APPENDIX A-8-2

Details of Cost Estimates for Alternative Study

Alternative	,	1
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Item	Dimension		Total Cost (x1000 Baht	Portion	cation Local Cur Portion (x1000 Baht)	Remark
1. Raw Water Intake						
a.Site Fill (2,000 c	u a) .	. 80	160	48	112	
b.Pumping Station (1		3,600			252	
c.Pump Pit (concrete		5,400			378	
d.Pumps (200mm 3cu m	/min, 3 units)	380,000	1,140		228	
e.Blectrical (50% of	Hechanical)		570	456	114	
f.Raw Water Pipe (30	0 мм, 1,000 м)	1,550	1,550	169	108	
Sub-Total of 1.			4,320	1,855	1,192	
. Transmission Pipe		(B/m)				
A/C Pipe, 300 ma	L=7,000 m	1,550	10,850	3,255	7,595	
A/C Pipe, 300 am	L=6,000 m	1,550	9,300		•	
Sub-Total of 2.			20,150		•	
3. Treatment Plant a.Modification of Exis. Plant b.New Treatment plant	(5,780 cu m/d) (9,400 cu n/d)	not incl	ıded			
Receiving Well			20	6	14	
Sedimentation Basin			7,840		and the second s	
Sand Filter	392 cu m/h		4,704			
Clear Water Reservo	ir 3,200 cu m		3,320		5,824	
Elevated Tank	250 cu m		1,800	540	1,260	
Pumping House	100 sq m		360	108	252	
Chemical House	100 sq n		380	114	266	
Administration Bldg	100 sq m		500		350	
Staff Quarter	200 sq m		1,000		700	
(Sub-total)			24,924	7,477	17,447	
Mechanical Works		(8/unit)				
Chemical Equip	Hixer, Tank, Zunits		1,520		364	
Chlorinator	2 kg/h x 2 sets				176	
Pumps	2 cu m/m , 4 units	350,000	1,400		280	
Hiscellaneous	20 % of above		760		152	
(Sub-total)		÷	4,560	3,648	912	
Electrical Acres	70% of Hech. Works		3,192		638	
Miscellaneous	10 % of above		3,268	2,480	3,736	
Sub-Total of (b)			35,944	27,284	8,659	unit cos: 3,79
		÷				V,101
Sub-Total of 3.			35,944	27,284	8,659	

Alternative :	1					
		Unit	Total	Cost Alloca		
Item	Dimension	Cost	Cost	Foreign Cur. L		Remark
		(Baht)	(x1000 Baht	Portion)(x1000 Baht)(x		
4.Distribution Pipes		(B/a)				
dia(am)	length(m)	(0) 1.1				
Replacement						
A/C Pipe, 200	3,330	920	3,064	919	2,145	
A/C Pipe, 250	1,970	1,220	2,403	721	1,682	
A/C Pipe, 300	530	1,680	890	267	623	
A/C Pipe, 400	740	2,900	2,146	644	1,502	
New Construction						
A/C Pipe, 100	8,235	450	3,706	1,112	2,594	
A/C Pipe, 150	6,940	630	4,372	1,312	3,061	
A/C Pipe, 200	5,690	320	5,235	1,570	3,664	
A/C Pipe, 250	880	1,220	1,074	322	752	
A/C Pipe, 300	2,320	1,680	3,398	1,169	2,728	
Sub-Total of 4.	30,635		26,787	8,036	18,751	7 - 2 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3
Total Construction Cost			87,201	43,220	42,708	
				.		

Note: Allocation Ratio (Foreign: Local) = 0.3: 0.7 (Civil/Architectural Works)

= 0.8 : 0.2 (Nech./Elect. Works)

= 0.8 : 0.2 (Steel Pipe Construction) = 0.3 : 0.7 (A/C Pipe Construction)

Alternative : 2

Item	Dimension		Cost	• .	Local Cur. Portion	Renark
l. Raw Water Intake		* ** = * * * * * * * * * * *				
a.Site Fill (2,000 c		80	160	48	112	
b.Pumping Station (1		3,600	360	108	252	
c.Pump Pit (concrete		5,400	540	162	378	
d.Pumps (200mm 3cu m		380,000	1,520	1,216	304	•
e Electrical (50% of			760	608	152.	
f.Raw Water Fipe (30	0 ma, 1,000m)	1,550	1,550	643	907	
Sub-Total of 1.			4,890	2,785	2,105	
. Transmission Pipe		(B/m)				
A/C Pipe, 300 mm	L=7,000 a	1,550	10,850	3,255	7,595	
A/C Pipe, 400 mm	L≈6,000 m	2,900	17,400			
Sub-Total of 2.		- ; - • •	28,250			
Treatment Plant a. Modification of Exis. Plant b. New Treatment plant Receiving Well Sedimentation Basin Sand Filter Clear Water Reservo Elevated Tank Punping House Chemical House Administration Bldg Staff Quarter Sub total	15 cu m 631 cu m/h 631 cu m/h ir 5,600 cu m 250 cu m 100 sq m 100 sq m	not includ	ed 30 12,620 7,572 12,000 1,800 360 380 500 1,000 36,262	3,786 2,272 3,600 540 108 114 150 300	21 8,834 5,300 8,400 1,260 252 266 350 700 25,383	
Hechanical Works Chemical Equip Chlorinator Pumps Miscellaneous Sub total	Mixer, Tank, 2units 2 kg/h x 2 sets 3 cu m/m , 5 units 20 % of above	440,000	1,520 880 2,100 900 5,400	704 1,680 720	304 176 420 180 1,030	·
Floatsian Unaba	70% of Hech. Works		3,780	3,024	756	
Electrical Works Miscellaneous	10 % of above		4,544	-	2,722	
u1206119U60A2	th wat grands		11411	1,000		unit cos
Sub-Total of (b)			49,986	35,243	14,743	3,29
Sub-Total of 3.			49,986	35,243	14,743	

Alternative :	2 Dimension	Unit Cost	Total Cost	Cost Alloca Foreign Cur. L		Renark
				Portion)(x1000 Baht)(x	Portion	
4.Distribution Pipes dia(en)	length(a)	(B/a)				
Replacement	. 1			114 1		
A/C Pipe, 200	3,330	920	3.064	919	2,145	· · · · · · · · · · · · · · · · · · ·
A/C Pipe, 250	1,970.		2,403	721	1,682	**
A/C Pipe, 300	530	1,680	890	267	623	
A/C Pipe, 400	740	2,900	2,146	644	1,502	*. *
New Construction						
A/C Pipe, 100	8,235	450	3,706	1,112	2,594	
A/C Pipe, 150	6,940	630	4,372	1,312	3,061	
A/C Pipe, 200	5,690	550	5,235	1,570	3,664	
A/C Pipe, 250	880	1,220	1,074	322	752	
A/C Pipe, 300	~ 2,320	1,680	3,898	1,169	2,728	* .
Sub-Total of 4.	30,635		26,787	8,036	18,751	
Total Construction Cost			109,914	54,839	55,374	
			:	ing and the second second	200	

Note: Allocation Ratio (Foreign: Local) = 0.3: 0.7 (Civil/Architectural Works)

= 0.8 : 0.2 (Mech./Elect. Works)

= 0.8 : 0.2 (Steel Pipe Construction)

= 0.3 : 0.7 (A/C Pipe Construction)

Alternative	 3

• T f -=	e de la composition della comp		Total	Cost Allo		
Iten	Dimension	Cost	Cost	v	Local Cur.	Remark
		(Baht)	(x1000 Baht	Portion](x1000 Baht)	Portion (x1000 Baht)	
I. Raw Water Intake						
a. Site Fill (2,000	cum)	80	160	48	112	
b.Pumping Station		3,600			252	
c.Pump Pit (concre		5,400	540		378	
d.Pumps (200mm 3cu		380,000			228	
e.Blectrical (50%		• • • • • • • • • • • • • • • • • • • •	570		114	
f.Raw Water Pipe (300 mm, 1,000 m)	1,550			1,044	
Sub-Total of 1.			,	2,192		
2. Transmission Pipe		(B/a)	e.			
A/C Pipe, 300 am		1,550	10.850	3,255	7,595	
A/C Pipe, 400 mm			17.400	5,220	12,180	÷
Sub-Total of 2.		-,000	23.250	3,475	19,775	
			741000	· alria	20,110	
. Treatment Plant	•					
a.Kodification of				•		
Exis. Plant	(5,760 cu m/d)	not includ	led -	•		
b New Treatment pla						
	10 cu n		20		14	٠,
Sedimentation Bas			7,840		5,488	
Sand Filter	392 cu m/h		4,704		3,293	
Clear Water Reser	- · · ·		8,320		5,824	
Elevated Tank			1,800		1,260	
Pumping House			360		252	
Chemical House	100 sq u		380	and the second s	266	
Administration Bl	-		500		350	
Staff Quarter	200 sq m		1,000		700	
Sub total	•		24,924	7,477	17,447	
Mechanical Works		(8/unit)				
Chemical Equip	Mixer, Tank, 2units		•	1,216	304	
Chlorinator					176	
Pumps	2 cu m/m , 4 units	350,000	1,400		280	
Kiscellaneous	20 % of above		760		152	
Sub total	•	•	4,560	3,648	912	
Blectrical Works	70% of Mech. Werks		3,192	2,554	638	
Hiscellaneous	10 % of above		3,268	1,368	1,900	
cok mak 1 in fill			35,944	26,172	9,772	unit cos 3,79
Sub-Total of (b)			4,544	F0) 116	0 j 1 t 4	4,131
Sub-Total of 3.			35,944	26,172	9,772	

Alternative :	3				4.	
Item	Dimension	Unit Cost (Baht)	Total Cost (x1000 Baht	Cost Alloca Foreign Cur. 1 Portion)(x1000 Baht)(x	Local Cur. Portion	Remark
4.Distribution Pipes		(B/m)				
dia(nm)	length(m)			:		*.
Replacement						
A/C Pipe, 200	3,330	920	3,064	919	2,145	
A/C Pipe, 250	1,970	1,220	2,403	721	1,682	
A/C Pipe, 300	530	1,680	890	267	623	Salar Salar
A/C Pipe, 400	740	2,900	2,146	644	1,502	
New Construction						
A/C Pipe, 100	8,235	450	3,706	1,112	2,594	11.
A/C Pipe, 150	6,940	630	4,372	1,312	3,061	1.1
A/C Pipe, 200	5,690	920	5,235	1,570	3,664	
A/C Pipe, 250	880	1,220	1,074	322	752	400
A/C Pipe, 300	2,320	1,680	3,898	1,169	2,728	
Sub-Total of 4.	30,635		26,787	8,036	18,751	
Total Construction Cost			95,301	44,875	50,426	
	1			100	9000	, contract of

Note: Allocation Ratio (Foreign: Local) = 0.3: 0.7 (Civil/Architectural Korks)

= 0.8 : 0.2 (Mech./Elect. Works)

= 0.8 : 0.3 (Steel Pipe Construction)

= 0.3 : 0.1 (A/C Pipe Construction)

38 files Colog Raper irreseleston Copt.														•								
Alternative :		# 	. :					11.4			A.					:				1	÷	
.	\$	1,394 1,331	1,312 1,313		1,994	1,11	1,996	1,197	1,998	66°1	3,98	2,901	2,003	2,003	7,604	2,605	2,066	2, 007	2,898	2,069	2,610	2,011
l. Plane bily br	bily dwirge tates denna (cx 1/4) 1,138 1,347 1,343	r densed (cr 11/4) 1,317 (,513	(a 1/4) 4,719 5,025	526'5	12°5	5,529 5,778	E,	199	6,307	1,588,9	18,4	1,24	3 7	1981	5	#	\$30.4	659°\$.		9,761 HE,01 TE,0	2
2. Planed hily Lar Perk Lactor -	hily kazina Kater Denad: (UK tetor = 1.18 5,438 [451 5,33	r Peaul:	1	(ce 1/6).	183	1,83	597' 907'4 D1'1 115'1 A1'1 538'5	1 5	1,18	9,200		8,48	5		8,23	10,763	98°21 TK,21 ET,11 88,11 ET,01 CT,81 11t,0	E.11	12,23	018,21	99,11	13,588
J. Treatment Flast Kristing Flast After Rediffed		###	***************************************	# # # # # # # # # # # # # # # # # # #		1		Tur. Capacity	12	3,838 cs s/d 5,769 cs s/d	P/2 2	Iffect	Tre Cape	Mective Capacity (fear 1 % ions)		1800	3,56	3,350 cm 1/d 5,330 cm 1/d	1,380 en 1/d (turmmentitumenentali))		1	Į į
Her Martspace 13 der Martspase 23	. 22 \$7		-			, ((4))(4)(4)(4)(4)(4)(4)(4)(4)(4)(4)(4)(4	1448)))			6,700 cm n/d	9/11			#	***************************************		4,352 Kez.Capa	4,352 cm a/d Naz.Capa - 4,709 cm a/d		Eff. Capa	Eff.Capa 4,352	Ca 12/d
lifective Capacity (cn 4/4) folal 3,560	1,560 1,560	5,330	5,338	6,330	5,336	289'6 289'6 282'8 982'8 022'8	3,642		3,632	3,682	3,682	3,682	5,682	9,682 14,034 14,034	14, 634	14,034	14,034	14,834	16,034 16,034 16,034	14,034	14,034 14,634	7
4. Ear falor Ascart to be transmitted from the new intake : 40Afgin, [on a/4]	22 23	assitted	fros to	e ner in	take : (Migir	(cr 1/d)															
faily brenge	4 ,153	1,191 4,347	4 ,563	4,789 5,025		\$,112	5,529 5,778		1,617	\$,30	6,588	1881	1,208	7,550	1,907	8,273	199'3	9,056	65)	9,877	9,877 10,311	19,760
faily Axian	5,458	5,651	5,932	\$77.9	6,226 6,533	5,833	1,117 1,111	1111	3,64	8,200	\$95.1	3,945	9.328	9,814	18,279	10 763	11,268	11,773	11,773 12,297 12,810 13,404	018,21	13, 484	13,928
5. Trussission Pipe		(interes)	skors <	ı thefti	782	; tttstt) shors a starting year of water transmirsion	trassit	5101											Bend Loss for Q(2011}3K	for 4	201135K	3
Pl: 4/C Pipe(Izis.TP) Pl: 4/C Pipe(Hew UTP)			(f#g			((\$\$\$\$3)	H2.= H1.=	300 m. 306 m.		7,000 B,](mx) = (1.005		Q(rec) :: Q(rec) ::	7,480 5,139	5/1 to			(8: 1/8)	(0.37)	17.5
6. Pup Characteristics ha later Pup for Figeliae El for Pipeliae FL	it ca			a a	292	200 m; P = 200 m; P =	# # # # # #		55.0 B,	97 GP H	i	2.6 cc e/ria, 2.8 cc n/cia,	Ho.of Ro.of	Bo.of braps = Bo.of Prays =		nits (e	2 units (excluding 1 exil stand-by) ? units (excluding 1 unit stand-by)	l alt	tand-by			
Clear Rater Pusp Elix.Flant New WF		į	:	4	200	260 st. P = 260 st. P =	8 E.	مودد حصابحت مردد	30.0 m,	2 to		3.6 cu n/nin, 3.6 cu n/nin,	lo.of	sere force so, of Preps x		mitr (e	I maits (excluding ! sait stand-by) I units (excluding ! unit stand-by)		rtaed-by rland-by			
1. Is of Operating Pups an Fater Pury for Lipstine Pl fax. Capacity of Pus	Pups Pup		7,480	€	7 85,7	1,480	7 8		1,480	~ <u>\$</u>	, ³⁵ ,	, g	, 188.	, te		7,480	7 8	7,480	7,680	2,189	1,68,	. 68 .
Not appeare to Nat. Capacity of Pasp Total Capacity (cm 2/d)	(Punp (cr 2/d)	7,48	1,486	1,480	8	1,065 11,545	- 85 H	4,065 11,345	1,65	. 25	# # # # # # # # # # # # # # # # # # #	1,065 11,515	58,1 11,585	4,08 11,545	15,618	8,130 15,610	3,136 15,636	3,13 15,61	93.23 82.23	8,136 15,610	8,138 15,616	8,130 15,610
Clear Sater Pasy Kris.A Sev Plant Mar.Cops.of Pray	° 93'8	5,840		12,966	12,964	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	12,960	12,568	12,360	12,960	12,966	12,960	, 17,280	11,280	17,280	11,280	11,286	17,280	17,286	21,600	21,600	2

Alternative :

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2,90	22.22	1,51	\$2.55	1,522 2,682		51,789	31,673	6,365	356.3					201,1
2,007	25	12,12	2 €	2,447		206.5	25,749 37.2	6,611 103.1	XI.1	٠٠,				2,615
2,906	22	##.	1,66	2,315		17,457	37.6	6,328 96.3	326.5			•	٠	2,522
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2,002	88	1,73 1,23	35.1	2,006		39,462	23,677	5,262 82.1	311.5		apocity		: [2,056
7,861 1861	923 88		# SE 1	1,363		37,672	12,603	5,023 78.4	259.2		[a]/sat.			1,391
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1,399	88	1,837	5 E	1.135		34,535	20,720	¥.	ħ		i dalit	of Jan		## F
1,331	8.8	1,596	5.5	1,105		13,654	13,133	1,101	1.		s is temped for 46s (Daily brenge beause) Largy Courselion (IM) = Rose Traps i Rose Crepat(IV) = 24 k/day = (actual daily denuel(qia)/nuz.copacity of punp(8) Lorgy Cauge = Rait	lind u		365 1, 194
1,997	22 8	= =	F18.	1,656		11,633	1:3	E.5	217.6		total Stor Bes (7.1) III	or farat	. :	1395
1,996	. S. P.	## ## ## ## ## ## ## ## ## ## ## ## ##	£ 5	1,619		3.23	2 H	63.0	260.3			in i		. 25 E
1,935	អ្នង	215.7 88	£ #	1,582		28,562 1	11.11	3,14	132.6		Output 12 sea/ 12 sea/ Feef for	utisřít, J		1,58 1,58
1,994	\$ \$	81,1 81	E S	8		258	3.5	3,68	18.1		r r foto f fron z ff for z fictual	tricity 15 Cert	11	£ 5,
1,953	= 3	. B.B	50.00	1,311		15,234 18.2	13,73	3,436	E		A Paris	ial Ilectricism, 2	מצו	181 1,33
1,952	22	11°11	-85	1,252		1,30 7	# C	3,331 \$2.8	1113		Chairy Il a 16 is of 16	Provincial unat livin	12.2	1919 1994 B 1. 10.46 E 1. 13.996 X 1008 Eart
166'1	22	. ii	11,009/year) 165 38 136 \$5	1,211		2,58 35.4	17.5	2,173 6.5	163.1		For Charles (E) Sales (E)	(Fil fracur	Ħ	11.66
966,1	- 2	[Lel/day # 798	# 25 H	6		**		_			is feriped for the factor of t	, in the same of t	line : Bakt Cl fas : Bakt	
Ites 1	8. Lotor Output (fie) far Later Pup Clear R.Pap	9. Reeff Consuption (Las fate: Pap Clear 1. Leap	16. Pasp Geration Cort beaud Clarge therff Clarge	Total Cast	Cerical Cost	tha (he 13.04/1) Chesical (hj.) Car(Oakt 1900)	Cost(Eah 1600)	Cost(Net, 1800)	Total Catt(Bakt 1004)		Min in temporal for the (Daily Average Senaed) 1. Latery Counsepies (Th) = Road Part & Lober Octypel [15] & 16 May & Cactual 2. Decard Charge = Rail 22 MY for a 12 son/year is fotor Bernal (15) for the Charge = Rail 1.23 MY & Latery Counsepies (4) fff/day x 16 Decard Charge = Rail 1.23 MY & Latery Counsepies (4) fff/day x 16 M = Raily Manage M = R	Herricity for a late of broinelal Herricity Atlantiq(III) for laratival as of launcy, 1993. Clarical cast (IV Frencest British, 1993 Carl) Line : Late : 4.85 for	। द्या द	Tear Operation/Chesical Cost Discount nate 139

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1. Planned Daily Average fater Dennad (on a/d)	e faber	Î X	(P/ 8 3							1												
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lazi.	ä.	Pend	3	7																1		
fest factor = Plained Total = 5		159'5	75,	522.5	6,533	6,453	1,111	1,511	1,848	J, 204	585,1	\$16'1	9,176	9,414	M,279	16,763	11,268	E1,13	12,23	~	2	856. 1854. 1854. 1854. 1854. 1854. 1854. 1854. 1855. 1856. 1855. 1856. 1856. 1856. 1856. 1856. 1856. 1856. 1858
3. Treateest Plast Existing Plast 199 After Rodified	160	***************************************			;;;;	Re. Cepelity 	d is 399	er.Capac		3,810 cm a/6 5,760 cm s/é	1/2	Iffecti	Effective Capacity (lear 0 % loss)	ly (les		•	3,560 cm s/d 5,330 cm s/d	9/4		!		
for Platifhus !} Ber Platifhuse ?}						(((anamana))	((¢###			11,339 cu n/d	· p/s s				T.	H##333	10,560 ca n/d u.Cepa 3,780	3,780	E 2/21	3	5	19,500 ca n/d
Effective Capacity (ew m/d) Total 3,560	(cu m/d) 1,560 5,760	5,760	5,766 5,750	5,750		16,590	16,569	10,500	10,500	10,500	900'E1 999'E1 998'91 998'91 998'91 998'91 998'91 908'91 998'91 998'91 998'91 998'81 998'81	10,500	005 '01	005.01	10,500	990'51		1,000	1,600	96*5		14,050 14,600 14,000 14,000 14,000
4. Atter knount for Ripeline Denign : {cu u/d}	a light		(cz sv			Treated Takes from flow Clause (Scarly Max (sententialists))	ther fro	Tar E	art (Sca	rly Nac	Ì											
Rew nater for Existing Plant (Dally Kax)	3,568	5,760	5,780 5,768	5,768	\$,768	5,760 Z,408 7,408 Z,400 Z,405	1,400	1,400°	3, 406	1,400	7, 100	7,400 7,400	7,400	7,169	1,400 7,400	7,400	7, 600	7,160	1,400 7,400	÷.		7,400
freated rater from Ker Plant (South Ran)	. :					2,085	2,352	3,000 3,467	1,461	1,55	4,439	1,985	5,574 5,189		228'9	7,503	8,202	106.8	9,626	6-4 6-4		8,501 9,626 [0,379 !1,16d 11,969
lotal						27.48	5,933	10,400	10,867	11,353	11,859	2,335	16,51	2,53	#, E	26	2,602	6,301	1,035	£	~	697'61 095'91 611'11 910'11 106'91 209'51 606'11 202'11 608'121 116'12 518'11 618'11 618'11 618'11 618'11 618'
5. Transaissian Pipe	1"	li li	Nows a	startin	1 Jul 1	tetetes); shows a starting year of water transmission	trannti	sion											rd Logs	ž	18	Read Logs for 4(2011)58
Pl: Bar vater for		***************************************	2		.*			Dia.	200	<u></u>	300 as, L = 7,000 m,		I(nax) = 0.6066 .	9309	- (ms))	:	7,400 cs s/6	5/4			= =	(0.35)
Entring Flant P2: Treated water from New Flant						,************	ŝ		965	 	690 km, & = 6,000 k,		[[ear] = 0.0070 ,	. 0076	: (20))		16,310 cu x/d	p/#				(0.60)
6 Daily Average Transmission Arount	egie 816	Arout																		1		
Ars vater for Life. Plant		4,347	4,563 4,789 5,025	4,789	\$20'\$					٠.			1	•								
Treated maker						5,372	625'5	90 4-0 1-0	6,03	6,307	5,272 5,529 5,778 6,037 6,307 6,568 6,881 7,208	. 188,		1,550	1,507	8,279	3,553	9,056	£53.	8	===	1,550 1,507 8,279 8,668 5,056 9,459 9,877 10,311 10,760

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Transmirator
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Illerialire :

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Hea 1950		1592	1993	1991 1992 1993 1995 1996 1994 1998 1998 2000	3661	36	1981	1681	1938	2000	1992	2002	2001 2002 2003 2004	502	2002	9002		2007 2008	2008	0192	107
f. Puy Chracteristics																					
lar fater füep			:	;		:		:		•	•					:		:			
for Life. TP			2	2	<u>.</u>	#	-	- -	r -	2	t this,	16.0	Faps :		2 mits (excluding I wit stand-by)	Je je je	H	144-14			
for New Web			ii.	75 75 75 75 75 75 75 75 75 75 75 75 75 7	200 411, ? c	2		20 IN, E = 19.8 a, Q = 4.5 ct s/ait, Bolof Pang :	H	÷	1,41,1	0.0) eaps	i	3 usits (excluding 1 unit stand-by)	- Jeipel:	i ni s	tanf-by)			
Clear fater bug																:					
1 Per 121			Piaz		¥.	2	**	56 EV, N = 55.4 m, Q ×	H		1 1/zig.	10.0	Fraps 7	÷	nite (en	clading	l mit s	tand-by)			
at Lin.M?			Pier		200 m, ? r	5 8	,, ,,	H. 6.		63 63	3.6 or s/min, No.of Prays = I units (excleding I unit stand-by)	0.0	raps =	<u>.</u>	sits (ev	clading	l wit s	(te-para)			
l. 12.0f Operating Pups has taker Pup for Exis. AT		**		**	: .																
Kar. Capacity of Prop or few ff?	1, 19	ž.,	1,100 7,404 7,408 7,408	7,488 84,7	**	+4	Fo	~	~	-	. ••	**	**	~	**	~-	~	6.2	**	77	•••
Rat. Capacity of Page					216*21	12,512	2,912	12,912	12,912	13,912	216'21	12,912	11,912	12,912	12,312	12,912	216 21	12,912	216,51	38.	13, 35
Total Capacity	₹.	1,160 1,405		1,104 1,404	12,312	61 96°61 316'41 316'41 316'41 316'41 316'41 316'41 316'41 316'41 316'41 316'41 316'41 316'41 316'41 316'41 316	12,912	216,31	12,312	12,112	11,912	11,912	11, 911	12,312	216,31	11,512	11,912	12,912	11,912	13,16	13,36
Clear fater frey	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	
	1,13	3,732	3,73	1921 61 1921 1921 1921 1921 1921 1921 19	3,732	1891	1,689	14,43	14,638	14,583	34,688	14,483	14,621	14.651	19, 584	19,564	19,584	19,584	19,580	13,58	13,55
							i		***************************************			***************************************		-	-			*******	******		

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Alternative :

Ites	1999	1861	2661		1991 1994	7.88	386	1897	1861 1861	1939 2008	\$002	1902	2002	2002	3002	2065	3005	2907	5693	2002	2050	2011
				İ									Ì			Ì				ĺ		
	:				• .•	* ,			;	٠		٠		1	•			. :				
fote: Pupp is durigned for Sta (baily Average bennat) B. Reergy Consusption (INH) = 80.0f Penps t Fot	is design	mpi is únigad dar dát (billy derrye bendé) . Kety Conrapios (CR) = Bood Penys x Robe Gespel(TV) x 24 k/day x (actual delly denadleja)/succepacity of preș(t)	(Paily Th. = Ho	dverage 1.0f Pan	bennak) 18 x Kotor	Gethat	11 [H]	1/day 1	(ectual	deily d	erani e	2]/322.0	specity)draid jo							•	
۳	de d	. Desud Chrys - Sult Leefy Chrys - Kall exim has leaded leaf Lo	2 to 12	E B	23 /RVson z 12 sen/gen: z dotor Denná(†) Uf 1.23 /RD: z Langy Consenption (4) Uil/day z 355 day/year tizelinels/Loton Hoof for U.S.(h) (Pam Lead 2,5 n)	12. Ben/1 bref Com	182 1 % 183 Lion 1.8 E)+(호 (1) 12 (1) 12 (1)		S days/g	: ##			;								
M	M : Baily Average M : Baily Maximas Electricity Res	d. : daily frerege. M : daily Kuisas. Electricity de = Eate of Loniscial Electricity Lathority(FEE) for Aunthing as of Japary, 1999.	Prorinc	ial Elec	tricity 1	lathority	6) (134)	r Sarath	- P	of Jan	uy.					٠						
Genic	Chemical Cost Elva : Eige	ilek ilek	1.05 Ph 1.15 /kg	22	•	•										•						
	13ec: 40 13	: भूग	15.69 /	ŧ,	٠																	
Year Peration Chemical Cont		1988	1990	1992	1,185	1991	1994	1395	1996	1997	1958	1398	2000	2041	2002	2002	1,954	2005	2,225	2007	2008	2009
Discount Late.	نو	10.00					:								į						-	

2011 2010

Alterative :

(1.86 (1.81	Ites	1530	55	1891	1993	1886	1988	SE .	1997	1988	1881	2002	700	2002	2003	7697	2002	1002	1002	2008	1903	0192	1102
(en a/d) (en a/	. Planed Daily ave	rage fate	r Perm	ice st	=																		
(co 1/2) (co 1/		161	4,347	1,563	4,183	1,025	5,272	\$,523	1,71	6,037	101.3	512	188.3	1,266		1,967	8,279	199'8	3'98'	\$,459	9,877	115,01	16, 769
	Pat Rater : Pat Rater : Flanes Total	12 E 2	r Jenus 5,632	5,832		6,53	137')	7,187	119"2	##' _\	1,20	1,363	8,365		3,816	16,273	10,763	192,11	11,713	12,237	99.21	13,404	13,98
(*************************************	1		#	##	***************************************				Tr. Gapte	121	3,886,2	9/8 m	Iffecti	se Capic	ity (lea	A 1 9 5	10	3,56	72.75				#
1766 1,766 1,668 1,668 1,668 1,668 1,568 13,399	des Plant[Phare I Ber Plant[Phase 2	~~					;	11111111	*******	Ĉ	85'5	p/s 10			Cretera	188228881	1 (((144)	4,336 c 84.Capa	1,680,1) p/s 1	Eff.Capa	6,330	## F
1,530	Effective Capacit Fotal) (cr 1/)	25.5	5,768	\$,764	3 2.43	32.5			89'6			99 6	899 6	13, 990	13,590	380	BSC 17	33	13,590	13,956	11,590	11.50
L,530 L,930 Z,451 Z,331 L,435 L,435 S,634 S,636 E,326 T,005 S,732 B,448 S,152 B,448 S,153 B,448 S,155 B,458 B,448 S,155 B,458 B,448	. Taker secus for for nater for Risking Plant (Daily star)	Heliae	i i	. E	(P/)	8,78		5,769		5.78		5,78		5.76			5,760	5,168	8,768	82.5	25.7	5,160	5,750
	freshed mater from the Plan (Courty Max)	ار د مساده				•	1,536	56. 1	1,461	1,326	11. 11.	1,927	4,459	5,054	5,676	6,116	7,005	22	8,418	3,152	5	10,702	25
4,345 4,745 5,415 4,306 4,366 4,306 4,300 4,300 4,300 4,300 4,300 4,300 4,300 4,300 4,300 4,300 4,300 6,300 6,300	i. Translistion Bip. Ha. Bar water for Existing Han. II: Treated extern from the Plan.) Disona (48)	. rtert	10. 10.	of rates	trumii (c)	ntion Dia.s Pia.s		: : : : : : : : : : : : : : : : : : :	88°.		1 (mg)	1.0074	1	1 1 H	16,316	1.	fend Los	is for Q((8: a/s) (0.36) (0.36)	3 3 3
4,288 6,387 4,785 5,885 6,386 4,386 6,386 6,380 4,380 6,380 6,380 6,380 6,380 6,300	bally inerage Tr	Lara ist ic	1 150																				
911 1,225 1,478 1,127 2,007 2,281 2,388 1,286 3,687 3,579 4,386 4,136 3,159	ta sater for Leisting Man	# ₁ ,	1,347	6,383	£.	3,013	1,30	\$0.	4,38	 85	¥6.4	1,38	. 380 1		1,38		4,360	900')	025'		90,4	1	(,399
	Truted mier					٠	#			1,131		1,131	2,581		1,25	1,667		1,36	4,156			110,7	6,460

Tritical This 180 m, P = 21 M, L = 55 d s, Q = 1.5 on Min, Boof Pape = 3 with (caching) said where This 180 m, P = 21 M, L = 35 d s, Q = 1.5 on Min, Boof Pape = 3 with (caching) said where This 180 m, P = 21 M, L = 35 d s, Q = 1.5 on Min, Boof Pape = 3 with (caching) said where The 180 m, P = 21 M, L = 35 d s, Q = 1.5 on Min, Boof Pape = 3 with (caching) said where The 180 m, P = 21 M, L = 35 d s, Q = 1.5 on Min, Boof Pape = 3 with (caching) said where The 180 m, P = 21 M, L = 35 d s, Q = 1.5 on Min, Boof Pape = 3 with (caching) said where The 2 m = 2	iter i	58	161	2661	133	133	1,555	386	1337] 181	250	2002	36	282	E	교	1105	1985	1001	2002	2903	2010	1182
This like 150	fup Chracteristics r later hap or lipeline H or the NY				Dia-	8 9		22		25.6	~~	111	3 1/1th, 3 1/1th,		Tops :		aits (a	cluding cluding	1 meter	tend-by rund-by)			
\$\(\) \text{5.70} \(\) \text{5.70} \(\) \text{5.70} \(\) \(\) \\ \text{5.70} \(\) \(\) \\ \text	Clear Taker Pasy at Kee Aff at Inis.Aff	Ē	Ę		No.	5 2		\$ \$		2 E		2.2	n s/eis, n s/eis,	Fo.of Fo.of	Table :		uits (ex aits (ex	cleding	in it	ttad-bri			
	So of Operating Pupe Nater Rus to Epplies 71 Nat Capacof Pup to Nor 177 Nat Capacof Pup		ř	i	5,760	** 25.4	5,76	* B * S	****	<u> </u>	•	5,15 1,15 1,15 1,15 1,15 1,15 1,15 1,15	. 5 5.	* 2 - 2	. 5 . 5	•		!	-	2,7,2 2,7,2 2,000,4	, 15 , 15 , 15 , 15 , 15 , 15 , 15 , 15	7 2 7 8 7	2 5° 5° 5° 5° 5° 5° 5° 5° 5° 5° 5° 5° 5°
60 66 60 60 60 60 100 100 100 100 100 10		~ 22			25.54	, , , , , , , , , , , , , , , , , , ,	4,326 4,326 15,850		7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7			7,500 1,320 1,540 1,540		i contract of the contract of									12,360 12,360 2,600 21,600
Ho	Rotor Ostpet (To) 2se Faler Pasy lear Rater Pasy		88	32	= 3	22	25 65	55 100	8 95	8 9	28 100	2 20	2 2	2 2	8 51	22 52	061 100 100 100 100 100 100 100 100 100	82	23	33	8.8	图包	88
Cont	. Large Corresption in fater fus	(Tuh/day	_ 2 2	1 B 2	1,480	1.1	E. 2	100	15 E	į	į	22	15.5	52	84	113	2,316	į	•	1,58	1,679	1,78	2,88
479 [1,302 [1,315 [1,315 [1,315 [1,315 [1,316 [1,516 [1,516 [1,516 [1,516 [1,516 [2,168 [2,147 [1,216 [2,218 [3,141 [2,195 [2,316 [2,31	i. Pary Operation Cont. Leand Charge Leafy Charge	14 53 E	1,000/7	12 2 2	2 56.1 2 56.1	11022	1	£ 55,	. ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ±	285 1,306	(\$5,1	883 1,476	1,563	119,1	1,681	1,738	i	i	1,997	765 1.081	291,2	2,25
1,200 14,200 14,200 14,200 15,72 16,50 17,11 14,105 14,01 15,10 17,10	Total Cort			1,339	1,335	1,352	1,646	1,63	1,748	•		11511	2,086	2,147		2,288				2,766 2,650 fotal (1991-2011)		64 P	1,035
21,840 24,882 26,220 27,511 28,62 39,779 31,633 34,644 34,533 35,472 31,672 39,462 41,334 41,239 45,330 47,457 41,532 30.3 86,43 111.4 186.4 111.4 186.3 131.5 132.3 132.3 146.1 131.5 131	erical Cort		-						-	į													
	lin (ave 15.5mg/!) Chemical (kg/y) Cost (babt 1000)	**				27,513 111.4	28,862									-				203.7	54,078 5 215.0	55. 23. 23. 23. 23. 23. 23.	215.6
773 3,331 3,498 3,688 3,648 4,026 4,218 4,407 4,604 4,810 5,023 5,282 5,511 5,772 6,044 6,328 5,51 5,712 5,04 6,328 5,52 5,52 5,53 5,52 5,04 6,32 5,53 5,53 5,53 5,53 5,53 5,53 5,53 5	Chemical (kg/y) Cost (Bakt 1000)				15,732	16,581	11,111 21.6													31,071 38.8	12,447 3	12,871	35,348
161.1 171.5 1864 189.3 1964 286.5 277.4 127.6 286.2 259.2 271.5 286.4 297.8 211.3 256.3	Norine (me 2.0 ng/i Chercal (hg/r) Cost (halt 1000)			3,331	3,45	3,66	3,848	4,036	4,218 65.1			4,818 75.0	5,023	5,262 25.1	115,511	5,772 90.8	6,046 94.3			£,965	7,210 112.5	1,527	2,68 2,53 2,54
	otal cost(Sakt 1900)		5.7	11.5	190.4	69.3	3.861	201.3	217.6			248.2	239.2	271.5	254.4	297.8	311.9			356.3	32.5 To	368.4 Fotal	665.3 S,653

Alterative :

	thielty Re a mate of Provincial Electricity Anthority (Sta) for Murahiusa na of January, 1863.	tricky de s tate of droniacial Electricity authority(PEA) for karaldium as of dunary. 1969. Ical Cost.	ericity des kies of droincial Moctricity dethority(PM) for hardding as of demary, 1983. Ical Cost. : And - 4-68 for	tricity Res = kate of Provincial Electricity Anthority (RM) for Burahiwa us of Jauney, 1987. ical Cost. Alsa. 5.45 / A. Alsa. 5.45 / A.	civilty des the of drovincial Libertricity dethority(TL) for durallism as of durary, 1988. Also shalt 4.68 /ty Line shalt 1.25 /ty	ricity de s'ute of broiscial libetricity dethority(Ta) for beraldium as of dumer, 1987. sia dest. de d	tricky fee = Reks of frontacial Electricity Authority(PLA) for burthissis as of Isaucz, 1989. ical Cost. Line : Ant t. 4.05 /bg Line : Last 125 /bg Cl. gas : Bait 15 /bg	5	The state of the s						
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Table 8.3.3 Cost Study on Alternatives

lternat	ive I		******						
Year	Water Demand (cu m/d)			tion Cost Trans.Pipe	Land Cost		ration Cos Chemical		Total Cost
NPV		*******					~	* = 0, + = u = = 0	*
r= 9 %	62,423	**							66,45
1990	4,198				20,000	479		******	20,47
1991	4,347				, , , , , ,	1,211	164		1,37
1992	4,563					1,252	172		1,42
1993	4,789		8,986			1,377	180		10,54
1994	5,025	4,320	8,986	9,300		1,422	189		24,21
1995	5,272		·	•		1,562	199	482	2,24
1996	5,529	:				1,610	208	507	2,32
1937	5,778					1,656	218	532	2,40
1998	6,037					1,705	227	559	2,49
1999	6,307					1,755	238	586	2,57
2000	6,583		,			1,808	248	616	2,67
2001	6,881		8,986	•		1,863	259	646	11,75
2002	7,208		8,986			2,006	272	679	11,94
2003	7,550					2,070	284	713	3,08
2004	7,907					2,234		748	3,28
2005	8,279					2,303	312	786	3,40
2006	8,668	100				2,375	327	825	3,52
2007	9,056					2,447	341	866	3;65
2008	9,459					2,522	356	910	3,78
2009	9,877	:				2,682	372	955	4,00
2010	10,311					2,762	388	1,003	4,15
2011	10,760	•			÷	2,815		1,053	4,30
Total		4,320	35,944	9,300	20,000	41,946	5,657	12,466	129,63

Alternative 2

Year	Water Demand (cu m/d)	Intake	Constru WTP	ction Cost Trans.Pipe	Land Cost		ration Cost Chemical Hanning	Total Cost
1197 r= 9 %	52,075	ဖစ ယည္တလုံးကလ ွန္					# # # # # # # # # # # # # # # # # # #	54,661
1990	4,198			· ~ ~ ~ ~ * * = = ~ * * * * *	0	397		397
1991	4,347					1,178	164	1;342
1992	4,563					1,218	172	1,390
1993	4,789		12,497			1,259		13,936
1994	5,025	4,890	12,497	17,400		1,302	189	36,278
1995	5,272	•				1,141	199	1,340
1996	5,529					1,315	208	1,523
1997	5,778					1,351	218	1,569
1998	6,037				i i	1,388		1,615
1999	6,307			٠		1,427	238	1,665
2000	6,588					1,467	248	1,715
200i	6,881		12,497			1,509	259	14,265
2002	7,208		12,497			1.556	272	14,324
2003	7,550	•			•	1,605		1,889
2004	7,907					1,656	298	1,954
2005	8,279					1,847	312	2,159
2006	8,668					1,303	327	2,230
2007	9,956					1,958	341	2,299
2008	9,459					2,016	356	2,372
2003	2,377					2,076	372	2,448
2010	10,011		•			2,133	388	2,581
2911	19,760					2,258	405	2,663
Total		4,890	49,986	17,400	0	34,020	5,657 0	111,953

Alternative 3

Year	Water Demand			tion Cost		0pe	ration Cos	t	Total
	(cu m/d)	Intake	yTP "	rans Pipe	Cost	Bnergy	Chemical	Manning	Cost
уру				********			****	****	****
r= 9 %	52,075								54,097
1990	4,198		*********	********	0	479		·	479
1991	4,347					1,302	164		1,466
1992	4,563					1,318			1,490
1993	4,789		8,986			1,335			10,501
1994	5,025	4,320	8,986	17,400		1,352			32,247
1995	5,272					1,646		482	2,327
1996	5,529					1,698		507	2,413
1997	5,778	-				1,748	218	532	2,497
1998	6,037					1,800		559	2,586
1999	6,307					1,855		586	2,679
2000	8,588					1,912	248	616	2,776
2001	6,881		8,986			2,080		646	11,972
2002	7,208		3,986			2,147		679	12,083
2003	7,550		.,			2,216	284	713	3,213
2004	7,907	•			•	2,288		748	3,334
2005	8,279					2,418	312	786	3,516
2006	8,668					2,496		825	3,648
2007	9,055					2,575	341	866	3,782
2008	9,459					2,766		910	4,032
2009	9,877	•				2,850		955	4,177
2010	10,311					2,938		1,003	-
2011	10,760					3,029		1,053	-
Total	*****	4,320	35,944	17,400	0	44,248	5,657	12,466	120,036

APPENDIX A-8-3

Capacity Calculation of the Water Treatment Plant

the tab and the the time type that the total and the time the total the	医胃 电子 医尿 医乳 医乳 电气 化气 医沙 医红 经记 有心 电子 医子	
Item	Total System (for 2011).	M to 40 TO 60 to to to to 10 t
Planned Flow	: Q= 9,400 cu m/d	ا مین بین ویو هو ست احد شد چه اسه بخو PP کرد شد اند
	: = 392 cu m/hr	
	: = 6.5 cu m/min	•
	: = 0.109 cu m/sec	
No. of Treatment	Line	an grae man ann ann ann ann ann ann ann ann ann
	: 2 Lines	•
	•	•
	4,700 cu m/d x 2 lines	:
(1)		
Receiving Well	•	:
Criteria	: T= 1.5 min	:
	: d= 2.0 m	:
		:
No.	1 unit	;
	: Circular	;
	: Dia 2.5 m	:
	: v= 10 cu m	
	t= 1.5 min	
(2)		
Mixing Tank		
		:
Criteria	: T= 1.0 min	
		:
Dimension	: Square x 2 units	:
	L m x W m x D m x units	:
	: 1.5 1.5 1.5 2	:
	7 00 5	:
i L	v = 7 cu	
	: : t = 1.0 min	
	· · · · · · · · · · · · · · · · · · ·	
Mixer	: Mechanical Flush Mixer	
		•
	·	

Capacity Calculation	for	Treatment	Plant
----------------------	-----	-----------	-------

Item	: Total System (for 2011)
(3) Coagulant M	xing
Typ	: Hydraulic Mixing
Coagulan	: Solid Aluminum Sulphate (A12(SO4)3) : containing 15 % A12-O3
	: Dosage Rate: 10-25 mg-solid alum/l : Average 10 mg/l :
	: Coagulant Solution : 5 % solution :
	: Dosage Amount: 94 kg-Alum/day:
•	: Coagulant Solution (5 % solution)
÷	= 2 cu m/day
No. of Mixer	2 units
T'ype	Batch Type Mixing
Capacity	0.9 cu m/unit
Dimension	: Square x 2 units (1 stand by) : L m x W m x D m x units : 1.5 1.5 2.0 2
	: v = 4.5 cu m/unit
	: Total V = 9.0 cu m
·	

Item	: Total System (for 2011)
(4) Flocculator	20 To 100 days way, can say, that arm upon the say was 100 me and was the saw one was part was not not say the saw the saw of the saw one was
Type	: Hydraulic Flocculation
No.	: N = 2 lines x 2 units
	: = 4 units
Unit Flow	: q = 1.63 cu m/min/unit
Criteria	: T = 30 min
Dimension	: W m x L m x D m x n lines : 1.7 12.0 2.5 4
•	: v = 51 cu m/unit
	: t = 31.3 min

*	ion for Treatment Plant
Item	: Total System (for 2011)
: (5) :Sedimentation Bas	in the state of th
Туре	: Rectanglar, Horizontal Flow
: : No.	: N = 2 line x 2 basins
: :	: = 4 basins
Unit Flow	: : q = 97.9 cu m/hr/basin
: Criteria	: Retention Time : T = 4 hours
: Dimension	: W m x L m x D m x N : 4 25 4.0 4
: :	: v = 400 cu m/basin
	: t = 4.1 hours
: :Flow_velocity	: : v = 10.2 cm/min
Surface Load	: : a = 23.5 m3/m2/day
Sludge Removal	: : Hydraulic Removal :
Sludge Amount	:
Solid Amount (ton-DS)	So = Q(K(T1-T2)+0.16xB)x10^-6 where So:Sludge dry weight(ton) Q:Treated water amount(m3/d) K:Coefficient converting turbidity to SS (0.8-1.5 ->>1.2) T1:Turbidity in raw water(ave= 57) T2:Turbidity after Sedimentation (ave = 7): B:Alum dosage rate (ave.= 10 mg/l)
<i>,</i>	: So = 0.58 ton-DS/day : Water Contents of Drained Sludge
: :	: w = 99.5 %
:	: : Sludge Volume
	: v = 116 cu m/d

Item	: Total System (for 2011)	dae 1700 dan
(6) Rapid Sand Filter		then field were some code data some stage plant were some some stage many upple some major was upple \$\frac{1}{2}\$ \$\tilde{0}\$ \$\tilde{0}\$
Type	: Down Flow, Single Media	;
No.	: : N = 2 lines x 4 units	:
: :	= 8 units	:
Unit Flow	q = 1,175 cu m/day/unit	: :
Criteria	Surface Load 120 - 150 m3/m2/day	: :
Dimension	W m x L m x N units 2.5 4.0 8	: :
: :	a = 10 sq m/unit	:
; : Surface Load	: La = 117.5 m3/m2/day	: :
Filter Washing Frequency	Once a day for each filter	; ;
Rate	: Surface Washing	: :
: :	0.2 m3/m2/min x 5 min	; ;
• ·	Backwashing	:
*. ·	0.6 m3/m2/min x 10 min	:
: Water Amount : required	Surface Washing	:
;	v = 10 sq m/unit x 8 units	:
	x 0.2 m3/m2/min x 5 min	:
	= 80 cu m/day	:
•	Backwashing	
	v = 10 sq m/unit x 8 units	:
	\times 0.6 m3/m2/min \times 10 min	; :
	= 480 cu m/day	:
	Total q= 560 cu m/day	:

```
Capacity Calculation for Treatment Plant
    Item : Total System (for 2011)
   Solid Amount :
   in Wastewater :
   Solid Amount :
                  So = Q*K*(T1-T2)*10^-6
       (ton-DS):
                 where So:Sludge dry weight(ton)
Q:Treated water amount(m3/d)
                          K : Coefficient converting turbidity
                             to SS (0.8-1.5 \rightarrow 1.2)
                          T1 :Turbidity before filter(ave= 7)
                          T2 : Turbidity after filter( ave = 0)
                              0.08 ton-DS/day
                       So =
                       s = 141 \text{ mg/l}
    SS Contents:
:Clear Water Reservoir
               : N = 1 units
         No.
    Criteria
               : Retention Time
                      8 hours
               : T =
 Required Volume: V = 3,133 cu m
               : L mx
                        W me x
     Dimension
                 30
               : Total Volume
                       3,300 cu m
               : v =
  Retention Time : t = 8.4 hours
```

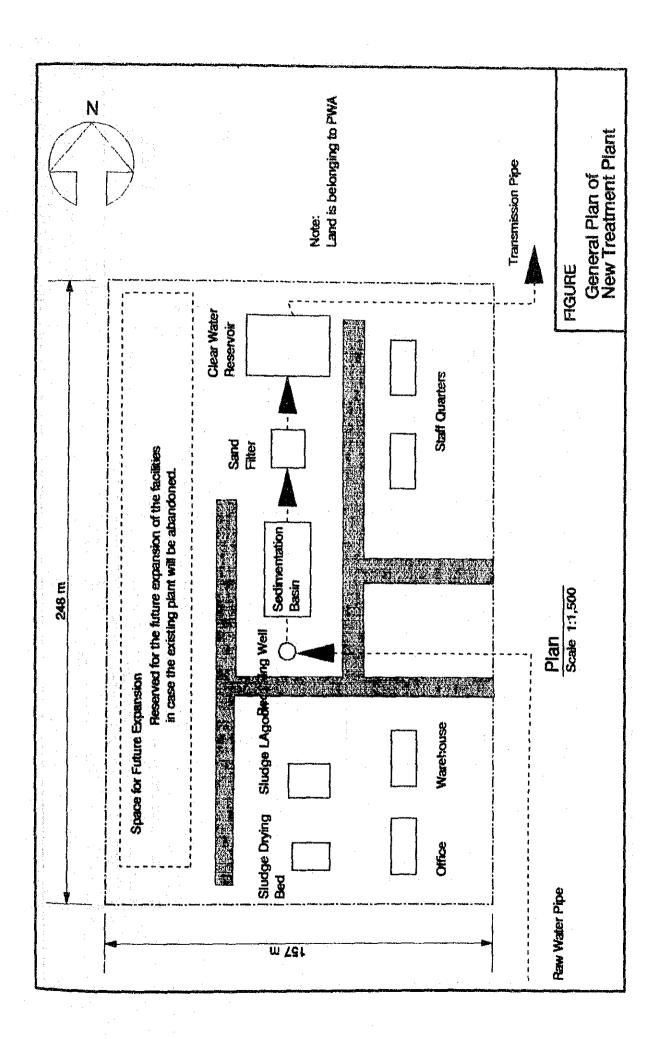
```
Total System ( for 2011 )
:Chlorination Equipment
: Injection Point : at the Inlet of Clear Water Reservoir
    Dosage Rate :
                       2.0 ppm
        Type : Liquid Chlorine (1-ton cylinder)
       Amount :
                       19 kg- Cl gas/day
     Injector : Vacuum Type Injector
              : No. of unit 2 units
                          (excl. 1 units stand-by)
                             0.39 kg/h/unit
              : Rate
     : Capacity 10 kg/h/unit
     Storage: 1 month
: Storage Amount : 19 kg /day x 30 day = 564 kg
                        = 12 cylinders (50 kg)
:Sludge Lagoon :
: Filter Washing : q1 = 560 cu m/day
        Water:
: Retention Time : T =
                      1.0 day .
: Required Volume : v = 560 cu m
   No of Lagoon: n = 2 units
     Dimension : (Bottom)
     : L'mx
                       W m x D m x
              : 10
                       8 2.0
              : (Top)
             : L m x
                16
                       14
              : v =
                       608 cu m
    Side Slope : s = 1 : 2.0
: Retention Time : t = 1.09 Day
```

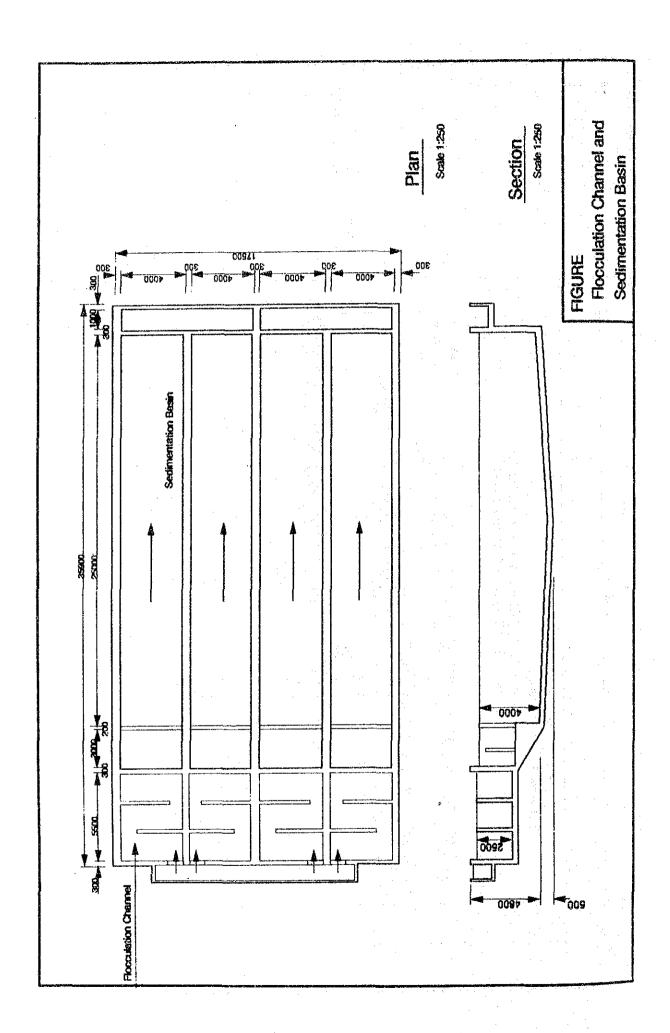
Item	: To	tal Sys	stem (1	or 2011)		155 1504 1505 1509 1500 1504 1504 1504 1504 1504 1504 1504
10) Sludge Dryin					· · · · · · · · · · · · · · · · · · ·	en e
Drain Water	from Sedi	mentat	ion Basi	i n		en e
Volume	: v1	=	116	cu m/d		
Solid	: : s1	=	0.6	ton-DS/d		
Drain Water	from Slud	ge Lage	oon (Thi	ckened ba	ckwash v	water)
Solid	: s1	=	0.1	ton-DS/d		
Water Contents	: W	=	99.0	%		
Volume	v	=	8	cu m/d		
Total Solid	s =	s1 +	s2 =	0.7	ton-DS/	i
والمراجع المراجع					. <u> </u>	
Water Contents		w =	55	%	, e	
of Dried Sludge					1. 1	en e
ludge Thickness		d =	30	cm after	dried	4 d
Drying Period		t = "	30	day		en de la companya de
Required Area		a =	146	sq a		And the second of the second o
No of Unit	n =	2 u	nits			en de la companya de La companya de la co
Type	: Recutang	lar, C	oncrete	Made	:	
Dimension						
	L m x 5	W m :	k D g	nx N	•	
	:					A Section of the sect
Surface Area	: a =	150 S	q m at 1	MOJJOS		

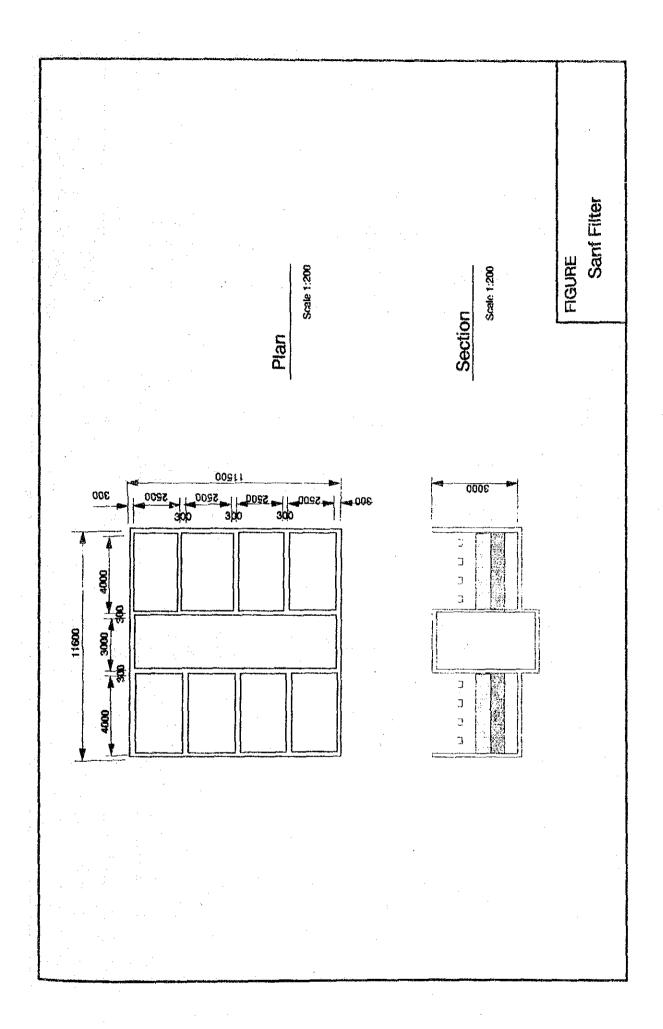
: Item	*	Total	System (for 2011)
:(10) Clear Water	Pump	. (1), and 20, and 20, 40, 70, 77	هو منظم منظ منظ منظ منظ منظ منظ منظ منظ من
: No.	: N =	3	units + 1 stand-by
: : Flow per unit	: q =	3.0	cu m/min/unit
: Diameter	: D =	200	mm :
: Head	: : H =	30	m :
: Motor output	: P =	30	KW
: Total Capacity	: : Q =	13,160	cu m/day :
:(11) Sludge Lago	on Drain	Pump	, and the last and and the last are put up and the last a
: No.	: N =	1	units + 1 stand-by :
: :Quantity drained	: Q =	560	cu m/day :
: : Draining Time	: : t =	6.0	hours
: Pump Flow	: : q =	1.6	cu m/min/unit :
: Diameter	: D =	100	mm :
: Head	: : H =	5	; m
: Motor output	: : P =	2	KW :

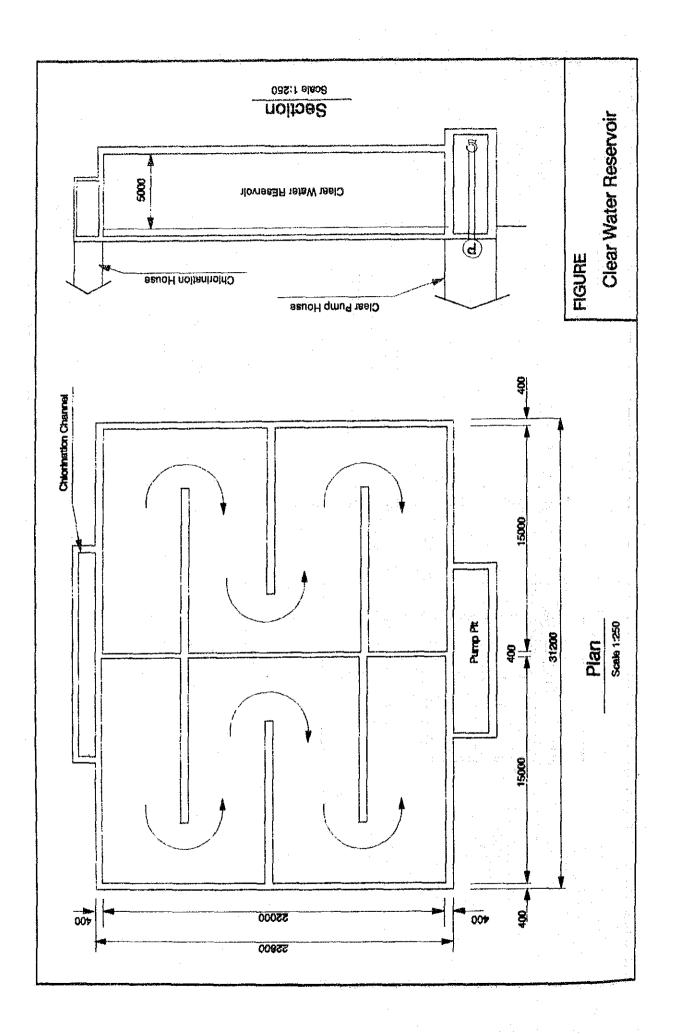
APPENDIX A-8-4

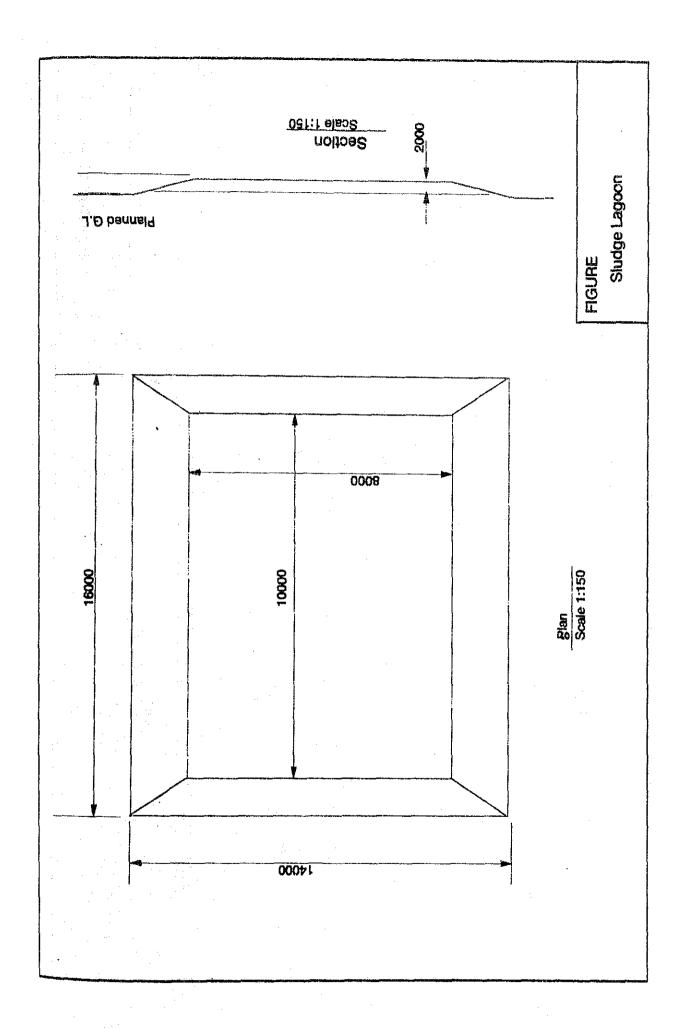
Water Treatment Plant Facility Plan

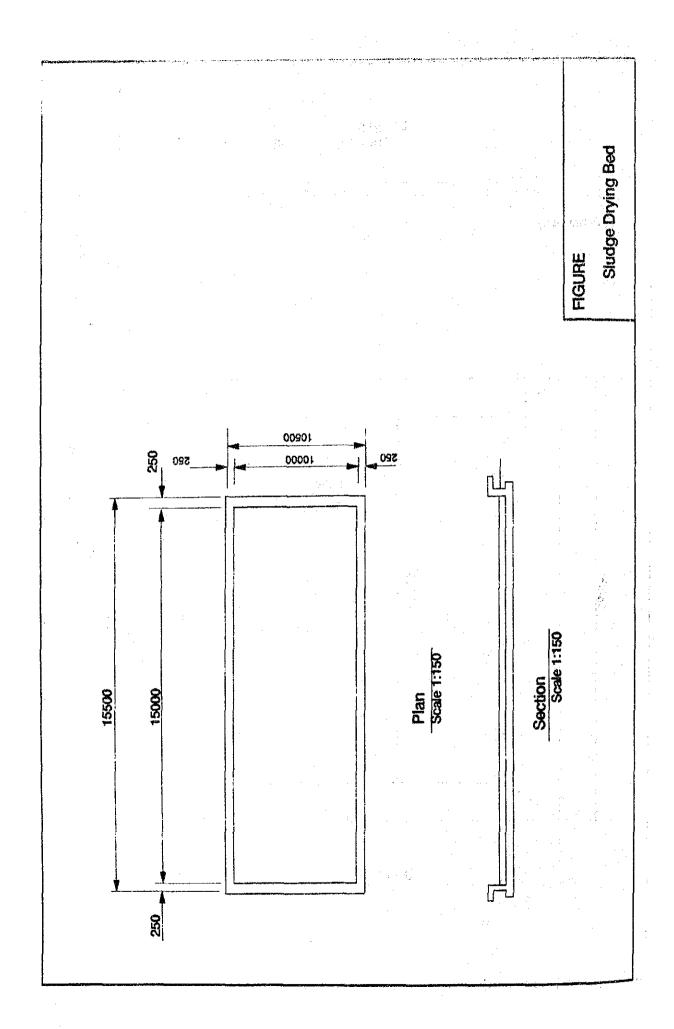












APPENDIX A-8-5

Distribution Network Analysis

: Su Ngai Golok (Proposed 1)

T I T L E NO. OF PIPES NO. OF NODES 205 169 PEAK FACTOR 1.718 MAX HEADLOSS/Km : 100 MAX UNBAL(LPS) : .009

PIPE NO.	FROM Node	TO Node	LENGTH (M)	DIA (MM)	HWC	FLOW (LPS)	VELOCITY (MPS)	HEADI (M/KM)	Coss (M)
1	300	1	22.00	400	100	99.15	0.79	2.56	0.06
2	1	2	365.00	350	100	46.92	0.49	1.23	0.45
3	2	3	22,00	300	100	45.39	0.64	2.45	0.05
4	3	4	45.00	250	100	11.98	0.24LO	0.51	0.02
5	5	4	20.00	250	100	16.95	0.35	0.96	0.02
6	5	6	482.00	100	100	1.30	0.17LO	0.72	0.35
7	7	5	80.00	250	100	20.36	0.41	1.35	0.11
8	7 :	8	474.00	100	100	1.29	0.16LO	0.71	0.34
9	9	7	105.00	250	100		0.45	1.57	0.17
10	9	10	510.00	100	100	0.48	0.06LO	0.11	0.06
11	1	38	350.00	350	100	52.23	0.54	1.50	0.52
1.2	11	9	142.00	250	100	22.71	0.46	1.65	0.23
13	11	12	312.00	100		0.25	0.03LO	0.04	0.01
14	12	13	162.00	100	100	0.13	0.02LO	0.01	0.00
16		11	260.00	250	100	41.37	0.84	5.01	1.30
17	15	14	40.00	250	100	41.49	0.85	5.04	0.20
18	11	16	154.00	200		18.27	0.58	3.28	0.50
19	16	17	104.00	200	100	4.33	0.14LO	0.23	0.02
20	4	17	68.00	200	100	1.36	0.04LO	0.03	0.00
21	4	19	108.00	250	110	27.44	0.56	1.97	0.21
22	17	18	116.00	150	100	5.56	0.31	1.47	0.17
23	16	27	104.00	200	100	13.78	0.44	1.94	0.20
24	. 19	20	80.00	250	100	29.73	0.61	2.72	0.22
25	18	19	68.00	150	100	3.35	0.19LO	0.58	0.04
26	18	27	100.00	150	100	1.15	0.07LO	0.08	0.01
27	20	83	20.00	150	100	17.22	0.97	11.92	0.24
28	20	21	183.00	250	100	11.27	0.2310	0.45	0.08
29	21	22	70.00	200	100	10.40	0.33	1.15	0.08
30	22	88	20.00	100	100	9.57	1.22	28.97	0.58
31	23	22	98.00	100	100	0.93	0.12LO	0.39	0.04
32	24	23	60.00	200	100	4.06	0.13LO	0.20	0.01
33	23	30	90.00	200	100	1,71	0.05LO	0.04	0.00
34	25	24	56.00	200	100	7.01	0.22LO	0.56	0.03
35	26	25	60.00	200	100	8.31	0.26LO	0.76	0.05
36	27	26	132.00	200	100	14.58	0.46	2.16	0.28
37	26	21	212.00	200	100	4.25	0.14LO	0.22	0.05
38	24	28	40.00	100	100	1.74	0.22LO	1.23	0.05
39	28	29	62.00	100	100	0.84	0.11LO	0.32	0.02
40	31	32	100.00	150	100	11.75	0.67	5.8 8	0.59
41	30	31	182.00	200	100	0.48	0.02LO	0.00	0.00
42	33	31	80.00	200	100	12.51	0.40		0.13

PIPE NO.	FROM Node	TO Node	LENGTH (M)	DIA (MM)	HWC	FLOW (LPS)	VELOCITY (MPS)	HEADLOS (M/KM)	
43	33	34	275.00	100	100		0.09LO	0.23	0.06
44	35	33	145.00	200	100	15.64	0.50	2.46	0.36
45	35	36	284.00	100	100	0.14	0.02LO	0.01	0.00
47	3	38	16.00	300	100	33.28	0.47	1.38	0.02
48	38	39	53.00	300	110	85.33	1.21	6.60	0.35
49	39	40	20.00	200	110	31.63	1.01	7.58	0.15
50	40	41	350.00	150	100	4.60	0.26LO	1.04	0.36
51	41	42	180.00	100	100	0.85	0.11LO	0.33	0.06
52	39	43	22.00	300	100	53.43	0.76	3.31	0.07
53	43	44	525.00	250	100	1.53	0.03LO	0.01	0.01
54	44		125.00	100	100	0.26	0.03LO	0.04	0.00
55	43	46	134.00	300	100	51.04	0.72	3.04	0.41
56	46	47	234.00	100	100	0.71	0.09LO	0.23	0.05
57	46	48	108.00	300	100	47.05	0.67	2.62	0.28
58	48	49	254.00	150	100	1.08	0.06LO	0.07	0.02
59	48	50	134.00	300	100	40.10	0.57	1.95	0.26
60	50	51	98.00	250	100	40.09	0.82	4.73	0.46
61	51	52	74.00	250	100	30.41	0.62	2.84	0.21
62	53	52	20.00	150	100	4.93	0.28LO	1.18	0.02
	52	63	32.00		100	34.93	0.71	3.67	0.12
63	51	54	18.00	150	100	9.27	0.52 0.33	3.79	0.07
64	54	4.7	73.00	150	100	5.85	0.33	1.62	0.12
65			147.00	150	100	3.14	0.18LO	0.51	0.08
66	54	56	50.00	100	100	0.28	0.04LO	0.04	0.00
67	55		14.00	150	100	2.58	0.15LO	0.36	0.00
68	55	57	50.00	100	100	0.28	0.04LO	0.36 0.04	0.00
69	57	58 50	117.00	150	100	2.02	0.11LO	0.23	0.03
70	57	59	294.00	150	100	0.64	0.0410	0.03	0.01
71	53	61	88.00	100	100	0.69	0.09FO	0.03 0.22	0.02
72	59	61	125.00	150	100	1.05	0.06LO	0.07 0.01 2.97	0.01
73	59	60		150			0.120.021.0	0.01	0.00
74	61	62	22.00	250	100	31.20	0.64	2.97	1.12
75	63	64	378.00	100	100 100 100	4.83	0.61	8.16	0.57
76	64	65	70.00		110	25.93	0.53		0.19
77	64	66	108.00	250 250			0.32	0.81	0.39
78	66	67	484.00	250 250	100 100 100 100	9.78	0.20LO	0.81 0.35	0.09
79	66	68	254.00 440.00	250 250	1000	3.31	0.07LO		0.02
80	68	69		150	100	4.58	0.26LO	0.05 1.03 0.02	0.18
81	68	72 70	178.00	250	100	2.13	0.04LO	0.02	0.00
82	69	70	150.00		100	0.61	0.08FO	0.18	0.12
83	70	71	688.00	100		2.19	0.12LO		0.11
84	72	73	420.00	150	100	1.82	0.10LO	0.19	0.02
85	73	74	126.00	150	100		0.10LO 0.02LO	0.01	0.00
86	74	75	123.00	100	100	0.14	0.02LO	0.11	0.00
87	74	76	12.00	150	100	1.40		0.11	0.00
88	76	77	122.00	100	100	0.14	0.02LO	0.01	0.00
89	76	78	26.00	150	100	1.12	0.06LO	0.08	0.00
90	78	79	118.00 10.00	$\begin{array}{c} 100 \\ 150 \end{array}$	100 100	$0.14 \\ 0.85$	0.02LO 0.05LO		0.00

•									
									ti.
PIPE NO	FROM Node	TO Node	LENGTH (N)	DIA (MM)	HWC	FLOW	VELOCITY (MPS)	HEADL	oss (M)
92	80	81	128,00	100	100	0.14	0.0210	0.01	0.00
93	80	82	20.00	150	100	0.57	0.03LO	0.02	0.00
94	40	83	75.00	250	100	26,79	0.55	2.24	0.17
95	83	84	66.00	250	100	43.87	0.89	5.59	0.37
96	84	85	18.00	250	100	25.78	0753	2.09	0.04
97	85	86	80.00	200	100	11.75	0.37	1.45	0.12
98	87	86	110.00	200	100	3.41	0.11LO	0.15	0.02
99	87	88	18.00	150	100	0.06	0.0010	0.00	0.00
100	88	89	120.00 96.00	150	100	8.59	0.49	3.29	0.39
101 102	89 90	90 91	150.00	150 150	100 100	2.78 0.34	0.16LO	0.41	0.04
103	92	91	60.00	150	100	0.34	0.02LO	0.01	0.00
104	93	92	120.00	150	100	2.88	0.05LO 0.16LO	0.05 0.44	0.00
105	94	93	260.00	150	100	4.03	0.10LO 0.23LO	0.81	0.21
106	95	94	55.00	150	100	5.49	0.31	1.44	0.08
107	96	95	775.00	150	100	6.69	0.38	2.07	1.61
108	84	103	358.00	250	100	16.69	0.34	0.94	0.33
109	103	50	and the second second second	200	100	0.53	0.02LO	0.00	0.00
110	85	97	72.00	150	100	12.94	0.73	7.03	0.51
111	97	98	18.00	150	100	8.96	0.51	3.56	0.06
112	98	99	96.00	150	100	7.82	0.44	2.76	0.27
113		100	60.00	150	100	9.72	0.55	4.13	0.25
114	100	101	90.00	150	100	0.24	0.01LO	0.00	0.00
115	101	102	190.00	100	100	0.47	0.06LO	0.11	0.02
116	32	87	300.00	250	100	4.45	0.0910	0.08	0.02
117	86	112	182.00	200	100		0.44	1.93	0.35
118	112 111	111 101	146.00 100.00	100 100	100	2.99	0.38 0.22LO	3.37	0.49
119 120	112	99	90.00	100	100 100	$\begin{array}{c} 1.74 \\ 3.32 \end{array}$	0.22LO 0.42	1.24	0.12
121	97	125	324.00	200	100	2.46	0.42 0.08LO	0.08	0.3
122	124	98	324.00	150	100	0.66	0.04LO	0.03	0.01
123	100	114	140.00	100	100	4.01	0.51	5.80	0.8
124	114	115	90.00	100	100	0.90	0.12Lo	0.37	0.0
125	114	116	56.00	100	100	1.91	0.24LO	1.46	0.0
126	116	117		100	100	0.95	0.12LO		0.0
127	103		16.00	250	100	14.09	0.29LO	0.68	0.03
128	104	105	100.00	150	100	2.05	0.12LO	0.23	0.0
129	105	106	90.00	100	100	0.28	0.04LO	0.04	0.00
130		107	70.00	150	100	1.31	0.07LO	0.10	0.0
131		108	44.00	150	100	0.84	0.05LO	0.04	0.0
132	108	109	55.00	100	100	0.28	0.04LO	0.04	0.0
133	108	110	18.00	150	100	0.28	0.02LO	0.01	0.00
134	89	125	50.00	100	100	1.31	0.17LO	0.73	0.04
135	125	126	90.00	100	100	0.64	0.08LO	0.19	0.0
136	125	124	20.00	100	100	1.89	0.2410	1.44	0.03
137	124	123	68.00	100	100	0.65	0.08LO	0.20	0.0
138	123	122	92.00	100	100	0.35	0.04LO 0.14LO	0.06	0.0
139	123	118	48.00	100	100	1.12	0.14LO	0.55	0.0

PIPE NO.	Node	Node	(M)	(MM)		FLOW VELOCITY HEADLOSS (LPS) (MPS) (M/KM) (M)
140	121	118	95.00	100	100	0.21 0.03LO 0.02 0.00
141	118	119	108.00	100	100	0.57 0.07LO 0.16 0.02
142	120	119	104.00	100	100	0.30 0.04LO 0.05 0.00
143	90	126	24.00	100	100	1.17 0.15LO 0.59 0.01 0.90 0.11LO 0.36 0.03
144	126	122	85.00 38.00		100	0.90 0.11LO 0.36 0.03
145	122	121	38.00			1.03 0.13LO 0.47 0.02
146	121	120	104.00		100	0.54 0.07LO 0.14 0.01 0.03 0.00LO 0.00 0.00
147	128	120	20.00	100	100	0.03 0.00LO 0.00 0.00
148	104	127	312.00	200		9.46 0.30 0.97 0.30
149	127	128	102.00	200	100	1.49 0.05LO 0.03 0.00 1.19 0.04LO 0.02 0.00
150	128	129	144.00		100	1.19 0.04LO 0.02 0.00
151	91	129	214.00		100	0.90 0.11LO 0.36 0.08
152	129	130	54.00	200	100	1.87 0.06LO 0.05 0.00 0.99 0.13LO 0.44 0.08
153	92	130	190.00	100	100	0.99 0.13LO 0.44 0.08
154		121	15.00	200	100	1.48 0.05LO 0.03 0.00
155		132	184.00	100	100	0.45 0.06LO 0.10 0.02
156		133	54.00	150	100	0.72 0.04LO 0.03 0.00
157		134	184.00	100	100	0.27 0.03LO 0.04 0.01
158		135	184.00 96.00 340.00	150	100	0.13 0.01LO 0.00 0.00
159	93	136	340.00	150	100	0.38 0.02LO 0.01 0.00 0.50 0.06LO 0.12 0.02
160		137	185.00	100	100	0.50 0.0000 0.12 0.02
161		138	198.00	200	100	6.80 0.22LO 0.53 0.10
162		138	1046.00	200	100	4.36 0.14LO 0.23 0.24
163			165.00	200	100	10.85 0.35 1.25 0.21
164			405.00	200	100	
165			460.00	100	100	0.50 0.06LO 0.12 0.06
166	142	143	135.00	100	100	0.07 0.01LO 0.00 0.00
167	142	144	70.00	100	100	0.07 0.01LO 0.00 0.00 0.17 0.02LO 0.02 0.00
168	144	145	85.00	100	100	0.07 0.01LO 0.00 0.00
169	112	123		100	100	0.91 0.12LO 0.37 0.11
170	112		290.00	100	100	0.91 0.12LO 0.37 0.11
200			7	200	110	
	201	201	470.00 570.00	200	110	6.87 0.22LO 0.45 0.26
201 202	203	202	880.00		110	A 40 A ACTO A 10 0 00
202	204	203	600.00	100	110	4 00 A 061A 3 2A 1 78
203	206		200.00	200	110	9.05 0.29LO 0.75 0.15 5.29 0.17LO 0.28 0.27
	204	205	970.00	200	110	5.29 0.17LO 0.28 0.27
205		205	300.00		110	9.14 0.29LO 0.76 0.23
206	141		980.00	160	110	1.76 0.10LO 0.15 0.14
207		207 206	600.00	150	110	
208	208		000.00		110	5.17 0.29LO 1.08 0.24
209	208	139	220.00	150	110	8.18 0.46 2.52 3.10
210	209	206	1230.00			1.33 0.17LO 0.63 0.45
211	210	209	720.00	100	110	17 27 0 55 2 50 2.58
212	210	208	1030.00	200	110	
213	211	209	1110.00	150	110	10.00
214	212	211	1130.00	200	110	12.05
215	212	213	1080.00	300	110	
216	213	210	520.00	200	110	25.45 0.81 5.07 2.64

PIPE	FROM TO	LENGTH	DIA	HWC	FLOW	VELOCITY	HEAD	Loss
NO.	Node Node	(M)	(MM)		(LPS)	(MPS)	(M/KM)	(M)
217	213 96	380.00	150	110	16.65	0.94	9.39	3.57
218	213 219	500,00	100	110	4.16	0.53	5.19	2.60
219	219 37	380.00	150	110	9.73	0.55	3.47	1,32
220	96 37	500.00	200	110	8.57	0.27LO	0.68	0.34
221	218 219	500.00	150	110	8.15	0.46	2.50	1.25
222	218 15	440.00	250	110	21.62	0.44	1.26	0.56
223	212 218	1200.00	300	110	58.48	0.83	3.28	3.94
224	212 214	1400.00	100	110	2.68	0.34	2.30	3.22
225	214 215	880.00	100	110	1.79	0.23LO	1.09	0.96
226	216 215	930.00	100	110	0.31	0.04LO	0.04	0.04
227	216 217	500.00	100	110	1.29	0.16ь0	0.60	0.30
228	218 216	660.00	150	110	2.62	0.15LO	0.31	0.20
229	218 15	440.00	250	110	21.62	0.44	1.26	0.56
230	65 220	650.00	100	110	1.91	0.24LO	1.24	0.80
231	67 221	880.00	150	110	5.23	0.30LO	1.10	0.97
232	221 222	1140.00	100	110	0.84	0.11LO	0.27	0.31
233	112 113	35.00	100	110	3.47	0.44	3.72	0.13
234	205 202	500.00	200	110	11.71	0.37	1.21	0.60
46	37 35	40.00	200	110	15.79	0.50	2.10	0.08
235	1000 212	40.00	300	110	127.50	1.80	13.87	0.55
٠		**,	÷					

NODE NO.	FLOW (LPS)	ELEVATION (M)	H G L	PRESSURE (M)
1	0.000	8.50	33.44	24.94
2	-1.532	14.50	33.00	18.50
3	-0.127	14.50	32.94	18.44
	-0.127	15.00	32.92	17.92
4 5	-2.109	15.00	32.94	17.94
6	-1.297	8.50	32.59	24.09
7	-0.461	16.00	33.05	17.05
8	-1.288	8.00	32.71	24.71
9	-0,127	16.50	33.21	16.71
10	-0.478	8.50	33.15	24.65
11	-0.127	14.50	33.45	18.95
12	-0.127	8.50	33.43	24.93
13	-0.127	9.50	33.43	23.93
14	-0.127	12.50	34.75	22.25
15	-1.742	11.00	34.95	23.95
16	-0.166	16.50	32.94	16.44
17	-0.127	16.00	32.92	16.92
18	-1.060	15.50	32.75	17.25
19	-1.060	15.50	32.71	17.21
20	-1.240	15.50	32.49	16.99
21	-5.125	13.50	32.41	18.91
22	-1.755	13.50	32.32	18.82
23	-1.419	11.00	32.36	21.36

*	OW ELEVATION PS) (M)	HGL P	RESSURE (M)
$ \begin{array}{ccccccccccccccccccccccccccccccccccc$.218 10.00 .298 9.50 .019 10.00	32.38 32.41 32.45	22.38 22.91 22.45
28 -0 29 -0	.354 15.00 .901 9.50 .836 9.50 .232 13.50	32.74 32.33 32.31 32.36	17.74 22.83 22.81 18.86
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$.232 10.00 .307 9.00 .429 11.50 .702 17.00	32.36 31.77 32.49 32.43	22.36 22.77 20.99 15.43
$ \begin{array}{ccccccccccccccccccccccccccccccccccc$.000 13.50 .143 16.00 .511 13.50	32.85 32.85 32.94	19.35 16.85 19.44 18.42
$ \begin{array}{ccc} 39 & -0 \\ 40 & -0 \\ 41 & -3 \end{array} $.187 14.50 .268 15.00 .239 15.00 .745 11.00	32.92 32.57 32.42 32.06	17.57 17.42 21.06
$\begin{array}{ccc} 43 & -0 \\ 44 & -1 \end{array}$.854 12.50 .860 15.00 .275 9.00 .256 8.50	32.00 32.50 32.49 32.49	19.50 17.50 23.49 23.99
46 -3 47 -0 48 -5	.285 13.50 .709 9.50 .869 10.50 .079 9.20	32.09 32.03 31.81 31.79	18.59 22.53 21.31 22.59
50 -0 51 -0 52 -0	.541 11.00 .408 12.50 .408 12.50 .281 12.50	31.55 31.08 30.87 30.90	20.55 18.58 18.37 18.40
54 -0 55 -0 56 -0	.281 12.50 .281 12.50 .281 12.50	31.01 30.94 30.94 30.93	18.51 18.44 18.44 18.43
58 -0 59 -0 60 -1	.281 12.50 .281 12.50 .050 12.50	30.93 30.91 30.90	18.43 18.41 18.40
62 -0 63 -3	.050 12.50 .281 12.50 .729 12.50 .447 11.00	30.89 30.89 30.75 29.63	18.39 18.39 18.25 18.63
$\begin{array}{cccc} 66 & -0 \\ 67 & -10 \end{array}$.913 11.00 .677 11.50 .240 11.50 .890 10.50	29.06 29.44 29.05 29.35	18.06 17.94 17.55 18.85
69 -1 70 -3	.181 13.50 .700 13.00 .612 11.00	29.33 29.33 29.20	15.83 16.33 18.20
	A-8-5 -6		

	NO.		(LPS)	(M)	(·M)	(M)
	72		-2.393	13.50	29.17	15.67
	73		-0.370	9.00	29.06	20.06
	74		-0.278	7.00	29.03	22.03
	75		-0.138	6.00	29.03	23.03
	76		-0.138	7.00	29.03	22.03
	77		-0.138	6.00	29.03	23.03
	78		-0.138	7.00	29.03	22.03
	79		-0.138	6.00	29.03	23.03
	80		-0.138	7.00	29.03	22.03
	81		~0.138	6.00	29.03	23.03
	82		-0.570	7.00	29.03	22.03
	83		-0.141	15.50	o	16.75
	84		-1.387	15.50	31.88	16.38
	85		-1.091	15.50	31.84	16.34
	86		-1.427	14.50	31.73	17.23
	87		-0.979	13.50	31.74	18.24
	88		-1.050	13.50	31.75	18.25
	89		-4.500	16.00	31.35	15.35
	.90		-1.261	18.00	31.31	13.31
	91		-0.351	18.50	31.31	12.81
	92		-0.987	18.00	31.31	13.31
	93		-0.773	18.00	31.37	13.37
	94		-0.949	13.00	31.60	18.60
	95		-1.204	12.50	31.68	19.18
	96		-1.389	14.00	33.28	19.28
	97		-1.522	15.00	31.34	16.34
	98		-1.804	15.00	31.27	16.27
	99		-1.420	13.00	31.01	18.01
	100		-5.465	11.50	30.76	19.26
	101		-1.510	11.50	30.76	19.26
•	102		-0.466	13.50	30.74	17.24
	103		-2.068	11.50	31.55	20.05
	104		-2.573	11.50	31.54	20.04
	105		-0.466	12.00	31.51	19.51
	106		-0.281	12.00	31.51	19.51
	107		-0.466	13.50	31.50	18.00
	108		-0.281	13.50	31.50	18.00
	109		-0.281	12.50	31.50	19.00
	110		-0.281	13.50	31.50	18.00
	111		-1.255	12.50	30.88	18.38
	112		-2.130	13.50	31.38	17.88
	113		-3.473	13.50	31.25	17.75
	114		-1.204	14.00	29.95	15.95
	115	•	-0.904	15.00	29.91	14.91
	116		-0.958	15.00	29.87	14.87
	117		-0.948	16.00	29.83	13.83
	118		-0.758	18.00	31.24	13.24
	119		-0.874		31.23	14.23

NODE	FLOW	ELEVATION	H G L	PRESSURE
NO.	(LPS)	(M)	(M)	(M)
		ه عدد بين ديد بين بيد بيد بيد بيد		
120	-0.268	18.00	31.23	13.23
121	-0.283	19.50	31.25	$\begin{matrix}11.75\\12.26\end{matrix}$
122	-0.218	19.00	$\begin{array}{c} 31.26 \\ 31.27 \end{array}$	13.27
123	-0.983	18.00	31.28	13.78
124	-0.589	$17.50 \\ 17.50$	31.31	13.81
125	-1.240	18.00	31.29	13.29
126	$-0.910 \\ -1.172$	17.00	31.23	14.23
127	-0.268	18.00	31.23	13.23
128	-0.224	18.50	31.23	12.73
129	-1.381	18.50	31.22	
130	-0.314	18.00	31.22	13.22
$\begin{array}{c} 131 \\ 132 \end{array}$	-0.447	17.00	31.20	14.20
133	-0.314	18.00	31.22	13.22
134	-0.268	17.00	31.21	14.21
135	-0.135	18.00	31.22	13.22
136	-0.380	17.00	31.36	
137	-0.502	15.00	31.58	
138	-0.312	14.50	31.13	
139	-0.810	15.00	31.37	16.37
140	-0.289	12.00	30.92	18.92
141	-0.925	15.00	30.44	15.44
142	-0.255	10.00	30.39	20.39
143	-0.073	9.00	30.38	21.38
144	-0.097	10.00	30.38	20.38
145	-0.073	9.00	30.38	21.38
201	-4.690	9.00	29.35	20.35
202	-5.325	12.00	29.61	17.61
203	-1.477	14.80	29.70	14.90
204	-1.795	19.20	30.48	11.28
205	-2.719	14.80	30.21	15.41
206	-3.811	20.00	30.63	10.63
207	-1.764	18.50	30.49	11.99
208	-5.750	15.00	31.61	16.61
209	-3.231	12.00	33.76	21.76
210	-6.741	8.50	34.22	25.72
211	-2.541	15.00	37.88	22.88
212	-4.338	11.50	39.44	27.94
213	-3.132	10.00	36.85	26.85
214	-0.884	10.00	36.23	26.23
215	-2.101	7.00	35.26	28.26
216	-1.016	8.00	35.30	27.30
217	-1.291	7.00	35.01	28.01
218	-4.482	10.00	35.51	25.51
219	-2.576	10.00	34.26	24.26
220	-1.914	10.00	28.25	18.25
221	-4.392	8.50	28.07	19.57
222	-0.842	7.00	27.77	20.77

NODE NO.	FLOW (LPS)	ELEVATION (M)	HGL (M)	PRESSURE (M)
300 R	99,151	8.50	33.50	25.00
1000 R	127.497	11.50	40.00	28.50

APPENDIX A-17-1

Alternatives for Debt Service, Cash Flow and Unit Cost of Water

Table A17-1-1 Debt Services (Alternative 1)

(Unit : Baht x 1000)

	with head Stag grade drift; berth State Color State And Anni Allen State and with head state drift; berth head play state and state Ways dark	# = = = = = = = =		
Year	Capital	Interest	Total annual repayment	Balance of Capital
1992	0	364	364	5,202
1993	0	1,218	1,218	17,397
1994	0	5,510	5,510	78,714
1995	0	6,652	6,652	95,025
1996	0	6,652	6,652	95,025
1997	3,781	6,652	10,433	95,025
1998	4,046	6,387	10,433	91,244
1999	4,329	6,104	10,433	87,197
2000	4,632	5,801	10,433	82,868
2001	4,957	5,476	10,433	78,235
2002	5,304	5,130	. 10,433	73,279
2003	5,675	4,758	10,433	67,975
2004	6,072	4,361	10,433	62,300
2005	6,497	3,976	10,473	56,798
2006	6,952	3,521	10,473	50,300
2007	7,439	3,034	10,473	43,348
2008	7,959	2,514	10,473	35,910
2009	8,517	1,957	10,473	27,950
2010	9,135	1,360	10,496	19,433
2011	9,775	721	10,496	10,298
2012	26	. 37	63	523
2013	28	35	63	497
2014	30	33	63	469
2015	32	31	63	440
2016	34	29	63	408
2017	36	26	63	374
2018	39	24	63	337
2019	42	21	63	298
2020	45	18	63	257
2021	48	1.5	63	212
2022	51	11	63	164
2023	55	8	63	113
2024	58	4	63	58
Total	95,595.0	82,437.2	178,032.2	

A-17-1-1

Table A17-1-2 Debt Services (Alternative 2) for Foreign Portion

Table A17-1-2 Debt Services (Alternative 2) for Local Portion

(Unit : Baht x 1000)

(Unit : Baht x 1000)

Year			and the second s							
	Capital	Interest	Repayment	Capital		Year	Capital	Interest	Repayment	Capital
1992	0	69	69	2,564		1992	0	185	185	2,638
1993	0	245	245	9,068		1993	0	583	583	8,329
1994	0	1,061	1,061	39,280	*	1994	0	2,760	2,760	39,434
1995	. 0	1,264	1,264	46,822		1995	0	3,374	3,374	48,203
1996	0	1,264	1,264	46,822		1996	. 0	3,374	3,374	48,203
1997	0	1,264	1,264	46,822		1997	1,918	3,374	5,292	48,203
1998	0	1,264	1,264	46,822		1998	2,052	3,240	5,292	46,285
1999	0	1,264	1,264	46,822		1999	2,196	3,096		44,232
2000	. 0	1,264	1,264	46,822		2000	2,350	2,943	5,292	42,036
2001	0	1,264	1,264	46,822	:	2001	2,514	2,778	5,292	39,686
2002	1,796	1,264	3,061	46,822		2002	2,690	2,602	5,292	37,172
2003	1,845	1,216	3,061	45,026		2003	2,879	2,414	5,292	34,481
2004	1,895	1,166	3,061	43,181		2004	3,080	2,212	5,292	31,603
2005	1,946	1,123	3,068	41,575		2005	3,296	2,016	5,312	28,803
2006	1,998	1,070	3,068	39,629		2006	3,527	1,786	5,312	25,508
2007		1,016	3,068	37,631		2007	3,773	1,539	5,312	21,981
2008	2,108	961	3,068	35,579	-	2008	4,038	1,275	5,323	18,208
2009	2,165	904	3,068	33,471		2009	4,320	992	5,323	14,170
2010	2,223	845	3,068	31,306		2010	4,634	689	5,323	9,850
2011		785	3,068	29,083		2011	4,958	365	5,323	5,216
2012		724	3,068	26,800		2012	13	18	31	258
2013	2,408	660	3,068	24,456		2013	14	17	31	245
2014	2,473	595	3,068	22,047		2014	15	16	31	231
2015	2,551	529	3,079	19,574		2015		15	31	217
2016	2,620	460	3,079	17,024		2016		14	31	201
2017	2,691	389	3,079	14,404		2017	18	13		184
2018	2,763	316	3,079	11,713		2018	19	12	•	166
2019	2,838	242	3,079	8,950		2019	21	10		147
2020	2,914	165	3,079	6,112		2,020		9		127
2021	2,993	86	3,079	3,198		2,021		7		105
2022		6	19	205		2,022	25	. 6	31	81
2023	14	5	19	. 191		2,023	27	4	31	56
2024	14	5	19	178		2,024	29	2	31	29
2025		4	19	164						~
2026	15	4	19	149		Total	48,484	41,740	90,246	
2027		4	19	134						阿贝尔巴克斯斯斯斯斯斯斯斯斯
2028		3	19	119						•
2029		3	19	103						
2030		2	19	87						
2030			19	71						
2032		2		7 1 54						
		1	19							
2033		1	19	36					Marina en en la esta en	:
2034	18	0	19	18						

Table A17-1-2 Debt Services (Alternative 2)

(Unit : Baht x 1000)	(Unit	: Baht	x 1000)
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Year 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010	0	Interest 254	Total Annual Repayment	Balance of Capital
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009		251	· · · · · · · · · · · · · · · · · · ·	
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009			254	5,202
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009	0	828	828	17,397
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009	0	3,821	3,821	78,714
1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009	0	4,638 4,638	4,638 4,638	95,025
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009	1,918	4,638	6,557	95,025 95,025
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009	2,052	4,504	6,557	93,107
2001 2002 2003 2004 2005 2006 2007 2008 2009	2,196	4,360	6,557	91,054
2002 2003 2004 2005 2006 2007 2008 2009	2,350	4,207	6,557	88,858
2003 2004 2005 2006 2007 2008 2009	2,514	4,042	6,557	86,508
2004 2005 2006 2007 2008 2009	4,487	3,866	8,353	83,994
2005 2006 2007 2008 2009	4,724	3,629	8,353	79,507
2006 2007 2008 2009	4,975 5,242	3,378	8,353	74,784
2007 2008 2009	5,525	3,139 2,856	8,380 8,380	70,379 65,137
2008 2009	5,826	2,555	8,380	59,612
2009	6,145	2,235	8,392	53,786
2010	6,485	1,896	8,392	47,641
the state of the s	6,857	1,535	8,392	41,156
2011	7,241	1,150	8,392	34,299
2012	2,358	742	3,099	27,058
2013 2014	2,422	677	3,099	24,701
2015	2,488 2,567	611 544	3,099 3,110	22,279 19,791
2016	2,637	474	3,110	17,225
2017	2,708	402	3,110	14,588
2018	2,782	328	3,110	11,879
2019	2,858	252	3,110	9,097
2020	2,936	174	3,110	6,239
2021	3,017	94	3,110	3,302
2022	39	11	50	286
2023 2024	41 43	9 · 7	50 50	247 207
2025	14	4	19	164
2026	1 5	4	19	149
2027	15		19	134
2028	16	3	19	119
2029	16	- 3	19	103
2030		2	19	87
2031	17	4		
2032	17 17	2	19	71
2033 2034	17 17 17	4 3 3 2 2 1	19 19	71 54
	17 17	2 2 1 1 0	19	71

Table A17-1-3 Debt Services (Alternative 3)
for Foreign Portion

Table A17-1-3 Debt Services (Alternative 3) for Local Portion

(Unit : Baht x 1000)

(Unit : Baht x 1000)

***************************************	90 tim mir find tok plet sint size fold bild !		Total Annual	Balance of		V	Canluat	Interest		Annual	Balance Capital
Year	Capital	Interest	Repayment	Capital		Year	Capital	THEOLOGE			oapi.caj
1992	0	69	69	2,564		1992) 145		145	1,319
1993		245	245	9,068		1993		458		458	4,165
1994		1,061	1,061	39,280	1	1994	(2,169	3.5	2,169	19,717
1995		1,264	1,264	46,822		1995	1,179	2,651		3,830	24,102
1996		1,264	1,264	46,822		1996	1,309	2,521		3,830	22,922
1997		1,264	1,264	46,822		1997	1,45	2,377	· · ·	3,830	21,614
1998	0	1,264	1,264	46,822		1998	1,87	2,218		4,092	20,161
1999		1,264	1,264	46,822		1999	2,08	2,011		4,092	18,286
2000		1,264	1,264	46,822	٠.	2000	2,310	1,783	u Elia	4,092	16,205
2001				46,822	1.	2001	2,56	1,528		4,092	13,895
2002				46,822		2002	2.84	1,246		4,092	11,331
2003				45,026		2003	3,15	933		4,092	8,485
2004			4 3	43,181		2004	3,50	7 586		4,092	5,326
2005			• .	41,575		2005	54	4 216	,7 d 	760	1,960
2006				39,629		2006	60	4 156		760	1,415
2007				37,631		2007	67	1 89)	760	811
2008			the state of the s	35,579		2.008		315	,	24	141
2009				33,471		2009	re en e	9 15	;	24	132
2010				31,306		2010	1) 14		24	123
2010				29,083		2011		1 12	3	24	112
2012				26,800		2012		3 11		24	101
2012				24,456		2013)	24	88
2013				22,047		2014			3	. 24	74
2015				19,574		2015	40.00	7 6	•	24	58
2015				17,024		2016		9 4		24	41
2017				14,404		. 2017		i 7	?	24	21
2017			. 1	11,713							
2019			the second secon	8,950	1	Total	24,24	2 21,187	,	45,429	192,605
2020				6,112		026232					
	•			3,198			· :			÷	÷
2021				205	100						
2022				191							
2023				171					11.		
2024				*					100		
2025			19	164			.*				
2026				149							
2027				134			. 1.1.1		1000		
2028		3		119					.:		
2029		3		103					- 1 1 N		
2030				87					201	i,	
2031	. 17	2	19	71			. *		100		
2032	17	1	. 19	54				•		:	
2033	18	. 1	19	36			+ ;				
2034	18		19	18							
Total	47,111	24,779	71,890			e grad	· · · · · · · · · · · · · · · · · · ·				

Table A17-1-3 Debt Services (Alternative 3)

(Unit	:	Baht	Х	1000	1)
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			(OUIC : Bau	x TOOO)
Year	Capital	Interest	Total Annual Repayment	Balance of Capital
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2029 2030 2031 2020 2031 2032 2033 2034 2035 2036 2037 2036 2037 2037 2038 2039 2030 2031 2032 2033 2034 2035 2036 2037 2036 2037 2038 2039 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2039 2030 2031 2031 2032 2032 2032 2033 2034 2035 2036 2037 2038 2039 2039 2030 2031 2032 2032 2032 2032 2033 2034 2035 2036 2037 2037 2038 2039 2039 2030 2031 2032 2032 2032 2032 2032 2032	0 0 0 1,179 1,309 1,453 1,875 2,081 2,564 4,642 5,400 2,603 2,723 2,116 2,233 2,174 2,233 2,295 2,357 2,489 2,568 2,763 2,763 2,763 2,763 2,763 2,993 14 14 15 16 17 17 17 18 18	214 703 3,229 3,915 3,786 3,642 3,276 3,047 2,793 2,511 2,149 1,752 1,338 1,226 1,105 976 918 859 798 735 670 603 535 464 391 316 242 165 86 55 54 44 44 44 43 33 22 11 10 10 10 10 10 10 10 10 10 10 10 10	214 703 3,229 5,094 5,094 5,094 5,357 5,357 5,357 7,153 7,153 7,153 7,153 7,153 7,153 3,828 3,828 3,828 3,092 3,092 3,092 3,092 3,092 3,092 3,092 3,092 3,092 3,093 3,093 3,079 3,079 3,079 3,079 19 19 19 19 19 19 19 19	3,883 13,233 58,997 70,924 69,744 68,436 66,983 65,108 63,027 60,717 58,153 53,511 48,507 43,535 41,045 38,442 35,719 33,603 31,429 29,196 26,901 24,544 22,122 19,633 17,064 14,425 11,713 8,950 6,112 3,198 205 191 178 164 149 134 119 103 87 71 54 36 18
Total	71,353	45,966	117,319 ========	-=========

Table A17-1-4 Debt Services (Alternative 4)
for Foreign Portion

Table A17-1-4 Dabt Services (Alternative 4)
for Local Portion

(IInt	+	•	Rя	hr	¥	14	ბიი	١

(Unit	1	Baht	х	1000)	

20 20 20 20 20 20 20 20 20 20 20 20 20 2		· · · · · · · · · · · · · · · · · · ·		四甲基磺胺 医红红球样 科勒斯	[25. CP. 25. Bb. gp. sp. 50]	= #		经复数 计电子 医电子	26 PL 12	医克里氏管电电阻法电阻	마음 마 전 화 보면 너 너 다 먹
			Total Annual		a de la composição de la La composição de la compo					tal Annual	Balanca o
Year	Capital	Interest	Repayment	Capital	Year		Capital	Interest	Ke)	payment	Capital
199	2 0	99	99	3,663	19	92	. 0	85		85	770
199	3 0	350	350	12,954	19	93	0			244	2,222
1994	. 0	1,515	1,515	56,114	19	94	0	1,243		1,243	008,11
199	5 ,0	1,806	1,806	66,888	19	95	676	1,548		2,223	14,069
199	5 0	1,806	1,806	66,888	19	96	750	1,473		2,223	13,393
1997	7 0	1,806	1,806	66,888	19	97	833	1,391		2,223	12,643
1998	3 . 0	1,806	1,806	66,888	19	98	1,090	1,299	١.	2,389	11,810
1999	0	1,806	1,806	888,66	19	99	1,210	1,179		2,389	10,720
2000) 0	1,806	1,806	66,888	20	00				2,389	9,511
200	. 0	1,806	1,806	66,888	20	01	1,490	898	1	2,389	8,168
200	2,566	1,806	4,372	66,888	20	02	1,654			2,389	6,678
2003	2,635	1,737	4,372	64,322	20	03	1,836	553		2,389	5,023
2004	2,707	1,666	4,372	61,686	20	04	2,038	351		2,389	3,187
200	2,780	1,604	4,383	59,393	20	05	344	1.6		479	1,227
2006	2,855	1,529	4,383	56,613	20	05	382	-		479	884
2007	2,932	1,451	4,383	53,758	20	07	424			479	502
2008	3,011	1,372	4,383	50,826	20	80	5	9		13	79
2009	3,092	1,291	4,383	47,815	20	09	5			13	74
2010	3,176	1,208	4,383	44,723	20	10	6			13	69
2013	3,262	1,122	4,383	41,547	20	11	6	. 7		13	63
2012	3,350	1,034	4,383	38,286	20	12	7	6	i-	13	56
2013	3,440	943	4,383	34,936		13				13	49
2014	3,533	850	4,383	31,496	20	14				13	41
2015	3,644	755	4,399	27,963	20	15	10	4		13	33
2016	3,743	657	4,399	24,319	20	16	11	3		13	23
2017	3,844	556	4,399	20,577	20	17	12	. 1		13	12
2018	3,947	452	4,399	16,733					m #4 %;		
2019	4,054	345	4,399	12,786	Total		14,147	12,386	,	26,533	
2020	4,163	236	4,399	8,732	明显机实产业 等	# m t	*******			******	*=
202	4,276	123	4,399	4,568			•				
2022	2 19	8	27	293							
202:	3 20	7	27	274	*		•	5.5			
2024	20	7	27	254							
202	5 21	6	27	234				•			
202	5 21	6	27	213							
202	7 22	. 5	27	192		•	`.·				
202	3 22	. 5	27	170					+15 • 1		
202	9 23	4	27	148				. *	+ 3+ +		
203	24	3	27	125	•		•	18.25			
203	1 24	3	27	101						+ 5	
203	2 25	2	27	77							
203	3 26	1	27	52				•			
203	4 26	1	27	26	•						
Total	67,301	35,399	102,700	# # # <u># = = = # # # #</u>							

Table A17-1-4 Debt Services (Alternative 4)

(Unit : Baht x 1000)	<i>(</i>)	Jni	t	:	Bah	t	Х	10	00	ו נ	١
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	Year	Capital	Interest	Total Annual Repayment	Balance of Capital
	1992	0	184	184	4,433
	1993	0	594	594	15,176
	1994	. 0	2,758	2,758	67,414
	1995	676	3,354	4,029	80,957
	1996	750	3,279	4,029	80,281
٠.	1997	833	3,197	4,029	79,531
	1998	1,090	3,105	4,195	78,698
	1999	1,210	2,985	4,195	77,608
	2000	1,343	2,852	4,195	76,399
17	2001	1,490	2,704	4,195	75,056
	2002	4,220	2,541	6,761	73,566
e e	2003	4,472	2,289	6,761	69,345
4. 4	2004	4,745	• .	6,761	64,873
	2005	3,123	1,739	4,862	60,620
	2006	3,236	1,626	4,862	57,497
	2007	3,355	1,507	4,862	54,260
	2008	3,016	1,381	4,397	50,905
· .	2009	3,097	1,299	4,397	47,889
	2010	3,182	1,215	4,397	44,792
	2011	3,268	1,129	4,397	41,610
	2012	3,357	1,040	4,397	38,342
	2013	3,448	949	4,397	34,986
	2014	3,542	855	4,397	31,538
	2015	3,654	759	4,412	27,996
	2016	3,753	659	4,412	24,342
	2017	3,856	557	4,412	20,589
	2018	3,947	452	4,399	16,733
	2019	4,054	345	4,399	12,786
	2020	4,163	236	4,399	8,732
	2021	4,276	123	4,399	4,568
	2022	19	- 8	27	293
	2023	20	7	27	274
	2024	20	7	27	254
	2025	21	6	27	234
	2026	21	6	27	213
	2027	22	5 5	27	192
	2028	22	5	27	170
	2029	23	4	27	148
	2030	24	3	27	125
	2031	24	4 3 3 2	27	101
,	2032	25		27	77
	2033	26	1	27	52
	2034	26	1	27	26
	Total	81,448	47,785	129,233	

Table A17-1-5 Debt Services (Alternative 5) for Foreign Portion

Table A17-1-5 Debt Services (Alternative 5) for Local Portion

(Unit : Baht x 1000) (Unit : Baht x 1000)

Year	Capital	Interest	Total Annual Repayment	Balance of Capital		Year	Capital	Interest	Total Annual Repayment	Balance of Capital
1992	0	99	99	3,663		1992	0	169	169	1,539
1993				12,954		1993	0	489	489	4,443
1994	0			56,114		1994	0	2,486	2,486	22,600
1995				66,888		1995	1,352	3,095	4,447	28,137
1996	0			66,888		1996	1,500	2,946	4,447	26,785
1997				66,888	٠.	1997	1,665	2,781	4,447	25,285
1998				66,888		1998	2,179	2,598	4,778	23,620
1999	0		and the second second	66,888		1999	2,419		4,778	21,441
2000				66,888		2000	2,685		grant of the second of the sec	19,021
2001	-0			66,888		2001	2,981			16,336
2002				65,888		2002	3,309		*	13,355
2003	2,635			64,322		2003	3,673	1,105		10,047
2003	2,707		the state of the s	61,686		2004	4,077		2.4	6,374
2005	2,780					2005	687	270		2,455
2005	2,855			56,613		2006	763			1,767
2007	2,932	*.		53,758		2007		110	and the second s	
2008	3,011			50,826		2008	:9			
2009	3,011			47,815		2009	10			148
2010	3,176			44,723		2010	12			137
2011	3,262			41,547		2011	13			
2011	3,350			38,286		2012				113
2012	3,440	943		34,936		2013				99
2013	3,533	850		31,496		2014	18			83
2015	3,644	755		27,963		2015	.74	7	21 F	65
	3,743	657	4	24,319		2016	,	5		
2016	3,844	556		20,577		2017			and the second s	
2017		-	N	16,733			<u> 703</u>			
2018	3,947		and the second second	12,786	2	Total	28,294	24,773	53,067	
2019	4,054			8,732		TOLAI	20,277	.,,,,,		· 收割为国际系数数数回数器
2020	4,163			4,568					1000	
2021	4,276	*		293			1			
2022	19									
2023	20			274 254			:		J 1, 44 *	
2024	20						+ 1			
2025		6	27	234					1.	
2026	21	6	27	213					1	
2027	22		27	192						
2028			27	170						
2029		4	27	148	-					
2030		3	27	125						
2031		3	27	101						
2032			7	77	,					
2033			27	52						4,14
2034	26	1	27	26				4 5 5 4		•
Total	67,301	35,399	102,700							

Table A17-1-5 Debt Services (Alternative 5)

(Unit : Baht x 1000)

==		:	=========		
				Total Annual	
	Year	Capital	Interest	Repayment	Capital
	4000				
	1992	0	268	268	5,202
	1993	0	838	838	17,397
	1994	1 250	4,001	4,001	78,714
	1995	1,352	4,901	6,253	95,025
	1996	1,500	4,752	6,253	93,673
a.	1997	1,665	4,587	6,253	92,173
	1998	2,179	4,404	6,584	90,508
	1999	2,419	4,164	6,584	88,329
	2000	2,685	3,898	6,584	85,909
	2001	2,981	3,603	6,584	83,224
	2002	5,875	3,275	9,150	80,243
	2003	6,308	2,842	9,150	74,369
	2004	6,783	2,367	9,150	68,060
	2005	3,467	1,874	5,341	61,847
4.2	2006	3,618	1,723	5,341	58,380
	2007	3,779	1,562	5,341	54,762
	2008	3,020	1,390	4,410	50,983
	2009	3,103	1,307	4,410	47,963
1.	2010	3,187	1,223	4,410	44,860
	2011	3,274	1,136	4,410	41,673
	2012	3,364	1,046	4,410	38,399
	2013	3,456	954	4,410	35,035
	2014	3,550	859	4,410	31,579
	2015	3,664	762		28,029
	2016	3,764	662		24,365
-	2017	3,868	558		20,601
	2018	3,947	452	4,399	16,733
	2019	4,054	345		12,786
1.	2020	4,163	236		8,732
	2021	4,276	123		4,568
	2022	19	. 8	27	293
÷	2023	20	7	27	274
	2024	20	7	27	254
	2025	21	6	27	234
	2026	21	6	27	213
	2027	22		27	192
	2027	22	5 5	27	170
		23		27	148
	2029		4	27	125
	2030	24	3	27	101
	2031	24			77
	2032	25	2	27	
	2033	26	. 1	27	52
	2034	26	1	27	26
				155,767	
	Total	95,595	60,172		

Table A17-1-6 Projected Cash Flow at Current Price

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cash Inflow	3 1 1 1 1 1 5 1 1			·						٠.						
Government contribution								. •				-				
Capital contribution	0	0	0	811	906	666	1,321	1,466	1,627	1,806	2,005	2,225	2,470	439	487	540
Laon	٥	0	4,887	12,436	63,496	17,284	0	0	0	6	0	0	0	0	0	
Local losn	0	0	848	1,681	11,035	3,533	0	0	0	0	0	0	0	0	0	163
Foreign loan	0	0	4,038	10,755	52,461	13,751	0	0	0	0	0	0	0	0	0	859
Operating Revenue	9,342	10,122	10,733	11,143	13,446	13,994	14,544	17,414	18,076	18,743	22,529	23,314	24,361	29,348	30,514	31,749
Water Sales	8,928	6,677	10,067	10,445	12,602	13,113	13,623	16,362	16,987	17,611	21,169	21,892	22,752	27,402	28,488	29,642
Connection Fee	208	223	433	455	551	574	909	999	688	713	857	899	1,064	1,286	1,339	1,390
Service Charge	27	29	32	34	41	45	47	59	62	99	80	iù 80	8	111	117	124
Obter Income	179	194	201	209	252	262	272	327	340	352	423	438	455	548	570	593
Total Inflow	9,342	10,122	15,620	24,390	77,843	32,277	15,865	18,880	19,703	20,549	24,534	25,539	26,831	29,787	31,001	33,311
				-		÷			· :							
Cash Outflow			•													. ,
Project expenditures														**.		
Local portion	0	0	2,908	6,588	37,808	11,192	0	0	0	0	0	0	0	Ö	o ,,	584
Foreign portion	0	0	2,827	7,529	36,723	9,626	0	0	0	o .	0	0	Φ.	o	0	109
Amortization														٠.		
Principal		0	0	0	0	811	906	666	1,321	1,466	1,627	1,806	5,113	5,417	5,748	3,805
Interest	0	٥	202	678	3,308	4,068	3,979	3,880	3,770	3,624	3,463	3,284	3,085	2,781	2,450	2,131
Operating Expenses	4,878	6,320	6,826	7,396	8,346	10,671	13,054	14,560	15,620	17,009	19,009	20,608	22,560	27,101	29,572	32,424
TSOO K TO O	2,513		4,116	4,610	5,021	7,247	9,529	10,391	11,334	12,601	13,758	15,210	16,933	20,376	22,633	25,261
Connection Expenses	104	111	216	227	275	287	300	333	344	357	428	450	532	643	699	695
Share of Head Office	2,261	2,427	2,494	2,559	3,050	3,137	3,225	3,836	3,943	4,051	4,823	676.4	5,095	6,081	6,270	6,468
Total Outflow	4,878		12,763	22,191	86,185	36,367	17,933	19,439	20,711	22,099	24,099	25,698	30,758	35,299	37,770	39,545
		,													1	4
Net Cash flow	4,464	3,802	2,857	2,199	-8,343	-4,090	-2,069	-559	-1,008	-1,550	435	-159	-3,927	212,5-	69769-	-6,235
Accumilated	4,464	8,266	11,123	13,322	4,979	888	-1,180	-1,740	-2,748	-4,298	-3,863	-4,022	-7,950	-13,462	-20,230	-26,464
				*6197771111		************	i + 5	1 6 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			'	1		i i i	

i cant	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cash Inflow								; ; ;					1		1
Capital contribution	2	#	12	13	. 15	16	18	20	77	22			٠.	. • • •.	
Laon															
Local loan	-		4					- 1.							A
Foreign loan			÷												
Operating Revenue	38,228	39,563	41,098	49,436	51,365	53,306	61,708	61,708	61,708	71,434	71,434	71,434	82,694	82,694	82,694
Water Sales	35,651	37,039	38,480	46,304	48,123	49,882	57,745	57,745	57,745	66,847	66,847	56,847	77,383	77,383	77,383
Connection Fee	1,711	1,622	1,681	2,001	2,065	2,198	2,545	2,545	2,545	2,946	2,946	2,946	3,411	3,411	3,411
Service Charge	153	162	168	205	215	227	263	263	263	305	305	305	353	353	353
Obter Income	713	741	770	926	962	866	1,155	1,155	1,155	1,337	1,337	1,337	1,548	1,548	1,548
Total Inflow	38,238	39,574	41,110	49,449	51,380	53,322	61,726	61,728	61,730	71,459	71,434	71,434	82,694	82,694	82,694
						٠									
Cash Outflow															
Project expenditures															
Local portion															
Foreign portion															
Amortîzation														-	
Principal	3,944	4,091	3,656	3,756	3,858	3,963	4,071	4,182	4,297	4,447	4,569	4,694	4,795	4,925	5,058
Interest	1,992	1,845	1,690	1,590	1,488	1,383	1,274	1,163	1,049	931	810	685	256	426	293
Operating Expenses	37,059	40,370	44,938	51,249	55,352	60,598	64,868	67,445	70,150	75,092	78,075	81,208	86,929	90,382	94,008
O & M Cost	28,487	31,602	35,895	40,449	44,207	49,083	51,537	54,114	56,820	59,661	62,644	65,776	69,065	72,518	76,144
Connection Expenses	856	811	840	1,001	1,032	1,099	1,272	1,272	1,272	1,473	1,473	1,473	1,705	1,705	1,765
Share of Head Office	7,716	7,957	8,203	9,800	10,113	10,416	12,058	12,058	12,058	13,959	13,959	13,959	16,159	16,159	16,159
Total Outflow	42,995	46,306	50,284	56,595	869'09	65,944	70,213	72,790	75,496	80,470	83,454	86,587	92,280	95,733	99,359
Net Cash flow	-4,757	-6,732	-9,174	-7,146	-9,318	-12,623	-8,487	-11,062	-13,766	-9,011	-12,620	-15,152	-9,586	-13,039	-16,665
			2 F B L 19 N T I I I	1		1 1 1 1 1 1	i fullification		# } } !		4 1 1				

Table A17-1-7 Unit Cost of Water after Depraciation

(Unit :Baht x 1000)

yoar	7	Capital Investement	Operating Expenses	Head Share	Dapre- ciation	Total Expenses	Cost (Baht/cu.
	(cu.m/day)	g gan inje de 100 ger mi inje 60 km 50 g					(pant) out
1990	3,653	0	2,617	2,261	. 0	7,139	5.3
1991	3,782	.0	3,708	2,311	0	8,330	6.0
1992	3,970	5,202	3,939	2,375	0	13,891	9.5
1993	4,166	12,195	4,199	2,437	0	21,268	13.9
1994	4,372	61,317	4,358	2,509	129	70,822	44.3
1995	4,586	16,311	5,914	2,581	1,097	28,484	17.0
1996	4,810	0	7,358	2,653	2,586	15,250	8,6
1997	5,027	. 0	7,622	2,726	2,586	15,660	8.5
1998	5,252	0	7,916	2,802	2,586	16,106	8.4
1 9 99	5,487	0	8,377	2,879	2,586	16,721	8.3
2000	5,732	0	8,709	2,961	2,586	17,217	8.2
2001	5,986	. 0	9,169	3,038	2,586	17,831	8.1
2002	6,271	0	9,756	3,128	2,586	18,598	8.1
2003	6,568	0	11,147	3,225	2,586	20,183	8.4
2004	6,879	. 0	11,786	3,325	2,586	21,022	8.3
2005	7,203	570	12,520	3,430	2,586	22,536	8.5
2006	7,541	0	13,442	3,535	2,605	23,117	8.4
2007	7,879	0	14,160	3,645	2,605	24,055	8,3
2008	8,229	0	15,300	3,758	2,605	25,421	8.4
2009	8,593	0	16,403	3,878	2,605	26,764	8.5
2010	8,971	0	17,070	4,002	2,605	27,679	8,4
2011	9,361	. 0	18,053	4,122	2,605	28,902	8.4
2012	9,361	. 0	18,053	4,122	2,605	28,902	8.4
2013	9,361	0	18,053	4,122	2,605	28,902	8,4
2014	9,361	0	18,053	4,122	2,605	28,902	
2015	9,361	Q			2,605		
2016	9,361	o	18,053	4,122	2,605	28,902	8.4
2017	9,361	0				28,902	8.4
2018	9,361	0	18,053				
2019	9,361	0	18,053	**.			8.4
2020	9,361	0	18,053	4,122	2,605	28,902	8.4

