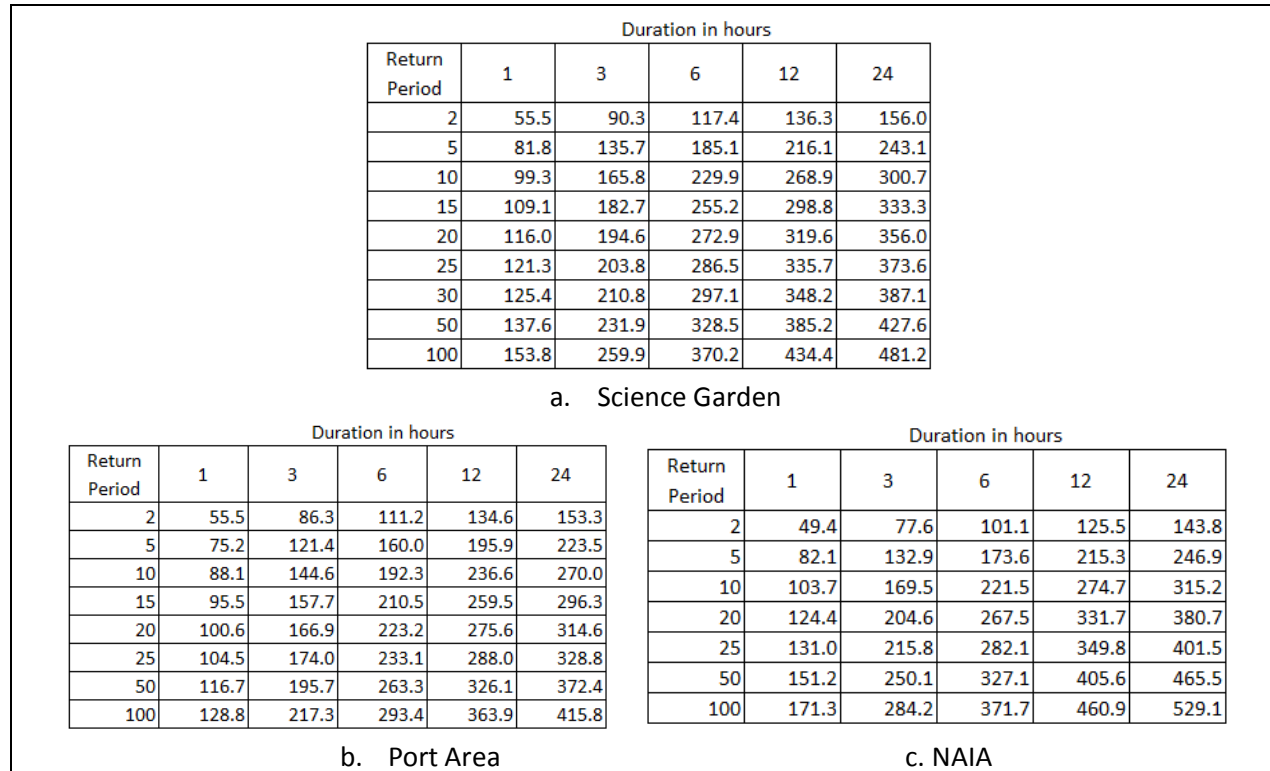


Figure 1. RIDF tables used in the study.

Then, flood discharges were based on Probable Maximum Precipitation (PMP). However, site specific PMP estimates are not available for the Philippines. In this case, Order of magnitude PMP estimates was therefore developed. These estimates were determined using generalized procedures which were originally developed in the United States and then adapted by the Australian Bureau of Meteorology for use in tropical areas of Australia. It is assumed that the storm mechanisms for a PMP event occurring in the Philippines area would be similar to those occurring in the tropical regions of northern Australia, given that various areas of tropical northern Australia are about the same distance from the equator as Metro Manila for example and have similar annual average rainfall totals. The amount of extreme rainfall was based on developed RIDF curves available and the temporal distribution of rainfall was based on the distribution in Figure 2.

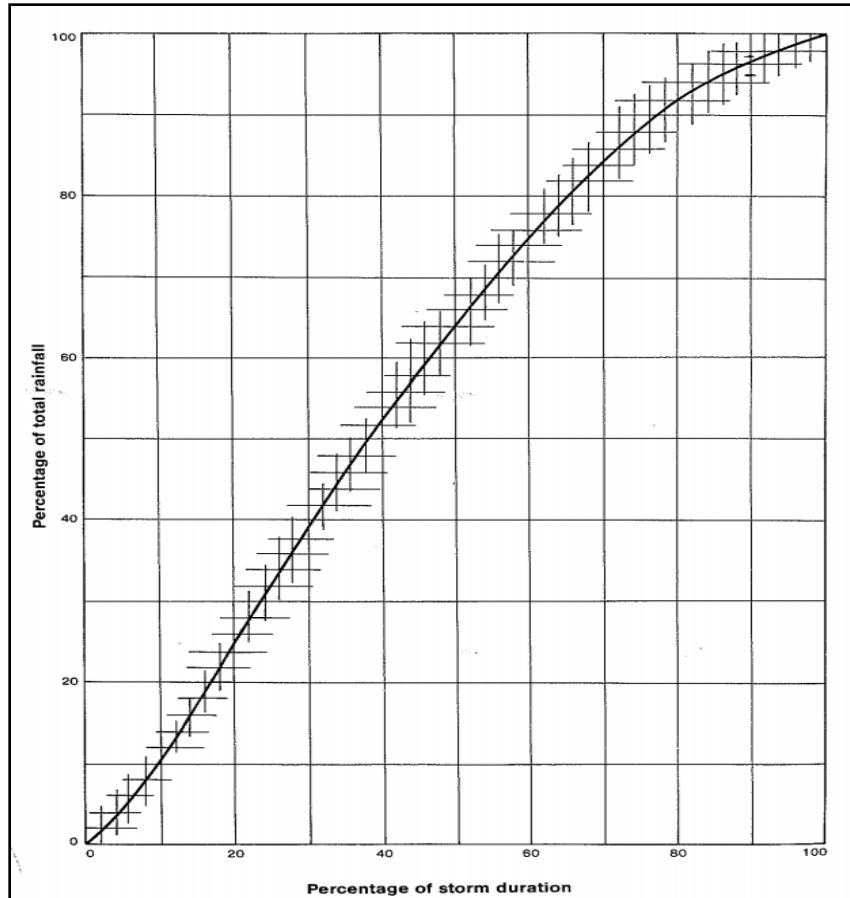


Figure 2. Rainfall distribution for extreme rainfall adopted for design flood discharges (Bureau of Meteorology, 2003).

2. Design Discharges

Using the RIDF and temporal distribution, the following peak discharges were generated for each composite catchment and project sites. The adopted rainfall duration is closest to the time of concentration. In project areas where volume of flood water is significant, longer storm duration was adopted. The corresponding tables summarized the peak design discharges used for each flood control project sites.

Table 1. Design Discharges for Buendia, Maricaban, NAIA, and Parañaque.

Project Site	Rainfall Station	Duration	Catchment Area (m ²)	Peak Discharge (m ³ /s)
BUENDIA				
Tripa de Gallina	Port Area	60 mins	833,220	14.49
Calatagan Creek I	Port Area	60 mins	1,172,262	44.04
Calatagan Creek II	Port Area	60 mins	2,455,889	79.02
Zobel DM	Port Area	60 mins	2,257,670	49.36
Makati Diversion I	Port Area	60 mins	3,626,985	59.08
Makati Diversion II	Port Area	60 mins	1,169,453	48.81
Makati Div-Tripa	Port Area	60 mins	322,367	5.04
Calatagan Creek	Port Area	60 mins	646,632	14.69
Paco	Port Area	60 mins	1,421,229	14.04
Pandacan	Port Area	60 mins	1,909,232	15.49
Provisor	Port Area	60 mins	2,299,079	18.49
Libertad Pumping Station	Port Area	60 mins	6,508,563	58.99
EDSA Outfall	Port Area	60 mins	1,265,780	55.68
Libertad Outfall	Port Area	60 mins	992,459	10.06
Buendia Outfall	Port Area	60 mins	2,268,004	22.14
Vito Cruz Outfall	Port Area	60 mins	418,900	6.01
MARICABAN				
Maricaban Creek I	NAIA	60 mins	6,452,411	217.36
Maricaban Creek II	NAIA	60 mins	1,559,394	77.56
Maricaban Creek III	NAIA	60 mins	3,336,983	164.21
NAIA				
Parañaque Channel 1	NAIA	60 mins	11,019,835	266.26
Rivera	NAIA	60 mins	440,793	23.07
Parañaque Channel 2	NAIA	60 mins	10,579,042	171.97
Airport Road	NAIA	60 mins	1,057,904	49.92
Parañaque Channel 3	NAIA	60 mins	12,075,867	186.57
Librada	NAIA	60 mins	1,207,587	20.24
Parañaque Channel 4	NAIA	60 mins	12,882,021	160.76
Seaside	NAIA	60 mins	1,487,280	10.30
Parañaque Channel 5	NAIA	60 mins	15,741,590	192.21
Inland Channel	NAIA	60 mins	1,736,539	101.35
Redemptorist Channel	NAIA	60 mins	2,683,733	105.00
Seaside Channel	NAIA	60 mins	4,725,641	126.99
Banana Island Creek	NAIA	60 mins	1,468,857	31.97
Ibayo Creek	NAIA	60 mins	268,113	13.46
Cut-cut Creek	NAIA	60 mins	1,940,485	48.38
PARAÑAQUE				
Baliwag River	NAIA	60 mins	9,085,982	276.31
Don Galo River	NAIA	60 mins	15,394,645	510.57
San Dionisio River	NAIA	60 mins	10,222,761	90.62
San Isidro River	NAIA	60 mins	13,541,773	521.25
Las Piñas River	NAIA	60 mins	1,237,975	122.85
South Parañaque River	NAIA	60 mins	42,362,463	863.92
Parañaque River (Manila Bay)	NAIA	60 mins	57,227,663	1024.68

Table 2. Design Discharges for Tullahan River.

Project Site	Rainfall Station	Duration	Catchment Area	Peak Discharge m ³ /s
1. Tenejeros Bridge	Science Garden	24-hrs	70.00 km ²	588.4
2. PNR	Science Garden	24-hrs	68.44 km ²	582.0
3. McArthur highway	Science Garden	24-hrs	62.12 km ²	564.4
4. NLEX	Science Garden	24-hrs	52.50 km ²	553.2

Table 3. Design Discharges for Zapote-Las Piñas River.

Project Site	Rainfall Station	Duration	Catchment Area	Peak Discharge m ³ /s
1. Zapote River	NAIA	24-hrs	67.00 km ²	703
2. Las Piñas River	NAIA	24-hrs	21.44 km ²	197

Table 4. Design Discharges UST-España Areas.

Project Site	Rainfall Station	Duration	Catchment Area (ha)	Peak Discharge m ³ /s
1. Constancia Interceptor	Port Area	1 hr	155.075	17.247
2. Antipolo Interceptor	Port Area	1 hr	150.299	21.924
3. Pureza Interceptor	Port Area	1 hr	325.330	51.548
4. Casanas-Margal-Quijote DM	Port Area	1 hr	197.923	19.680
5. Earnshaw DM	Port Area	1 hr	23.225	5.805
6. Lepanto-Forbes DM (Existing)	Port Area	1 hr	242.502	20.096
7. Estero de Valencia	Port Area	1 hr	184.107	29.080
8. Estero de Sampaloc I	Port Area	1 hr	273.494	20.172
9. Estero de San Miguel-Uli-Uli	Port Area	1 hr	47.289	7.085

Table 5. Design Discharges for San Juan River.

Project Site	Rainfall Station	Duration	Catchment Area km ²	Peak Discharge m ³ /s
1. STA 1+100	Science Garden	24 hrs	91.60	822.50
2. STA 3+350	Science Garden	24 hrs	82.58	728.46
3. STA 7+250	Science Garden	24 hrs	51.49	436.95
4. STA 11+100	Science Garden	24 hrs	14.40	283.60

3. Design Sections

The typical cross-sections are in ANNEX A to E.

ANNEX A. UST España Areas

Table 1. Indicative Dimensions of Proposed RCBC within España-UST Vicinity Area

Proposed Box Culverts	Indicative Dimensions		
	Number of Barrels	Width (meters)	Depth (meters)
1.Constancia Interceptor	3	3	2
2.Antipolo Interceptor	2	3	4
3.Pureza Interceptor	2	3.2	4.5
4.Casanas-Margal-Quijote DM	2	3.5	2.4
5.Earnshaw DM	2	2.4	2.4

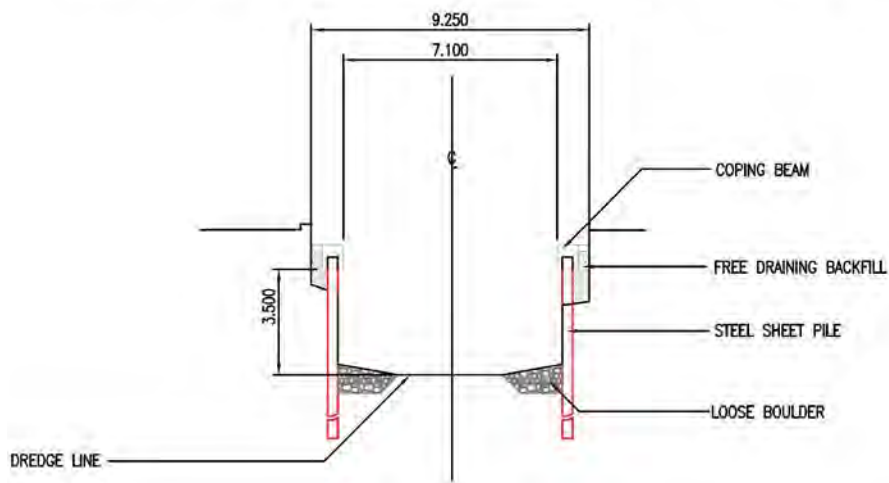


Figure 1. Typical Section for the Improvement of Estero de Valencia

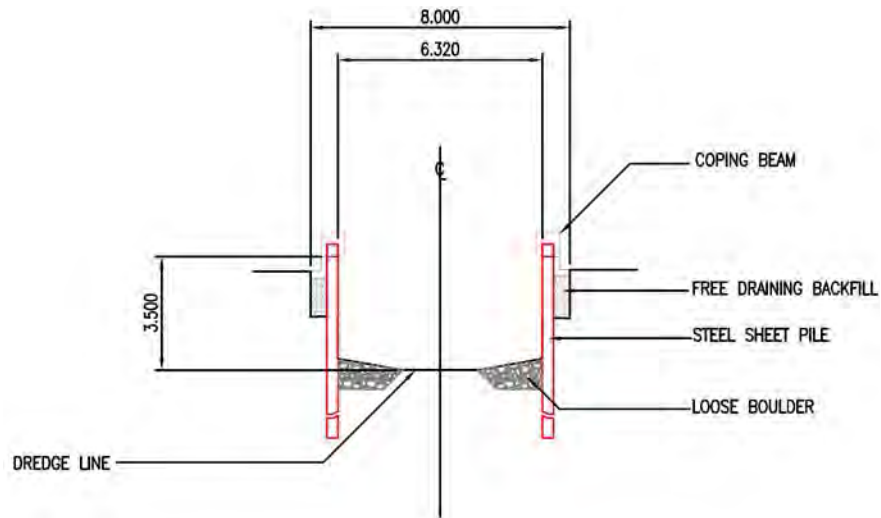


Figure 2. Typical Section for the Improvement of Estero de San Miguel – Uli-Uli

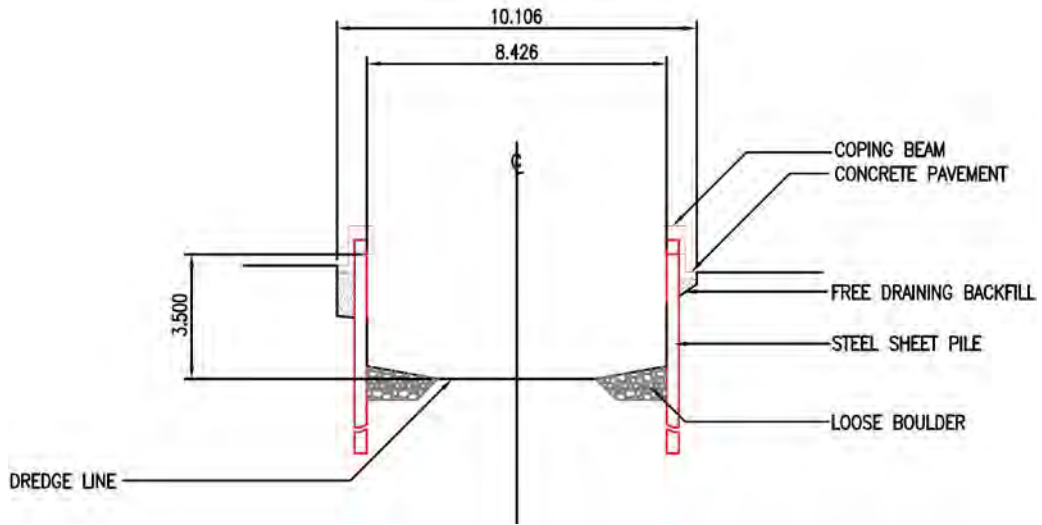
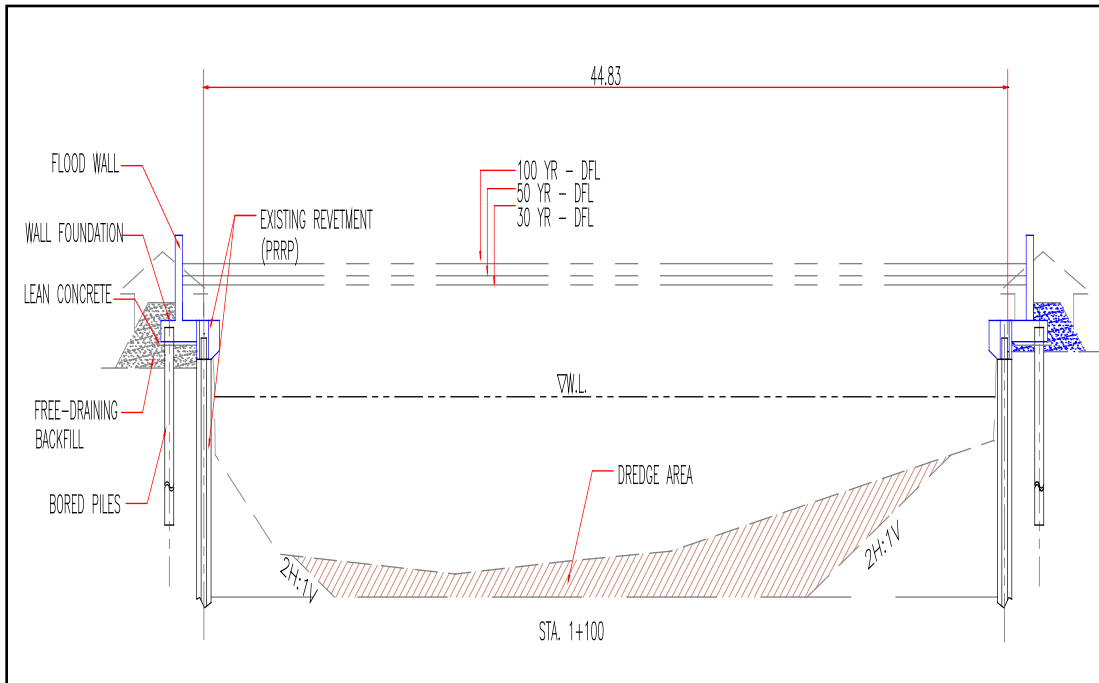
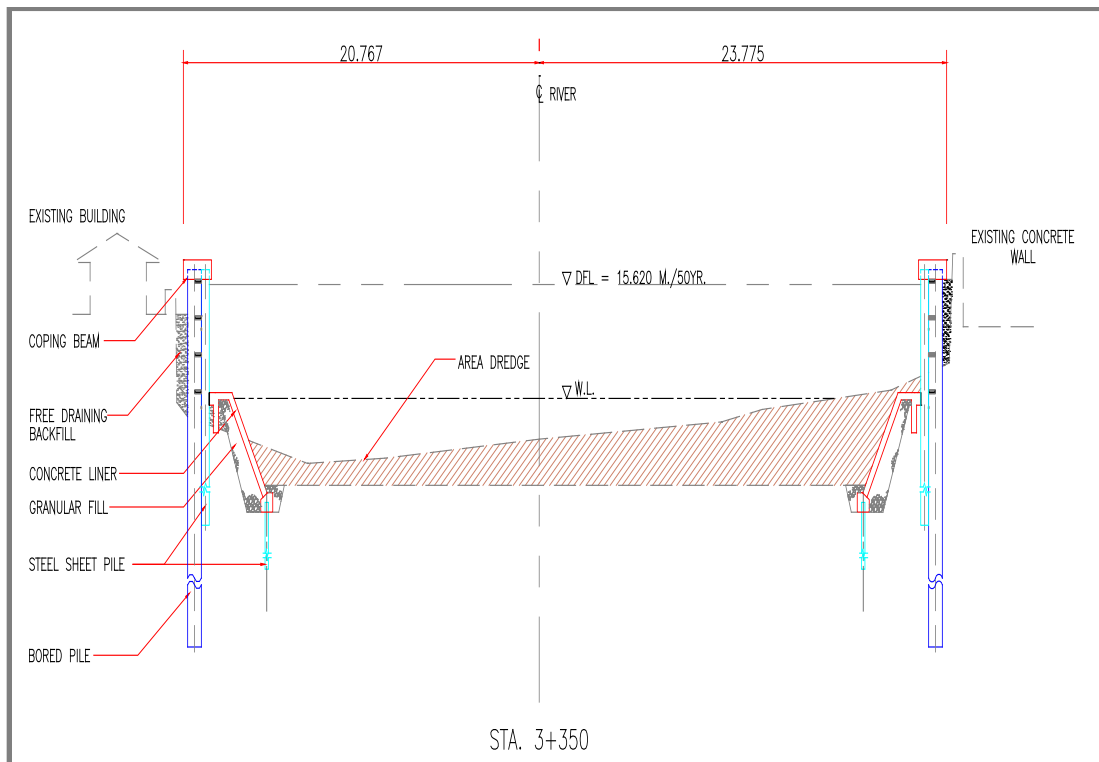


Figure 3. Typical Section for the Improvement of Estero de Sampaloc I

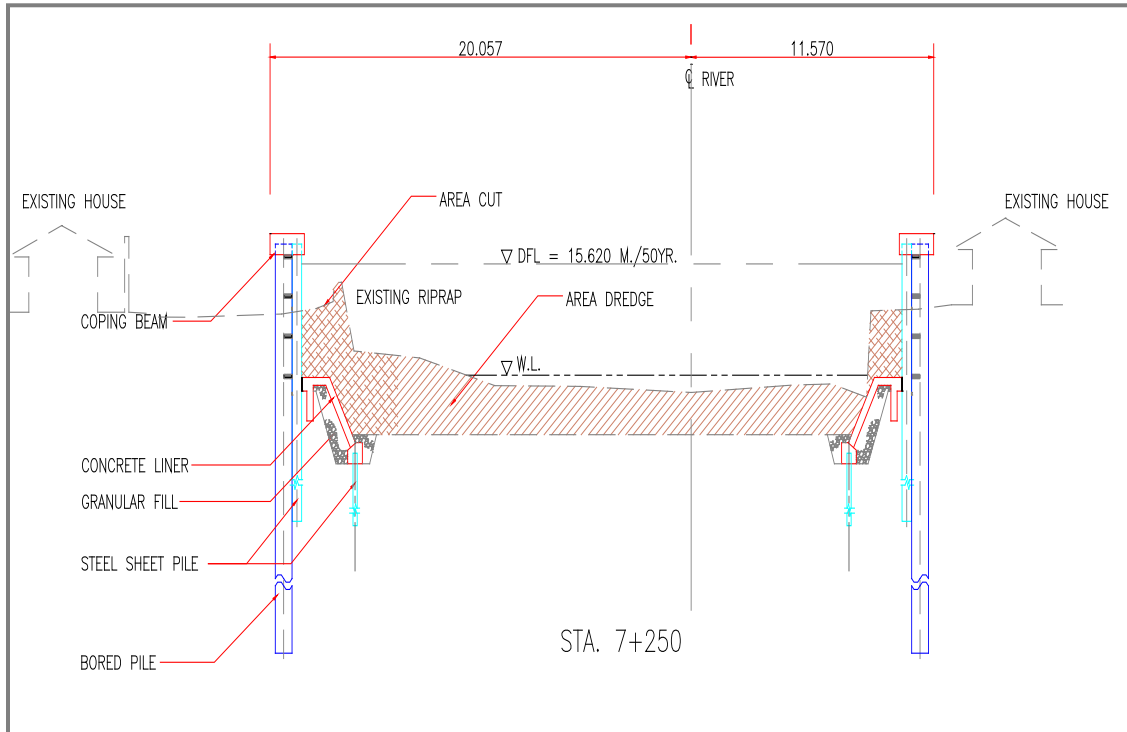
ANNEX B. San Juan River



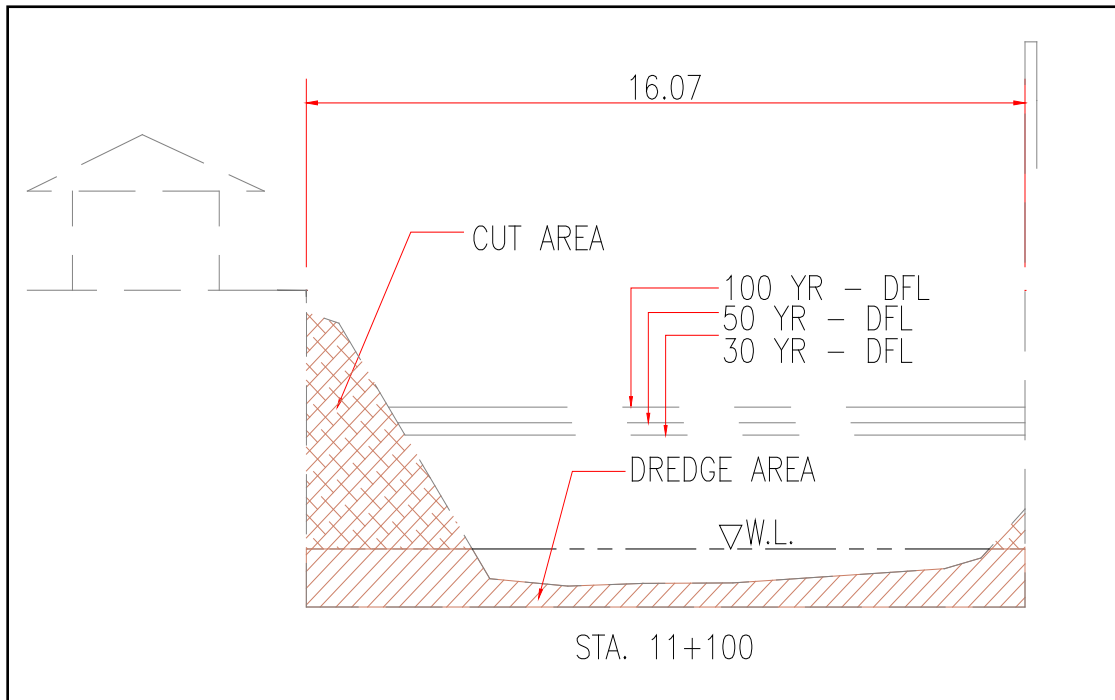
Package 4



Package 1

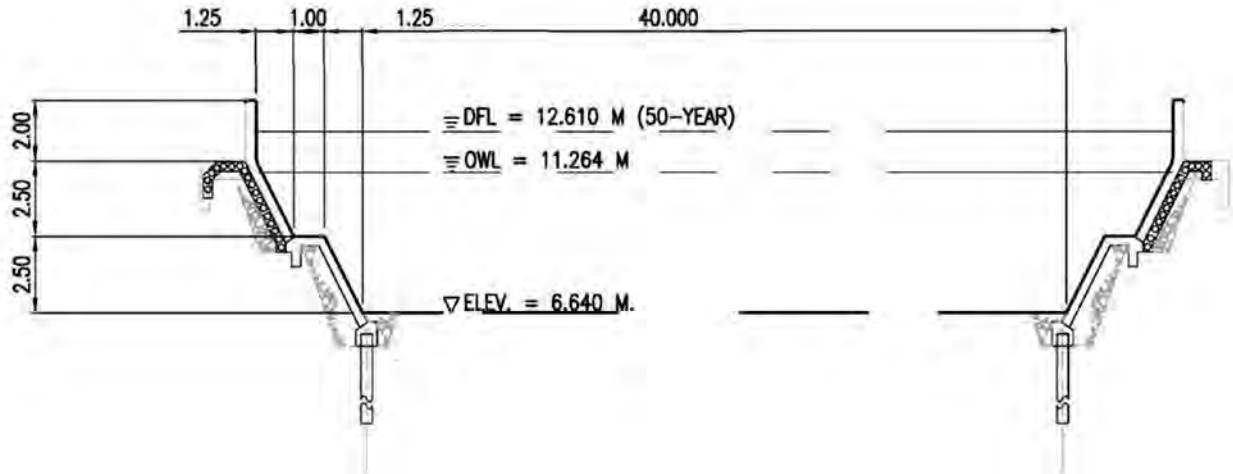


Package 2

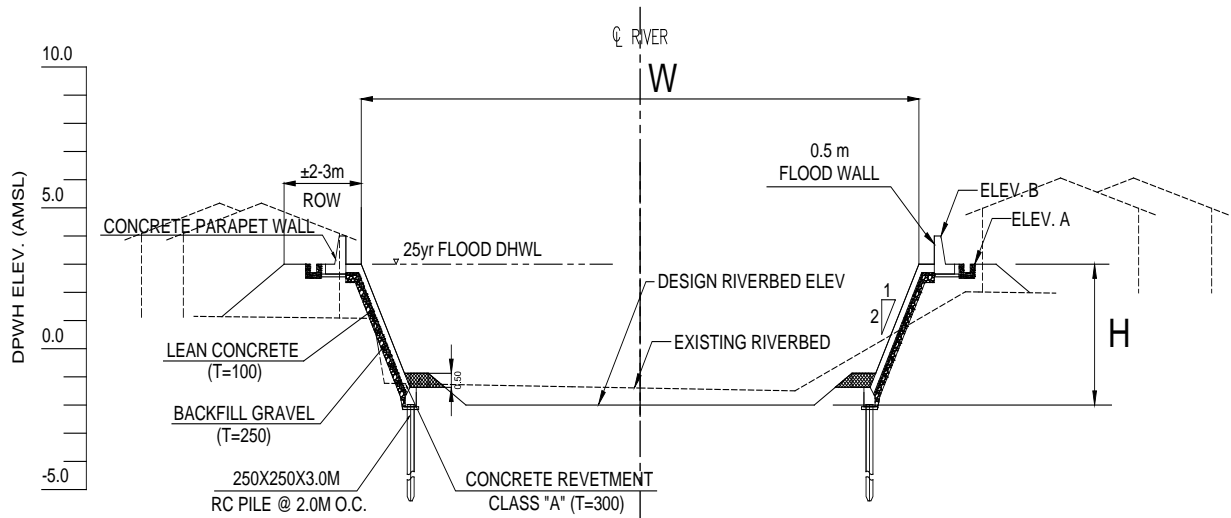


Package 3

ANNEX C. Tullahan River



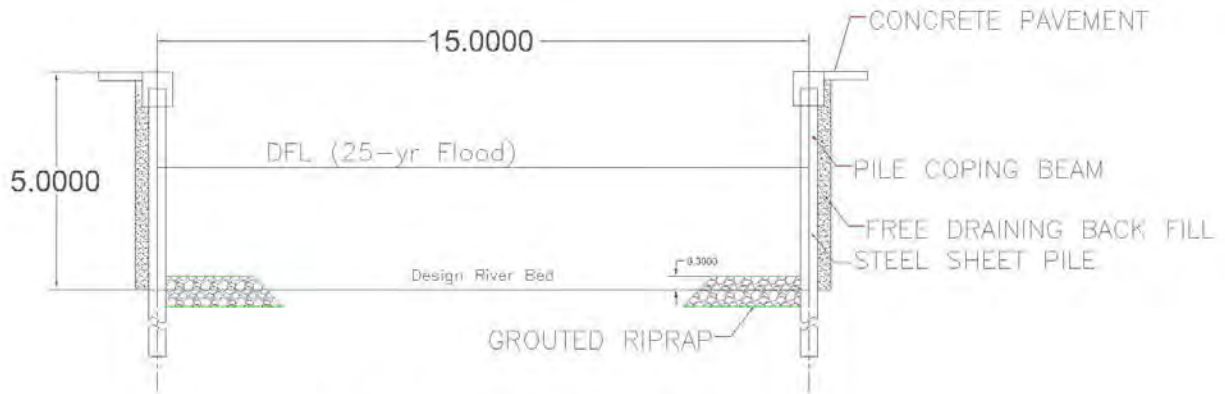
ANNEX D. Zapote-Las Piñas River



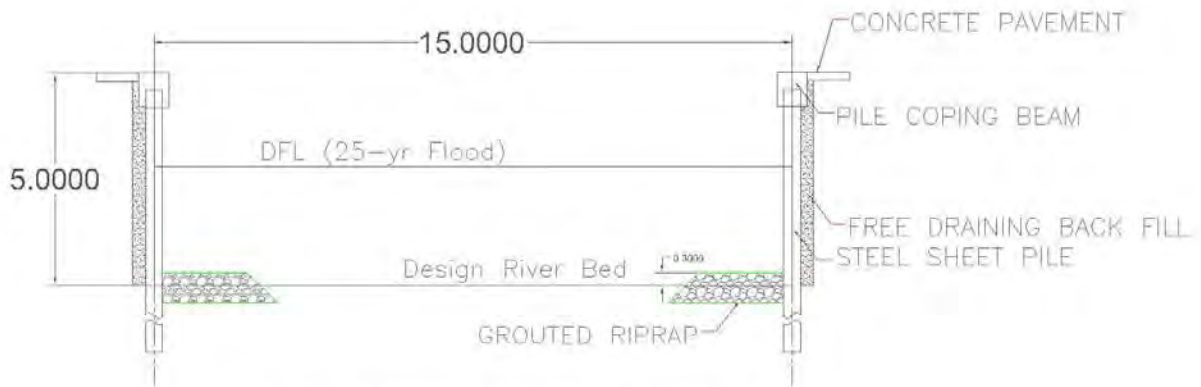
Notes:

Zapote River 25-yr					Las Piñas River 25-yr				
Reach	W	H	Existing Width	Landmark	Reach	W	H	Existing Width	Landmark
5	50	6	20		4	21	5	12	
4	57	6	21		3	24	4.5	14	
3	68	5	22		2	30	4	15	
2	80	5	25		1	36	3.5	18	Mouth
1	99	4	38	Mouth					

ANNEX E. Buendia-Maricaban-NAIA-Parañaque



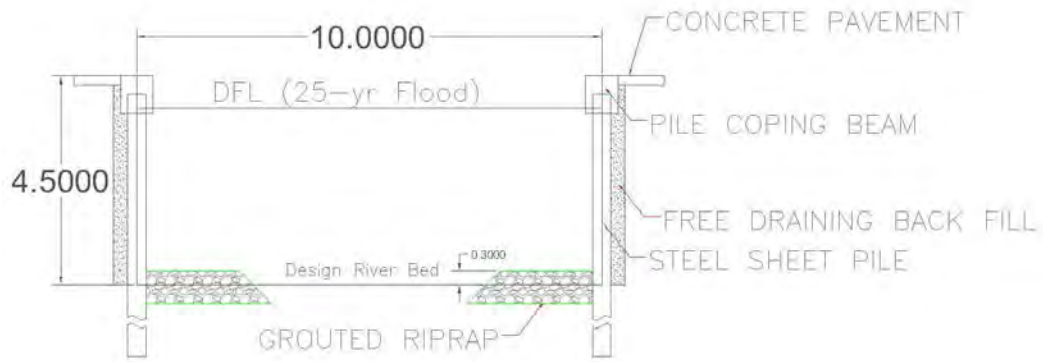
Calatagan Creek



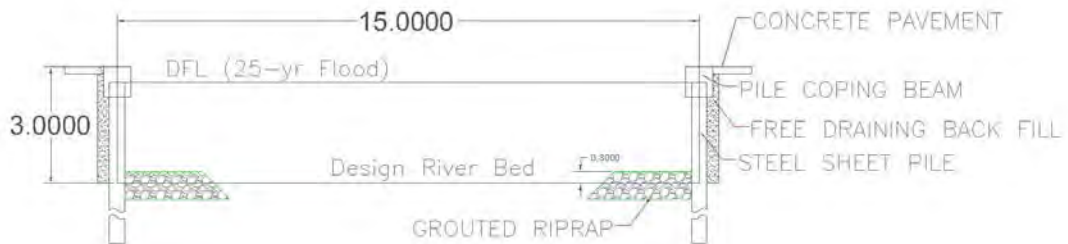
Makati Diversion Channel



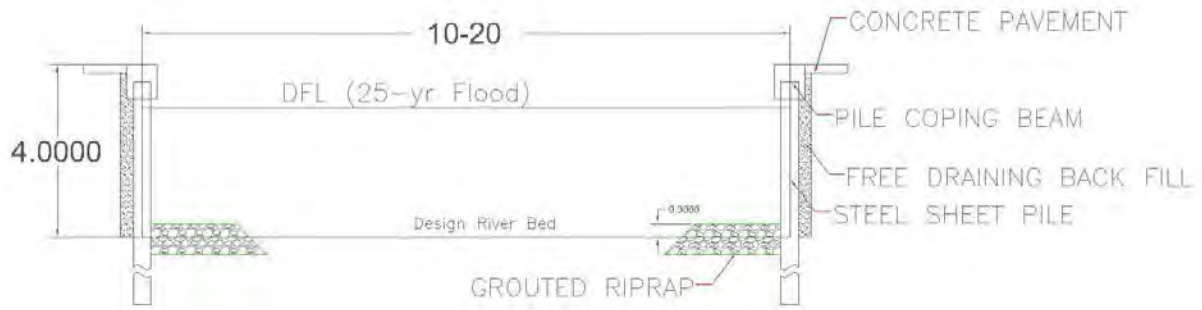
Maricaban I



Maricaban II



Maricaban III



Estero de Tripa de Gallina

(1) Design Discharge for Buendia, Maricaban, NAIA, and Parañaque.

Project Site	Rainfall Station	Duration	Catchment Area (km ²)	Peak Discharge (m ³ /s)	Specific Discharge (m ³ /s/km ²)
BUENDIA					
Tripa de Gallina	Port Area	60 mins	0.83	14.49	17.39
Calatagan Creek I	Port Area	60 mins	1.17	44.04	37.57
Calatagan Creek II	Port Area	60 mins	2.46	79.02	32.18
Zobel DM	Port Area	60 mins	2.26	49.36	21.86
Makati Diversion I	Port Area	60 mins	3.63	59.08	16.29
Makati Diversion II	Port Area	60 mins	1.17	48.81	41.74
Makati Div-Tripa	Port Area	60 mins	0.32	5.04	15.63
Calatagan Creek	Port Area	60 mins	0.65	14.69	22.72
Paco	Port Area	60 mins	1.42	14.04	9.88
Pandacan	Port Area	60 mins	1.91	15.49	8.11
Provisor	Port Area	60 mins	2.30	18.49	8.04
Libertad pumping Station	Port Area	60 mins	6.51	58.99	9.06
Edsa Outfall	Port Area	60 mins	1.27	55.68	43.99
Libertad Outfall	Port Area	60 mins	0.99	10.06	10.14
Buendia Outfall	Port Area	60 mins	2.27	22.14	9.76
Vito Cruz Outfall	Port Area	60 mins	0.42	6.01	14.35
Project Site	Rainfall Station	Duration	Catchment Area (km ²)	Peak Discharge (m ³ /s)	Specific Discharge (m ³ /s/km ²)
MARICABAN					
Maricaban Creek I	NAIA	60 mins	6.45	217.36	33.69
Maricaban Creek II	NAIA	60 mins	1.56	77.56	49.74
Maricaban Creek III	NAIA	60 mins	3.34	164.21	49.21
Project Site	Rainfall Station	Duration	Catchment Area (km ²)	Peak Discharge (m ³ /s)	Specific Discharge (m ³ /s/km ²)
NAIA					
Parañaque Channel 1	NAIA	60 mins	11.02	266.26	24.16
Rivera	NAIA	60 mins	0.44	23.07	52.34
Parañaque Channel 2	NAIA	60 mins	10.58	171.97	16.26
Airport Road	NAIA	60 mins	1.06	49.92	47.19
Parañaque Channel 3	NAIA	60 mins	12.08	186.57	15.45
Librada	NAIA	60 mins	1.21	20.24	16.76
Parañaque Channel 4	NAIA	60 mins	12.88	160.76	12.48
Seaside	NAIA	60 mins	1.49	10.30	6.93
Parañaque Channel 5	NAIA	60 mins	15.74	192.21	12.21
Inland Channel	NAIA	60 mins	1.74	101.35	58.36
Redemptorist Channel	NAIA	60 mins	2.68	105.00	39.12
Seaside Channel	NAIA	60 mins	4.73	126.99	26.87
Banana Island Creek	NAIA	60 mins	1.47	31.97	21.77
Ibaya Creek	NAIA	60 mins	0.27	13.46	50.20
Cut-cut Creek	NAIA	60 mins	1.94	48.38	24.93
Project Site	Rainfall Station	Duration	Catchment Area (km ²)	Peak Discharge (m ³ /s)	Specific Discharge (m ³ /s/km ²)
PARANAQUE					
Baliwag River	NAIA	60 mins	9.09	276.31	30.41
Don Galo River	NAIA	60 mins	15.39	510.57	33.17*
San Dionisio River	NAIA	60 mins	10.22	90.62	8.86
San Isidro River	NAIA	60 mins	13.54	521.25	38.49
Las Piñas River	NAIA	60 mins	12.38	122.85	9.92
South Parañaque River	NAIA	60 mins	42.36	863.92	20.39
Parañaque River (Manila Bay)	NAIA	60 mins	57.23	1024.68	17.91

Source: DPWH-UPMO-FCMC- and Woodfields Consultants Inc.

Specific discharges are computed by JICA Survey Team based on the data source.

*: Catchment area was modified

Requested Data Summary for JICA Study on Flood Control

(2) Design Discharge for Tullahan River

Project Site	Rainfall Station	Duration	Catchment Area (km ²)	Peak Discharge (m ³ /s)	Specific Discharge (m ³ /s/km ²)
1. Tenejeros Bridge	Science Garden	24-hrs	70.00	588.40	8.41
2. PNR	Science Garden	24-hrs	68.44	582.00	8.50
3. McArthur highway	Science Garden	24-hrs	62.12	564.40	9.09
4. NLEX	Science Garden	24-hrs	52.50	553.20	10.54

(3) Design Discharge for Zapote-Las Piñas River

Project Site	Rainfall Station	Duration	Catchment Area (km ²)	Peak Discharge (m ³ /s)	Specific Discharge (m ³ /s/km ²)
1. Zapote River	NAIA	24-hrs	67.00	703.00	10.49
2. Las Piñas River	NAIA	24-hrs	21.44	197.00	9.19

(4) Design Discharge for UST-España Areas

Project Site	Rainfall Station	Duration	Catchment Area (km ²)	Peak Discharge (m ³ /s)	Specific Discharge (m ³ /s/km ²)
1. Constancia Interceptor	Port Area	1 hr	1.55	17.25	11.12
2. Antipolo Interceptor	Port Area	1 hr	1.50	21.92	14.59
3. Pureza Interceptor	Port Area	1 hr	3.25	51.55	15.84
4. Casanas-Margal-Quijote DM	Port Area	1 hr	1.98	19.68	9.94
5. Earnshaw DM	Port Area	1 hr	0.23	5.81	24.99
6. Lepanto-Forbes DM (Existing)	Port Area	1 hr	2.43	20.10	8.29
7. Estero de Valencia	Port Area	1 hr	1.84	29.08	15.80
8. Estero de Sampaloc I	Port Area	1 hr	2.73	20.17	7.38
9. Estero de San Miguel- Uli-Uli	Port Area	1 hr	0.47	7.09	14.98

(5) Design Discharge for San Juan River

Project Site	Rainfall Station	Duration	Catchment Area (km ²)	Peak Discharge (m ³ /s)	Specific Discharge (m ³ /s/km ²)
1. STA 1+100	Science Garden	24-hrs	91.60	822.50	8.98
2. STA 3+350	Science Garden	24-hrs	82.58	728.46	8.82
3. STA 7+250	Science Garden	24-hrs	51.49	436.95	8.49
4. STA 11+100	Science Garden	24-hrs	14.40	283.60	19.69

Source: DPWH-UPMO-FCMC- and Woodfields Consultants Inc.

Specific discharges are computed by JICA Survey Team based on the data source.

a. Science Garden

Duration in hours

Return Period	1	3	6	12	24
2	55.5	90.3	117.4	136.3	156.0
5	81.8	135.7	185.1	216.1	243.1
10	99.3	165.8	229.9	268.9	300.7
15	109.1	182.7	255.2	298.8	333.3
20	116.0	194.6	272.9	319.6	356.0
25	121.3	203.8	286.5	335.7	373.6
30	125.4	210.8	297.1	348.2	387.1
50	137.6	231.9	328.5	385.2	427.6
100	153.8	259.9	370.2	343.4	481.2

b. Port Area

Duration in hours

Return Period	1	3	6	12	24
2	55.5	86.3	111.2	134.6	153.3
5	75.2	121.4	160.0	195.9	223.5
10	88.1	144.6	192.3	236.6	270.0
15	95.5	157.7	210.5	259.5	296.3
20	100.6	166.9	223.2	275.6	314.6
25	104.5	174.0	233.1	288.0	328.8
50	116.7	195.7	263.3	326.1	372.4
100	128.8	217.3	293.4	363.9	415.8

c. NAIA

Duration in hours

Return Period	1	3	6	12	24
2	49.4	77.6	101.1	125.5	143.8
5	82.1	132.9	173.6	215.3	246.9
10	103.7	169.5	221.5	274.7	315.2
20	124.4	204.6	267.5	331.7	380.7
25	131.0	215.8	282.1	349.8	401.5
50	151.2	250.1	327.1	405.6	465.5
100	171.3	284.2	371.7	460.9	529.1

Appendix 3-1
Cost of Damages
of Tropical Storm “Ondoy”
(OCD Situation Report)

Table Damage Estimation in Each Area by City/Municipality

City Area (m2) in each area					Damage		
Area Name	City/Municipality Name	Area	City Area	Ratio	Ondoy	in each Area	Total
		[1]	[2]	[3]=[1]/[2]	[4]	[5]=[4]*[3]	
Buendia	Makati City	8,529,800	31,973,600	0.27	195,000	52,650	
Buendia	Manila City	2,970,870	41,302,300	0.07	12,269,380	858,857	
Buendia	Pasay City	4,873,140	17,786,300	0.27	4,255,250	1,148,918	
Buendia	Pranaque City	54,778	45,625,500	0.00	32,207,679	0	2,060,424
Espana-UST	Manila City	7,715,000	41,302,300	0.19	12,269,380	2,331,182	
Espana-UST	Queson City	2,520,600	165,391,000	0.02	55,951,466	1,119,029	3,450,212
Las Pinas	Las Pinas City	15,498,600	32,279,400	0.48	10,591,150	5,083,752	
Las Pinas	Muntinlupa City	54,856	38,144,000	0.00	14,482,500	0	
Las Pinas	Pranaque City	991,375	45,625,500	0.02	32,207,679	644,154	5,727,906
Maricaban	Makati City	6,381,310	31,973,600	0.20	195,000	39,000	
Maricaban	Pasay City	3,390,520	17,786,300	0.19	4,255,250	808,498	
Maricaban	Pranaque City	50,575	45,625,500	0.00	32,207,679	0	
Maricaban	Taguig City	1,813,970	27,531,100	0.07	4,960,150	347,211	1,194,708
Naia	Pasay City	6,170,160	17,786,300	0.35	4,255,250	1,489,338	
Naia	Pranaque City	5,287,650	45,625,500	0.12	32,207,679	3,864,922	5,354,259
Paranaque	Las Pinas City	4,681,800	32,279,400	0.15	10,591,150	1,588,673	
Paranaque	Muntinlupa City	36,935	38,144,000	0.00	14,482,500	0	
Paranaque	Pasay City	2,076,160	17,786,300	0.12	4,255,250	510,630	
Paranaque	Pranaque City	33,919,900	45,625,500	0.74	32,207,679	23,833,683	
Paranaque	Taguig City	621,945	27,531,100	0.02	4,960,150	99,203	24,443,516
San Juan	Kalookan City	1,475,520	53,137,300	0.03	5,464,150	163,925	
San Juan	Malabon City	1,682	15,969,800	0.00	10,660,900	0	
San Juan	Mandaluyong City	6,577,600	11,073,100	0.59	4,174,421	2,462,908	
San Juan	Manila City	1,427,430	41,302,300	0.03	12,269,380	368,081	
San Juan	Pasig City	735,362	31,893,500	0.02	17,426,000	348,520	
San Juan	Queson City	72,542,000	165,391,000	0.44	55,951,466	24,618,645	
San Juan	San Juan City	5,881,880	5,881,880	1.00	15,660,000	15,660,000	43,622,079
Tullahan	Kalookan City	5,837,300	53,137,300	0.11	5,464,150	601,057	
Tullahan	Malabon City	14,890,100	15,969,800	0.93	10,660,900	9,914,637	
Tullahan	Manila City	207,765	41,302,300	0.01	12,269,380	122,694	
Tullahan	Navotas City	6,305,000	10,954,000	0.58	0	0	
Tullahan	Queson City	53,370,300	165,391,000	0.32	55,951,466	17,904,469	
Tullahan	Rodriguez City	609,465	263,142,000	0.00	0	0	
Tullahan	San Jose Del Monte City	448,003	104,855,000	0.00	0	0	
Tullahan	Valenzuela City	8,326,560	44,537,900	0.19	4,692,900	891,651	29,434,507
Zapote	Bacoor	26,536,800	46,961,800	0.57	2,810,142	1,601,781	
Zapote	Dasmarinas	11,694,700	88,209,200	0.13	5,278,340	686,184	
Zapote	Las Pinas City	11,450,900	32,279,400	0.35	10,591,150	3,706,903	
Zapote	Muntinlupa City	322,969	38,144,000	0.01	14,482,500	144,825	6,139,693

Area in each area	m2
Naia	11,460,208
Zapote	50,342,270
Las Pinas	16,580,130
Tullahan	90,064,825
Paranaque	41,361,833
Maricaban	11,636,372
Buendia	16,428,585
San Juan	88,641,444
Espana-UST	10,235,595

336,751,261

City/Municipality Area	m2
Bacoor	46,961,800
Dasmariñas	88,209,200
Kalookan City	53,137,300
Las Pinas City	32,279,400
Makati City	31,973,600
Malabon City	15,969,800
Mandaluyong City	11,073,100
Manila City	41,302,300
Muntinlupa City	38,144,000
Navotas City	10,954,000
Pranaque City	45,625,500
Pasay City	17,786,300
Pasig City	31,893,500
Queson City	165,391,000
San Juan City	5,881,880
Taguig City	27,531,100
Valenzuela City	44,537,900
Rodriguez City	263,142,000
San Jose Del Monte City	104,855,000

Cavite Province	1,512,410,000
Bacoor	0.03
Dasmariñas	0.06

2009 Ondoy Damage	Php
Bacoor	2,810,142 *
Dasmariñas	5,278,340 *
Kalookan City	5,464,150
Las Pinas City	10,591,150
Makati City	195,000
Malabon City	10,660,900
Mandaluyong City	4,174,421
Manila City	12,269,380
Muntinlupa City	14,482,500
Navotas City	
Pranaque City	32,207,679
Pasay City	4,255,250
Pasig City	17,426,000
Queson City	55,951,466
San Juan City	15,660,000
Taguig City	4,960,150
Valenzuela City	4,692,900
Rodriguez City	
San Jose Del Monte City	
Cavite Province	90,500,930

*: computed based on Area Ratio

between province and the city/municipality

Source: Situation Report Effects of Tropical Storm "Ondoy"

EFFECTS OF TROPICAL STORM "ONDOY"
COST OF DAMAGES
September 24 - 27, 2009

Region/Province/City/Municipality	INFRASTRUCTURE				AGRICULTURE						Private Property	TOTAL COST (Infrastructure + Agriculture)		
	ROADS/BRIDGES/ OTHER STRUCTURES	FLOOD CONTROL	HEALTH FACILITIES	SCHOOLS		CROPS (Rice and Corn)		LIVESTOCKS	HVCC (Mango, Banana, Papaya, Vegetables)	FISHERIES			FACILITIES/ INFRASTRUCTURE/ EQUIPMENT DAMAGED	
				No. of Schools Damaged	AMOUNT (Schools)	Type of Crops / Livestocks	Estimated Peso Value			Estimated Peso Value				Type of Project/ Species
Pampanga	1,302,000,000.00			52	44,587,000.00	Rice	1,320,912,092.00		52,400,000.00	Tilapia, Milkfish, Prawn fishpond	48,279,725.00	185,675,000.00		2,953,853,817.00
Angeles City				1	150,000.00	Corn	3,342,613.00							3,492,613.00
San Fernando City				5	950,000.00	Livestock		23,000.00						23,000.00
UPRIS												158,411,416.00		158,411,416.00
Tarlac	1,500,000.00			8	667,000.00	Rice	638,356,400.00		4,500,000.00					663,423,400.00
Tarlac City				25	9,120,000.00	Livestock		255,150.00					18,400,000.00	9,375,150.00
Zambales	31,300,000.00			29	42,600,000.00	Rice	31,035,956.00		1,200,000.00				307,520.00	106,443,476.00
Olangapo City				17	13,360,000.00	Corn	55,000.00							55,000.00
Region IV-A	836,635,000.00	15,000,000.00	-	502	227,918,426.00		928,661,263.00	42,535,716.00	53,570,000.00		48,153,657.00	102,362,980.00		2,239,837,042.00
Batangas	35,300,000.00			44	35,070,000.00	Rice	39,525,000.00		2,660,000.00	Tilapia Fincage/Fishpond	19,302,500.00			131,857,500.00
						Corn	6,131,500.00			Seaweeds	45,000.00			6,176,500.00
						Livestock		11,100,036.00						11,100,036.00
						Service Boat							80,000.00	80,000.00
						Poultry House, flying pens, pigpens							142,500.00	142,500.00
Cavite	20,000,000.00	12,000,000.00		107	39,495,000.00	Rice	14,824,000.00		2,610,000.00	Sugpo/Milkfish Fishpond	3,358,830.00			80,287,830.00
						Corn	5,382,000.00							5,382,000.00
						Livestocks		88,500.00						88,500.00
						Motorized Banca							580,000.00	580,000.00
						Baklad/Fishpond							4,082,600.00	4,082,600.00
						Hook & Line/Gillnets							65,000.00	65,000.00
						Pigpens							15,000.00	15,000.00
Laguna	7,500,000.00			119	108,353,000.00	Rice	646,926,870.00		43,500,000.00	Tilapia				844,343,870.00
						Corn	11,635,450.00			Fishpond	6,064,000.00			11,635,450.00
						Livestock		10,336,800.00						10,336,800.00
						Gillnets/Fishtraps							2,000,000.00	2,000,000.00
						Fishnets/Bancas							300,000.00	300,000.00
Sta. Rosa City				8	2,875,900.00	Hatchery pond for Tilapia							6,820,000.00	9,695,900.00
San Pablo City				54	14,800,000.00	Fishcages/fishponds							2,482,880.00	17,282,880.00
Calamba City				57	928,000.00									928,000.00
Quezon	8,000,000.00	3,000,000.00		2	900,000.00	Rice	8,829,750.00		1,300,000.00	Tilapia				20,157,750.00
						Corn	1,092,000.00			Milkfish				1,092,000.00
						Livestock		153,600.00					2,000,000.00	2,153,600.00
						Fishing/MBs							360,000.00	360,000.00
Quezon - Marinduque						Fishnets/Bancas							200,000.00	200,000.00
Rizal	375,385,000.00			103	24,390,350.00	Rice	192,642,893.00		3,500,000.00	Seaweeds	18,255,327.00			614,173,570.00
						Corn	1,671,800.00							1,671,800.00
						Livestock		20,856,780.00						20,856,780.00
						P. House + Pigpens							1,235,000.00	1,235,000.00
Antipolo City	35,000,000.00			8	1,106,176.00	CIS							50,000,000.00	86,106,176.00
Baras	53,500,000.00													53,500,000.00
Tanay	301,950,000.00													301,950,000.00
Region IV-B	62,700,000.00	-	-	21	3,215,000.00		132,439,000.00	-	9,032,500.00		-	189,000.00		207,575,500.00
Marinduque				6	75,000.00	Corn	234,000.00		2,250,000.00					2,559,000.00
Occidental Mindoro	38,700,000.00			15	3,140,000.00	Rice	120,811,750.00		6,100,000.00					168,751,750.00
						Corn	8,010,250.00							8,010,250.00
						Motorized Banca							180,000.00	180,000.00
						Squid Jiggers							9,000.00	9,000.00
Oriental Mindoro							3,383,000.00							3,383,000.00
Palawan	3,000,000.00								682,500.00					3,682,500.00
Romblon	21,000,000.00													21,000,000.00
Region V	96,410,000.00	-	-	0	-		74,224,587.00	-	9,019,570.00		-	109,588,000.00		289,242,157.00
Albay	1,270,000.00					Rice	6,528,000.00		2,900,159.00					10,698,159.00
						Corn	190,168.00							190,168.00
Camarines Norte	54,000,000.00					Rice	3,536,000.00		530,563.00			80,700,000.00		138,766,563.00
Camarines Sur	35,000,000.00					Rice	62,476,129.00		5,362,072.00			2,638,000.00		105,476,201.00
						Corn	342,590.00							342,590.00
Catanduanes	6,140,000.00								38,571.00					6,178,571.00
Masbate						Rice	913,700.00		188,205.00			26,250,000.00		27,351,905.00
Sorsogon						Rice	238,000.00							238,000.00
Region IX	-	-	-	0	-		374,000.00	-	-		-	-		374,000.00
Zamboanga Sur						Rice	374,000.00							374,000.00

Appendix 3-2
Pumping Capacity Calculation
to cope with 50-yr flood
Espana-UST Area

Computation of Pumping Capacity to cope with 50-yr flood (España-UST Area)

時間	Inflow m ³ /s				Inflow m ³	32.6 m ³ /s	
	Intake 1	Intake 2	Intake 3	Total		Pumping	Storage Pipe
						m ³	446,000
25-9-2009 09:00:00	0.0	0.0	0.0	0.0		445,123	
25-9-2009 09:10:00	0.0	0.0	0.0	0.0	0		
25-9-2009 09:20:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 09:30:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 09:40:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 09:49:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 10:00:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 10:09:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 10:20:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 10:30:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 10:39:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 10:50:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 11:00:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 11:10:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 11:19:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 11:30:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 11:40:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 11:49:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 12:00:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 12:10:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 12:19:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 12:30:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 12:40:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 12:49:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 13:00:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 13:09:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 13:20:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 13:30:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 13:39:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 13:50:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 14:00:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 14:09:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 14:20:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 14:30:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 14:39:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 14:50:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 15:00:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 15:09:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 15:20:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 15:30:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 15:39:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 15:50:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 16:00:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 16:09:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 16:20:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 16:30:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 16:39:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 16:50:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 17:00:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 17:10:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 17:19:59	0.0	0.0	0.0	0.0	0	0	

Computation of Pumping Capacity to cope with 50-yr flood (España-UST Area)

時間	Inflow m ³ /s				Inflow m ³	32.6 m ³ /s	
	Intake 1	Intake 2	Intake 3	Total		Pumping	Storage Pipe
						m ³	446,000
25-9-2009 17:30:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 17:40:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 17:49:59	0.0	0.0	0.0	0.0	0	0	
25-9-2009 18:00:00	0.0	0.0	0.0	0.0	0	0	
25-9-2009 18:10:00	0.0	0.0	0.0	0.1	18	18	
25-9-2009 18:19:59	0.1	0.1	0.1	0.3	96	114	
25-9-2009 18:30:00	0.1	0.1	0.2	0.4	197	311	
25-9-2009 18:40:00	0.1	0.1	0.2	0.5	259	569	
25-9-2009 18:49:59	0.1	0.1	0.2	0.5	286	856	
25-9-2009 19:00:00	0.1	0.1	0.2	0.5	299	1,154	
25-9-2009 19:10:00	0.2	0.2	0.3	0.7	364	1,519	
25-9-2009 19:19:59	0.4	0.4	0.6	1.4	626	2,145	
25-9-2009 19:30:00	0.5	0.5	0.9	1.8	966	3,111	
25-9-2009 19:40:00	0.5	0.5	1.0	2.1	1,172	4,283	
25-9-2009 19:49:59	0.6	0.5	1.0	2.2	1,265	5,548	
25-9-2009 20:00:00	0.6	0.6	1.1	2.2	1,305	6,853	
25-9-2009 20:10:00	0.5	0.5	1.0	2.0	1,265	8,118	
25-9-2009 20:19:59	0.4	0.3	0.7	1.4	1,016	9,134	
25-9-2009 20:30:00	0.2	0.2	0.5	0.9	679	9,813	
25-9-2009 20:40:00	0.2	0.2	0.3	0.7	475	10,288	
25-9-2009 20:49:59	0.2	0.1	0.3	0.6	383	10,671	
25-9-2009 21:00:00	0.2	0.1	0.3	0.6	343	11,015	
25-9-2009 21:10:00	0.3	0.3	0.5	1.1	504	11,519	
25-9-2009 21:19:59	0.8	0.8	1.4	3.1	1,272	12,790	
25-9-2009 21:30:00	1.2	1.2	2.1	4.5	2,288	15,078	
25-9-2009 21:40:00	1.4	1.3	2.5	5.2	2,903	17,981	
25-9-2009 21:49:59	1.4	1.4	2.6	5.4	3,181	21,162	
25-9-2009 22:00:00	1.5	1.4	2.7	5.6	3,302	24,464	
25-9-2009 22:10:00	1.5	1.4	2.7	5.7	3,374	27,838	
25-9-2009 22:19:59	1.6	1.5	2.8	5.9	3,476	31,314	
25-9-2009 22:30:00	1.6	1.5	2.9	6.1	3,590	34,904	
25-9-2009 22:40:00	1.6	1.5	2.9	6.1	3,657	38,561	
25-9-2009 22:49:59	1.7	1.5	3.0	6.2	3,689	42,250	
25-9-2009 23:00:00	1.7	1.5	3.0	6.2	3,702	45,952	
25-9-2009 23:10:00	1.6	1.5	2.9	6.0	3,666	49,617	
25-9-2009 23:19:59	1.5	1.4	2.7	5.6	3,488	53,105	
25-9-2009 23:30:00	1.4	1.3	2.5	5.3	3,250	56,355	
25-9-2009 23:40:00	1.4	1.3	2.5	5.1	3,106	59,461	
25-9-2009 23:49:59	1.4	1.3	2.4	5.0	3,043	62,504	
26-9-2009 00:00:00	1.3	1.3	2.4	5.0	3,016	65,520	
26-9-2009 00:10:00	1.3	1.2	2.3	4.7	2,925	68,445	
26-9-2009 00:19:59	1.0	0.9	1.9	3.9	2,582	71,027	
26-9-2009 00:30:00	0.9	0.8	1.6	3.3	2,137	73,163	
26-9-2009 00:40:00	0.8	0.7	1.4	3.0	1,869	75,032	
26-9-2009 00:49:59	0.8	0.7	1.4	2.9	1,749	76,780	
26-9-2009 01:00:00	0.8	0.7	1.3	2.8	1,695	78,475	
26-9-2009 01:09:59	1.2	1.1	2.0	4.2	2,100	80,575	
26-9-2009 01:20:00	2.4	2.4	4.1	9.0	3,953	84,527	
26-9-2009 01:30:00	3.3	3.3	5.8	12.3	6,395	90,923	
26-9-2009 01:39:59	3.7	3.6	6.6	13.9	7,872	98,795	
26-9-2009 01:50:00	3.9	3.7	7.0	14.6	8,539	107,334	

Computation of Pumping Capacity to cope with 50-yr flood (España-UST Area)

時間	Inflow m ³ /s				Inflow m ³	32.6 m ³ /s	
	Intake 1	Intake 2	Intake 3	Total		Pumping	Storage Pipe
					m ³	446,000	
26-9-2009 02:00:00	4.0	3.8	7.1	14.9	8,831		116,164
26-9-2009 02:09:59	3.8	3.6	6.8	14.2	8,712		124,877
26-9-2009 02:20:00	3.1	2.8	5.6	11.4	7,686		132,562
26-9-2009 02:30:00	2.6	2.3	4.6	9.5	6,285		138,847
26-9-2009 02:39:59	2.3	2.1	4.2	8.6	5,435		144,282
26-9-2009 02:50:00	2.2	2.0	4.0	8.2	5,052		149,333
26-9-2009 03:00:00	2.2	2.0	3.9	8.1	4,885		154,218
26-9-2009 03:09:59	2.2	2.0	3.8	8.0	4,809		159,027
26-9-2009 03:20:00	2.1	2.0	3.8	7.9	4,774		163,801
26-9-2009 03:30:00	2.1	2.0	3.8	7.9	4,758		168,559
26-9-2009 03:39:59	2.1	2.0	3.8	7.9	4,751		173,310
26-9-2009 03:50:00	2.1	2.0	3.8	7.9	4,747		178,057
26-9-2009 04:00:00	2.1	2.0	3.8	7.9	4,745		182,801
26-9-2009 04:09:59	2.2	2.1	4.0	8.3	4,863		187,665
26-9-2009 04:20:00	2.6	2.5	4.6	9.6	5,381		193,046
26-9-2009 04:30:00	2.8	2.7	5.0	10.6	6,061		199,107
26-9-2009 04:39:59	2.9	2.8	5.3	11.0	6,472		205,579
26-9-2009 04:50:00	3.0	2.8	5.4	11.2	6,657		212,236
26-9-2009 05:00:00	3.0	2.8	5.4	11.3	6,738		218,974
26-9-2009 05:09:59	2.8	2.6	5.1	10.6	6,554		225,528
26-9-2009 05:20:00	2.2	2.0	4.0	8.1	5,614		231,142
26-9-2009 05:30:00	1.7	1.5	3.2	6.4	4,364		235,506
26-9-2009 05:39:59	1.5	1.3	2.7	5.6	3,607		239,113
26-9-2009 05:50:00	1.4	1.3	2.6	5.3	3,265		242,379
26-9-2009 06:00:00	1.4	1.3	2.5	5.1	3,116		245,495
26-9-2009 06:09:59	1.2	1.1	2.2	4.6	2,917		248,411
26-9-2009 06:20:00	0.8	0.7	1.6	3.1	2,317		250,728
26-9-2009 06:30:00	0.6	0.5	1.0	2.1	1,556		252,284
26-9-2009 06:39:59	0.4	0.4	0.8	1.6	1,097		253,381
26-9-2009 06:50:00	0.4	0.3	0.7	1.4	889		254,270
26-9-2009 07:00:00	0.4	0.3	0.6	1.3	797		255,067
26-9-2009 07:09:59	0.3	0.3	0.6	1.2	757		255,824
26-9-2009 07:20:00	0.3	0.3	0.6	1.2	739		256,563
26-9-2009 07:30:00	0.3	0.3	0.6	1.2	730		257,292
26-9-2009 07:39:59	0.3	0.3	0.6	1.2	726		258,018
26-9-2009 07:50:00	0.3	0.3	0.6	1.2	724		258,743
26-9-2009 08:00:00	0.3	0.3	0.6	1.2	723		259,466
26-9-2009 08:09:59	0.3	0.3	0.5	1.1	699		260,165
26-9-2009 08:20:00	0.2	0.2	0.4	0.9	595		260,760
26-9-2009 08:30:00	0.2	0.2	0.3	0.7	459		261,219
26-9-2009 08:39:59	0.2	0.1	0.3	0.6	376		261,595
26-9-2009 08:50:00	0.1	0.1	0.3	0.5	339		261,934
26-9-2009 09:00:00	0.1	0.1	0.3	0.5	322		262,256
26-9-2009 09:09:59	0.5	0.4	0.8	1.7	668		262,924
26-9-2009 09:20:00	1.5	1.5	2.6	5.6	2,192		265,115
26-9-2009 09:30:00	2.2	2.2	3.9	8.4	4,196		269,311
26-9-2009 09:39:59	2.6	2.5	4.6	9.6	5,407		274,718
26-9-2009 09:50:00	2.7	2.6	4.9	10.2	5,953		280,671
26-9-2009 10:00:00	2.8	2.6	5.0	10.4	6,193		286,864
26-9-2009 10:09:59	3.9	3.6	6.7	14.2	7,381		294,245
26-9-2009 10:20:00	7.1	7.0	12.2	26.2	12,115		306,361

Computation of Pumping Capacity to cope with 50-yr flood (España-UST Area)

時間	Inflow m ³ /s				Inflow m ³	32.6 m ³ /s	
	Intake 1	Intake 2	Intake 3	Total		Pumping m ³	Storage Pipe 446,000
	26-9-2009 10:30:00	9.2	9.2	16.4	34.7	18,292	19,560
26-9-2009 10:39:59	10.3	10.0	18.4	38.7	22,021	19,560	307,554
26-9-2009 10:50:00	10.8	10.3	19.3	40.4	23,704	19,560	311,698
26-9-2009 11:00:00	11.0	10.4	19.7	41.1	24,442	19,560	316,580
26-9-2009 11:09:59	10.8	10.2	19.5	40.5	24,495	19,560	321,514
26-9-2009 11:20:00	10.1	9.3	18.2	37.6	23,429	19,560	325,384
26-9-2009 11:30:00	9.5	8.8	17.1	35.4	21,902	19,560	327,726
26-9-2009 11:39:59	9.3	8.6	16.6	34.5	20,970	19,560	329,136
26-9-2009 11:50:00	9.2	8.5	16.4	34.0	20,551	19,560	330,127
26-9-2009 12:00:00	9.1	8.4	16.3	33.9	20,368	19,560	330,935
26-9-2009 12:09:59	9.2	8.5	16.4	34.2	20,404	19,560	331,779
26-9-2009 12:20:00	9.5	8.9	17.0	35.4	20,883	19,560	333,102
26-9-2009 12:30:00	9.8	9.1	17.5	36.4	21,545	19,560	335,087
26-9-2009 12:39:59	9.9	9.2	17.7	36.8	21,948	19,560	337,475
26-9-2009 12:50:00	9.9	9.3	17.8	37.0	22,130	19,560	340,045
26-9-2009 13:00:00	10.0	9.3	17.8	37.1	22,209	19,560	342,694
26-9-2009 13:09:59	10.4	9.7	18.5	38.5	22,681	19,560	345,815
26-9-2009 13:20:00	11.7	11.0	20.7	43.4	24,586	19,560	350,841
26-9-2009 13:30:00	12.5	11.9	22.4	46.8	27,076	19,560	358,357
26-9-2009 13:39:59	13.0	12.2	23.2	48.4	28,578	19,560	367,375
26-9-2009 13:50:00	13.2	12.4	23.6	49.1	29,257	19,560	377,073
26-9-2009 14:00:00	13.3	12.4	23.8	49.4	29,555	19,560	387,068
26-9-2009 14:09:59	13.1	12.2	23.5	48.9	29,493	19,560	397,000
26-9-2009 14:20:00	12.6	11.6	22.6	46.8	28,700	19,560	406,140
26-9-2009 14:30:00	12.2	11.2	21.8	45.2	27,605	19,560	414,186
26-9-2009 14:39:59	12.0	11.1	21.5	44.6	26,940	19,560	421,566
26-9-2009 14:50:00	11.9	11.0	21.3	44.3	26,642	19,560	428,648
26-9-2009 15:00:00	11.9	11.0	21.2	44.1	26,512	19,560	435,600
26-9-2009 15:09:59	11.2	10.4	20.2	41.8	25,784	19,560	441,825
26-9-2009 15:20:00	9.2	8.3	16.8	34.4	22,858	19,560	445,123
26-9-2009 15:30:00	7.9	7.0	14.2	29.1	19,038	19,560	444,601
26-9-2009 15:39:59	7.2	6.5	12.9	26.7	16,730	19,560	441,771
26-9-2009 15:50:00	6.9	6.3	12.4	25.6	15,689	19,560	437,900
26-9-2009 16:00:00	6.8	6.2	12.1	25.2	15,233	19,560	433,573
26-9-2009 16:09:59	6.4	5.9	11.4	23.6	14,639	19,560	428,652
26-9-2009 16:20:00	5.2	4.6	9.4	19.2	12,864	19,560	421,956
26-9-2009 16:30:00	4.4	3.9	7.9	16.1	10,610	19,560	413,006
26-9-2009 16:39:59	4.0	3.6	7.1	14.7	9,253	19,560	402,699
26-9-2009 16:50:00	3.8	3.5	6.8	14.1	8,640	19,560	391,779
26-9-2009 17:00:00	3.7	3.4	6.7	13.8	8,372	19,560	380,591
26-9-2009 17:10:00	3.7	3.4	6.5	13.5	8,209	19,560	369,240
26-9-2009 17:19:59	3.5	3.2	6.3	13.0	7,973	19,560	357,653
26-9-2009 17:30:00	3.4	3.1	6.1	12.7	7,709	19,560	345,801
26-9-2009 17:40:00	3.4	3.1	6.0	12.5	7,553	19,560	333,794
26-9-2009 17:49:59	3.3	3.1	6.0	12.4	7,482	19,560	321,717
26-9-2009 18:00:00	3.3	3.1	6.0	12.4	7,451	19,560	309,608
26-9-2009 18:10:00	3.2	3.0	5.7	11.9	7,282	19,560	297,330
26-9-2009 18:19:59	2.7	2.5	4.9	10.1	6,603	19,560	284,373
26-9-2009 18:30:00	2.4	2.2	4.3	8.9	5,716	19,560	270,529
26-9-2009 18:40:00	2.3	2.0	4.0	8.4	5,180	19,560	256,149
26-9-2009 18:49:59	2.2	2.0	3.9	8.1	4,939	19,560	241,528

Computation of Pumping Capacity to cope with 50-yr flood (España-UST Area)

時間	Inflow m ³ /s				Inflow m ³	32.6 m ³ /s	
	Intake 1	Intake 2	Intake 3	Total		Pumping	Storage Pipe
					m ³	m ³	446,000
26-9-2009 19:00:00	2.2	2.0	3.9	8.0	4,833	19,560	226,801
26-9-2009 19:10:00	2.1	1.9	3.7	7.7	4,707	19,560	211,948
26-9-2009 19:19:59	1.8	1.7	3.3	6.8	4,349	19,560	196,737
26-9-2009 19:30:00	1.7	1.5	3.0	6.2	3,896	19,560	181,073
26-9-2009 19:40:00	1.6	1.5	2.8	5.9	3,625	19,560	165,138
26-9-2009 19:49:59	1.6	1.4	2.8	5.8	3,502	19,560	149,080
26-9-2009 20:00:00	1.5	1.4	2.8	5.7	3,448	19,560	132,968
26-9-2009 20:10:00	1.4	1.3	2.5	5.1	3,244	19,560	116,652
26-9-2009 20:19:59	0.8	0.7	1.6	3.1	2,456	19,560	99,548
26-9-2009 20:30:00	0.5	0.3	0.9	1.7	1,432	19,560	81,420
26-9-2009 20:40:00	0.3	0.2	0.5	1.0	814	19,560	62,674
26-9-2009 20:49:59	0.2	0.2	0.4	0.8	535	19,560	43,649
26-9-2009 21:00:00	0.2	0.1	0.3	0.6	412	19,560	24,501
26-9-2009 21:10:00	0.3	0.3	0.5	1.0	495	19,560	5,436
26-9-2009 21:19:59	0.7	0.7	1.2	2.5	1,065	19,560	-13,059
26-9-2009 21:30:00	1.0	1.0	1.7	3.6	1,835	19,560	-30,784
26-9-2009 21:40:00	1.1	1.1	1.9	4.1	2,301	19,560	-48,043
26-9-2009 21:49:59	1.1	1.1	2.1	4.3	2,512	19,560	-65,092
26-9-2009 22:00:00	1.2	1.1	2.1	4.4	2,605	19,560	-82,047
26-9-2009 22:10:00	1.2	1.1	2.1	4.3	2,611	19,560	-98,997
26-9-2009 22:19:59	1.1	1.0	1.9	3.9	2,474	19,560	-116,082
26-9-2009 22:30:00	1.0	0.9	1.8	3.7	2,279	19,560	-133,364
26-9-2009 22:40:00	1.0	0.9	1.7	3.5	2,159	19,560	-150,765
26-9-2009 22:49:59	0.9	0.9	1.7	3.5	2,105	19,560	-168,219
26-9-2009 23:00:00	0.9	0.9	1.7	3.5	2,082	19,560	-185,697
26-9-2009 23:10:00	0.8	0.8	1.5	3.0	1,953	19,560	-203,304
26-9-2009 23:19:59	0.5	0.4	0.9	1.7	1,429	19,560	-221,435
26-9-2009 23:30:00	0.2	0.1	0.4	0.8	747	19,560	-240,248
26-9-2009 23:40:00	0.1	0.1	0.2	0.3	335	19,560	-259,473
26-9-2009 23:49:59	0.1	0.0	0.1	0.2	150	19,560	-278,883
27-9-2009 00:00:00	0.0	0.0	0.0	0.1	68	19,560	-298,375
27-9-2009 00:10:00	0.0	0.0	0.0	0.1	49	19,560	-317,885
27-9-2009 00:19:59	0.1	0.1	0.1	0.3	110	19,560	-337,335
27-9-2009 00:30:00	0.1	0.1	0.2	0.4	204	19,560	-356,691
27-9-2009 00:40:00	0.1	0.1	0.2	0.5	262	19,560	-375,988
27-9-2009 00:49:59	0.1	0.1	0.2	0.5	288	19,560	-395,260
27-9-2009 01:00:00	0.1	0.1	0.2	0.5	299	19,560	-414,520
27-9-2009 01:10:00	0.1	0.1	0.2	0.5	305	19,560	-433,775
27-9-2009 01:19:59	0.1	0.1	0.2	0.5	308	19,560	-453,028
27-9-2009 01:30:00	0.1	0.1	0.2	0.5	309	19,560	-472,279
27-9-2009 01:40:00	0.1	0.1	0.2	0.5	309	19,560	-491,530
27-9-2009 01:49:59	0.1	0.1	0.2	0.5	309	19,560	-510,781
27-9-2009 02:00:00	0.1	0.1	0.2	0.5	309	19,560	-530,032
27-9-2009 02:10:00	0.1	0.1	0.2	0.5	291	19,560	-549,300
27-9-2009 02:19:59	0.1	0.1	0.1	0.3	214	19,560	-568,647
27-9-2009 02:30:00	0.0	0.0	0.1	0.1	112	19,560	-588,094
27-9-2009 02:40:00	0.0	0.0	0.0	0.1	51	19,560	-607,603
27-9-2009 02:49:59	0.0	0.0	0.0	0.0	23	19,560	-627,140
27-9-2009 03:00:00	0.0	0.0	0.0	0.0	10	19,560	-646,689
27-9-2009 03:10:00	0.0	0.0	0.0	0.0	4	19,560	-666,245
27-9-2009 03:19:59	0.0	0.0	0.0	0.0	2	19,560	-685,803

Computation of Pumping Capacity to cope with 50-yr flood (España-UST Area)

時間	Inflow m ³ /s				Inflow m ³	32.6 m ³ /s	
	Intake 1	Intake 2	Intake 3	Total		Pumping	Storage Pipe
						m ³	446,000
27-9-2009 03:30:00	0.0	0.0	0.0	0.0	1	19,560	-705,362
27-9-2009 03:40:00	0.0	0.0	0.0	0.0	1	19,560	-724,921
27-9-2009 03:49:59	0.0	0.0	0.0	0.0	0	19,560	-744,480
27-9-2009 04:00:00	0.0	0.0	0.0	0.0	0	19,560	-764,040
27-9-2009 04:10:00	0.0	0.0	0.0	0.0	0	19,560	-783,600
27-9-2009 04:19:59	0.0	0.0	0.0	0.0	0	19,560	-803,160
27-9-2009 04:30:00	0.0	0.0	0.0	0.0	0	19,560	-822,720
27-9-2009 04:40:00	0.0	0.0	0.0	0.0	0	19,560	-842,280
27-9-2009 04:49:59	0.0	0.0	0.0	0.0	0	19,560	-861,840
27-9-2009 05:00:00	0.0	0.0	0.0	0.0	0	19,560	-881,400
27-9-2009 05:10:00	0.0	0.0	0.0	0.0	0	19,560	-900,960
27-9-2009 05:19:59	0.0	0.0	0.0	0.0	0	19,560	-920,520
27-9-2009 05:30:00	0.0	0.0	0.0	0.0	0	19,560	-940,080
27-9-2009 05:40:00	0.0	0.0	0.0	0.0	0	19,560	-959,640
27-9-2009 05:49:59	0.0	0.0	0.0	0.0	0	19,560	-979,200
27-9-2009 06:00:00	0.0	0.0	0.0	0.0	0	19,560	-998,760
27-9-2009 06:10:00	0.0	0.0	0.0	0.0	0	19,560	-1,018,320
27-9-2009 06:19:59	0.0	0.0	0.0	0.0	0	19,560	-1,037,880
27-9-2009 06:30:00	0.0	0.0	0.0	0.0	0	19,560	-1,057,440
27-9-2009 06:40:00	0.0	0.0	0.0	0.0	0	19,560	-1,077,000
27-9-2009 06:49:59	0.0	0.0	0.0	0.0	0	19,560	-1,096,560
27-9-2009 07:00:00	0.0	0.0	0.0	0.0	0	19,560	-1,116,120
27-9-2009 07:10:00	0.0	0.0	0.0	0.0	0	19,560	-1,135,680
27-9-2009 07:19:59	0.0	0.0	0.0	0.0	0	19,560	-1,155,240
27-9-2009 07:30:00	0.0	0.0	0.0	0.0	0	19,560	-1,174,800
27-9-2009 07:40:00	0.0	0.0	0.0	0.0	0	19,560	-1,194,360
27-9-2009 07:49:59	0.0	0.0	0.0	0.0	0	19,560	-1,213,920
27-9-2009 08:00:00	0.0	0.0	0.0	0.0	0	19,560	-1,233,480
27-9-2009 08:10:00	0.0	0.0	0.0	0.0	0	19,560	-1,253,040
27-9-2009 08:19:59	0.0	0.0	0.0	0.0	0	19,560	-1,272,600
27-9-2009 08:30:00	0.0	0.0	0.0	0.0	0	19,560	-1,292,160
27-9-2009 08:40:00	0.0	0.0	0.0	0.0	0	19,560	-1,311,720
27-9-2009 08:49:59	0.0	0.0	0.0	0.0	0	19,560	-1,331,280
27-9-2009 09:00:00	0.0	0.0	0.0	0.0	0	19,560	-1,350,840
27-9-2009 09:10:00	0.0	0.0	0.0	0.0	0	19,560	-1,370,400
27-9-2009 09:19:59	0.0	0.0	0.0	0.0	0	19,560	-1,389,960
27-9-2009 09:30:00	0.0	0.0	0.0	0.0	0	19,560	-1,409,520
27-9-2009 09:40:00	0.0	0.0	0.0	0.0	0	19,560	-1,429,080
27-9-2009 09:49:59	0.0	0.0	0.0	0.0	0	19,560	-1,448,640
27-9-2009 10:00:00	0.0	0.0	0.0	0.0	0	19,560	-1,468,200
27-9-2009 10:10:00	0.0	0.0	0.0	0.0	0	19,560	-1,487,760
27-9-2009 10:19:59	0.0	0.0	0.0	0.0	0	19,560	-1,507,320
27-9-2009 10:30:00	0.0	0.0	0.0	0.0	0	19,560	-1,526,880
27-9-2009 10:40:00	0.0	0.0	0.0	0.0	0	19,560	-1,546,440
27-9-2009 10:49:59	0.0	0.0	0.0	0.0	0	19,560	-1,566,000
27-9-2009 11:00:00	0.0	0.0	0.0	0.0	0	19,560	-1,585,560
27-9-2009 11:10:00	0.0	0.0	0.0	0.0	0	19,560	-1,605,120
27-9-2009 11:19:59	0.0	0.0	0.0	0.0	0	19,560	-1,624,680
27-9-2009 11:30:00	0.0	0.0	0.0	0.0	0	19,560	-1,644,240
27-9-2009 11:40:00	0.0	0.0	0.0	0.0	0	19,560	-1,663,800
27-9-2009 11:49:59	0.0	0.0	0.0	0.0	0	19,560	-1,683,360

Appendix 3-3
Pumping Capacity Calculation
to cope with 50-yr flood
Buendia-Maricaban Area

Computation of Pumping Capacity to cope with 50-yr flood (Buendia-Maricaban Area)

時間	Inflow m ³ /s					Inflow m ³	44.7 m ³ /s	
	Intake1	Intake2	Intake3	Intake4	Total		Pumping m ³	Storage Pipe 844,000
25-9-2009 09:00:00	0.0	0.0	0.0	0.0	0.0			843,836
25-9-2009 09:10:00	0.0	0.0	0.0	0.0	0.0	0		
25-9-2009 09:20:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 09:30:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 09:40:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 09:49:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 10:00:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 10:09:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 10:20:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 10:30:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 10:39:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 10:50:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 11:00:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 11:10:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 11:19:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 11:30:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 11:40:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 11:49:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 12:00:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 12:10:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 12:19:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 12:30:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 12:40:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 12:49:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 13:00:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 13:09:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 13:20:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 13:30:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 13:39:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 13:50:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 14:00:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 14:09:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 14:20:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 14:30:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 14:39:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 14:50:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 15:00:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 15:09:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 15:20:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 15:30:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 15:39:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 15:50:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 16:00:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 16:09:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 16:20:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 16:30:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 16:39:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 16:50:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 17:00:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 17:10:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 17:19:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 17:30:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 17:40:00	0.0	0.0	0.0	0.0	0.0	0		0

Computation of Pumping Capacity to cope with 50-yr flood (Buendia-Maricaban Area)

時間	Inflow m ³ /s					Inflow m ³	44.7 m ³ /s	
	Intake1	Intake2	Intake3	Intake4	Total		Pumping m ³	Storage Pipe 844,000
25-9-2009 17:49:59	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 18:00:00	0.0	0.0	0.0	0.0	0.0	0		0
25-9-2009 18:10:00	0.0	0.0	0.0	0.0	0.0	12		12
25-9-2009 18:19:59	0.1	0.0	0.0	0.0	0.2	68		80
25-9-2009 18:30:00	0.2	0.0	0.1	0.1	0.4	168		248
25-9-2009 18:40:00	0.2	0.1	0.1	0.2	0.5	271		519
25-9-2009 18:49:59	0.2	0.1	0.1	0.2	0.7	356		875
25-9-2009 19:00:00	0.2	0.1	0.1	0.2	0.7	413		1,288
25-9-2009 19:10:00	0.3	0.1	0.2	0.3	0.9	487		1,774
25-9-2009 19:19:59	0.6	0.2	0.2	0.4	1.4	694		2,468
25-9-2009 19:30:00	0.8	0.2	0.4	0.6	2.0	1,037		3,505
25-9-2009 19:40:00	1.0	0.3	0.5	0.8	2.6	1,392		4,898
25-9-2009 19:49:59	1.0	0.3	0.6	1.0	3.0	1,677		6,575
25-9-2009 20:00:00	1.1	0.4	0.7	1.1	3.2	1,867		8,442
25-9-2009 20:10:00	1.0	0.4	0.7	1.2	3.2	1,940		10,382
25-9-2009 20:19:59	0.8	0.3	0.6	1.1	2.8	1,822		12,204
25-9-2009 20:30:00	0.6	0.3	0.5	0.9	2.3	1,532		13,736
25-9-2009 20:40:00	0.4	0.2	0.4	0.7	1.8	1,209		14,945
25-9-2009 20:49:59	0.4	0.2	0.3	0.5	1.4	945		15,889
25-9-2009 21:00:00	0.3	0.1	0.3	0.4	1.2	766		16,656
25-9-2009 21:10:00	0.6	0.2	0.3	0.4	1.4	781		17,437
25-9-2009 21:19:59	1.4	0.3	0.4	0.7	2.8	1,279		18,716
25-9-2009 21:30:00	2.0	0.5	0.8	1.3	4.6	2,236		20,952
25-9-2009 21:40:00	2.4	0.7	1.1	2.0	6.2	3,256		24,207
25-9-2009 21:49:59	2.6	0.9	1.4	2.5	7.4	4,082		28,290
25-9-2009 22:00:00	2.7	0.9	1.6	2.8	8.1	4,635		32,925
25-9-2009 22:10:00	2.8	1.0	1.7	3.0	8.5	4,977		37,901
25-9-2009 22:19:59	3.0	1.0	1.8	3.1	8.9	5,231		43,132
25-9-2009 22:30:00	3.1	1.1	1.9	3.3	9.3	5,451		48,583
25-9-2009 22:40:00	3.1	1.1	1.9	3.4	9.5	5,628		54,210
25-9-2009 22:49:59	3.1	1.1	2.0	3.4	9.7	5,757		59,967
25-9-2009 23:00:00	3.2	1.1	2.0	3.5	9.8	5,841		65,809
25-9-2009 23:10:00	3.1	1.1	2.0	3.5	9.8	5,864		71,673
25-9-2009 23:19:59	2.9	1.1	2.0	3.4	9.5	5,763		77,436
25-9-2009 23:30:00	2.8	1.0	1.9	3.3	9.0	5,550		82,985
25-9-2009 23:40:00	2.7	1.0	1.8	3.2	8.7	5,318		88,303
25-9-2009 23:49:59	2.7	1.0	1.8	3.0	8.4	5,129		93,433
26-9-2009 00:00:00	2.6	0.9	1.7	3.0	8.3	5,001		98,434
26-9-2009 00:10:00	2.5	0.9	1.7	2.9	8.0	4,872		103,306
26-9-2009 00:19:59	2.1	0.8	1.6	2.7	7.3	4,584		107,889
26-9-2009 00:30:00	1.8	0.7	1.4	2.5	6.5	4,125		112,014
26-9-2009 00:40:00	1.7	0.6	1.2	2.2	5.7	3,656		115,670
26-9-2009 00:49:59	1.6	0.6	1.1	1.9	5.2	3,281		118,951
26-9-2009 01:00:00	1.5	0.6	1.0	1.8	4.9	3,031		121,982
26-9-2009 01:09:59	2.1	0.6	1.1	1.8	5.7	3,173		125,155
26-9-2009 01:20:00	4.1	1.0	1.5	2.5	9.1	4,431		129,586
26-9-2009 01:30:00	5.6	1.6	2.3	4.0	13.5	6,764		136,350
26-9-2009 01:39:59	6.5	2.1	3.2	5.6	17.3	9,233		145,584
26-9-2009 01:50:00	7.0	2.4	3.9	6.8	20.1	11,232		156,816
26-9-2009 02:00:00	7.3	2.5	4.4	7.6	21.8	12,570		169,385
26-9-2009 02:09:59	7.1	2.6	4.6	7.9	22.2	13,197		182,582
26-9-2009 02:20:00	6.1	2.4	4.5	7.8	20.8	12,889		195,471
26-9-2009 02:30:00	5.3	2.1	4.1	7.1	18.5	11,787		207,258

Computation of Pumping Capacity to cope with 50-yr flood (Buendia-Maricaban Area)

時間	Inflow m ³ /s					Inflow m ³	44.7 m ³ /s	
	Intake1	Intake2	Intake3	Intake4	Total		Pumping m ³	Storage Pipe 844,000
26-9-2009 02:39:59	4.8	1.8	3.6	6.2	16.5	10,504		217,762
26-9-2009 02:50:00	4.5	1.7	3.2	5.5	15.0	9,435		227,196
26-9-2009 03:00:00	4.4	1.6	3.0	5.1	14.1	8,715		235,911
26-9-2009 03:09:59	4.3	1.5	2.8	4.9	13.5	8,286		244,198
26-9-2009 03:20:00	4.2	1.5	2.8	4.8	13.2	8,029		252,227
26-9-2009 03:30:00	4.2	1.5	2.7	4.7	13.0	7,875		260,102
26-9-2009 03:39:59	4.1	1.5	2.7	4.6	12.9	7,781		267,882
26-9-2009 03:50:00	4.1	1.5	2.6	4.6	12.8	7,721		275,604
26-9-2009 04:00:00	4.1	1.5	2.6	4.6	12.8	7,684		283,288
26-9-2009 04:09:59	4.3	1.5	2.7	4.6	13.0	7,742		291,030
26-9-2009 04:20:00	4.8	1.6	2.8	4.8	14.0	8,102		299,131
26-9-2009 04:30:00	5.3	1.8	3.0	5.2	15.2	8,755		307,887
26-9-2009 04:39:59	5.5	1.9	3.3	5.6	16.3	9,446		317,333
26-9-2009 04:50:00	5.6	2.0	3.5	6.0	17.1	10,004		327,337
26-9-2009 05:00:00	5.7	2.0	3.6	6.2	17.5	10,379		337,716
26-9-2009 05:09:59	5.5	2.0	3.6	6.3	17.3	10,453		348,168
26-9-2009 05:20:00	4.5	1.8	3.4	6.0	15.7	9,894		358,062
26-9-2009 05:30:00	3.7	1.5	3.0	5.2	13.5	8,747		366,810
26-9-2009 05:39:59	3.3	1.3	2.6	4.4	11.5	7,511		374,320
26-9-2009 05:50:00	3.0	1.1	2.2	3.8	10.1	6,504		380,824
26-9-2009 06:00:00	2.8	1.0	2.0	3.4	9.3	5,830		386,654
26-9-2009 06:09:59	2.5	1.0	1.8	3.2	8.5	5,338		391,992
26-9-2009 06:20:00	1.9	0.8	1.6	2.8	7.1	4,685		396,677
26-9-2009 06:30:00	1.4	0.6	1.3	2.3	5.6	3,810		400,487
26-9-2009 06:39:59	1.1	0.5	1.0	1.7	4.3	2,955		403,442
26-9-2009 06:50:00	0.9	0.4	0.8	1.3	3.3	2,283		405,725
26-9-2009 07:00:00	0.8	0.3	0.6	1.1	2.8	1,837		407,562
26-9-2009 07:09:59	0.7	0.3	0.5	0.9	2.5	1,570		409,133
26-9-2009 07:20:00	0.7	0.3	0.5	0.8	2.2	1,409		410,542
26-9-2009 07:30:00	0.7	0.2	0.4	0.8	2.1	1,311		411,853
26-9-2009 07:39:59	0.7	0.2	0.4	0.7	2.0	1,251		413,104
26-9-2009 07:50:00	0.6	0.2	0.4	0.7	2.0	1,216		414,320
26-9-2009 08:00:00	0.6	0.2	0.4	0.7	2.0	1,195		415,515
26-9-2009 08:09:59	0.6	0.2	0.4	0.7	1.9	1,165		416,680
26-9-2009 08:20:00	0.5	0.2	0.4	0.6	1.7	1,082		417,763
26-9-2009 08:30:00	0.4	0.2	0.3	0.6	1.4	944		418,707
26-9-2009 08:39:59	0.3	0.1	0.3	0.5	1.2	802		419,509
26-9-2009 08:50:00	0.3	0.1	0.2	0.4	1.1	688		420,197
26-9-2009 09:00:00	0.3	0.1	0.2	0.4	1.0	613		420,810
26-9-2009 09:09:59	0.8	0.2	0.3	0.4	1.7	805		421,615
26-9-2009 09:20:00	2.4	0.5	0.6	1.0	4.6	1,883		423,498
26-9-2009 09:30:00	3.7	1.0	1.3	2.2	8.2	3,824		427,322
26-9-2009 09:39:59	4.4	1.4	2.1	3.6	11.4	5,864		433,186
26-9-2009 09:50:00	4.8	1.6	2.7	4.6	13.7	7,511		440,697
26-9-2009 10:00:00	5.1	1.7	3.0	5.2	15.0	8,613		449,310
26-9-2009 10:09:59	6.9	2.1	3.4	5.9	18.3	10,002		459,312
26-9-2009 10:20:00	12.0	3.1	4.6	8.0	27.7	13,787		473,099
26-9-2009 10:30:00	15.8	4.6	6.9	11.9	39.1	20,028		493,127
26-9-2009 10:39:59	18.1	5.8	9.2	16.0	49.1	26,463	26,820	492,770
26-9-2009 10:50:00	19.4	6.6	11.1	19.2	56.3	31,627	26,820	497,577
26-9-2009 11:00:00	20.3	7.0	12.2	21.1	60.6	35,074	26,820	505,831
26-9-2009 11:09:59	20.4	7.2	12.8	22.2	62.5	36,942	26,820	515,953
26-9-2009 11:20:00	19.4	7.1	12.9	22.4	61.8	37,301	26,820	526,434

Computation of Pumping Capacity to cope with 50-yr flood (Buendia-Maricaban Area)

時間	Inflow m ³ /s					Inflow m ³	44.7	m ³ /s
	Intake1	Intake2	Intake3	Intake4	Total		Pumping m ³	Storage Pipe 844,000
26-9-2009 11:30:00	18.6	6.8	12.6	21.8	59.8	36,494	26,820	536,107
26-9-2009 11:39:59	18.1	6.5	12.2	21.0	57.9	35,315	26,820	544,602
26-9-2009 11:50:00	17.9	6.4	11.8	20.4	56.4	34,274	26,820	552,056
26-9-2009 12:00:00	17.7	6.3	11.5	20.0	55.5	33,564	26,820	558,801
26-9-2009 12:09:59	17.8	6.3	11.4	19.8	55.3	33,226	26,820	565,207
26-9-2009 12:20:00	18.3	6.4	11.5	19.8	55.9	33,351	26,820	571,738
26-9-2009 12:30:00	18.7	6.5	11.6	20.1	57.0	33,865	26,820	578,783
26-9-2009 12:39:59	18.9	6.6	11.9	20.5	57.9	34,468	26,820	586,431
26-9-2009 12:50:00	19.0	6.7	12.0	20.8	58.6	34,967	26,820	594,578
26-9-2009 13:00:00	19.1	6.8	12.2	21.0	59.0	35,303	26,820	603,061
26-9-2009 13:09:59	19.8	6.9	12.3	21.3	60.3	35,798	26,820	612,039
26-9-2009 13:20:00	21.9	7.3	12.8	22.1	64.0	37,285	26,820	622,505
26-9-2009 13:30:00	23.4	7.9	13.7	23.6	68.6	39,778	26,820	635,463
26-9-2009 13:39:59	24.3	8.4	14.6	25.3	72.6	42,361	26,820	651,004
26-9-2009 13:50:00	24.9	8.7	15.4	26.6	75.5	44,436	26,820	668,620
26-9-2009 14:00:00	25.2	8.9	15.8	27.4	77.2	45,822	26,820	687,622
26-9-2009 14:09:59	25.1	8.9	16.0	27.8	77.8	46,515	26,820	707,316
26-9-2009 14:20:00	24.3	8.8	16.0	27.7	76.8	46,395	26,820	726,892
26-9-2009 14:30:00	23.7	8.6	15.7	27.2	75.2	45,603	26,820	745,675
26-9-2009 14:39:59	23.3	8.4	15.3	26.6	73.6	44,639	26,820	763,493
26-9-2009 14:50:00	23.1	8.3	15.0	26.0	72.5	43,825	26,820	780,498
26-9-2009 15:00:00	23.0	8.2	14.9	25.7	71.8	43,275	26,820	796,953
26-9-2009 15:09:59	21.9	8.0	14.6	25.3	69.9	42,497	26,820	812,630
26-9-2009 15:20:00	18.8	7.4	13.9	24.1	64.1	40,206	26,820	826,016
26-9-2009 15:30:00	16.4	6.5	12.5	21.7	57.1	36,373	26,820	835,570
26-9-2009 15:39:59	15.0	5.7	11.1	19.1	50.9	32,408	26,820	841,158
26-9-2009 15:50:00	14.2	5.2	9.9	17.2	46.5	29,223	26,820	843,560
26-9-2009 16:00:00	13.7	5.0	9.2	16.0	43.8	27,096	26,820	843,836
26-9-2009 16:09:59	12.8	4.7	8.7	15.1	41.4	25,564	26,820	842,580
26-9-2009 16:20:00	10.8	4.3	8.1	14.0	37.2	23,582	26,820	839,341
26-9-2009 16:30:00	9.3	3.7	7.2	12.4	32.6	20,963	26,820	833,484
26-9-2009 16:39:59	8.4	3.2	6.3	10.8	28.8	18,424	26,820	825,088
26-9-2009 16:50:00	7.9	2.9	5.6	9.6	26.0	16,430	26,820	814,698
26-9-2009 17:00:00	7.6	2.8	5.1	8.9	24.4	15,107	26,820	802,985
26-9-2009 17:10:00	7.3	2.7	4.9	8.4	23.3	14,286	26,820	790,450
26-9-2009 17:19:59	7.0	2.6	4.7	8.1	22.3	13,676	26,820	777,306
26-9-2009 17:30:00	6.8	2.5	4.5	7.8	21.5	13,153	26,820	763,639
26-9-2009 17:40:00	6.6	2.4	4.4	7.5	20.9	12,736	26,820	749,555
26-9-2009 17:49:59	6.6	2.4	4.3	7.4	20.5	12,434	26,820	735,169
26-9-2009 18:00:00	6.5	2.3	4.2	7.3	20.3	12,238	26,820	720,587
26-9-2009 18:10:00	6.2	2.3	4.1	7.1	19.8	12,015	26,820	705,782
26-9-2009 18:19:59	5.5	2.1	4.0	6.8	18.4	11,455	26,820	690,418
26-9-2009 18:30:00	4.9	1.9	3.6	6.3	16.8	10,549	26,820	674,146
26-9-2009 18:40:00	4.6	1.7	3.3	5.7	15.3	9,619	26,820	656,946
26-9-2009 18:49:59	4.4	1.6	3.0	5.2	14.3	8,876	26,820	639,002
26-9-2009 19:00:00	4.3	1.6	2.9	4.9	13.7	8,380	26,820	620,562
26-9-2009 19:10:00	4.1	1.5	2.7	4.8	13.1	8,032	26,820	601,774
26-9-2009 19:19:59	3.7	1.4	2.6	4.5	12.3	7,609	26,820	582,563
26-9-2009 19:30:00	3.4	1.3	2.4	4.2	11.3	7,069	26,820	562,811
26-9-2009 19:40:00	3.2	1.2	2.2	3.9	10.5	6,551	26,820	542,543
26-9-2009 19:49:59	3.1	1.1	2.1	3.6	10.0	6,148	26,820	521,870
26-9-2009 20:00:00	3.1	1.1	2.0	3.5	9.6	5,879	26,820	500,929
26-9-2009 20:10:00	2.7	1.0	1.9	3.3	9.0	5,597	26,820	479,707

Computation of Pumping Capacity to cope with 50-yr flood (Buendia-Maricaban Area)

時間	Inflow m ³ /s					Inflow m ³	44.7	m ³ /s
	Intake1	Intake2	Intake3	Intake4	Total		Pumping m ³	Storage Pipe 844,000
26-9-2009 20:19:59	1.9	0.9	1.7	3.0	7.4	4,939	26,820	457,825
26-9-2009 20:30:00	1.2	0.6	1.3	2.3	5.5	3,884	26,820	434,890
26-9-2009 20:40:00	0.9	0.4	0.9	1.6	3.8	2,806	26,820	410,876
26-9-2009 20:49:59	0.6	0.3	0.6	1.1	2.6	1,943	26,820	385,999
26-9-2009 21:00:00	0.5	0.2	0.4	0.8	1.9	1,367	26,820	360,546
26-9-2009 21:10:00	0.6	0.2	0.4	0.6	1.8	1,118	26,820	334,844
26-9-2009 21:19:59	1.2	0.3	0.4	0.7	2.7	1,342	26,820	309,367
26-9-2009 21:30:00	1.7	0.5	0.7	1.1	3.9	1,979	26,820	284,526
26-9-2009 21:40:00	1.9	0.6	0.9	1.6	5.1	2,702	26,820	260,408
26-9-2009 21:49:59	2.1	0.7	1.2	2.0	5.9	3,300	26,820	236,888
26-9-2009 22:00:00	2.2	0.7	1.3	2.2	6.4	3,703	26,820	213,771
26-9-2009 22:10:00	2.2	0.8	1.4	2.3	6.6	3,919	26,820	190,870
26-9-2009 22:19:59	2.0	0.8	1.4	2.4	6.5	3,950	26,820	168,000
26-9-2009 22:30:00	1.9	0.7	1.3	2.3	6.3	3,839	26,820	145,019
26-9-2009 22:40:00	1.9	0.7	1.3	2.2	6.0	3,683	26,820	121,882
26-9-2009 22:49:59	1.8	0.7	1.2	2.1	5.8	3,547	26,820	98,609
26-9-2009 23:00:00	1.8	0.6	1.2	2.1	5.7	3,456	26,820	75,244
26-9-2009 23:10:00	1.6	0.6	1.1	2.0	5.4	3,320	26,820	51,745
26-9-2009 23:19:59	1.1	0.5	1.0	1.8	4.3	2,913	26,820	27,838
26-9-2009 23:30:00	0.6	0.3	0.8	1.3	3.1	2,231	26,820	3,249
26-9-2009 23:40:00	0.4	0.2	0.5	0.9	2.0	1,524	26,820	-22,048
26-9-2009 23:49:59	0.2	0.1	0.3	0.5	1.2	955	26,820	-47,913
27-9-2009 00:00:00	0.2	0.1	0.2	0.3	0.7	575	26,820	-74,158
27-9-2009 00:10:00	0.1	0.1	0.1	0.2	0.5	360	26,820	-100,618
27-9-2009 00:19:59	0.2	0.1	0.1	0.1	0.5	279	26,820	-127,159
27-9-2009 00:30:00	0.2	0.1	0.1	0.2	0.5	296	26,820	-153,683
27-9-2009 00:40:00	0.2	0.1	0.1	0.2	0.6	351	26,820	-180,153
27-9-2009 00:49:59	0.2	0.1	0.1	0.2	0.7	405	26,820	-206,568
27-9-2009 01:00:00	0.3	0.1	0.2	0.3	0.8	441	26,820	-232,947
27-9-2009 01:10:00	0.3	0.1	0.2	0.3	0.8	463	26,820	-259,303
27-9-2009 01:19:59	0.3	0.1	0.2	0.3	0.8	477	26,820	-285,647
27-9-2009 01:30:00	0.3	0.1	0.2	0.3	0.8	485	26,820	-311,982
27-9-2009 01:40:00	0.3	0.1	0.2	0.3	0.8	489	26,820	-338,313
27-9-2009 01:49:59	0.3	0.1	0.2	0.3	0.8	492	26,820	-364,641
27-9-2009 02:00:00	0.3	0.1	0.2	0.3	0.8	495	26,820	-390,966
27-9-2009 02:10:00	0.2	0.1	0.2	0.3	0.8	484	26,820	-417,302
27-9-2009 02:19:59	0.2	0.1	0.1	0.3	0.6	428	26,820	-443,694
27-9-2009 02:30:00	0.1	0.1	0.1	0.2	0.5	330	26,820	-470,184
27-9-2009 02:40:00	0.1	0.0	0.1	0.1	0.3	225	26,820	-496,779
27-9-2009 02:49:59	0.0	0.0	0.0	0.1	0.2	141	26,820	-523,458
27-9-2009 03:00:00	0.0	0.0	0.0	0.0	0.1	85	26,820	-550,193
27-9-2009 03:10:00	0.0	0.0	0.0	0.0	0.1	52	26,820	-576,961
27-9-2009 03:19:59	0.0	0.0	0.0	0.0	0.0	31	26,820	-603,750
27-9-2009 03:30:00	0.0	0.0	0.0	0.0	0.0	19	26,820	-630,550
27-9-2009 03:40:00	0.0	0.0	0.0	0.0	0.0	12	26,820	-657,358
27-9-2009 03:49:59	0.0	0.0	0.0	0.0	0.0	7	26,820	-684,171
27-9-2009 04:00:00	0.0	0.0	0.0	0.0	0.0	4	26,820	-710,987
27-9-2009 04:10:00	0.0	0.0	0.0	0.0	0.0	2	26,820	-737,804
27-9-2009 04:19:59	0.0	0.0	0.0	0.0	0.0	1	26,820	-764,623
27-9-2009 04:30:00	0.0	0.0	0.0	0.0	0.0	1	26,820	-791,442
27-9-2009 04:40:00	0.0	0.0	0.0	0.0	0.0	1	26,820	-818,261
27-9-2009 04:49:59	0.0	0.0	0.0	0.0	0.0	0	26,820	-845,081
27-9-2009 05:00:00	0.0	0.0	0.0	0.0	0.0	0	26,820	-871,901

Appendix 3-4
Simulation Result of Flood Inundation

(1) Result of Inundation Analysis

(Inundation Area)

(km2)

Inundation Depth (m)	Inundation Area (5-yr Without Project)		Inundation Area (5-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	2.57	3.66	1.09	2.31
0.50m - 0.99m	0.09	0.94	0.00	0.42
1.00m - 1.99m	0.00	0.10	0.00	0.06
2.00m - 2.99m	0.00	0.00	0.00	0.00
More than 3.0m	0.00	0.00	0.00	0.00
Total	2.66	4.70	1.09	2.79

(km2)

Inundation Depth (m)	Inundation Area (10-yr Without Project)		Inundation Area (10-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	3.51	4.71	2.11	3.17
0.50m - 0.99m	0.23	1.70	0.05	0.96
1.00m - 1.99m	0.00	0.14	0.00	0.10
2.00m - 2.99m	0.00	0.00	0.00	0.00
More than 3.0m	0.00	0.00	0.00	0.00
Total	3.74	6.55	2.17	4.23

(km2)

Inundation Depth (m)	Inundation Area (25-yr Without Project)		Inundation Area (25-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	3.70	5.22	3.32	4.48
0.50m - 0.99m	0.76	2.56	0.20	2.30
1.00m - 1.99m	0.01	0.31	0.00	0.20
2.00m - 2.99m	0.00	0.00	0.00	0.00
More than 3.0m	0.00	0.00	0.00	0.00
Total	4.47	8.09	3.52	6.97

(km2)

Inundation Depth (m)	Inundation Area (50-yr Without Project)		Inundation Area (50-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	3.28	4.97	3.72	5.07
0.50m - 0.99m	1.56	3.82	0.45	3.26
1.00m - 1.99m	0.01	0.50	0.00	0.34
2.00m - 2.99m	0.00	0.00	0.00	0.00
More than 3.0m	0.00	0.00	0.00	0.00
Total	4.85	9.29	4.17	8.67

(km2)

Inundation Depth (m)	Inundation Area (100-yr Without Project)		Inundation Area (100-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	2.63	4.45	3.71	5.01
0.50m - 0.99m	2.46	4.95	1.02	4.20
1.00m - 1.99m	0.03	0.66	0.01	0.55
2.00m - 2.99m	0.00	0.01	0.00	0.00
More than 3.0m	0.00	0.00	0.00	0.00
Total	5.12	10.07	4.74	9.76

(Estimated Number of House and Buildings)

Inundation Depth (m)	Number of Houses (5-yr Without Project)		Number of Houses (5-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	26,363	39,738	12,262	27,009
0.50m - 0.99m	893	13,866	20	5,787
1.00m - 1.99m	0	2,003	0	1,122
2.00m - 2.99m	0	0	0	0
More than 3.0m	0	0	0	0
Total	27,256	55,607	12,282	33,917

Inundation Depth (m)	Number of Houses (10-yr Without Project)		Number of Houses (10-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	35,998	48,432	22,730	36,634
0.50m - 0.99m	1,851	23,033	491	13,640
1.00m - 1.99m	0	2,678	0	2,003
2.00m - 2.99m	0	0	0	0
More than 3.0m	0	0	0	0
Total	37,848	74,142	23,221	52,276

Inundation Depth (m)	Number of Houses (25-yr Without Project)		Number of Houses (25-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	37,764	51,821	34,235	47,519
0.50m - 0.99m	7,474	33,000	1,563	28,954
1.00m - 1.99m	49	5,036	0	3,393
2.00m - 2.99m	0	0	0	0
More than 3.0m	0	0	0	0
Total	45,287	89,857	35,798	79,866

Inundation Depth (m)	Number of Houses (50-yr Without Project)		Number of Houses (50-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	36,455	48,660	37,498	51,132
0.50m - 0.99m	13,699	45,230	4,815	39,527
1.00m - 1.99m	49	7,388	0	5,379
2.00m - 2.99m	0	0	0	0
More than 3.0m	0	0	0	0
Total	50,203	101,278	42,313	96,037

Inundation Depth (m)	Number of Houses (100-yr Without Project)		Number of Houses (100-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	31,246	43,134	38,641	49,815
0.50m - 0.99m	22,042	55,873	10,346	48,255
1.00m - 1.99m	185	9,683	49	8,345
2.00m - 2.99m	0	202	0	0
More than 3.0m	0	0	0	0
Total	53,473	108,892	49,036	106,415

(Estimated Population)

Inundation Depth (m)	Population (5-yr Without Project)		Population (5-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	106,672	156,148	49,614	106,385
0.50m - 0.99m	3,614	55,471	82	22,607
1.00m - 1.99m	0	8,124	0	4,552
2.00m - 2.99m	0	0	0	0
More than 3.0m	0	0	0	0
Total	110,286	219,744	49,696	133,544

Inundation Depth (m)	Population (10-yr Without Project)		Population (10-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	145,655	190,590	91,971	144,047
0.50m - 0.99m	7,488	91,935	1,988	54,010
1.00m - 1.99m	0	10,863	0	8,124
2.00m - 2.99m	0	0	0	0
More than 3.0m	0	0	0	0
Total	153,144	293,387	93,959	206,182

Inundation Depth (m)	Population (25-yr Without Project)		Population (25-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	152,804	204,173	138,522	185,891
0.50m - 0.99m	30,242	131,353	6,325	115,040
1.00m - 1.99m	197	20,343	0	13,641
2.00m - 2.99m	0	0	0	0
More than 3.0m	0	0	0	0
Total	183,243	355,869	144,846	314,572

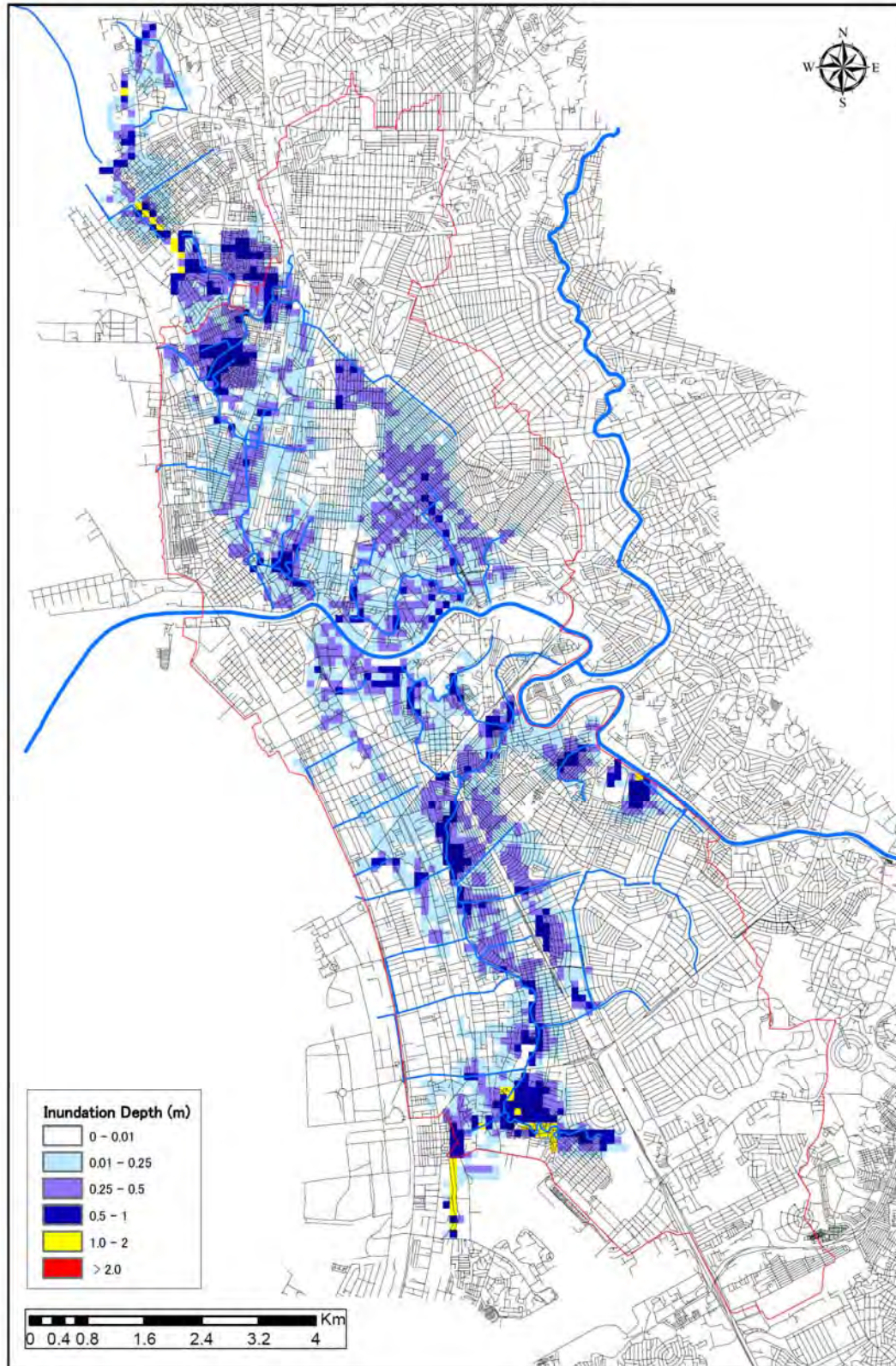
Inundation Depth (m)	Population (50-yr Without Project)		Population (50-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	147,508	192,147	151,726	200,684
0.50m - 0.99m	55,430	179,575	19,482	156,692
1.00m - 1.99m	197	29,781	0	21,637
2.00m - 2.99m	0	0	0	0
More than 3.0m	0	0	0	0
Total	203,135	401,504	171,209	379,014

Inundation Depth (m)	Population (100-yr Without Project)		Population (100-yr With Project)	
	Espana - UST	Buendia + Maricaban	Espana - UST	Buendia + Maricaban
0.15m - 0.49m	126,428	169,887	156,350	196,092
0.50m - 0.99m	89,187	221,611	41,864	190,940
1.00m - 1.99m	750	39,050	197	33,527
2.00m - 2.99m	0	820	0	0
More than 3.0m	0	0	0	0
Total	216,365	431,367	198,411	420,560

(2) Flood Inundation Map

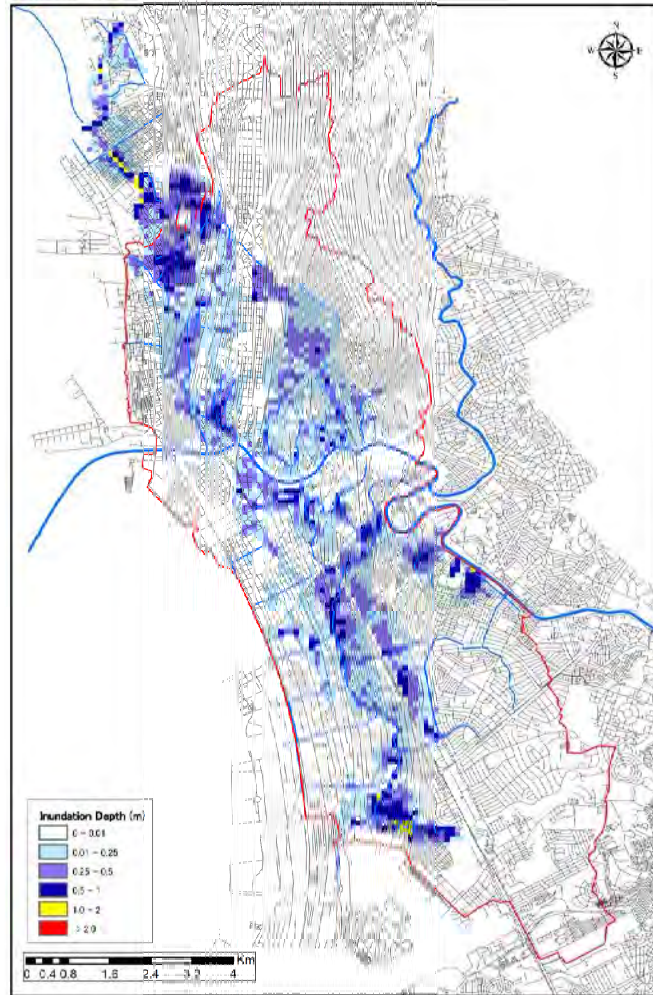
Flood Inundation Map

(Rainfall = Ondoy / River = Existing / Pump = Existing)



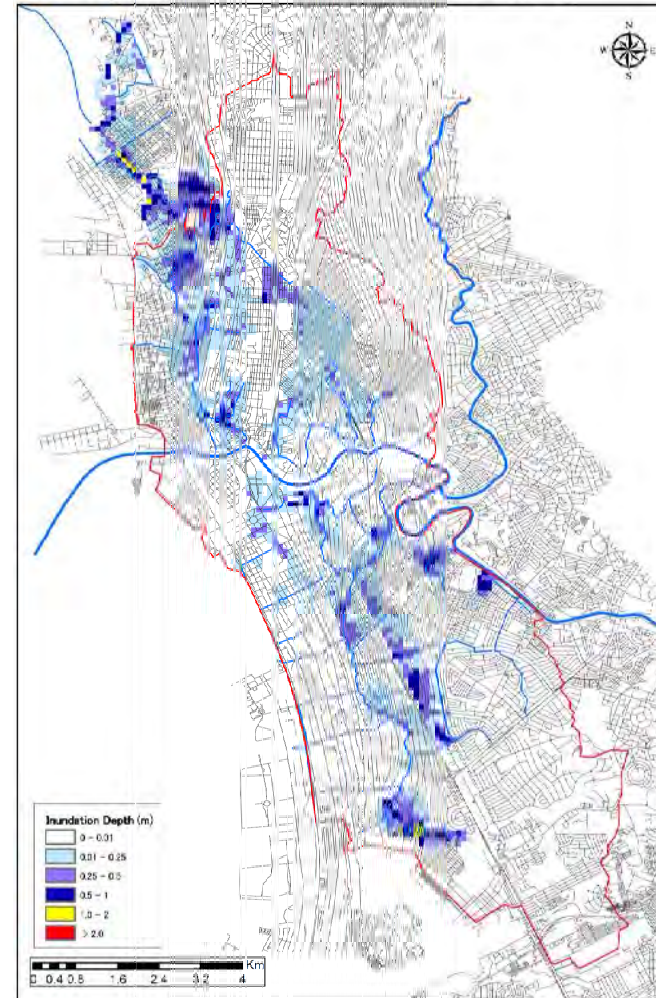
Rainfall: Ondoy / River: Present / Pump: Existing / Without Tunnel

Flood Inundation Map
 (Rainfall = 5yr / River = Existing / Pump = Improved)



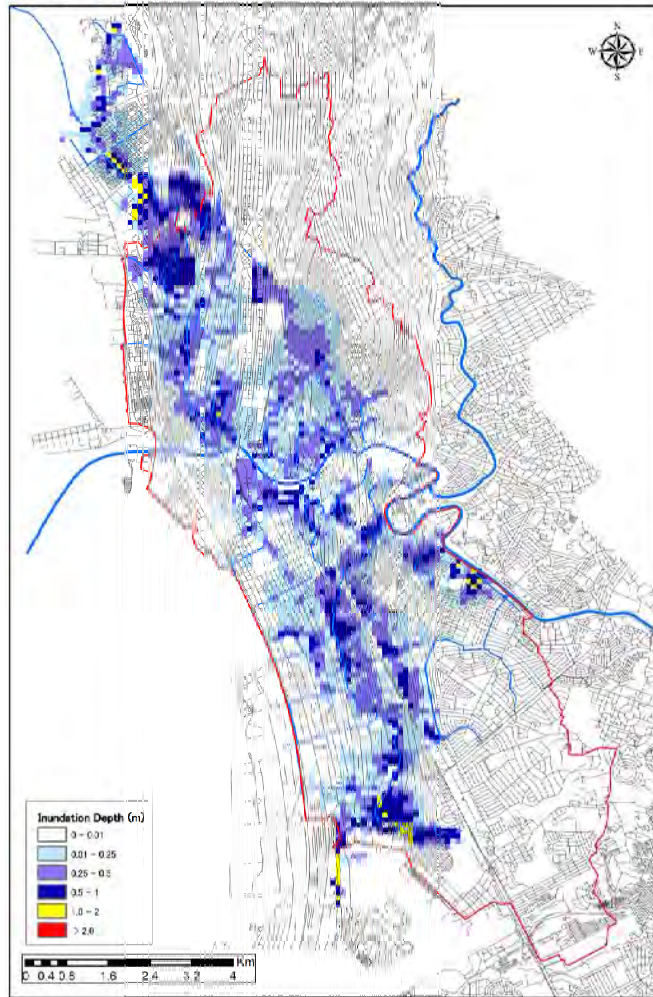
Rainfall : 5-yr / River : Present / Pump : Rehabilitated

Flood Inundation Map
 (Rainfall = 5yr / River = Existing / Pump = Improved / with TUNNEL)



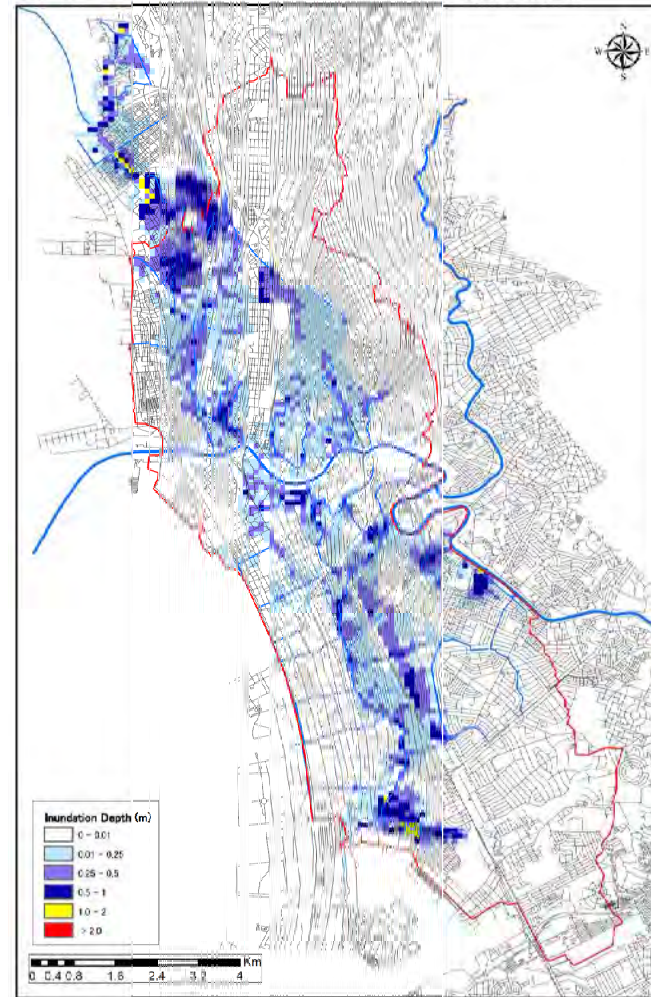
Rainfall : 5-yr / River : Present / Pump : Rehabilitated With Tunnel

Flood Inundation Map
 (Rainfall = 10yr / River = Existing / Pump = Improved)



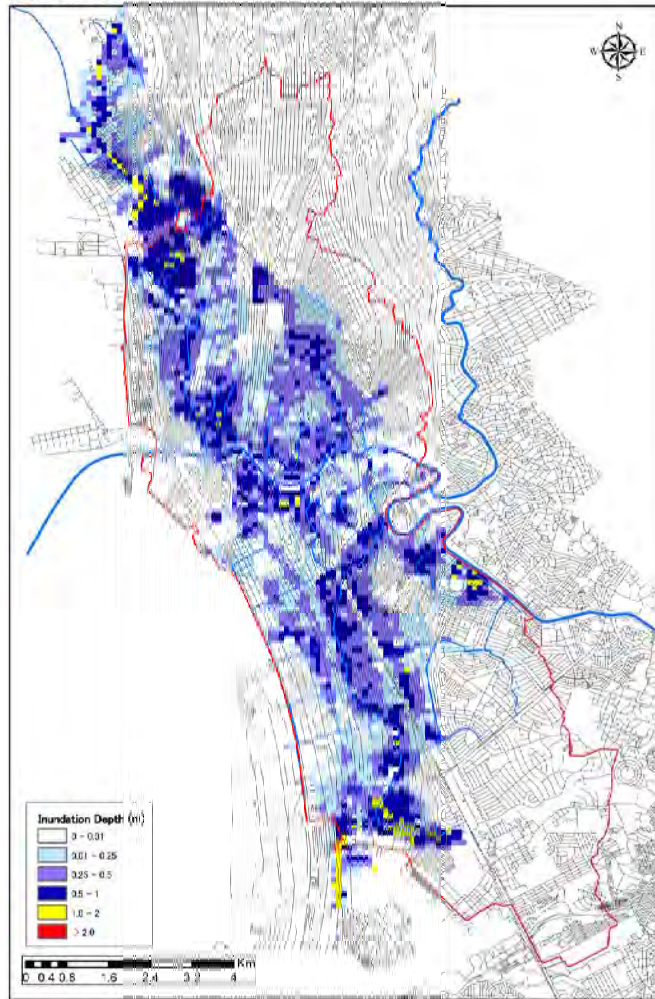
Rainfall : 10-yr / River : Present / Pump : Rehabilitated

Flood Inundation Map
 (Rainfall = 10yr / River = Existing / Pump = Improved / with TUNNEL)



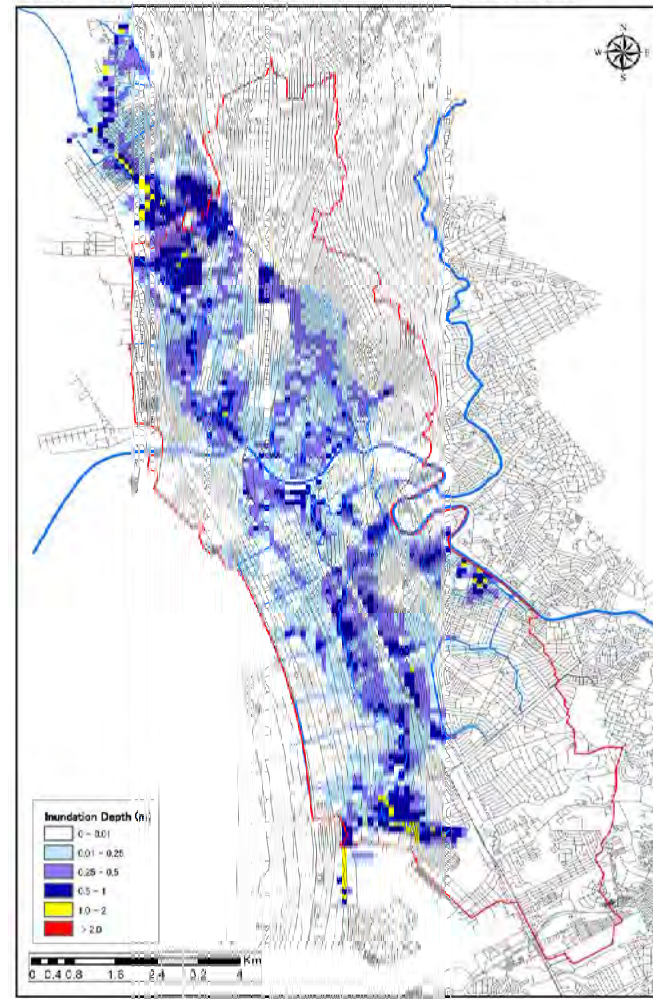
Rainfall : 10-yr / River : Present / Pump : Rehabilitated With Tunnel

Flood Inundation Map
 (Rainfall = 25yr / River = Existing / Pump = Improved)



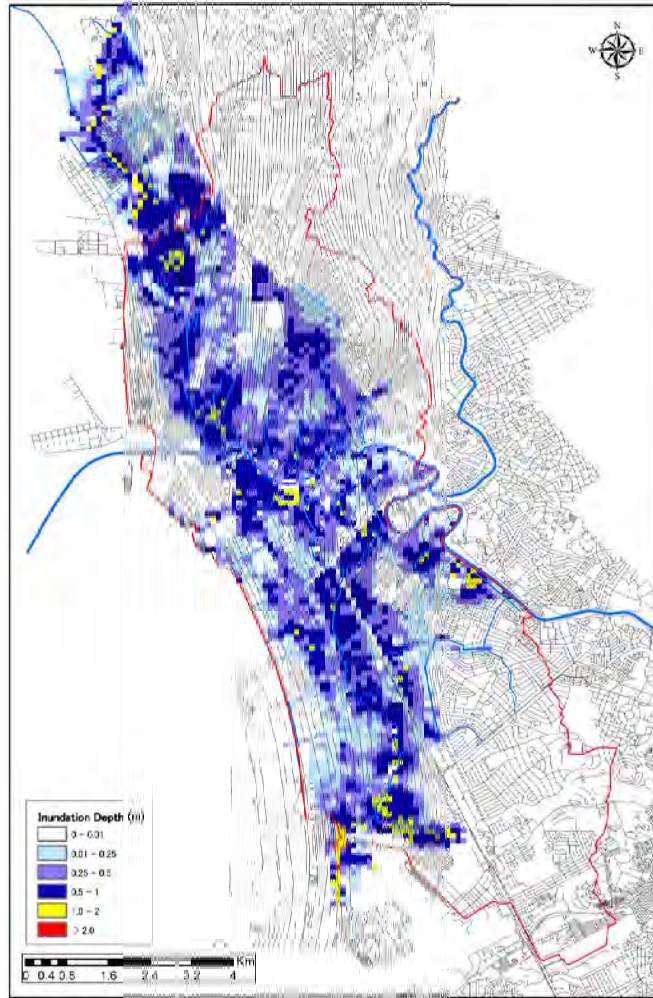
Rainfall : 25-yr / River : Present / Pump : Rehabilitated

Flood Inundation Map
 (Rainfall = 25yr / River = Existing / Pump = Improved / with TUNNEL)



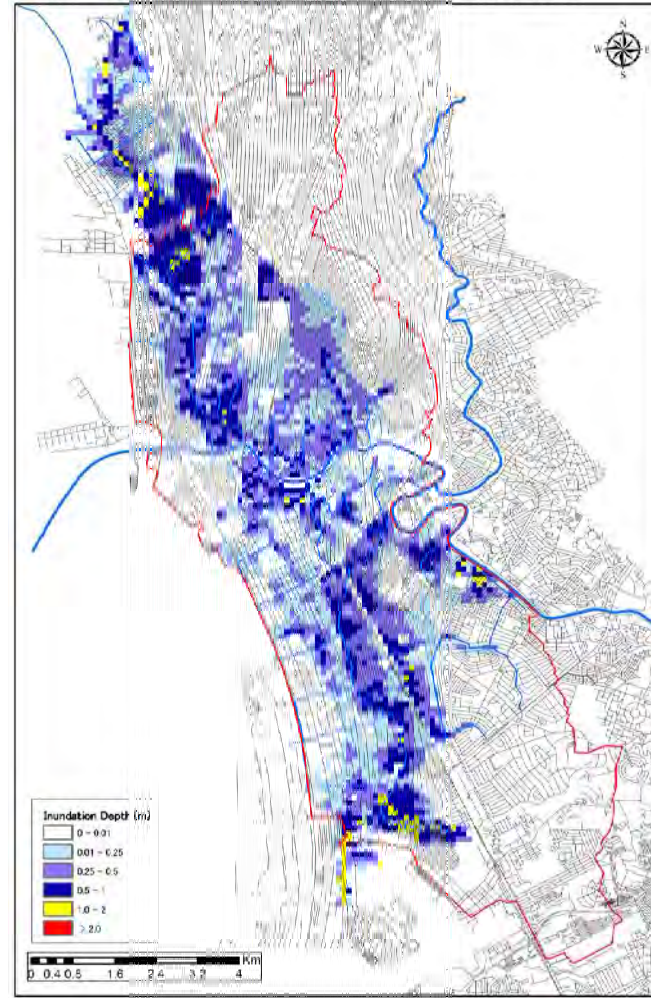
Rainfall : 25-yr / River : Present / Pump : Rehabilitated With Tunnel

Flood Inundation Map
 (Rainfall = 50yr / River = Existing / Pump = Improved)



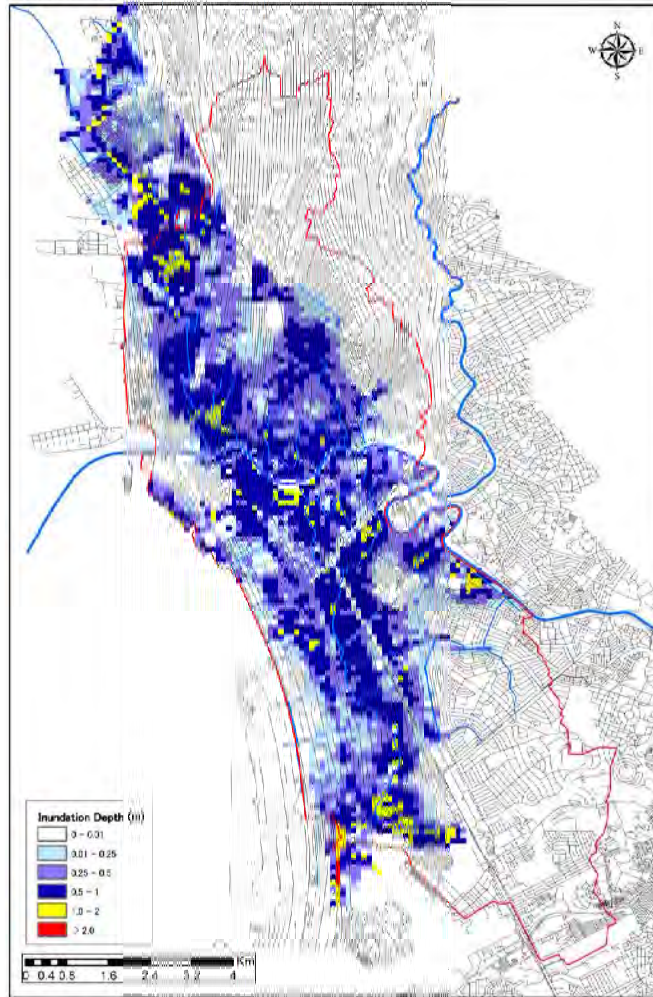
Rainfall : 50-yr / River : Present / Pump : Rehabilitated

Flood Inundation Map
 (Rainfall = 50yr / River = Existing / Pump = Improved / with TUNNEL)



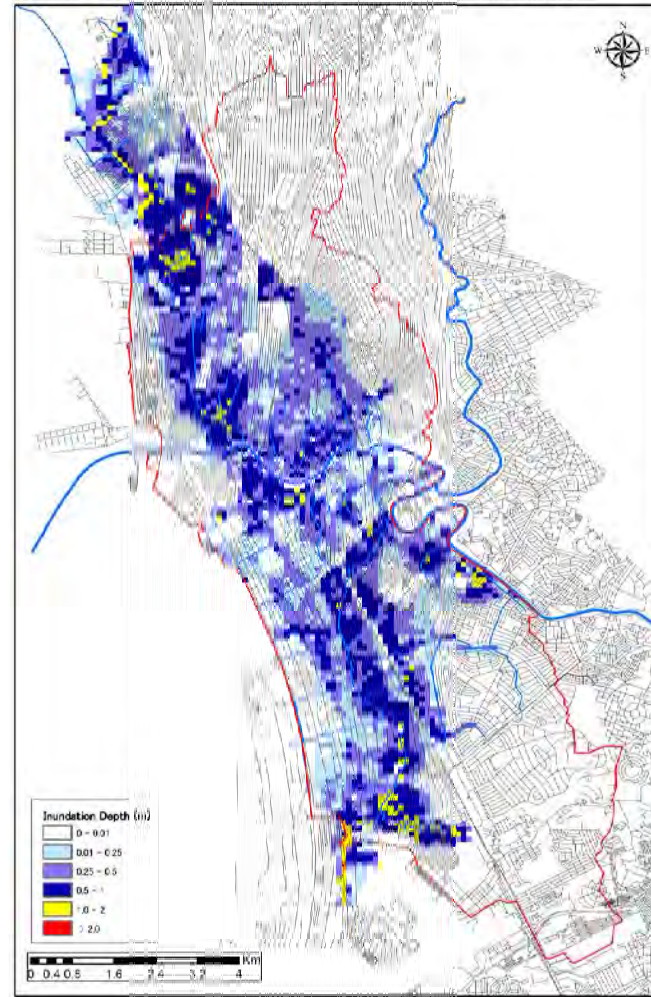
Rainfall : 50-yr / River : Present / Pump : Rehabilitated With Tunnel

Flood Inundation Map
 (Rainfall = 100yr / River = Existing / Pump = Improved)



Rainfall : 100-yr / River : Present / Pump : Rehabilitated

Flood Inundation Map
 (Rainfall = 100yr / River = Existing / Pump = Improved / with TUNNEL)



Rainfall : 100-yr / River : Present / Pump : Rehabilitated With Tunnel