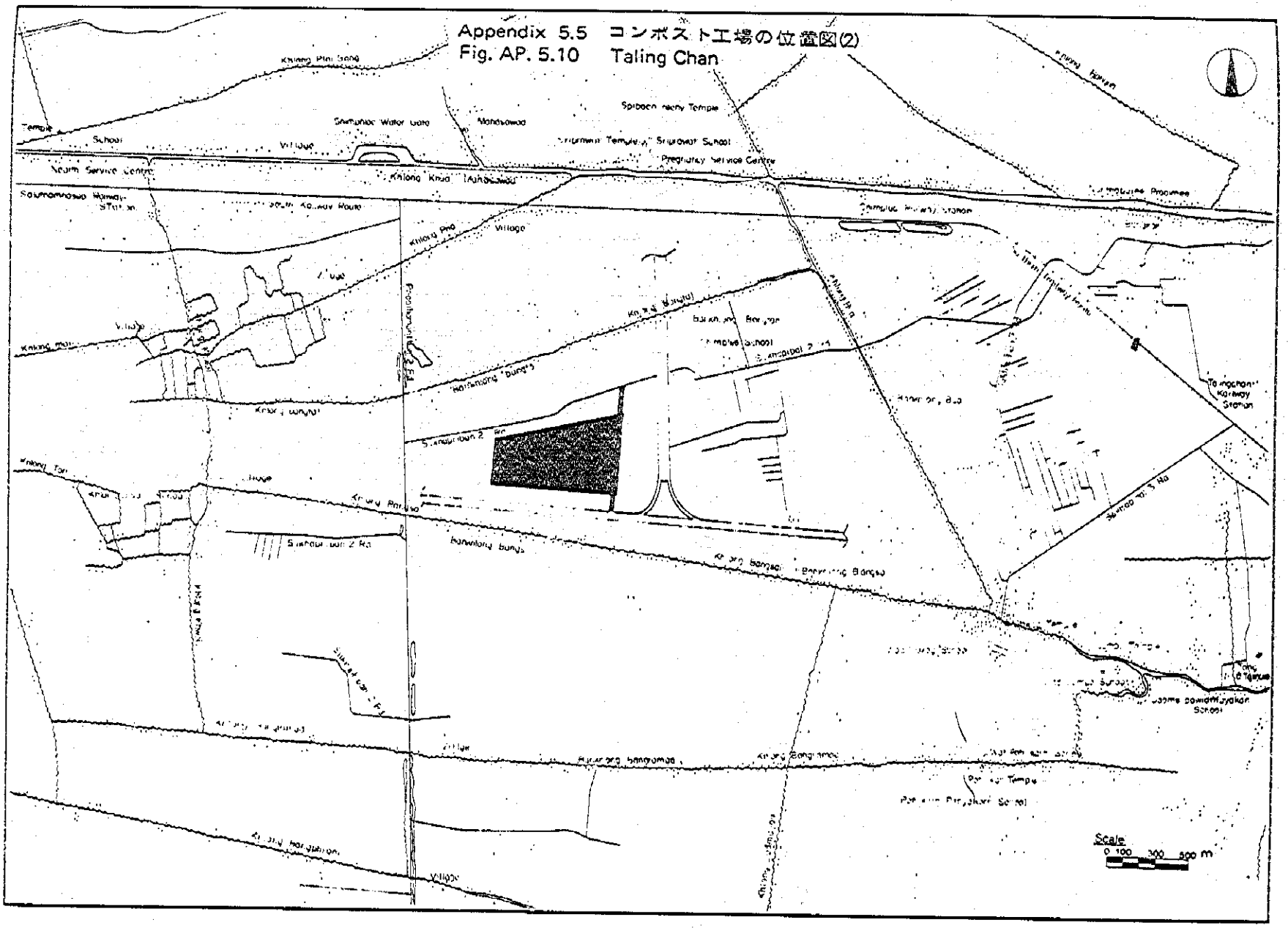
Appendix 5.4
Fig. AP. 5.8
Dusit
焼却工場の位置図(5)
Scale
0 100 300 500 m

Appendix 5.5 コンポスト工場の位置図(1)
Fig. AP. 5.9 Bang Khun Tian
Scale
0 100 200 500 m

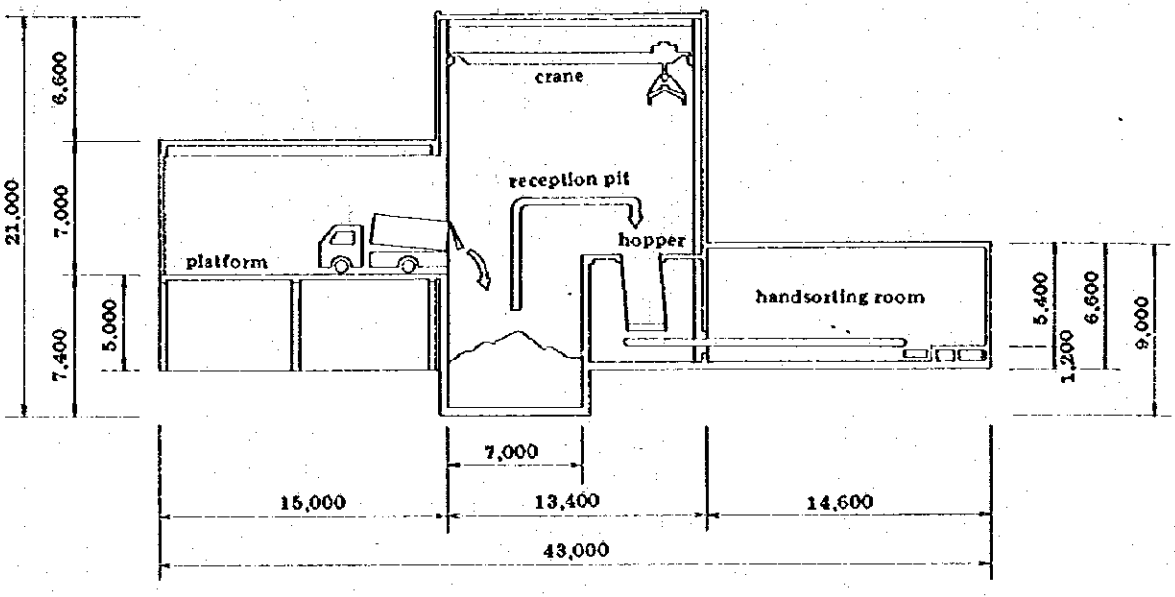
Appendix 5.5 コンポスト工場の位置図(2)
Fig. AP. 5.10 Taling Chan



Appendix 5.6　コンポスト工場計画図

Fig. Ap 5.11　Solid waste reception and separation house

(1) Section (Unit: mm)



(2) Plane (Unit: mm)

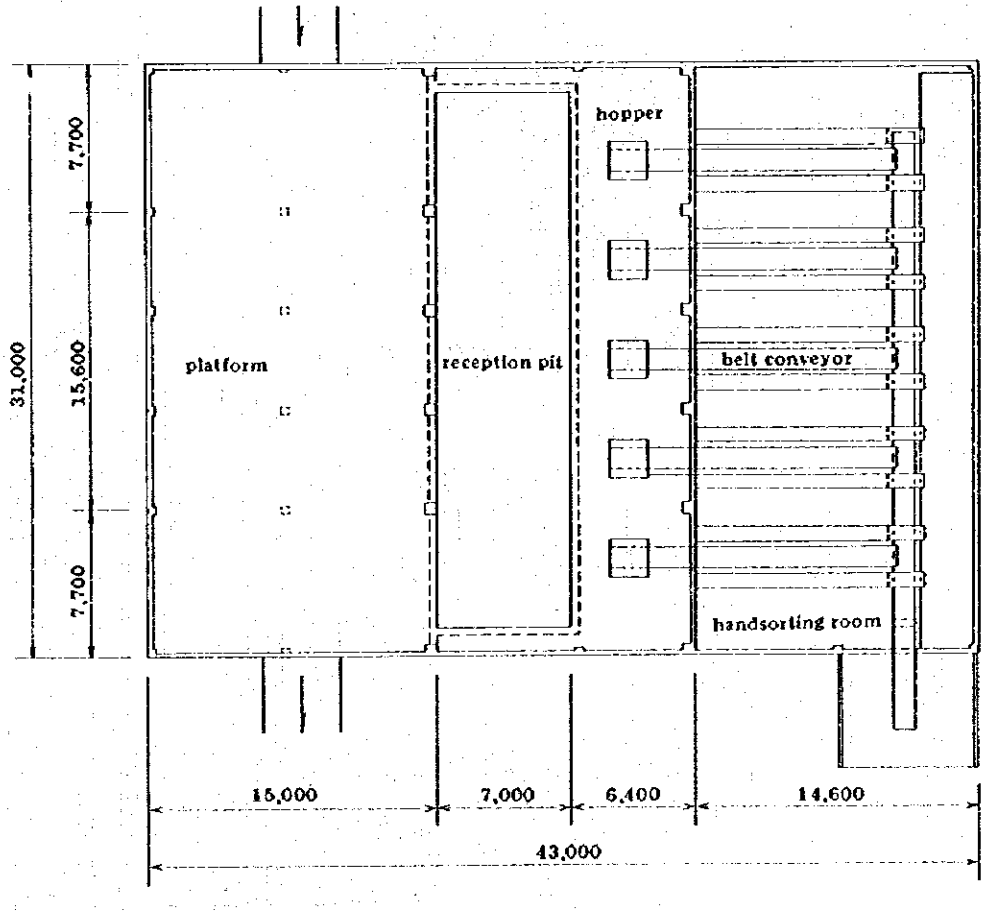


Fig. Ap 5.12 Fermentation house

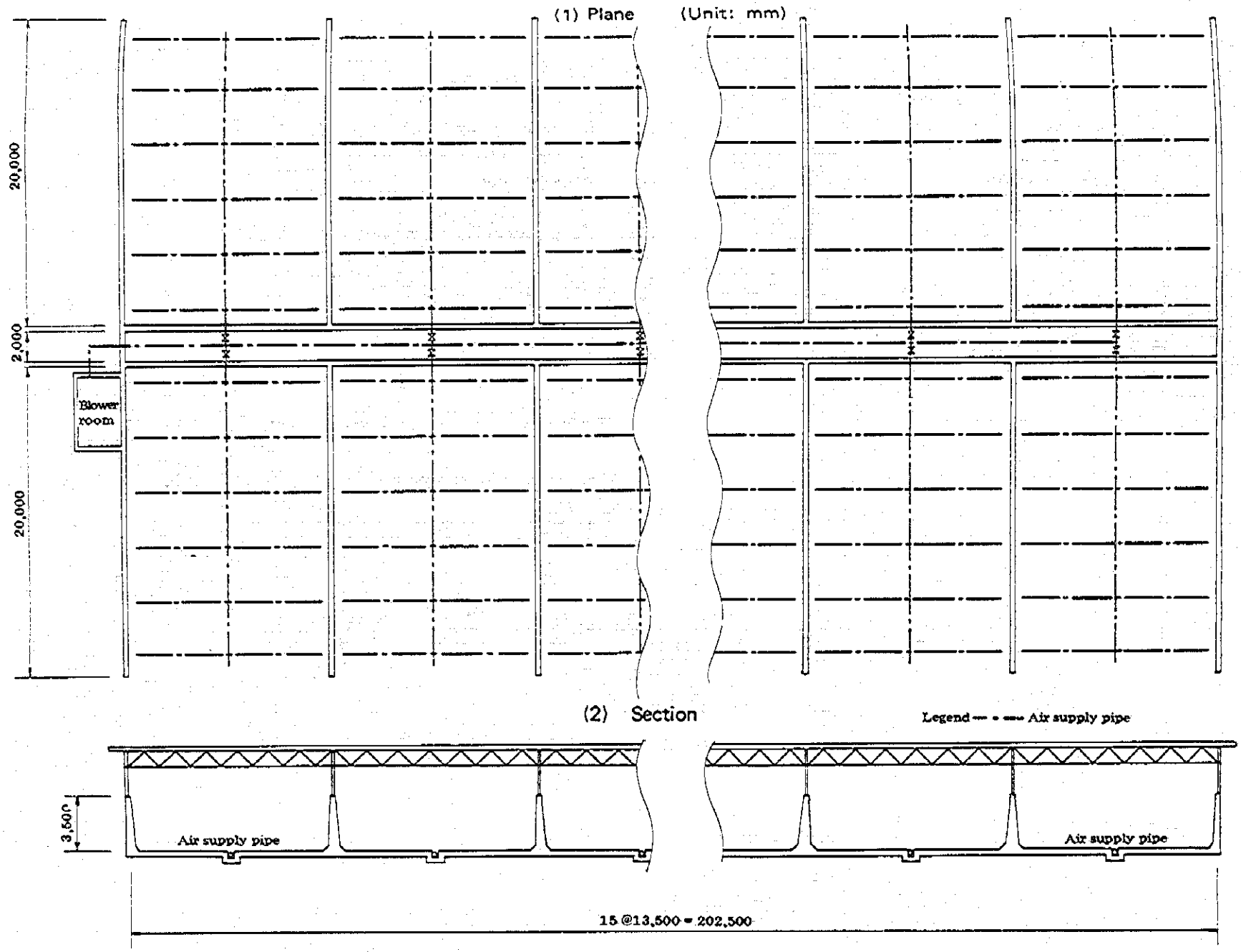
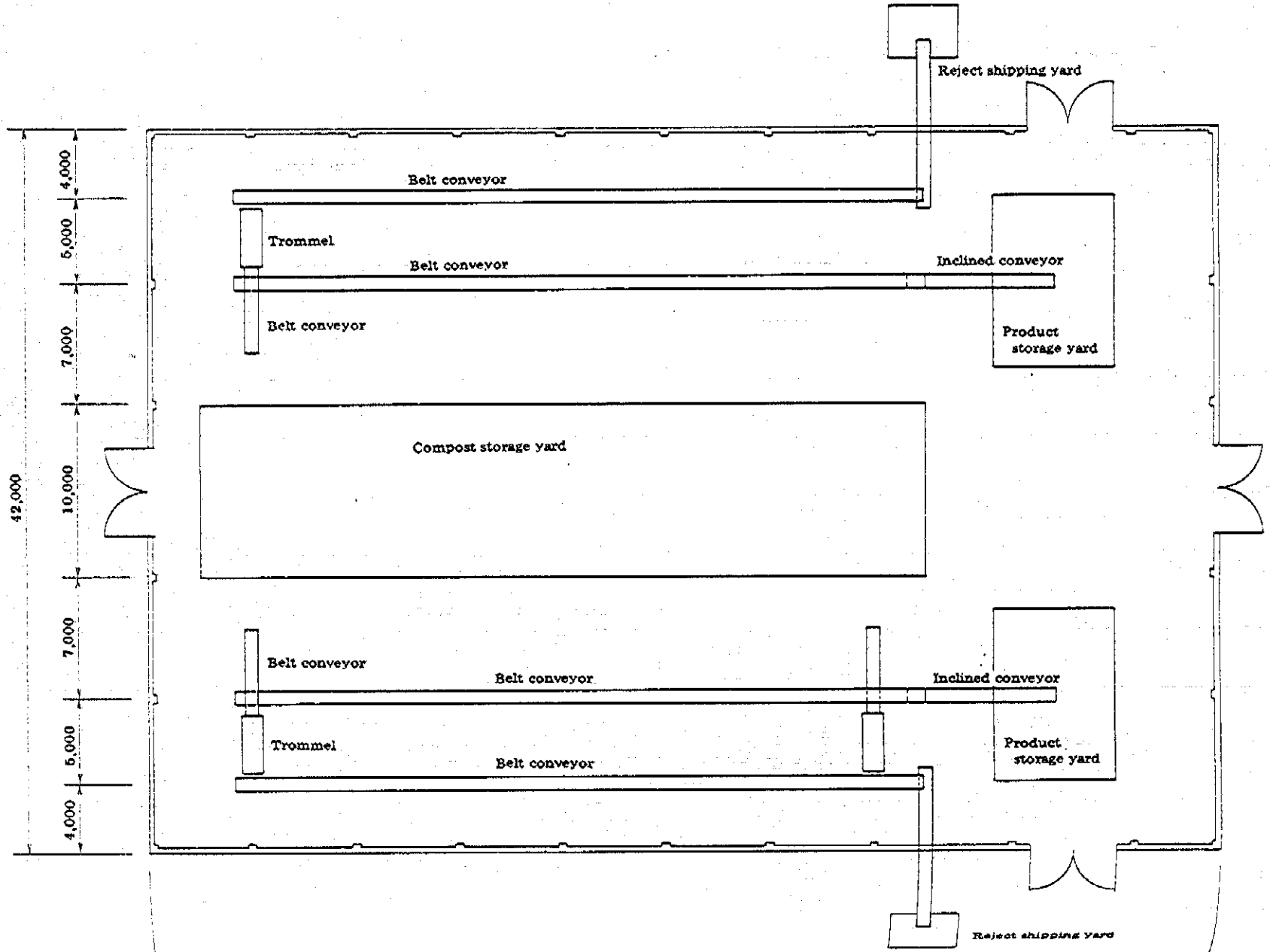


Fig. AP 5.13 Trommel screen house (Unit: mm)



Appendix 5.7 年度別計画ごみ埋立量

Table AP 5.1 Planned landfill volume (Case No. 9)

(Unit: m^3)

Fiscal Year	Disposal volume					
	On-Nooch		Nong Khaem		Ram Intra	
	Gross (incl. rejects and residue)	Incoming waste	Gross (incl. rejects and residue)	Incoming waste	Gross (incl. rejects and residue)	Incoming waste
1983	170,755	105,283	247,712	225,193	32,736	0
4	187,924	122,452	257,991	234,537	〃	0
5	192,784	143,184	270,068	245,516	〃	0
6	202,871	169,143	285,100	259,182	〃	0
7	230,640	196,912	301,032	273,665	16,864	0
8	198,602	164,874	236,149	214,681	152,796	135,932
9	217,991	184,263	251,342	228,493	176,389	159,525
1990	233,642	199,914	289,083	262,803	176,944	160,080
1	256,506	222,778	316,481	287,710	〃	〃
2	280,830	247,102	345,133	313,757	〃	〃
3	302,303	268,575	395,060	359,145	〃	〃
4	329,481	295,753	432,616	393,287	〃	〃
5	358,114	324,386	471,783	428,894	〃	〃
6	391,447	355,861	507,825	461,659	〃	〃
7	427,429	388,572	401,619	365,108	〃	〃
8	477,026	433,660	432,354	393,049	〃	〃
9	526,766	478,878	462,994	420,904	〃	〃
2000	582,575	529,614	496,984	451,804	〃	〃
1	639,855	581,686	525,303	477,548	152,198	135,334
2	669,203	608,366	549,397	499,452	158,406	141,542
3	701,663	637,875	574,281	522,074	162,864	146,000
4	740,251	672,955	599,983	545,439	〃	〃
5	779,089	708,263	623,997	567,270	〃	〃
6	813,142	739,220	646,610	587,827	〃	〃
7	845,876	768,978	668,346	607,587	〃	〃
8	879,440	799,491	690,635	627,850	〃	〃
9	913,858	830,780	713,490	648,627	〃	〃
2010	949,150	862,864	736,925	669,932	〃	〃
Total	13,499,213	12,041,682	12,730,293	11,572,993	4,036,893	3,501,213

Volume of rejects and residue is detailed in the table below.

(Period: fiscal 1983-2010)

(Unit: m^3)

Site	Rejected materials from compost	Residue from the incinerator attached to the existing compost plants	Residue from the incineration plants	*1 Covering soil
On-Nooch	690,432	333,312	0	433,787
Nong Khaem	152,768	83,328	0	921,204
Ram Intra	369,024	166,656	0	0

Note *1 Compost rejects and incineration residue will be utilized as covering material and the shortage of the material will be made up for by soil.

Table AP 5.2 Planned landfill volume (Case No. 13)

(Unit: m^3)

Fiscal Year	Disposal volume					
	On-Nooch		Nong Khaem		Ram Intra	
	Gross (incl. rejects and residue)	Incoming waste	Gross (incl. rejects and residue)	Incoming waste	Gross (incl. rejects and residue)	Incoming waste
1983	170,755	105,283	247,712	225,193	32,736	0
4	187,924	122,452	257,991	234,537	"	0
5	192,784	143,184	270,068	245,516	"	0
6	202,871	169,143	285,100	259,182	"	0
7	230,640	196,912	301,032	273,665	16,864	0
8	198,602	164,874	280,250	254,773	112,704	95,840
9	217,991	184,263	321,396	292,178	"	"
1990	239,833	206,105	352,937	320,852	"	"
1	105,688	71,960	170,612	155,102	109,971	93,107
2	112,585	78,857	217,327	197,570	110,975	94,111
3	119,447	85,719	353,175	321,068	111,956	95,092
4	127,074	93,346	411,415	374,014	112,704	95,840
5	135,092	101,364	473,260	430,236	"	95,840
6	83,245	49,517	144,883	131,712	36,755	19,891
7	85,850	52,122	163,424	148,567	59,344	42,480
8	93,331	59,603	203,258	184,780	69,944	53,080
9	105,061	71,333	193,843	176,221	75,310	58,446
2000	126,455	92,727	246,799	224,363	87,534	70,670
1	55,556	21,828	26,663	18,231	26,732	9,868
2	79,511	45,783	46,671	38,239	37,562	20,698
3	104,252	70,524	67,335	58,903	48,746	31,882
4	129,804	96,076	88,676	80,244	60,298	43,434
5	156,194	122,466	112,221	102,019	72,017	55,153
6	177,552	143,824	131,793	119,812	81,636	64,772
7	199,238	165,510	151,665	137,877	91,402	74,538
8	221,475	187,747	172,042	156,402	101,417	84,553
9	244,277	210,549	192,937	175,397	111,686	94,822
2010	267,658	233,930	214,361	194,874	122,215	105,351
Total	4,370,745	3,347,001	6,098,846	5,531,527	2,126,828	1,591,148

Volume of rejects and residue is detailed in the table below.

(Period: fiscal 1983-2010)

(Unit: m^3)

Site	Rejected materials from compost	Residue from the incinerator attached to the existing compost plants	Residue from the incineration plants	*1 Covering soil
On-Nooch	690,432	333,312	0	0
Nong Khaem	152,768	83,328	188,089	143,134
Ram Intra	369,024	166,656	0	0

Note *1 Compost rejects and incineration residue will be utilized as covering material and the shortage of the material will be made up for by soil.

Table AP 5.3 Planned landfill volume (Case No. 19-(2))

(Unit: m^3)

Fiscal Year	Disposal volume					
	On-Nooch		Nong Khaem		Ram Intra	
	Gross (incl. rejects and residue)	Incoming waste	Gross (incl. rejects and residue)	Incoming waste	Gross (incl. rejects and residue)	Incoming waste
1983	170,755	105,283	247,712	225,193	32,736	0
4	187,924	122,452	257,991	234,537	"	0
5	192,784	143,184	270,068	245,516	"	0
6	202,871	169,143	285,100	259,182	"	0
7	230,640	196,912	301,032	273,665	16,864	0
8	198,602	164,874	280,250	254,773	112,704	95,840
9	217,991	184,263	321,396	292,178	"	"
1990	239,833	206,105	352,937	320,852	"	"
1	105,688	71,960	170,612	155,102	109,971	93,107
2	112,585	78,857	217,327	197,570	110,975	94,111
3	119,447	85,719	353,175	321,068	111,956	95,092
4	127,074	93,346	411,415	374,014	112,704	95,840
5	135,092	101,364	473,260	430,236	"	"
6	133,884	100,156	226,667	206,061	51,927	35,063
7	147,789	114,061	280,674	255,158	59,005	42,141
8	162,342	128,614	326,304	296,640	76,000	59,136
9	189,024	155,296	283,098	257,362	96,878	80,014
2000	231,092	197,364	309,351	281,228	112,704	95,840
1	273,568	239,840	206,209	187,463	83,329	66,465
2	300,182	266,454	229,092	208,265	90,705	73,841
3	327,670	293,942	252,724	229,749	98,322	81,458
4	356,058	322,330	277,132	251,938	106,189	89,325
5	386,815	351,650	299,893	272,630	113,215	96,351
6	414,522	376,838	321,373	292,157	120,116	103,252
7	441,101	401,001	341,980	310,891	126,737	109,873
8	468,357	425,779	363,111	330,101	133,526	116,662
9	496,305	451,186	384,778	349,798	140,487	123,623
2010	524,962	477,238	406,996	369,996	147,624	130,761
Total	7,094,957	6,025,211	8,451,657	7,683,323	2,600,995	2,065,315

Volume of rejects and residue is detailed in the table below.

(Period: fiscal 1983-2010)

(Unit: m^3)

Site	Rejected materials from compost	Residue from the incinerator attached to the existing compost plants	Residue from the incineration plants	*1 Covering soil
On-Nooch	690,432	333,312	46,002	0
Nong Khaem	152,768	83,328	389,104	143,134
Ram Intra	369,024	166,656	0	0

Note *1 Compost rejects and incineration residue will be utilized as covering material and the shortage of the material will be made up for by soil.

Table AP 5.4 Planned landfill volume (without-project case)

(Unit: m^3)

Fiscal Year	Disposal volume					
	On-Nooch		Nong Khaem		Ram Intra	
	Gross (incl. rejects and residue)	Incoming waste	Gross (incl. rejects and residue)	Incoming waste	Gross (incl. rejects and residue)	Incoming waste
1983	170,755	705,283	233,625	225,193	32,736	0
4	187,924	122,452	242,969	234,537	"	0
5	192,784	143,184	253,948	245,516	"	0
6	202,871	169,143	267,614	259,182	"	0
7	230,640	196,912	282,097	273,665	16,864	0
8	198,602	164,874	223,113	214,681	152,796	135,932
9	217,991	184,263	236,925	228,493	176,389	159,525
1990	233,642	199,914	271,235	262,803	176,944	160,080
1	256,506	222,778	296,142	287,710	"	"
2	280,830	247,102	322,189	313,757	"	"
3	305,328	271,600	429,032	420,600	"	"
4	332,630	298,902	463,050	454,618	"	"
5	361,363	327,635	498,557	490,125	"	"
6	392,987	359,259	531,173	522,741	"	"
7	436,436	402,708	557,804	549,372	"	"
8	481,872	448,144	585,398	576,966	"	"
9	527,511	493,783	612,729	604,297	"	"
2000	578,640	544,912	643,360	634,928	"	"
1	641,754	608,026	654,998	646,566	155,254	138,390
2	665,670	631,942	680,430	671,998	160,698	143,834
3	693,827	660,099	706,696	698,264	162,864	146,000
4	725,144	691,416	733,824	725,392	"	"
5	756,664	722,936	759,428	750,996	"	"
6	784,305	750,577	783,316	774,884	"	"
7	810,866	777,138	806,273	797,841	"	"
8	838,103	804,375	829,812	821,380	"	"
9	866,031	832,303	853,950	845,518	"	"
2010	894,669	860,941	878,701	870,269	"	"
Total	13,266,345	12,242,601	14,638,388	14,402,292	4,042,241	3,506,561

Volume of rejects and residue is detailed in the table below.

(Period: fiscal 1983-2010)

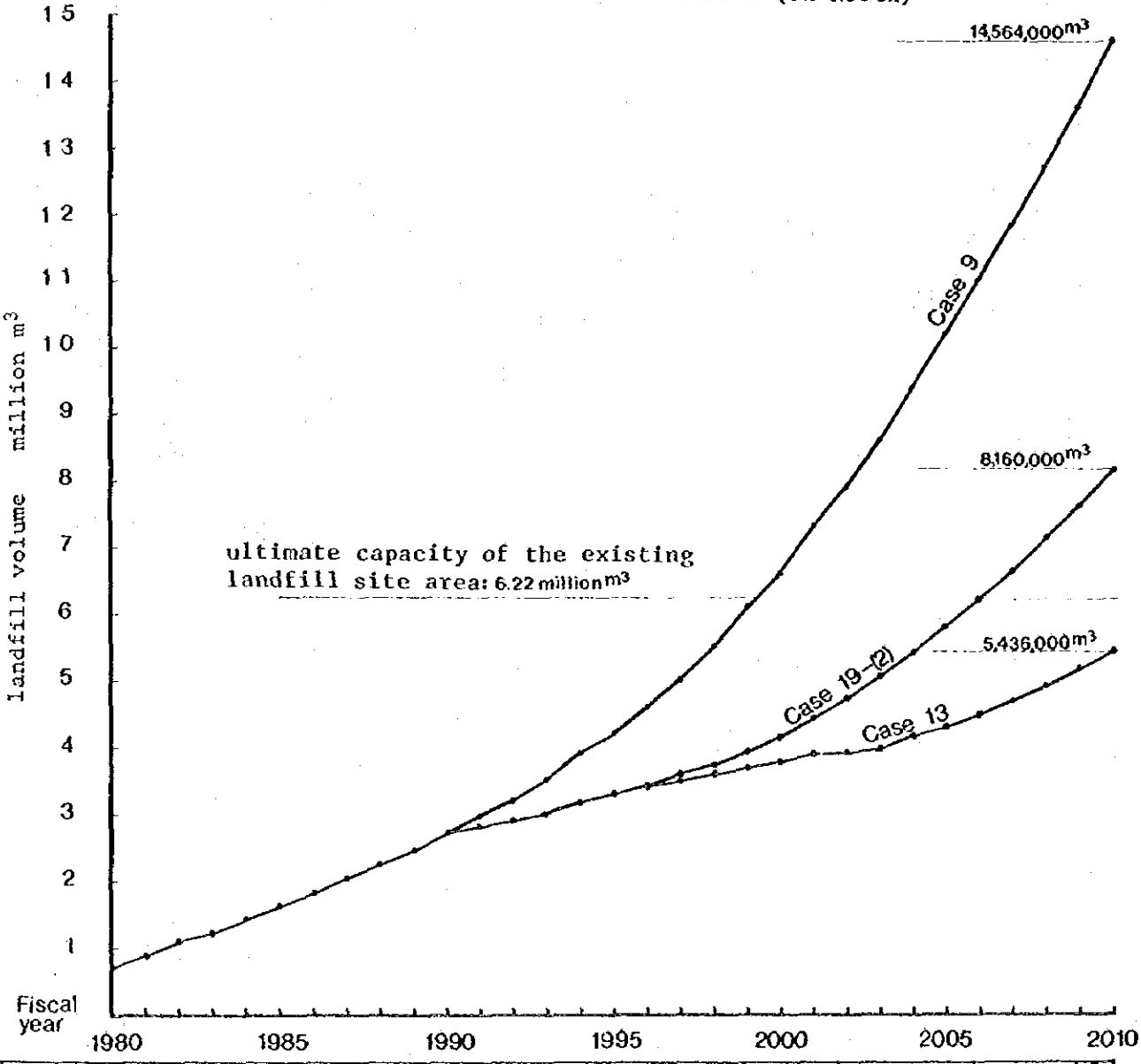
(Unit: m^3)

Site	Rejected materials from compost	Residue from the incinerator attached to the existing compost plants	Residue from the incineration plants	*1 Covering soil
On-Nooch	690,432	333,312	0	0
Nong Khaem	152,768	83,328	0	0
Ram Intra	369,024	166,656	0	0

Note *1 Compost rejects and incineration residue will be utilized as covering material and the shortage of the material will be made up for by soil.

Appendix 5.8 セクション別埋立容量と埋立工程

Fig. Ap 5.14 Planned landfill volume (On-Nooch)



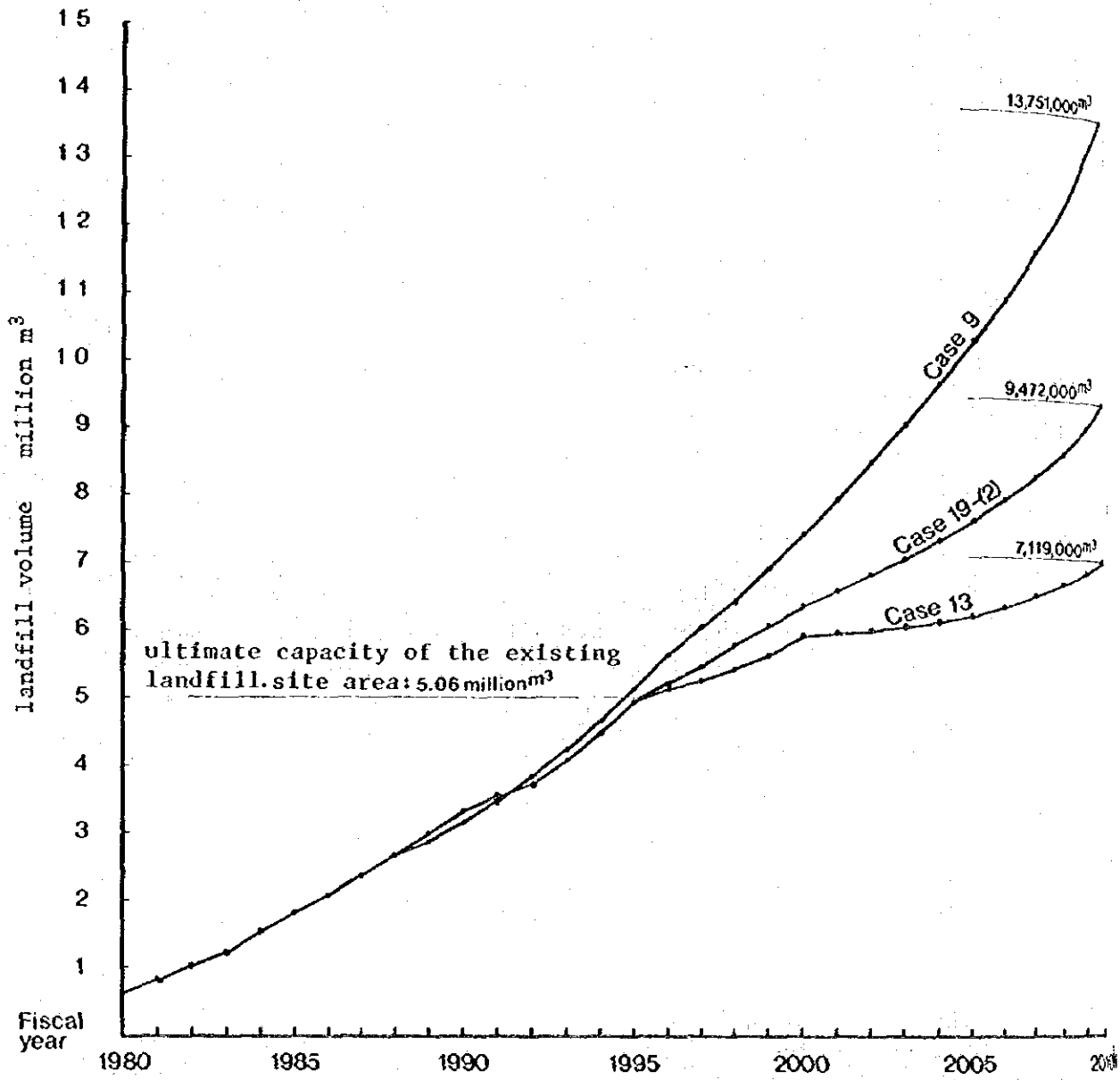
Case No.19-(2)	Section No	1	2	3	4	5	6	7	8	9 10 11
	Capacity (1,000m3)	1,322	453	801	371	965	856	1,433	1,400	696
	Area (1,000m2)	119	48	78	40	92	65	106	85	86

Case No.13	Section No	1	2	3	4	5	6	7.8.9
	Capacity (1,000m3)	1,322	453	801	371	965	856	1,454
	Area (1,000m2)	119	48	78	40	92	65	136

Case No.9	Section No	1	2	3	4	5	6	7	8	9.10
	Capacity (1,000m3)	1,322	453	801	371	1,820	2,292	2,507	1,952	3,164
	Area (1,000m2)	119	48	78	40	158	189	203	42	,269

Note : 1. Capacity means ultimate capacity of the section. Capacity of the final section is planned to enable to accept the disposed-of volume with a room.
2. Area means botton area of the landfill.

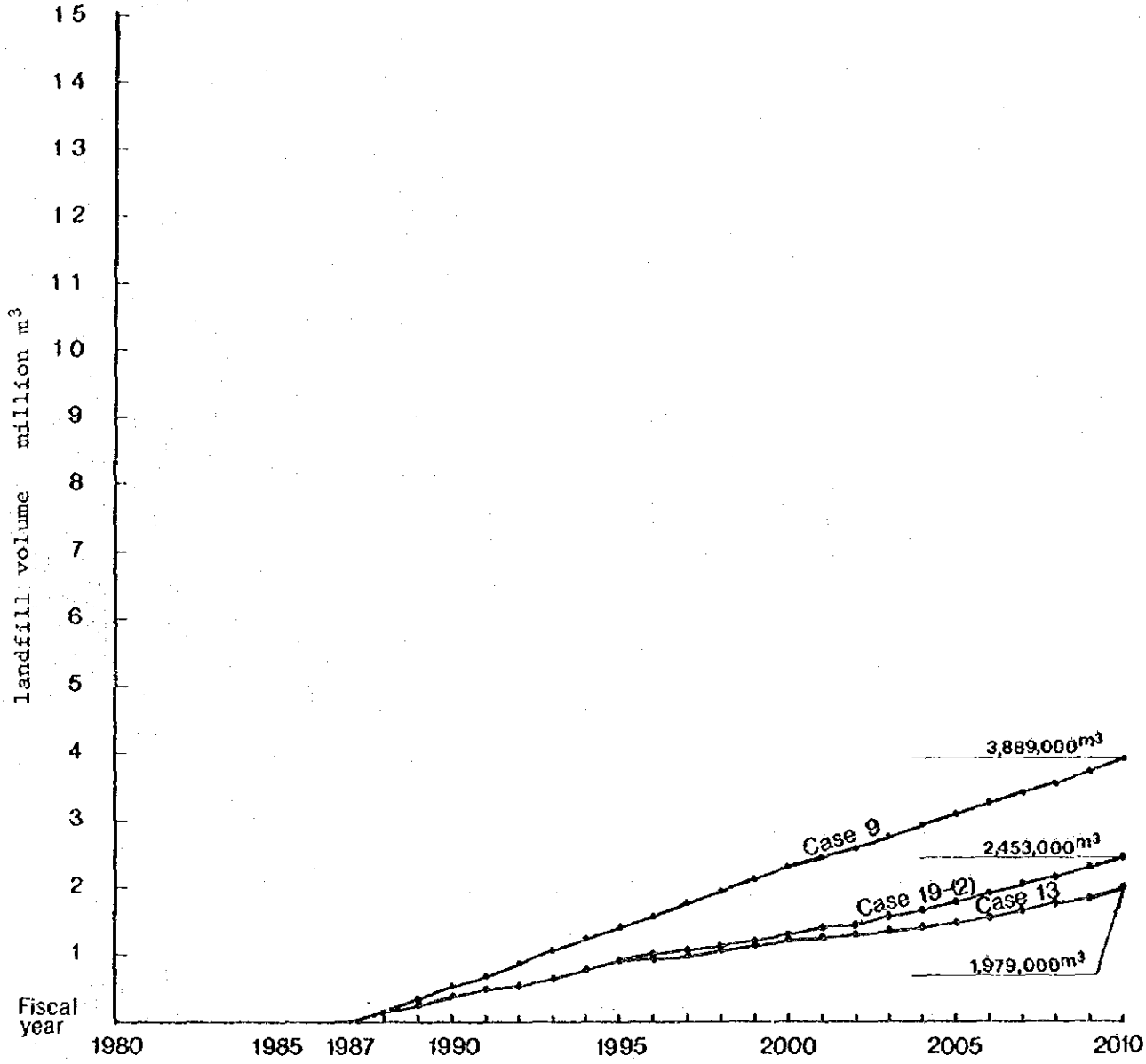
Fig. AP 5.15 Planned landfill volume (Nong Khaem)



Case No9-12	Section No	1	2	3	4	5		6.7.8
	Capacity (1,000m³)	1,770	1,823	1,419	1,390	2,309		768
	Area (1,000m²)	136	154	111	127	163		44
Case No13	Section No	1	2	3	4		5 . 6 . 7	
	Capacity (1,000m³)	1,770	1,823	1,419	1,145		1,012	
	Area (1,000m²)	136	154	111	118		53	
Case No.9	Section No	1	2	3	4	5	6	7.8.9
	Capacity (1,000m³)	1,770	1,823	2,523	2,309	1,784	2,675	942
	Area (1,000m²)	136	154	227	163	131	179	43

Note : 1. Capacity means ultimate capacity of the section. Capacity of the final section is planned to enable to accept the disposed-of volume and a little more.
2. Area means bottom area of a fill.

Fig. Ap 5.16 Planned landfill volume (Ram Intra)

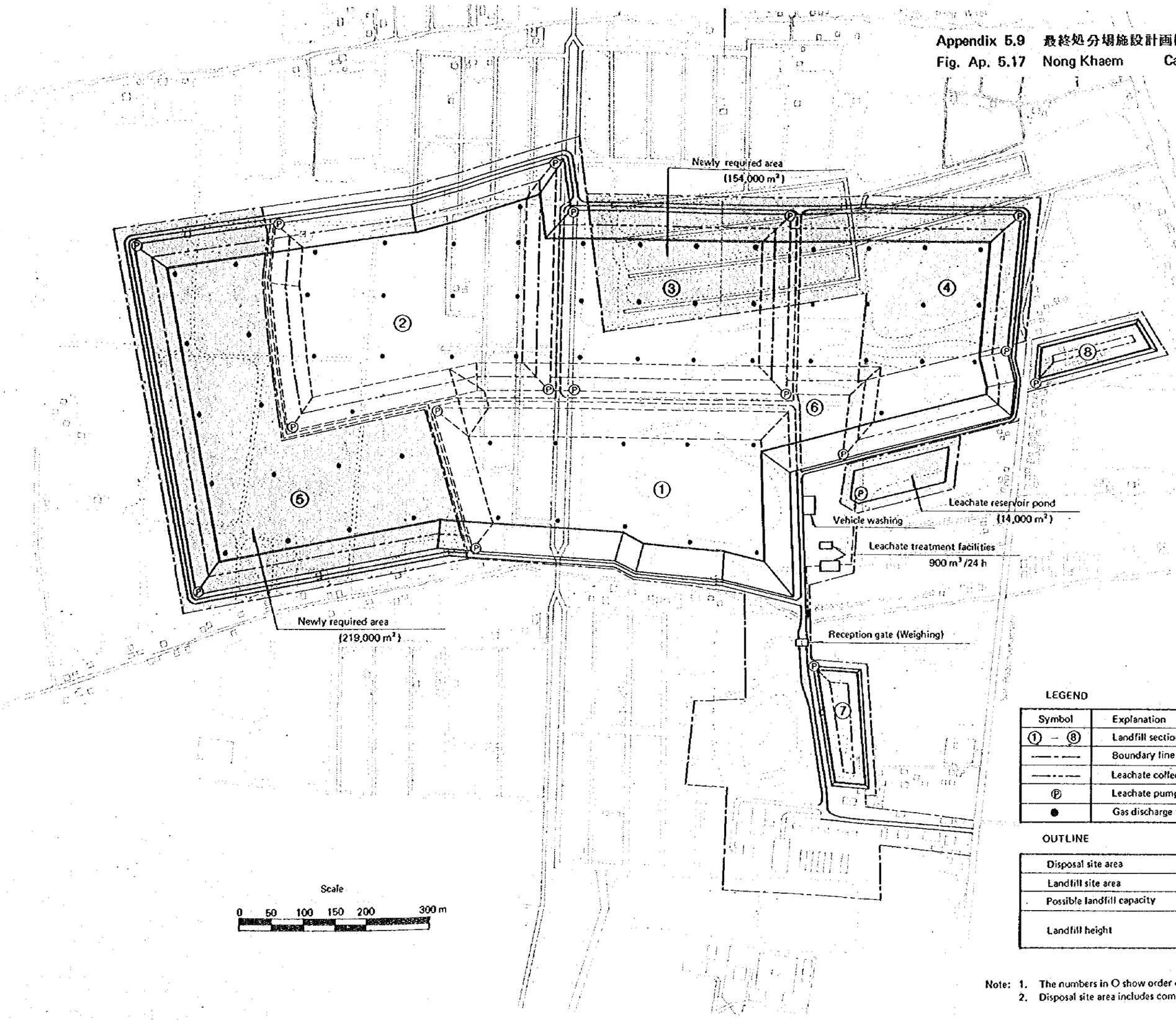


Case No19-(2)	Section No		1	2	3	4	5
	Capacity (1000m³)		606	593	513	543	212
	Area (1000m²)		58	59	42	38	7
Case No13	Section No		1	2	3		4
	Capacity (1000m³)		669	567	515		242
	Area (1000m²)		64	47	51		11
Case No9	Section No		1	2	3	4	5
	Capacity (1000m³)		882	835	922	312	960
	Area (1000m²)		82	78	69	14	87

Note : 1. Capacity means ultimate capacity of the section. Capacity of the final section is planned to enable to accept the disposed-of volume and a little more.
2. Area means bottom area of a fill.

Appendix 5.9 最終処分場施設計画図(1)

Fig. Ap. 5.17 Nong Khaem Case 19–(2)



LEGEND

Symbol	Explanation
① – ⑧	Landfill section
———	Boundary line
——·——	Leachate collection facilities
Ⓟ	Leachate pumping facilities (pump station)
●	Gas discharge facilities

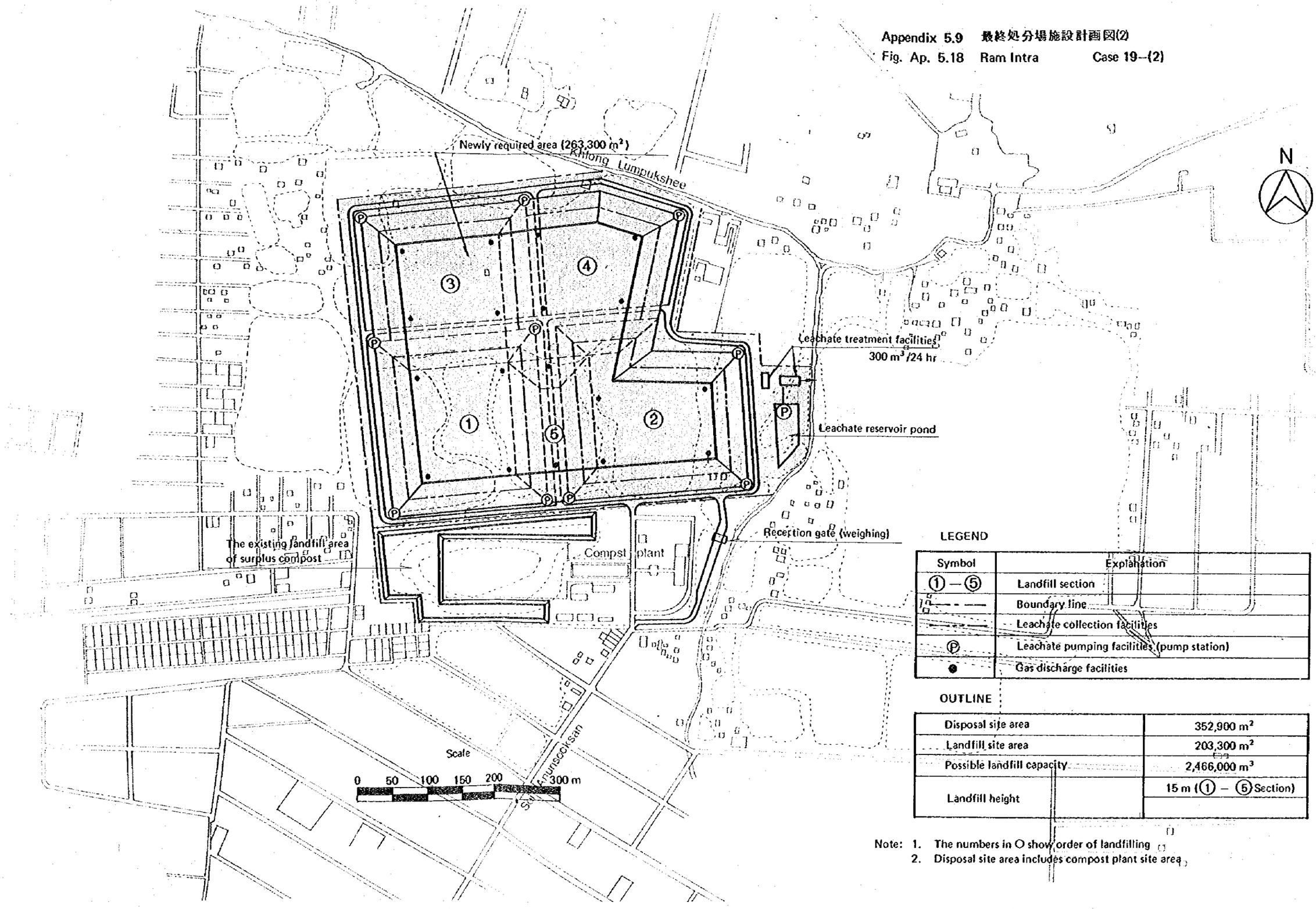
OUTLINE

Disposal site area	976,700 m²
Landfill site area	734,500 m²
Possible landfill capacity	9,478,000 m³
Landfill height	15 m (①–⑥ Section)
	3 m (⑦, ⑧ Section)

Note: 1. The numbers in O show order of landfilling.
2. Disposal site area includes compost plant site area.

Appendix 5.9 最終処分場施設計画図(2)

Fig. Ap. 5.18 Ram Intra Case 19--(2)



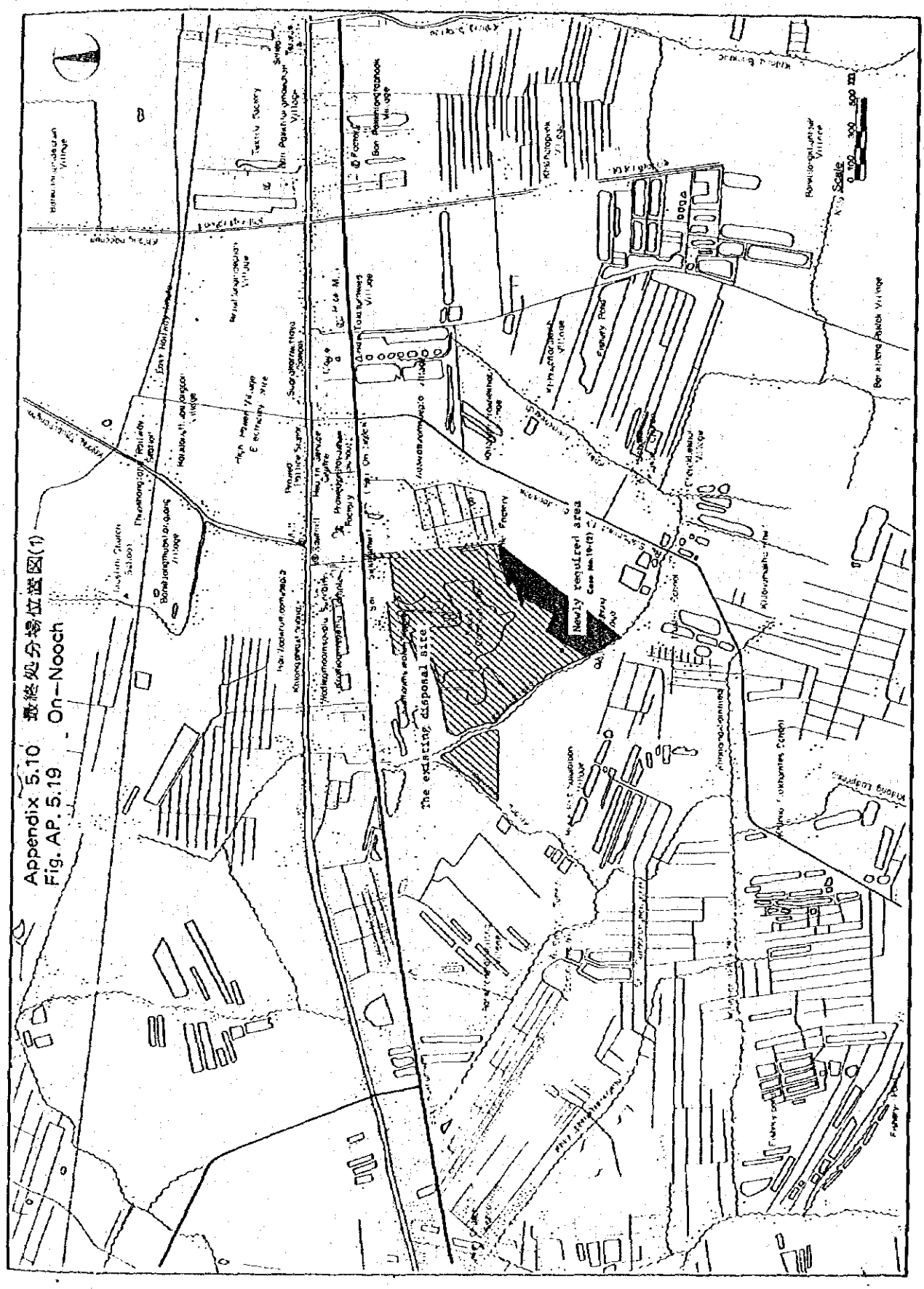
LEGEND

Symbol	Explanation
① — ⑤	Landfill section
	Boundary line
	Leachate collection facilities
Ⓟ	Leachate pumping facilities (pump station)
●	Gas discharge facilities

OUTLINE

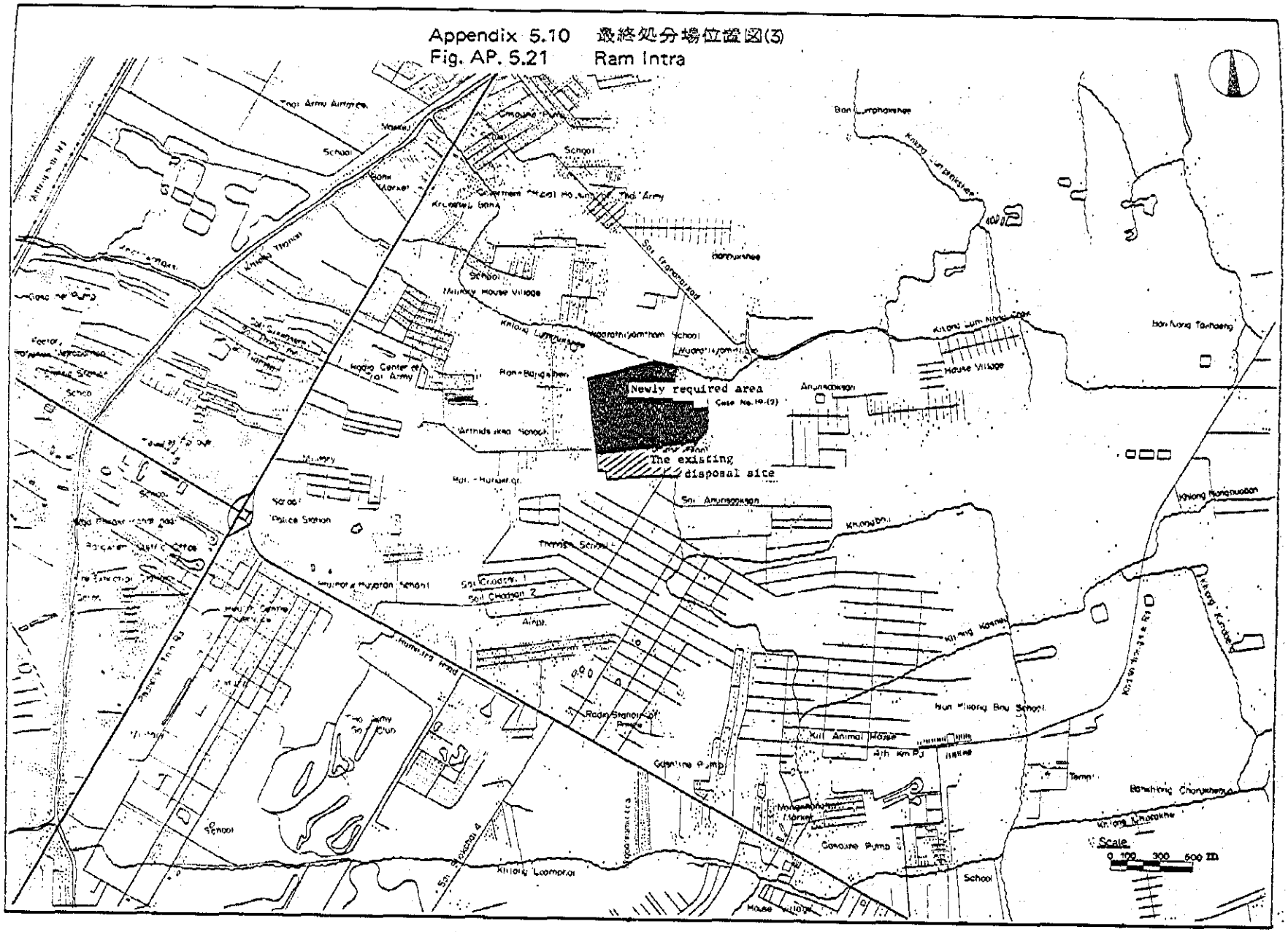
Disposal site area	352,900 m²
Landfill site area	203,300 m²
Possible landfill capacity	2,466,000 m³
Landfill height	15 m (① – ⑤ Section)

Note: 1. The numbers in O show order of landfilling
2. Disposal site area includes compost plant site area


Appendix 5.10 最終処分場位置図(1)
Fig. AP. 5.19 On-Nooch
Newly requested area
The existing disposal site
Scale

Appendix 5.10
Fig. AP. 5.20
最終処分場位置図(2)
Nong Khaem
Newly required area
The existing disposal site
Newly required area
Scale
0 100 200 500 m

Appendix 5.10 最終処分場位置図(3)
Fig. AP. 5.21 Ram Intra



Appendix 5.11 浸出水処理設備の概要

Table AP 5.5 Capacity of leachate treatment facilities

Site	Case No.	Capacity (m^3/d)	Remark
On-Nooch	9	400	to be constructed by 1987
		600	to be constructed in 1992
		500	to be constructed in 2003
	13	500	to be constructed by 1987
	19-(2)	500	to be constructed by 1987
		200	to be constructed in 2000
Nong Khaem	9	800	to be constructed by 1986
		500	to be constructed in 2002
	13	800	to be constructed by 1987
	19-(2)	900	to be constructed by 1987
Ram Intra	9	450	to be constructed by 1988
	13	300	- ditto -
	19-(2)	300	- ditto -

Note: The total of the capacities are planned to increase as the completed landfill increases. The quantity of leachate is determined by the following equation.

$$Q = \frac{1}{1,000}(C_1A_1 + C_2A_2)P$$

where, Q = leachate discharge volume per year (m^3/year)

C_1 = coefficient of seepage in a working section (assumed to be 1.0)

C_2 = coefficient of seepage in a completed section (assumed to be 0.4)

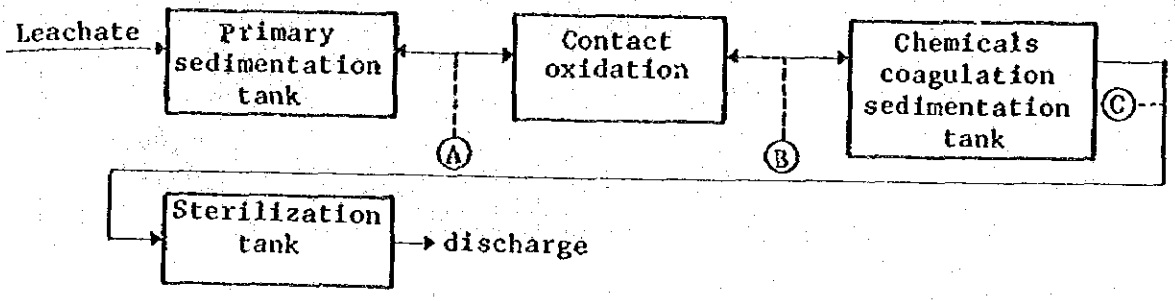
A_1 = area of a working section (m^2)

A_2 = area of a completed section (m^2)

P = precipitation (assumed 912 mm/year)

Capacity is determined to treat Q on a 80% operation rate and 20% surplus rate bases.

Table AP 5.6 Process flow and pollutant concentration



(Unit: mg/L*1)

Leachate (incoming and after treatment)				
Constituent	Position			
	Incoming	Ⓐ	Ⓑ	Ⓒ
pH	7 - 9			5 - 9
BOD	200	200	20(90%)*2	20
COD	700	700	700	350(50%)*2
SS	200	120(40%)*2	120	30(75%)*2

Note: *1 Except pH

*2 Figures in parentheses show the removed quantity of constituent in percent.

Table AP 5.7 Design criteria

Item	Criteria
1. Primary sedimentation tank Surface loading Retention time Weir loading	 $\leq$20 $m^3/m^2 \cdot d$ $\geq$3 h $\leq$100 $m^3/m \cdot d$
2. Contact oxidation tank BOD loading	0.6 $kg/m^3 \cdot d$ (for fillers)
3. Chemicals mixing tank Retention time	 $\geq$10 min
4. Chemicals coagulation tank Retention time	 $\geq$10 min
5. Coagulation sedimentation tank Surface loading Retention time Weir loading	 $\leq$20 $m^3/m^2 \cdot d$ $\geq$3 h $\leq$100 $m^3/m \cdot d$

Table AP 5.8 Reservoir pond capacity

(Unit: m^3)

Case No.	On-Nooch	Nong Khaem	Ram Intra
9	26,000	22,000	8,000
13	9,000	14,000	5,000
19-(2)	11,000	16,000	5,000

Note: Capacity was determined by the following equation:

$$Q = \frac{1}{1,000} (Cm\ P\ A_1 + Cm'\ P'\ A_2)$$

$$Cm = \frac{1}{100} (0.002\ P^2 + 0.16\ P + 21)$$

$$Cm' = \frac{1}{100} (0.002\ P'^2 + 0.16\ P + 21)$$

where, Q = Reservoir pond capacity (m^3)

P = Annually probable maximum precipitation per day (assumed to be 89.3 mm/d)

P' = Absorbed portion of P by fill (P-run-off quantity) (assumed to be 0.6 P)

A_1 = Working section (m^2)

A_2 = Completed section (m^2)

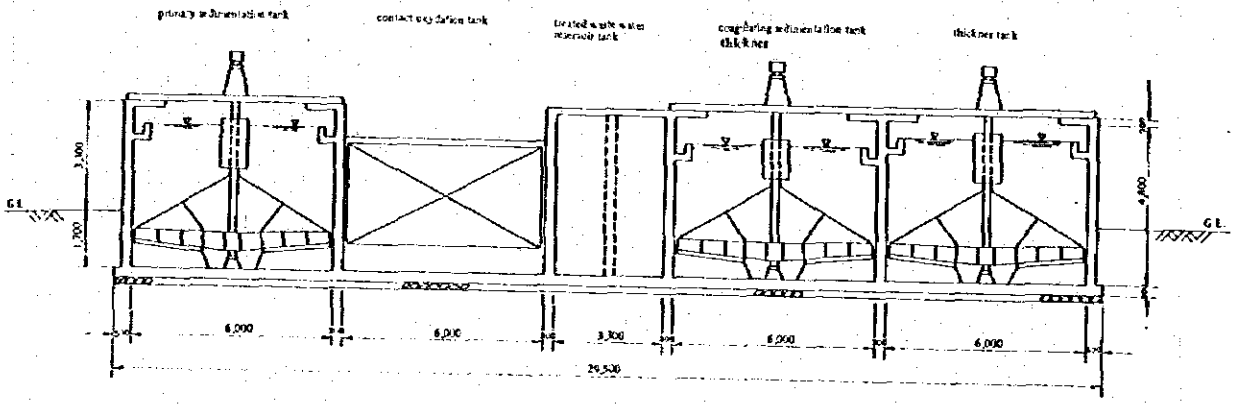
Cm = Percolation coefficient of landfill-working section

Cm' = Percolation coefficient of completed section

Fig. Ap 5.22 Design drawing of leachate treatment facilities

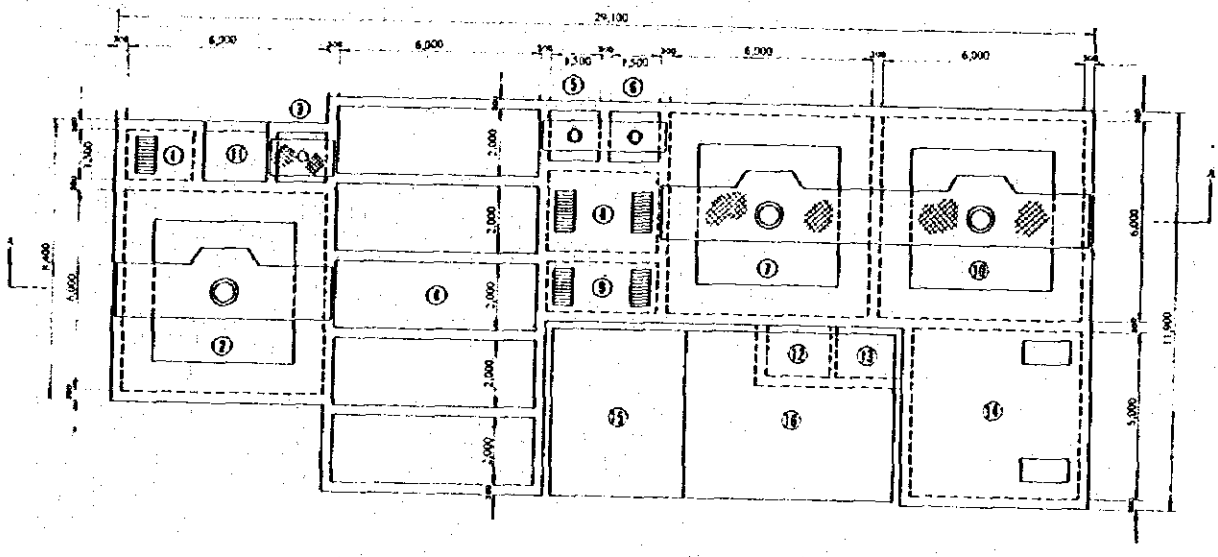
(1) Section (A-A section)

(Unit: mm)



(2) Plane

(Unit: mm)



Symbol	Name of equipment	Symbol	Name of equipment	Symbol	Name of equipment
①	weight-in tank (flow meter installed)	⑦	coagulating sedimentation tank	⑬	sludge discharge pump sump
②	primary sedimentation tank	⑧	treated waste water reservoir tank	⑭	sludge storage tank
③	pH adjustment tank	⑨	sterilizing tank	⑮	blower and pump room
④	contact oxydation tank	⑩	thickner tank	⑯	chemicals pumps and tanks room
⑤	chemical reaction tank	⑪	sludge discharge pump sump		
⑥	coagulation tank	⑫	sludge discharge pump sump		

Note Besides above shown equipment, a control house (including operation room, instrument room and analysing room), an electric house and a warehouse are necessary.

Appendix 5.12 作業用機材調達計画

Table AP 5.9 Collection

(Unit: vehicle)

Case No.	Equipment	Period (fiscal year) 1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	Total
9	Compactor	90	238	515	600	570	790	2,803
	Container loader	0	0	20	5	14	20	59
	Dump truck	52	17	0	55	23	10	157
	Total	142	255	535	660	607	820	3,019
13	Compactor	90	206	428	490	435	610	2,259
	Container loader	0	0	21	6	12	21	60
	Dump truck	52	17	0	45	18	6	138
	Total	142	223	449	541	465	637	2,457
19-(2)	Compactor	90	206	428	515	495	640	2,374
	Container loader	0	0	21	6	12	21	60
	Dump truck	52	17	0	0	45	23	137
	Total	142	223	449	521	552	684	2,571
W/O	Compactor	90	238	515	630	580	810	2,863
	Container loader	0	0	21	6	16	21	64
	Dump truck	52	17	0	57	23	10	159
	Total	142	255	536	693	619	841	3,086

Table AP 5.10 Road sweeping

(Unit: vehicle)

Equipment	Period (fiscal year) 1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	Total
Dump truck	0	8	8	7	12	11	46
Mech. road sweeper	2	2	9	11	5	17	46
Road washer	0	0	11	10	2	23	46
Compactor with a crane	0	7	10	10	9	10	46
Total	2	17	38	38	28	61	184

Note: Equipment plan is the same in all cases (9, 13, 19-(2), W/O).

Table AP 5.11 River and canal cleaning

(Unit: unit)

Equipment	Period (fiscal year)						Total
	1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	
Mechanical working boat	1	1	1	2	1	1	7
Small boat	4	10	55	40	10	55	174
Dump truck	0	1	17	7	6	17	48
Total	5	12	73	49	17	73	229

Note: Equipment plan is the same in all cases (9, 13, 19-(2), W/O).

Table AP 5.12 Incineration residue hauling

(Unit: vehicle)

Case No.	Equipment	Period (fiscal year)						Total
		1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	
13	Residue truck	0	13	19	10	13	19	74
19-(2)		0	13	13	0	13	13	52

Table AP 5.13 Compost plant

(Unit: vehicle)

Case No.	Equipment	Period (fiscal year)						Total
		1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	
9	Front-end loader	0	11	3	7	7	0	28
	Crawler dozer	0	8	2	2	7	0	19
	Backhoe	0	2	2	0	4	0	8
	Other vehicle	1	9	5	4	9	1	29
			2	2	1	2	3	10
	Total	1	32	14	14	29	4	94
13 & 19-(2)	Front-end loader	0	9	2	10	2	5	28
	Crawler dozer	0	5	2	4	3	4	18
	Backhoe	0	0	2	2	0	4	8
	Dump truck	1	7	4	9	4	7	32
	Other vehicle	0	0	2	2	1	3	8
	Total	1	21	12	27	10	23	94
W/O	Front-end loader	0	9	0	7	2	0	18
	Crawler dozer	0	5	0	2	3	0	10
	Dump truck	1	7	2	5	4	1	20
	Total	1	21	2	14	9	1	48

Note: Other vehicles include station wagons for general use.

Table AP 5.14 Final disposal

(Unit: vehicle)

Case No.	Equipment	Period (fiscal year) 1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2006	2007 to 2010	Total
9	Front-end loader		7	5	5	10	3	30
	Crawler dozer		3		3			6
	Backhoe		3		2	1		6
	Dump truck		3		3	2		8
	Other vehicle	2	13	2	13	2	10	42
	Total	2	29	7	26	15	13	92
13	Front-end loader		6	4	2	5	2	19
	Crawler dozer		3		3			6
	Backhoe		3		2	1		6
	Dump truck		3		2	1		6
	Other vehicle	2	13	2	13	2	10	42
	Total	2	28	6	22	9	12	79
19-(2)	Front-end loader		7	3	3	9	1	23
	Crawler dozer		3		3			6
	Backhoe		3		2	1		6
	Dump truck		3		2	1		6
	Other vehicle	2	13	2	13	2	10	42
	Total	2	29	5	23	13	11	83
W/O	Crawler dozer		2	4	2	7		15
	Other vehicle		6		6			12
	Total		8	4	8	7		27

Note: Other vehicles include jeeps, disinfecting trucks, water trucks, fire engines, etc.

Appendix 5.13 人員補充計画

Table AP 5.15 Collection

(Unit: person)

Case No.	Kind of worker	Period (fiscal year) 1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	Total
9	Driver	129	153	280	430	263	233	1,488
	Collector	272	353	601	1,015	777	687	3,705
	Total	401	506	881	1,445	1,040	920	5,193
13	Driver	129	153	203	253	157	184	1,079
	Collector	272	353	338	511	464	543	2,481
	Total	401	506	541	764	621	727	3,560
19-(2)	Driver	129	153	203	282	231	194	1,192
	Collector	272	353	338	598	684	574	2,819
	Total	401	506	541	880	915	768	4,011
W/O	Driver	129	153	288	466	271	240	1,547
	Collector	272	353	625	1,118	798	709	3,875
	Total	401	506	913	1,584	1,069	949	5,422

Table AP 5.16 Road sweeping

(Unit: person)

Kind of worker	Period (fiscal year) 1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	Total
Sweeper	72	170	330	460	150	150	1,332
Driver	0	19	26	22	7	14	88
Assistant	Δ 39	9	11	9	5	9	4
Total	33	198	367	491	162	173	1,424

Note: Excess labor (refer to as Δ) is to be redistributed to other positions.
Manpower requirements are the same in all cases (9, 13, 19-(2), W/O).

Table AP 5.17 River cleaning

(Unit: person)

Kind of worker	Period (fiscal year) 1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	Total
Boat crew member	29	66	75	112	0	0	282
Driver, Worker	0	0	26	30	0	0	56
Total	29	66	101	142	0	0	338

Note: Manpower requirements are the same in all cases (9, 13, 19-(2), W/O).

Table AP 5.18 Incineration residue hauling

(Unit: person)

Case No.	Kind of worker	Period (fiscal year)						Total
		1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	
13	Driver	0	14	22	10	0	0	46
19-(2)	Driver	0	14	14	0	0	0	28

Table AP 5.19 Incineration plant

(Unit: person)

Plant capacity	Officer	Driver	Worker	Skilled worker	Engineer	Total
1,500 ton per day plant	8	3	30	47	10	98
1,100-1,200 ton per day plant	7	3	28	36	10	84

Table AP 5.20 Compost plant

(Unit: person)

Name of plant	Skilled worker	Hand-sorting workman	Officer	Landfill operation worker	Engineer	Total
Bang Khun Tian	19	60	5	10	2	96
Taling Chan	29	120	7	12	3	171
Total	48	180	12	22	5	267

Table AP 5.21 Final disposal site

(Unit person)

Case No.	Period (fiscal year)						Total
	1983 to 1985	1986 to 1990	1991 to 1995	1996 to 2000	2001 to 2005	2006 to 2010	
9	20	42	25	28	35	30	180
13	20	35	1	Δ 18	Δ 3	13	48
19-(2)	20	36	1	Δ 9	15	24	87
W/O	9	10	29	26	23	30	127

Note: Figures in the table show the total number of officers, engineers, drivers, landfill operation workers and skilled workers.

Appendix 5.14 焼却工場の業務と職種別人員

Table AP 5.22 Personnel for an incineration plant

Duty	Content	Number of workers (person)				
		W	S	D	O	E
Concerning scaling	reception, scaling, data processing	2 1	1 1		1 1	
Concerning platform	control and indication of incoming trucks, sweeping	4 3	1 1			
Control center	control and operation of equipment	4 4	4 4			
Concerning furnace	operation and routine maintenance of furnace	4 4	12 8			
Crane operation	operation and routine maintenance of cranes	7 7				
Technical management	operation and maintenance planning, pollution control		3 3			1 1
Material management	acquisition of items necessary for daily operation and routine maintenance	1 1	1 1			
Power generation management	power generation management, safety management		1 1			1 1
Boiler-turbine	operation and maintenance of boiler and turbine	4 4	8 4			
Special maintenance	planning and management of overhaul, special maintenance		11 8			1 1
Shredder	operation and routine maintenance of shredder		1 1			
Water treatment	operation and maintenance of waste water treatment and pure water production equipment	4 4	4 4			
Driver	driving of a commuters' car and a messenger car			3 3		
General management	general management, personnel management, contract, accounting				6 5	
Manager	top and middle managers				1 1	7 7
Total		30 28	47 36	3 3	8 7	10 10

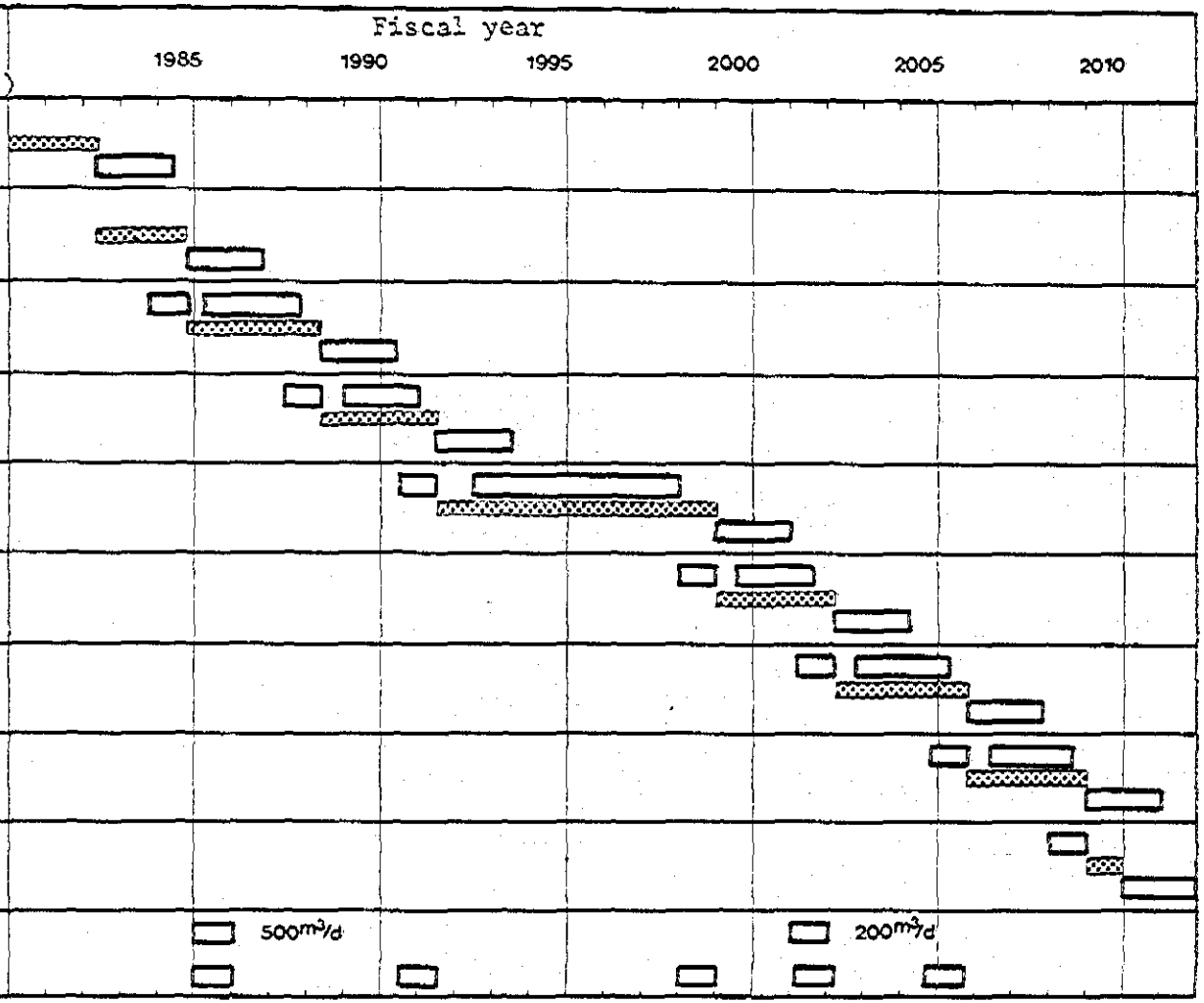
Legend: Upper figures in the column "No. of workers" are for a 1,500 ton per day plant and lower figures for a 1,100 or 1,200 ton per day plant.

W: Worker
S: Skilled worker
D: Driver
O: Officer
E: Engineer

Fig. AP 5.23 On-Nooch Case No. 19-(2)

Legend : Landfill work
Construction

Section No.	Kind of construction	Ultimate capacity (thousand m^3)
1	Step 1 Step 2	1,322
2	-do- -do-	453
3	-do- -do-	801
4	-do- -do-	371
5	-do- -do-	965
6	-do- -do-	856
7	-do- -do-	1,433
8	-do- -do-	1,440
9 10 11	-do- -do-	695
Leachate treatment facilities		
Management facilities		



Note : (1) Step 1 includes the construction of leachate collection and discharge facilities embankment, etc.
(2) Step 2 includes the final soil covering, construction of rainwater drain and gas discharge facilities, etc.
(3) Construction during landfill work includes construction of embankment from the

Fig. AP 5.24 Nong Khaem Case No. 19-(2)

Legend : Landfill work
construction

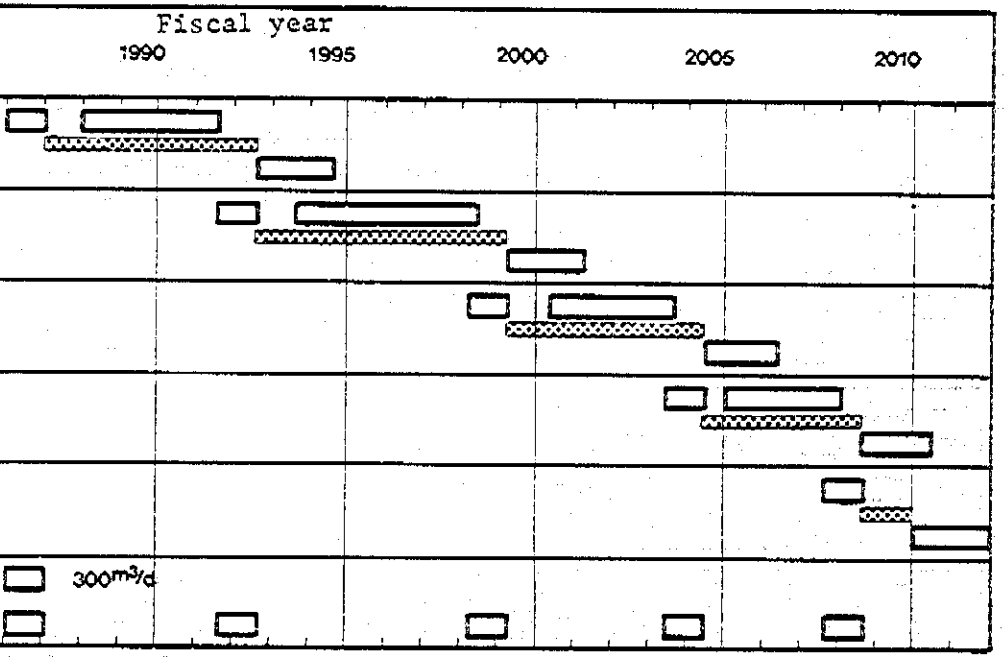
Section No.	Kind of construction	Ultimate capacity (thousand m^3)
1	Step 1 Step 2	1,770
2	-do- -do-	1,823
3	-do- -do-	1,419
4	-do- -do-	1,390
5	-do- -do-	2,309
6	-do- -do-	706
7	-do- -do-	35
8	-do- -do-	27
Leachate treatment facilities		
Management facilities		

Note : (1) Step 1 includes the construction of leachate collection and discharge facilities embankment, etc.
(2) Step 2 includes the final soil covering, construction of rainwater drain and gas discharge facilities, etc.
(3) Construction during landfill work includes construction of embankment from the second to fifth stories.

Fig. AP 5.25 Ram Intra Case No. 19-(2)

Legend : Landfill work
Construction

Section No.	Kind of construction	Ultimate capacity (thousand m^3)
1	Step 1 Step 2	605
2	-do- -do-	593
3	-do- -do-	513
4	-do- -do-	543
5	-do- -do-	212
Leachate treatment facilities		
Management facilities		



Note : (1) Step 1 includes the construction of leachate collection and discharge facilities embankment, etc.
(2) Step 2 includes the final soil covering, construction of rainwater drain and gas discharge facilities, etc.
(3) Construction during landfill work includes construction of embankment from the second to fifth stories.

Appendix 5.16 焼却工場の工事費内訳

Table AP 5.23 Cost for architectural and civil work (incineration plant)

(Unit: thousand Baht)

Construction item	Construction work	Plant									
		Yannawa		Dusit		Bang Kapi		Bangkok Noi		Phasi Charoen	
		Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local	Foreign	Local
Superstructure	Concrete work	0	70,201	0	70,201	0	56,160	0	51,480	0	51,480
	Steel work	41,664	66,893	41,664	66,893	33,332	53,514	30,554	87,555	30,554	87,555
	Others	0	60,849	0	60,849	0	48,827	0	6,258	0	6,258
	Total	41,664	197,943	41,664	197,943	33,332	158,501	30,554	145,293	30,554	145,293
Substructure	Pile and foundation	104	28,943	104	28,943	81	22,633	75	20,783	75	20,783
Miscellaneous	Clearance & reclamation	0	29,888	0	15,054	0	20,100	0	14,265	0	17,640
	Access road	0	0	0	502	0	505	0	257	0	8,615
	In-site road	2	2,964	2	2,118	2	2,896	2	2,287	2	2,553
	Parking yard	0	3,694	0	5,540	0	0	0	4,925	0	0
	Electricity and water supply	207	393	240	527	281	538	190	395	182	968
	Others	4	5,684	4	6,103	0	6,455	4	4,810	0	6,119
	Total	213	42,623	246	29,844	283	30,494	196	26,939	184	35,895

Table AP 5.24 Purchase and installation cost for equipment of the incineration plant
(1,500 ton per day)

(Unit: thousand Baht)

Name of equipment	Equipment Cost						Installation work cost	
	CIF	Duty	Standard profit	Business tax	Financial cost	Economic cost	Foreign labor	Local labor
Reception and charging equipment	40,842	4,084.2	7,188.2	1,886.5	54,000.9	48,030.2	3,726.8	555.2
Incinerator	133,064	13,306.4	23,419.3	5,093.7	174,883.3	156,483.2	19,059.6	2,839.6
Boiler	114,328	11,432.8	20,121.8	4,376.6	150,259.2	134,449.8	11,365.2	1,693.1
Steam condenser	3,026	302.6	532.6	115.8	3,977.0	3,558.6	142.8	31.6
Pure water production	8,117	811.7	1,428.6	310.7	10,668.0	9,545.6	943.6	140.7
Particulate emission control	125,594	12,559.4	22,104.5	4,807.7	165,065.6	147,698.5	12,807.2	1,908.1
Water supply	4,055	405.5	713.7	155.2	5,329.4	4,768.7	245.0	36.6
Waste water treatment	37,631	3,763.1	6,623.1	1,440.5	49,457.7	44,254.1	3,740.8	557.3
Recovered heat utilization	34,660	3,466.0	6,100.2	1,326.8	45,553.0	40,760.2	432.6	64.3
Power generation	36,720	10,795.6	5,287.4	3,639.9	56,442.9	42,007.4	3,956.4	589.4
Air supply	10,752	1,075.2	1,892.3	411.5	14,131.0	12,644.3	1,068.2	159.3
Flue and others	18,715	3,406.1	3,040.6	1,197.7	26,359.4	21,755.6	1,412.6	210.5
Stack	14,820	1,482.0	2,608.3	567.3	19,477.6	17,428.3	3,017.0	449.4
Residue crane	10,690	1,069.0	1,881.4	409.2	14,049.6	12,571.4	1,950.2	290.6
Electric equipment	79,992	23,997.6	11,438.9	8,080.0	123,508.5	91,430.9	7,298.2	1,087.4
Instrumentation	79,239	23,771.7	11,331.2	8,003.9	122,345.8	90,570.2	5,376.0	800.9
Piping	28,129	8,438.7	4,022.4	2,841.3	43,431.4	32,151.4	7,099.4	1,057.7

Table AP 5.25 Purchase and installation cost for equipment of the incineration plant
(1,200 ton per day)

(Unit: thousand Baht)

Name of equipment	Equipment Cost						Installation work cost	
	CIF	Duty	Standard profit	Business tax	Financial cost	Economic cost	Foreign labor	Local labor
Reception and charging equipment	35,884	3,588.4	6,315.5	1,657.5	47,445.4	42,199.5	3,274.6	487.9
Incinerator	116,431	11,643.1	20,491.8	4,457.1	153,023	136,922.8	16,676.8	2,484.6
Boiler	100,037	10,003.7	17,606.6	3,829.5	131,476.8	117,643.6	9,944.2	1,481.4
Steam condenser	2,659	265.9	468.0	101.8	3,494.7	3,127.0	186.2	13.9
Pure water production	6,757	675.7	1,189.2	258.7	8,880.6	7,946.2	830.2	123.6
Particulate emission control	109,895	10,989.5	19,341.5	4,206.8	144,432.8	129,236.5	10,026.8	1,493.8
Water supply	19,479	1,947.9	3,428.3	745.7	25,600.9	22,907.3	229.6	34.1
Waste water treatment	33,063	3,306.3	5,819.1	1,265.7	43,454.1	38,882.1	3,287.2	489.6
Recovered heat utilization	30,453	3,045.3	5,359.7	1,165.7	40,023.7	35,812.7	379.4	56.5
Power generation	32,475	9,547.7	4,676.2	3,219.2	49,918.1	37,151.2	3,500.0	521.3
Air supply	9,408	940.8	2,003.8	370.6	12,723.2	11,411.8	935.2	139.3
Flue and others	16,375	2,980.3	2,660.4	1,048.0	23,063.7	19,035.4	1,236.2	184.2
Stack	13,021	1,302.1	2,291.7	498.4	17,113.2	15,312.7	2,650.2	394.8
Residue crane	9,393	939.3	1,653.2	359.6	12,345.1	11,046.2	1,713.6	255.3
Electric equipment	70,282	21,084.6	10,050.3	7,099.2	108,516.1	80,332.3	6,413.4	955.4
Instrumentation	69,620	20,886.0	9,955.7	7,032.3	107,494.0	79,575.7	4,723.6	703.7
Piping	23,836	7,150.8	3,408.5	2,407.7	36,803.0	27,244.5	6,238.4	929.3

Fig. AP 5.26 Unit construction cost (financial)

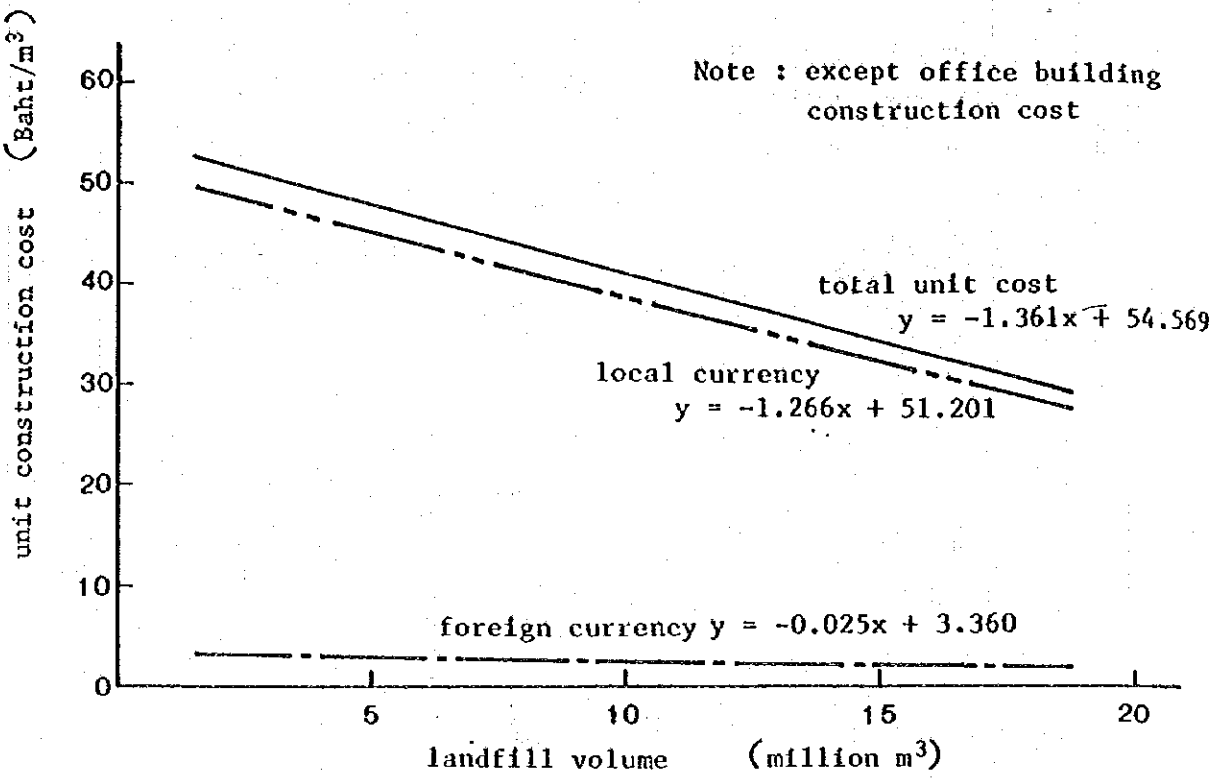


Fig. AP 5.27 Unit construction cost (economic)

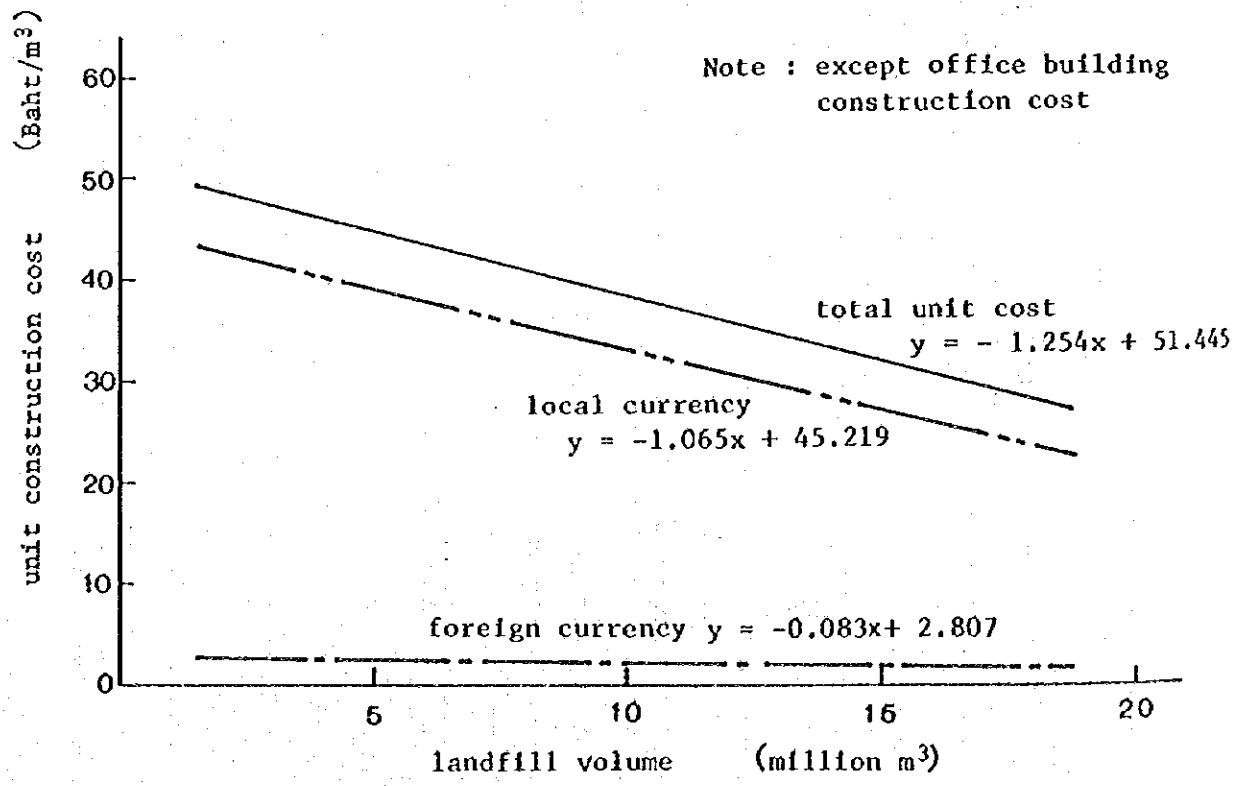


Table AP 5.26 Construction cost items (On-Nooch) (Financial cost)

(Unit: 1,000 Baht)

Name of equipment	Number & Size	Material and equipment		Labor		Total	
		Foreign	Local	Foreign	Local	Foreign	Local
Case 13 (per 4,893,900 m)							
Leachate collection and discharge facilities	1 unit	1,581	11,684	0	3,987	1,581	15,671
Embankment	5,800 m	0	20,534	0	5,887	0	26,421
Final soil covering	53 ha	0	72,034	0	12,773	0	84,807
Gas discharge facilities	47 unit	0	2,325	0	873	0	3,198
Rainwater drain facilities	14,800 m	0	4,134	0	5,262	0	9,396
On-site road	1 unit	0	8,572	0	6,700	0	15,272
Leachate treatment facilities	500 m^3/d	8,110	1,200	230	480	8,340	1,680
On-site building*1	1 unit	1,474	4,427	0	2,356	1,474	6,783
Others*2	1 unit	3,901	1,578	212	400	4,113	1,978
Subtotal		15,066	126,488	442	38,718	15,508	165,206
Miscellaneous expense	30%						54,214
Business tax	3.3%	15,066	126,488	422	38,718		7,753
Total						15,508	227,173
Unit cost per landfill volume (m^3)*3 (Baht)						2.9	45.0
Case 9 (per 13,350,400 m^3)							
Leachate collection and discharge facilities	1 unit	2,428	20,559	0	4,596	2,428	25,155
Embankment	10,400 m	0	36,461	0	10,453	0	46,914
Final soil covering	126 ha	0	172,350	0	27,281	0	199,631
Gas discharge facilities	107 unit	0	5,443	0	2,005	0	7,448
Rainwater drain facilities	26,200 m	0	7,200	0	9,165	0	16,365
On-site road	1 unit	0	15,757	0	12,717	0	28,474
Leachate treatment facilities	1,500 m^3/d	16,372	2,889	460	1,037	16,832	3,926
On-site building*1	1 unit	1,474	4,427	0	2,356	1,474	6,783
Others*2	1 unit	7,800	2,990	424	794	8,224	3,784
Subtotal		28,074	268,076	884	70,404	28,958	338,480
Miscellaneous expense	30%						110,231
Business tax	3.3%						15,763
Total		28,074	268,076	884	70,404	28,958	464,474
Unit cost per landfill volume (m^3)*3 (Baht)						2.1	34.3

Note: *1 including office building, warehouse, repairing house, rest house, etc.

*2 including truck scale, truck washing, electric equipment, illumination, vegetation, etc.

*3 except on-site building construction cost.

Appendix 5.18 駐車場の工事費内訳.

Table AP 5.27 Parking lot construction cost (Case No. 9)

(1) Cost items

(Unit: million Baht)

Location	Cost items	Financial cost			Economic cost		
		Foreign	Local	Total	Foreign	Local	Total
Yannawa	Main construction	2.7	42.7	45.4	1.9	42.6	44.5
	Scafolding, temporary construction and miscellaneous expenditure	-	9.1	9.1	-	9.1	9.1
	Business tax	-	1.8	1.8	-	-	-
	Total	2.7	53.6	56.3	1.9	51.7	53.6
Bangkok Noi	Main construction	2.7	40.3	43.0	1.9	40.2	42.1
	Scafolding, temporary construction and miscellaneous expenditure	-	8.6	8.6	-	8.6	8.6
	Business tax	-	1.7	1.7	-	-	-
	Total	2.7	50.6	53.3	1.9	48.8	50.7
Total		5.4	104.2	109.6	3.8	100.5	104.3

(2) Main construction cost items

(Unit: thousand Baht)

Location	Cost items	Size	Financial cost		Economic cost		
			Foreign	Local	Foreign	Local	Unskilled
Yannawa	Pavement	14,600m^2	-	28,382.4	-	19,710.0	8,672.4
	Building	560m^2	2,738.4	8,086.4	1,892.8	7,414.4	672.0
	Clearance & reclamation	40,000m^3	-	6,000.0	-	5,440.0	560.0
	Fence	600m	-	183.6	-	177.0	6.6
	Total		2,738.4	42,652.4	1,892.8	32,741.4	9,911.0
Bangkok Noi	Pavement	14,600m^2		28,382.4	-	19,710.0	8,672.4
	Building	560m^2	2,738.4	8,086.4	1,892.8	7,414.4	672.0
	Clearance & reclamation	24,000m^3	-	3,600.0	-	3,264.0	336.0
	Fence	600m	-	183.6	-	177.0	6.6
	Total		2,738.4	40,252.4	1,892.8	30,565.4	9,687.0

第6章　経済・財務評価

Appendix 6－1　ごみ処理プロジェクトにおける経済評価

ごみ処理プロジェクトの経済評価における便益と費用の比較は以下のごとく要約される。

1. 便益は現在の処理量 1,966トン／日（1980年）から 5,540トン／日（2000年）までの増加分 3,574トン／日（2000年次）に対し計上される。

2. これに対し、費用は以下により計上される。（下図参照）

（1）現行ごみ処理システムで今後も処理する場合

1,966トン／日 の処理費用は　（a＋b）

3,574トン／日 の処理費用は　（c＋d）

よって（c＋d）は現行システムで5,540トン/日を処理する費用から現行ごみ処理システムで今後も 1,966トン/日のみを処理するとした場合の費用を除いた費用で、これが追加便益に対応する追加コストとなる。

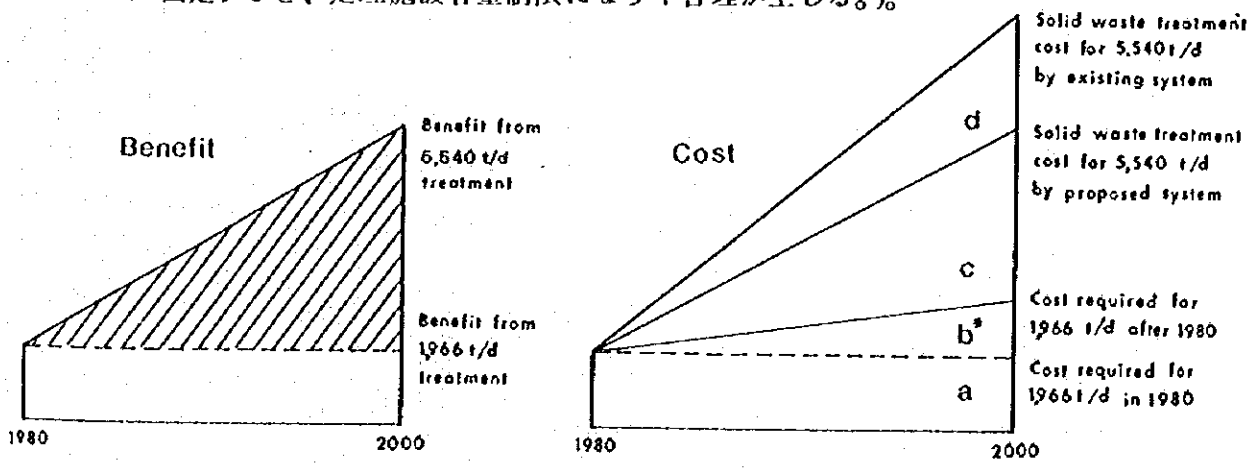
（2）新ごみ処理システムを導入する場合

新ごみ処理システムを導入して5,540トン／日を処理する費用のうち現行処理分1,966トン／日の処理費用は、新ごみ処理システムが導入されたことにより、この分についても影響を受け上述の（a＋b）ではなくなる。

新ごみ処理システムを導入したとしても（a＋b）が不変であれば3,574トン／日に対応するコストはcで表現できるが、新システムの合計費用は、既に1,966トン/日に対しても新ごみ処理システムの導入の効果が含まれているためcが追加便益に対応するコストとは言えない。

これをさけるには1,966トン／日を現行システムで処理し、残りの3,574トン／日のみを新ごみ処理システムで処理した場合の3,574トン／日に対応するコストを計算しなくてはならない。

しかしながら将来の発生量5,540トン／日のうちどの分（どの地区からどの処分場へ）を現行システムで、またどの分を新ごみ処理システムで処理するかを分離することは不可能である（現行発生ごみ量は現行ごみ処理システムで処理するというように固定すると、処理施設容量制限により不合理が生じる。）。



※b：現状の処理量を今後も持続するとしても最終処分場へのごみの累積搬入量は年々増加するため、処分場への追加投資が必要となる。したがって、現在の費用では現在の処理量を処理するのに不足することになり、図中bの部分の費用が必要となる。

Appendix 6.2　年次別直接便益

Table Ap 6.1(A)　Benefit flow (Case No. 9)

(Unit: million Baht)

Year	Primary Direct Benefit		Secondary Direct Benefit				Total Direct Benefit	
	15 m height of solid waste	3 m height of solid waste	Ash for reclamation land	Electric power generation	Compost product	Retrieved ferrous metal	15 m height	3 m height
1983	80.0	397.5	-	-	13.0	1.3	94.3	411.8
1984	83.2	413.7	-	-	13.0	1.3	97.5	428.0
1985	87.1	433.0	-	-	13.0	1.3	101.4	447.3
1986	92.0	457.2	-	-	13.0	1.3	106.3	471.5
1987	97.1	482.8	-	-	13.0	1.3	111.4	497.1
1988	102.6	509.8	-	-	13.0	1.3	116.9	524.1
1989	108.0	536.8	-	-	13.0	1.3	122.3	551.1
1990	114.0	566.7	-	-	13.0	1.3	128.3	581.0
1991	119.7	594.9	-	-	13.0	1.3	134.0	609.2
1992	125.6	624.5	-	-	13.0	1.3	139.9	638.8
1993	131.6	654.0	-	-	16.0	1.4	149.0	671.4
1994	138.1	686.4	-	-	16.0	1.4	155.5	703.8
1995	144.9	720.2	-	-	16.0	1.4	162.3	737.6
1996	151.7	753.8	-	-	16.0	1.4	169.1	771.2
1997	159.0	790.3	-	-	22.3	2.0	183.3	814.6
1998	166.6	828.1	-	-	22.3	2.0	190.9	852.4
1999	174.2	865.6	-	-	22.3	2.0	198.5	889.9
2000	182.6	907.6	-	-	22.3	2.0	206.9	931.9
2001	188.7	937.7	-	-	22.3	2.0	213.0	962.0
2002	194.8	968.1	-	-	22.3	2.0	219.1	992.4
2003	201.1	999.6	-	-	22.3	2.0	225.4	1,023.9
2004	207.8	1,032.8	-	-	22.3	2.0	232.1	1,057.1
2005	214.6	1,066.6	-	-	22.3	2.0	238.9	1,090.9
2006	219.9	1,093.1	-	-	22.3	2.0	244.2	1,117.4
2007	225.6	1,121.5	-	-	22.3	2.0	249.9	1,145.8
2008	231.3	1,149.5	-	-	22.3	2.0	255.6	1,173.8
2009	237.1	1,178.7	-	-	22.3	2.0	261.4	1,203.0
2010	243.4	1,209.5	-	-	22.3	2.0	267.7	1,233.8
Total	4,422.3	21,980.0	-	-	506.2	46.6	4,975.1	22,532.8

Table Ap 6.1(B) Benefit flow (Case No. 13)

(Unit: million Baht)

Year	Primary Direct Benefit		Secondary Direct Benefit				Total Direct Benefit	
	15 m height of solid waste	3 m height of solid waste	Ash for reclamation land	Electric power generation	Compost product	Retrieved ferrous metal	15 m height	3 m height
1983	80.0	397.5	-	-	13.0	1.3	94.3	411.8
1984	83.2	413.7	-	-	13.0	1.3	97.5	428.0
1985	87.1	433.0	-	-	13.0	1.3	101.4	447.3
1986	92.0	457.2	-	-	13.0	1.3	106.3	471.5
1987	97.1	482.8	-	-	13.0	1.3	111.4	497.1
1988	102.6	509.8	-	-	13.0	1.3	116.9	524.1
1989	108.0	536.8	-	-	13.0	1.3	122.3	551.1
1990	114.0	566.7	-	-	13.0	1.3	128.3	581.0
1991	119.7	594.9	8.9	35.9	13.0	1.3	178.8	654.0
1992	125.6	624.5	8.4	35.9	13.0	1.3	184.2	683.1
1993	131.6	654.0	7.0	35.9	13.0	1.3	188.8	711.2
1994	138.1	686.4	6.4	35.9	13.0	1.3	194.7	743.0
1995	144.9	720.2	5.8	35.9	13.0	1.3	200.9	776.2
1996	151.7	753.8	23.9	89.2	13.0	1.3	279.1	881.2
1997	159.0	790.3	23.7	89.2	13.0	1.3	286.2	917.5
1998	166.6	828.1	23.3	89.2	13.0	1.3	293.4	954.9
1999	174.2	865.6	23.4	89.2	16.0	1.4	304.2	995.6
2000	182.6	907.6	22.9	89.2	16.0	1.4	312.1	1,037.1
2001	188.7	937.7	31.5	113.8	22.3	2.0	358.3	1,107.3
2002	194.8	968.1	31.5	113.8	22.3	2.0	364.4	1,137.7
2003	201.1	999.6	31.5	113.8	22.3	2.0	370.7	1,169.2
2004	207.8	1,032.8	31.5	113.8	22.3	2.0	377.4	1,202.4
2005	214.6	1,066.6	31.3	113.8	22.3	2.0	384.0	1,236.0
2006	219.9	1,093.1	31.1	113.8	22.3	2.0	389.1	1,262.3
2007	225.6	1,121.5	30.9	113.8	22.3	2.0	394.6	1,290.5
2008	231.3	1,149.5	30.7	113.8	22.3	2.0	400.1	1,318.3
2009	237.1	1,178.7	30.5	113.8	22.3	2.0	405.7	1,347.3
2010	243.4	1,209.5	30.3	113.8	22.3	2.0	411.8	1,377.9
Total	4,422.3	21,980.0	464.5	1,763.5	463.0	43.6	7,156.9	24,714.6

Table Ap 6.1(C) Benefit flow (Case No. 19-(2))

(Unit: million Baht)

Year	Primary Direct Benefit		Secondary Direct Benefit				Total Direct Benefit	
	15 m height of solid waste	3 m height of solid waste	Ash for reclamation land	Electric power generation	Compost product	Retrieved ferrous metal	15 m height	3 m height
1983	80.0	397.5	-	-	13.0	1.3	94.3	411.8
1984	83.2	413.7	-	-	13.0	1.3	97.5	428.0
1985	87.1	433.0	-	-	13.0	1.3	101.4	447.3
1986	92.0	457.2	-	-	13.0	1.3	106.5	471.5
1987	97.1	482.8	-	-	13.0	1.3	111.4	497.1
1988	102.6	509.8	-	-	13.0	1.3	116.9	524.1
1989	108.0	536.8	-	-	13.0	1.3	122.3	551.1
1990	114.0	566.7	-	-	13.0	1.3	128.3	581.0
1991	119.7	594.9	8.9	35.9	13.0	1.3	178.8	654.0
1992	125.6	624.5	8.4	35.9	13.0	1.3	184.2	683.1
1993	131.6	654.0	7.0	35.9	13.0	1.3	188.8	711.2
1994	138.1	686.4	6.4	35.9	13.0	1.3	194.7	743.0
1995	144.9	720.2	5.8	35.9	13.0	1.3	200.9	776.2
1996	151.7	753.8	17.9	71.8	13.0	1.3	255.7	857.8
1997	159.0	790.3	17.4	71.8	13.0	1.3	262.5	893.8
1998	166.6	828.1	16.9	71.8	13.0	1.3	269.6	931.1
1999	174.2	865.6	17.4	71.8	16.0	1.4	280.8	972.2
2000	182.6	907.6	17.1	71.8	16.0	1.4	288.9	1,013.9
2001	188.7	937.7	18.1	71.8	22.3	2.0	302.9	1,051.9
2002	194.8	968.1	17.9	71.8	22.3	2.0	308.8	1,082.1
2003	201.1	999.6	17.7	71.8	22.3	2.0	314.9	1,113.4
2004	207.8	1,032.8	17.4	71.8	22.3	2.0	321.3	1,146.3
2005	214.6	1,066.6	17.0	71.8	22.3	2.0	327.7	1,179.7
2006	219.9	1,093.1	16.6	71.8	22.3	2.0	332.6	1,205.8
2007	225.6	1,121.5	16.1	71.8	22.3	2.0	337.8	1,233.7
2008	231.3	1,149.5	15.6	71.8	22.3	2.0	343.0	1,261.2
2009	237.1	1,178.7	15.1	71.8	22.3	2.0	348.3	1,289.9
2010	243.4	1,209.5	14.6	71.8	22.3	2.0	354.1	1,320.2
Total	4,422.3	21,980.0	289.3	1,256.5	463.0	43.6	6,474.7	24,032.4

Appendix 6.3　タイ国の電力開発

タイ国における1980年の年間発電量は147億5,300万kW・hで、このうちの80%以上を石油火力発電に依存している。

国内の電化率は低く、特に農村部を中心とした電化率の向上や産業振興を考えると、電力需要は今後とも高い伸びで続くものと思われる。EGATでは、そのPower Development Plan において、7～13%の高い伸びで電力需要が伸びるものと予測し、石油から水力や天然ガスにウェイトを移しながら、需要への対応をはかっていくとしている。

こうした状勢のもとで、焼却工場の余熱を利用した発電は、高価な発電施設の建設費の削減や原油輸入量の節減につながり、また生みだす電力は国民生活の向上や国民経済の発展に大きく寄与するものである。

Table Ap 6.2　Energy generation in Thailand

Energy Generation from	1980		1979	
	Million kW·h	percent	Million kW·h	percent
Hydro	1,653.31	11.20	3,099.07	22.19
Thermal	11,998.71	81.33	9,899.45	70.89
Gas Turbine	284.35	1.93	241.06	1.73
Diesel	64.43	0.44	66.08	0.47
Purchased from Laos	752.93	5.10	658.89	4.72
Total	14,753.73	100.00	13,964.55	100.00

Source:　Annual Report 1980, EGAT

Table Ap 6.3　EGAT power development plan

Fiscal Year	Peak (MW)	Energy (GW·h)
1981	2,663.0	16,221.0
1982	3,001.0	18,386.0
1983	3,433.0	20,570.0
1984	3,817.0	22,894.0
1985	4,195.0	25,252.0
1986	4,604.0	27,725.0
1987	4,968.0	29,944.0
1988	5,346.0	32,273.0
1989	5,742.0	34,693.0
1990	6,150.0	37,211.0

Source:　EGAT Power Development Plan
(Planned in 1981)

Appendix 6.4　水力発電費用

Table Ap 6.4 Percentage of annual expenses in the case of hydro-type electric power station

(Unit: percent)

Year	Book value	Rate of interest + Depreci-ation	Repair expenses	Personnel expenses	General management cost + Others	Total expenses
1	100.00	6.07	0.78	0.04	1.41	8.30
2	97.43	5.98	0.88	0.05	1.50	8.41
3	94.86	5.89	0.98	0.05	1.59	8.51
4	92.29	5.80	1.09	0.05	1.68	8.62
5	89.72	5.71	1.22	0.05	1.78	8.76
6	87.15	5.62	1.35	0.06	1.89	8.91
7	84.58	5.53	1.50	0.06	2.00	9.09
8	82.01	5.44	1.66	0.07	2.12	9.29
9	79.44	5.35	1.83	0.07	2.25	9.50
10	76.87	5.26	2.02	0.07	2.39	9.74
11	74.30	5.17	2.22	0.08	2.53	10.00
12	71.73	5.08	2.44	0.08	2.69	10.29
13	69.16	4.99	2.68	0.09	2.85	10.61
14	66.59	4.90	2.94	0.09	3.01	10.95
15	64.02	4.81	3.22	0.10	3.20	11.33
16	61.45	4.71	3.52	0.10	3.40	11.74
17	58.88	4.63	3.82	0.11	3.58	12.14
18	56.31	4.54	4.12	0.11	3.73	12.50
19	53.74	4.45	4.44	0.12	3.91	12.92
20	51.17	4.36	4.78	0.12	4.09	13.35
21	48.60	4.27	5.16	0.12	4.28	13.83
22	46.03	4.18	5.50	0.13	4.48	14.29
23	43.46	4.09	5.80	0.13	4.67	14.69
24	40.89	4.00	6.18	0.14	4.86	15.18
25	38.32	3.91	6.54	0.14	5.06	15.65

Appendix 6.5　都市ごみコンポストの施用効果

Table Ap 6.5 Comparison of effect of city compost, farm manure, and chemical fertilizer on rice yield

(Suwanawong, S. and Suthdhani, S. 1968)

Treatment	Yield (kg/ha)
No treatment	1,944
City compost, 2 t/ha	2,181
City compost, 6 t/ha	2,396
Farm manure, 2 t/ha	2,198
Farm manure, 6 t/ha	2,349
City compost (2 t/ha) + Fertilizer	2,350
City compost (6 t/ha) + Fertilizer	2,504
Farm manure (2 t/ha) + Fertilizer	2,271
Farm manure (6 t/ha) + Fertilizer	2,398
Chemical fertilizer	2,274

Table Ap 6.6 Effect on rice yield using compost in successive years (Unhulled rice)

(Unit : kg/1,000 m²)

Treatment	Year									
	1976		1977		1978		1979		1980	
City compost 250 kg (dry weight)	591 kg	(113)	607 kg	(100)	676 kg	(104)	682 kg	(104)	577 kg	(106)
- do - 550 (- do -)	594	(113)	682	(104)	682	(105)	702	(107)	559	(102)
- do - 1,000 (- do -)	574	(103)	619	(102)	698	(108)	665	(102)	586	(107)
Farm compost 250 kg (dry weight)	603	(115)	618	(102)	694	(107)	662	(101)	554	(101)
- do - 500 (- do -)	572	(109)	598	(99)	634	(99)	650	(101)	549	(101)
- do - 1,000 (- do -)	598	(114)	597	(99)	680	(105)	667	(102)	553	(101)
No supply of organic fertilizer	525	(100)	605	(100)	647	(100)	655	(100)	546	(100)
Much supply of organic fertilizer	537	(102)	584	(97)	669	(103)	654	(100)	532	(97)

Notes : Number in ( ) indicates yield index.

Source: TAKAHASHI, Urban waste disposal and agriculture utilization, Agriculture and Horticulture, Vol. 57 No. 1

Table Ap 6.7 The ingredients of compost and the market price

Component	Unit price of the ingredient (yen/kg)		Compost component (%)		Market price of the component: Japan (yen/kg)		Market price of the component: Thailand (Baht/kg)	
			On-Nooch compost	Nong Khaem compost*	On-Nooch compost	Nong-* Khaem compost*	On-Nooch	Nong Khaem compost*
N	1.41 ← Ammonium Sulfate / Urea	T-N : 21% / T-N : 46%	1.00	0.92	1.41	1.30		
P	2.39 ← Super Phosphate / Fused Phosphate	T-P_2O_5 : 17% / T-P_2O_5 : 20%	0.72	1.04	1.72	2.49	0.26 (average)	0.30 (average)
K	0.92 ← Potassium Sulfate / Potassium Chloride	T-K_2O : 50% / T-K_2O : 60%	1.12	1.06	1.03	0.98		
Ca	0.43 ← Slaked Lime / Calcium Silicate	Alkali : 60% / Alkali : 35%	5.80	7.74	2.49	3.33	0.08	0.11
	Total				6.65	8.10	0.34	0.41

Note : * After trommel processing

Table Ap 6.8 Price comparison of chemical fertilizer between Thailand and Japan

Sort of fertilizer	Thailand	Japan
High-analysis compound fertilizer (15-15-15)	4,800 Baht/t	77,000 yen/t
Lime	600 Baht/t	18,000 yen/t

Appendix 6.7 肥料の施用費用

Table Ap 6.9 Cost for application of chemical fertilizer and compost in Japan

Sort of fertilizer	Chemical fertilizer	Compost
Amount of supplied fertilizer	150 kg/0.1 ha	1,500 kg/0.1 ha
Necessary time for fertilizer application per 0.1 ha	0.5 d/0.1 ha	2.5 d/0.1 ha
Necessary time for fertilizer application per ton	27 h/t	13 h/t
Productivity of labor	557 yen/h	
Cost of fertilizer application per ton	15,039 yen/t	7,241 yen/t

Appendix 6.8 コンポストの生産に必要とされる時間

Table Ap 6.10 Necessary time for producing compost in Japan

Material collection and conveyance	Collection area	0.1 ha
	Compost production volume (fully fermented compost)	1 t
	Necessary time	25 man.hour
Turn-over of compost		7 man.hour
Total		32 man.hour

Table Ap 6.11 Agricultural income and working hours in Japan

(Unit : Thousand yen)

Farm Household income	Agricultural sector			Other sector			Working hours (h)		
	Agricultural income	Agricultural receipt	Agricultural running expenses	Other income	Other receipt	Other expenses	Total hours	Family member	Employee
4,417.7	1,126.7	2,446.7	1,320.0	3,291.0	3,527.1	236.1	2,021	1,974	47

Source : The statistics of farm household economy in 1979, Ministry of Agriculture, Forestry and Fishery.

Table Ap 6.12 Average cash income from agricultural sector per agricultural household by type of income sources and regions, 1978/79

(Unit : Baht/farm)

Regions	Income from livestocks	Income from crops	Other income	Cash income from agricultural sector
Northeast	933.52 (12.25)	6,387.08 (83.69)	310.33 (4.06)	7,630.93 (100.00)
North	1,004.83 (6.43)	13,502.48 (86.25)	1,416.14 (7.32)	15,653.45 (100.00)
Central	4,109.99 (13.36)	24,711.96 (80.33)	1,940.59 (6.31)	30,762.54 (100.00)
South	1,297.41 (9.67)	11,218.71 (83.65)	894.68 (6.68)	13,410.80 (100.00)
Average Thailand	1,597.90 (10.72)	12,383.43 (83.10)	919.91 (6.18)	14,901.24 (100.00)

Remarks : The number in brackets is the percentage of cash income from agricultural sector by type of various income sources.

Source : Agricultual Statistics of Thailand, Crop Year 1979/80

Appendix 6.9 間接効果

(1)地　　価

without-project caseの場合、ごみの最終処分方法をオープンダンプ方式でおこない、覆土や浸出水処理対策が実施されないので、汚濁物質の流出や悪臭の発生、ごみ飛散、洪水時のごみの流出などにより、周辺の居住環境は悪化し、相対的な地価の低下が心配される。

これに対して、基本計画選択案は各ケースとも処理の近代化、衛生水準の改善等がはかられ、周辺地域の居住環境への悪影響は僅少と考えられる。従ってwithout-project caseにみられるような相対的な地価の低下はないものと考えられる。むしろBang KapiやPhasi Charoenの焼却工場のように、工場の立地により道路の拡幅や取付道路の整備がなされ、住民の生活利便性が向上することから、土地の経済価値が向上し、周辺地域よりも地価が上昇することも局地的には考えられる。

(2)焼却工場の余熱利用

今後ともエネルギー環境の厳しさが予想されるタイ国にとって、エネルギー資源の高度有効利用をはかることは、きわめて意義のあることである。

焼却工場の場合、ごみ焼却の過程で生成する余熱の多目的な利用が可能である。本プロジェクトにおいては、ごみ発電を考えているが、この外にも、将来的には、焼却工場周辺の都市化の進展とあいまって、公共施設への給湯、冷房等、地域住民のための公益的な有効利用が考えられる。

(3)関連産業への波及効果

建設工事が完了し、稼動状態に入れば、本来の清掃面のみならず、施設管理や清掃、作業員の福利厚生、商業等産業面にも効用をもたらす。また建設過程にあっては、器材、資材の購入や土木建設、作業員を対象とした販売等、有効需要として地域の生産、所得面に効用をもたらす。

一般に公共投資は、同一目的の事業にあっては投資規模が大きいほど、地域の産業への波及効果は大きいと考えられる。

(4)雇用機会の創出

提案された各ケース別の雇用者数は下表にまとめられる。

	Case 9	Case 13	Case 19-(2)
Workers required during the construction period (million man·days)	1.10	4.60	3.20
New employees required for project operation, 1983-2010 (man·years)	7,700	6,300	6,500

必要とされる雇用者数はバンコック市全体から考えるとさ程、多大ではないが、各区のレベルでみると相当数になる。Yannawa焼却工場における建設期間中に必要とされる合計雇用者数は延べ105百万人・日であり、一日平均約７００人が建設に従事することになる。

さらに、Yannawa 焼却工場が運転を開始したときには 98 人の新規採用が工場のオペレーションのために必要となる。これらの雇用創出効果は地域経済にとっても、波及効果をもたらすであろう。

Appendix 6.10 年次別経済費用

Table Ap 6.13(A) Economic cost flow (Case No. 9)

(Unit: million Baht)

Year	Facilities construction cost	Land acquisition cost	Operation & maintenance cost	Collection & transport cost	Collection trucks purchase cost	General admin. cost	Total Cost	Total cost (Excluding land acquisition cost)
1983	121.4		84.9	117.7	21.8	33.3	379.1	379.1
1984			106.5	122.8	17.5	37.0	283.8	283.8
1985			120.0	128.8	17.0	39.9	305.7	305.7
1986	5.5	47.4	132.7	136.7	17.5	43.0	382.8	335.2
1987	48.0		112.9	144.4	19.7	41.6	366.6	366.6
1988	104.4		112.9	147.8	24.3	42.8	432.2	432.2
1989		14.6	112.9	153.9	29.2	44.4	355.0	340.4
1990	290.1	9.7	112.9	166.7	29.2	46.3	654.9	645.2
1991	109.4		112.9	174.1	39.3	48.9	484.6	484.6
1992	153.7	44.5	112.9	183.6	50.0	52.0	596.7	552.2
1993	230.9	99.3	124.1	190.7	50.0	54.7	749.7	650.4
1994	95.2		136.9	205.6	62.1	60.7	560.5	560.5
1995	131.3		136.9	216.9	62.8	62.5	610.4	610.4
1996	227.9	204.2	136.9	228.2	65.3	64.6	927.1	722.9
1997			144.9	232.3	61.4	65.8	504.4	504.4
1998	147.3		144.9	245.1	61.9	67.8	667.0	669.0
1999			144.9	258.0	60.2	69.5	532.6	532.6
2000	989.5		144.9	284.1	59.5	73.3	1,551.3	1,551.3
2001			144.9	293.4	52.9	73.7	564.9	564.9
2002			144.9	303.0	57.8	75.9	581.6	581.6
2003			144.9	313.0	58.5	77.5	593.9	593.9
2004			144.9	323.2	61.6	79.5	609.2	609.2
2005			144.9	333.8	61.6	81.0	621.3	621.3
2006			144.9	342.3	61.6	82.3	631.1	631.1
2007			144.9	351.0	81.0	86.5	663.4	663.4
2008			144.9	359.9	85.9	88.6	679.3	679.3
2009			144.9	369.0	85.9	90.0	689.8	689.8
2010	-612.4		144.9	378.4	85.9	91.4	88.2	88.2
Total	2,042.2	419.7	3,684.9	6,704.4	1,441.4	1,774.6	16,067.4	15,647.7

Table Ap 6.13(B) Economic cost flow (Case No. 13)

(Unit: million Baht)

Year	Facilities construction cost	Land acquisition cost	Operation & maintenance cost	Collection & transport cost	Collection trucks purchase cost	General admin. cost	Total cost	Total cost (Excluding land acquisition cost)
1983	161.5		82.8	117.7	21.8	33.3	417.1	417.1
1984			104.4	122.8	17.5	36.7	281.4	281.4
1985	4.5	44.4	117.8	128.8	17.0	39.5	352.0	307.6
1986	11.8	205.0	130.5	136.7	17.5	42.7	544.2	339.2
1987	260.2		110.7	144.4	19.7	41.2	576.2	576.2
1988	824.7		110.7	147.8	22.4	42.1	1,147.7	1,147.7
1989	688.1		110.7	153.9	22.4	43.1	1,018.2	1,018.2
1990	440.2		110.7	166.7	22.4	45.0	785.0	785.0
1991	11.0	117.3	129.3	159.2	21.3	46.5	484.6	367.7
1992	376.7		137.5	168.0	40.3	51.9	774.4	774.4
1993	1,351.9	14.5	142.9	177.2	50.0	55.5	1,792.0	1,777.5
1994	1,198.3		159.6	192.5	60.4	61.9	1,672.7	1,672.7
1995	315.3	14.5	162.4	204.0	50.7	62.6	809.5	795.0
1996	43.5	23.8	197.2	183.6	43.4	63.6	555.1	531.3
1997	326.3	47.9	202.2	195.3	51.7	67.4	890.8	842.9
1998	852.2		212.4	208.2	54.1	71.2	1,398.1	1,398.1
1999	726.5		231.2	216.7	51.7	74.9	1,301.0	1,301.0
2000	797.7		237.2	240.1	52.2	79.4	1,406.6	1,406.6
2001			278.8	227.7	31.6	80.7	618.8	618.8
2002			290.2	242.9	45.6	86.8	665.5	665.5
2003			298.0	250.8	48.0	89.5	686.3	686.3
2004			304.6	259.1	49.4	92.0	705.1	705.1
2005			309.8	267.6	49.4	94.0	720.8	720.8
2006			314.6	274.4	47.0	95.4	731.4	731.4
2007			318.9	281.4	66.2	100.0	766.5	766.5
2008			322.7	288.5	66.2	101.6	779.0	779.0
2009			326.7	295.8	66.2	103.3	792.0	792.0
2010	-2,196.8		329.3	303.4	66.9	104.9	-1,392.3	-1,392.3
Total	6,194.0	467.4	5,783.8	5,755.2	1,173.0	1,906.8	21,280.2	20,812.8

Table Ap 6.13(C) Economic cost flow (Case No. 19-(2))

(Unit: million Baht)

Year	Facilities construction cost	Land acquisition cost	Operation & maintenance cost	Collection & transport cost	Collection trucks purchase cost	General admin. cost	Total cost	Total cost (Excluding land acquisition cost)
1983	147.5		82.8	117.7	21.8	33.3	403.1	403.1
1984			104.4	122.8	17.5	36.7	281.4	281.4
1985	4.5	44.4	118.2	128.8	17.0	39.6	352.5	308.1
1986	12.5	210.0	130.5	136.7	17.5	42.7	549.9	339.9
1987	259.4		110.7	144.4	19.7	41.2	575.4	575.4
1988	807.1		110.7	147.8	22.4	42.1	1,130.1	1,130.1
1989	688.1		110.7	153.9	22.4	43.1	1,018.2	1,018.2
1990	435.7		110.7	166.7	22.4	45.0	780.5	780.5
1991	5.3	195.3	129.3	159.2	21.3	46.5	556.9	361.6
1992	212.3		137.5	168.0	40.3	51.9	610.0	610.0
1993	842.1	28.2	142.9	177.2	50.0	55.5	1,295.9	1,267.7
1994	687.4		159.6	192.5	60.4	61.9	1,161.8	1,161.8
1995	179.7	14.5	162.4	204.0	50.7	62.6	673.9	659.4
1996	36.5	9.6	182.8	190.2	50.7	63.6	533.4	523.8
1997	131.5	47.9	181.9	202.5	51.7	65.4	680.9	633.0
1998	281.4		188.5	215.3	56.6	69.1	810.9	810.9
1999	131.3		204.5	223.5	54.1	72.3	685.7	685.7
2000	873.1	53.9	208.5	247.2	52.2	76.2	1,511.1	1,457.2
2001			230.8	248.1	52.2	79.7	610.8	610.8
2002			234.0	264.6	48.0	82.6	628.6	628.6
2003			236.5	273.3	50.5	84.0	644.3	644.3
2004			239.3	282.3	51.9	86.0	659.5	659.5
2005			241.2	291.5	51.9	87.7	672.3	672.3
2006			243.5	298.9	51.9	89.1	683.4	683.4
2007			245.3	306.5	66.2	92.7	710.7	710.7
2008			247.1	314.3	68.6	94.5	724.5	724.5
2009			249.2	322.3	68.6	96.0	736.1	736.1
2010	-1,110.3		250.3	330.5	71.8	97.9	-359.8	-359.8
Total	4,625.1	603.8	4,993.8	6,030.7	1,230.3	1,838.2	19,321.9	18,718.1

Appendix 6.1 1　タイ国における火力発電費用

タイ国における火力発電による燃料の消費量は以下の表に要約される。1980年価格で平均0.98 Baht／kW･hの重油が必要とされる。

Table Ap 6.14 Existing unit performance data

Plant	Mae Moh	N. Bangkok	N. Bangkok	S. Bangkok	S. Bangkok	Krabi	Surat Thani	Udon Thani	Nakhon Ratchasima	Phuket
Type*	ST	ST	ST	ST	ST	ST	ST	CT	CT	D
Unit No. (S)	1, 2 & 3	1 & 2	3	1 & 2	3, 4 & 5	1, 2 & 3	1	1	1	1 to 4
Nominal rating, MW (each)	75	75	87.5	200	300	20	30	15	15	2.65
Fuel	Lignite	Heavy oil	Heavy oil	Heavy oil	Heavy oil	Lignite	Heavy oil	Diesel oil	Diesel oil	Diesel oil
Gross station heat rate (Btu/kW-h)	11,500	10,238.4	10,011.7	10,246.5	10,046	12,076	12,076	20,401	20,405	10,175
Plant efficiency(%)	29.7	33.3	34.1	33.3	34.0	28.3	28.3	16.7	16.7	33.5
Unit cost of electricity (Baht/kW.h)	0.48	1.19	1.16	1.18	1.16	0.48	1.47	7.34	4.34	2.18

Plant	Hat Yai	Surat Thani	Chiang Mai	Mae Moh	Bang Pakong	Mea Moh	Mea Moh	Bang Pakong	Nakhon Si Thammarat	Khanom
Type*	CT	CT	D	D	CC	ST	ST	ST	D	ST
Unit No. (S)	1, 2 & 3	1 to 5	1 to 3	1 to 9	1 & 2	3	4 & 5	1 & 2	1 & 2	1
Nominal rating MW (each)	15	15	1	1	360	75	150	550	1	75
Fuel	Diesel oil	Diesel oil	Diesel oil	Diesel oil	Nat. Gas/ Diesel oil	Lignite	Lignite	Nat. Gas	Diesel oil	Heavy oil/ Nat. Gas
Gross station heat rate (Btu/kW-h)	18,588	18,718	13,628	11,191	11,588**/ 13,157**	11,500	10,168	9,087	12,081	10,125/ 10,599
Plant efficiency(%)	18.4	18.2	25.0	30.5	25.1**/ 25.9**	29.7	33.6	37.6	28.3	33.7/32.2
Unit cost of electricity (Baht/kW.h)	3.96	3.96	2.93	2.40	1.00/2.72	0.48	0.42	0.78	2.57	1.26/0.92

Note : * ST = Steam Turbine
CT = Combustion Turbine
CC = Combined Cycle
D = Diesel

** Combustion Turbine only

Appendix 6.12 火力発電費用

Table Ap 6.15 Percentage of annual expenses in the case of thermal-type power station

(Unit: percent)

Year	Book value	Rate of interest + Depreci-ation	Repair expenses	Personnel expenses	General management cost + Others	Total expenses
1	100.0	8.77	0.78	0.04	1.41	11.00
2	94.73	8.59	0.88	0.05	1.50	11.02
3	89.56	8.40	0.98	0.05	1.59	11.02
4	84.19	8.22	1.09	0.05	1.68	11.04
5	78.92	8.03	1.22	0.05	1.78	11.08
6	73.56	7.85	1.35	0.06	1.89	11.15
7	68.38	7.66	1.50	0.06	2.00	11.22
8	63.11	7.48	1.66	0.07	2.12	11.33
9	57.84	7.29	1.83	0.07	2.25	11.44
10	52.57	7.11	2.02	0.07	7.39	11.59
11	47.36	6.93	2.22	0.08	2.53	11.76
12	42.03	6.74	2.44	0.08	2.69	11.99
13	36.76	7.01	2.68	0.09	2.85	12.18
14	31.49	6.37	2.94	0.09	3.02	12.42
15	26.22	6.19	3.22	0.10	3.20	12.71
16	20.95	6.00	3.52	0.10	3.40	13.02
17	15.68	5.82	3.82	0.11	3.58	13.33
18	10.41	5.63	4.12	0.11	3.73	13.59
19	5.14	5.50	4.44	0.12	3.91	13.79
20	0.00	0.00	4.78	0.12	4.09	8.99

Appendix 6.13 施設別年間投資費用

Table Ap. 6.16(A) Appropriate Master Plan alternative No. 9

(Unit : million Baht)

	Compost plant		Landfill site			Parking lot	Major repair of the existing compost plant	Total
	Bang Khun Tian	Taling Chan	On-Nooch	Nong Khaem	Ram Intra			
1983			58.2	76.4				134.6
1984								
1985								
1986					81.7			81.7
1987					51.0			51.0
1988			52.3	65.4				117.7
1989	23.2							23.2
1990	53.1						284.6	337.7
1991	119.3							119.3
1992	97.3					140.0*1		237.3
1993		99.6	79.6	182.6	52.6			414.4
1994		100.1						100.1
1995		145.4						145.4
1996		183.6	292.2			99.2*2		575.0
1997								
1998			69.9	63.4	31.5			164.8
1999								
2000			349.3	287.7	95.9		284.6	1,017.5
Total	292.9	528.7	901.5	675.5	312.7	239.2	569.2	3,519.7

Note: *1 Yannawa parking lot
*2 Bangkok Noi parking lot

Table Ap 6.16(B) Appropriate Master Plan alternative No. 13

(Unit : million Baht)

	Incineration plant				Compost plant		Landfill site			Major repair of the existing compost plant	Total
	Yannawa	Bangkok Noi	Bang Kapi	Phasi Charoen	Bang Khun Tian	Taling Chan	On-Nooch	Nong Khaem	Ram Intra		
1983							76.5	93.9			170.4
1984											
1985	75.6										75.6
1986	293.6								47.3		340.9
1987	253.0								36.3		289.3
1988	797.4						61.3	83.2			941.9
1989	797.4										797.4
1990	204.8	4.6	4.6							284.6	498.6
1991		140.9	57.6								198.5
1992		209.0	217.1								426.1
1993		690.3	700.3				38.5	119.1	28.1		1,576.3
1994		690.3	700.3								1,390.6
1995		179.4	179.1	4.6	23.2						386.3
1996				30.0	53.1						83.1
1997				219.6	119.3	99.6					438.5
1998				691.0	97.3	100.1	22.8	39.9	15.0		966.1
1999				691.0		145.4					836.4
2000				177.0		183.6	114.5	74.6	48.9	284.6	883.2
Total	2,421.8	1,914.5	1,859.0	1,813.2	292.9	528.7	313.6	410.7	175.6	569.2	10,299.2

Table Ap 6.16(C) Appropriate Master Plan alternative No. 19-(2)

(Unit : million Baht)

	Incineration plant		Compost plant		Landfill site			Major repair of the existing compost plant	Total
	Yannawa	Dusit	Bang Khun Tian	Taling Chan	On-Nooch	Nong Khaem	Ram Intra		
1983					68.6	86.5			155.1
1984									
1985	75.6								75.6
1986	293.6						56.1		349.7
1987	253.0						35.3		288.3
1988	797.4				51.7	73.7			922.8
1989	797.4								797.4
1990	204.8	4.6						284.6	494.0
1991		317.7							317.7
1992		240.3							240.3
1993		796.5			39.2	140.9	28.3		1,004.9
1994		796.5							796.5
1995		206.8	23.2						230.0
1996			53.1						53.1
1997			119.3	99.6					218.9
1998			97.3	100.1	34.5	50.6	18.2		300.7
1999				145.4					145.4
2000				183.6	322.2	169.9	73.1	284.6	1,033.4
Total	2,421.8	2,362.4	292.9	528.7	516.2	521.6	211.0	569.2	7,423.8

Appendix 6.14 清掃事業予算

Table Ap 6.17(A) BMA budget during fiscal year 1977 ~ 1981

Functions	Fiscal 1977		Fiscal 1978		Fiscal 1979		Fiscal 1980		Fiscal 1981	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
1. Public Works	507,548,910	23.71	835,728,505	28.69	881,647,882	26.72	1,102,077,035	28.18	900,284,298	22.76
2. Education	553,669,250	25.87	605,215,750	20.78	658,330,420	19.96	799,779,047	20.45	858,737,001	21.71
3. Central Fund	298,873,128	13.96	464,009,211	15.93	681,500,805	20.66	735,906,378	18.81	573,687,921	14.50
4. General Administration	157,855,707	7.37	251,353,682	8.63	292,769,385	8.87	354,870,879	9.07	528,772,220	13.36
5. Public Health	194,301,610	9.08	221,962,020	7.62	273,712,280	8.30	302,142,504	7.73	386,719,255	9.77
6. Sanitation	173,394,720	8.10	233,599,730	8.02	227,347,230	6.89	272,353,560	6.96	346,373,719	8.75
7. Drainage	114,991,350	5.37	187,830,780	6.45	135,074,231	4.09	154,485,510	3.96	147,668,575	3.73
8. Social Welfare	97,076,100	4.54	68,184,500	2.34	94,832,485	2.88	123,528,245	3.16	145,536,620	3.68
9. B.M.A. Enterprises	31,504,250	1.47	33,583,900	1.15	44,631,250	1.35	56,461,263	1.44	60,486,500	1.53
10. Loan Payments	11,303,982	0.53	11,303,982	0.39	9,303,982	0.28	9,303,983	0.24	8,143,991	0.21
11. Miscellaneous	-	-	-	-	-	-	-	-	-	-
Total	2,140,519,007	100.00	2,912,772,060	100.00	3,299,149,950	100.00	3,910,908,404	100.00	3,956,410,200	100.00

Note : 1. Fiscal year begins on 1 October and ends on 30 September.
2. The figures include subsidy from the government.

Table Ap 6.17(B) Annual budget in 1980 (Bureau of Sanitation)

(Unit : Baht)

Fixed Expenditure		1. Salary			2. Permanent Wages			3.Temporary Wages	4.Remuneration	5. Expenses	6. Supply	7. Equipment			8. Land and Construction			9. Other Expenses					Total
		Former Rate	Promotion		Former Rate	Promotion						Vehicles	Other Equipment		Land	Construction		Reimburse Accrued Loan: Salary & wage	Reimburse Accrued Loan: Equipment	Refund borrowing from accrued fund	Contract for operation		
1. General service	1.1 General administrative work	911,600	35,700	947,300	914,900	52,800	967,700	21,600	200,000	317,000	247,000	96,000	15,000	111,000	-	4,050,000	4,050,000	273,140	-	-	-	273,140	7,134,240
	1.2 Technical section	675,360	28,740	704,100	99,360	5,940	105,300	38,000	18,000	10,000	153,000	-	510,750	510,750	-	-	-	-	-	-	-	-	1,539,150
2. Sanitation	2.1 Refuse collection	1,348,500	59,900	1,408,400	7,195,600	303,200	7,499,800	358,300	1,100,000	557,000	4,617,300	-	54,500	54,500	-	33,900	33,900	-	140,000	-	-	140,000	15,769,200
	2.2 Refuse disposal work	1,068,100	27,900	1,096,000	7,509,250	374,150	7,883,400	256,000	1,200,000	1,252,000	7,013,300	5,645,400	891,100	6,536,500	-	6,009,000	6,000,000	-	-	-	-	-	33,235,200
	2.3 Refuse disposal plant	3,121,420	82,680	3,204,100	6,825,960	347,240	7,173,200	702,100	2,000,000	4,154,400	10,085,700	350,000	21,786,000	22,136,000	-	18,140,700	18,140,700	-	-	1,742,960	13,202,270	14,945,230	82,551,430
Total - Baht		7,124,980	234,920	7,359,900	22,546,070	1,083,330	23,629,400	1,374,000	4,518,000	6,300,400	22,116,300	6,091,400	23,257,350	29,348,750	-	28,224,600	28,224,600	273,140	140,000	1,742,960	13,202,270	15,358,370	138,229,220

Table Ap 6.17(C) Budget for fiscal year 1980 (Fertilizer Production & Selling Administration)

(Unit : Baht)

Plan-Work-Project	Salary	Permanent Wage	Temporary Wage	Renumeration	Expenditure	Public Utility Expenditure	Supply	Equipments	Land & Construction	Other Expenses	Total
Fixed Expenditure	1,616,000	7,064,700	-	384,400	846,000	252,000	611,000	1,431,400	1,400,000	-	13,605,500
Special Expenditure (Subsidy from BMA)	-	-	-	-	-	-	-	-	10,360,000	5,755,000	16,115,000
Total	1,616,000	7,064,700	-	384,400	846,000	252,000	611,000	1,431,400	11,760,000	5,755,000	29,720,500

Table Ap 6.17(D) District budget by work in 1980

(Unit : Baht)

District Name	1 Governmental Work	2 Finance Work	3 Registration Work	4 Civil Work	5 Sanitary Work	6 Health Caring Affairs	7 Income Affairs	8 Education Affairs	Total
1. Phra Nakhon	3,776,197	-	1,033,300	2,916,300	11,591,600	420,800	656,700	346,100	20,740,997
2. Pom Prap	2,835,510	-	755,300	4,057,700	7,441,200	392,100	637,400	210,100	16,379,310
3. Pathum Wan	3,268,236	-	780,000	4,644,300	7,949,500	350,000	577,100	326,400	17,895,536
4. Sam Phan Thawong	1,964,780	-	516,100	3,507,400	5,410,500	336,500	606,800	234,300	12,576,380
5. Bang Rak	3,047,160	-	754,900	4,486,500	5,626,980	386,500	833,300	254,600	15,389,940
6. Yannawa	4,812,430	-	1,433,900	15,125,550	9,469,000	495,300	912,300	424,900	32,673,380
7. Dusit	4,519,631	-	1,549,150	11,363,050	11,257,660	410,100	700,600	404,800	30,204,991
8. Phayathai	5,613,610	-	2,083,500	10,766,600	11,986,300	488,500	943,300	348,100	32,229,910
9. Huai Khwang	2,178,239	-	709,700	16,661,400	5,159,100	200,300	414,800	193,700	25,517,239
10. Phra Khanong	5,842,718	-	1,813,200	28,288,000	12,262,700	540,900	1,319,800	786,100	50,853,418
11. Bang Khen	5,004,250	-	1,333,900	23,060,400	5,231,500	297,500	712,500	415,300	36,055,350
12. Bang Kapi	2,988,920	-	957,200	16,081,600	3,683,900	349,700	589,400	357,600	25,008,320
13. Nong Chok	3,536,970	-	237,700	16,299,500	537,400	151,200	449,300	401,800	21,613,870
14. Minburi	2,216,545	-	354,400	14,305,700	1,190,200	169,900	375,600	308,600	18,920,945
15. Lat Krabang	2,347,330	-	191,500	16,159,500	867,300	144,800	321,100	188,400	20,219,930
16. Thonburi	2,933,740	-	942,300	13,638,500	6,350,500	552,700	568,300	454,700	25,440,740
17. Khlong San	2,435,752	-	542,140	4,444,000	4,317,500	457,100	453,500	276,200	12,926,192
18. Bangkok Noi	3,467,637	-	1,057,600	14,856,800	6,086,700	456,800	787,500	439,500	27,152,537
19. Bangkok Yai	2,829,940	-	499,700	9,124,500	2,937,900	305,800	415,300	213,900	16,327,040
20. Bang Khun Tien	2,516,188	-	603,300	15,718,100	3,169,000	319,200	402,300	404,200	23,132,288
21. Phasi Charoen	3,308,340	-	626,200	16,854,200	3,682,300	340,000	1,495,100	390,800	26,696,940
22. Rat Burana	2,026,575	-	540,200	12,885,800	4,201,700	360,000	517,600	315,000	20,846,825
23. Taling Chan	3,044,686	-	298,700	10,724,700	1,190,300	162,050	346,500	253,700	16,020,636
24. Nong Khaem	1,881,250	-	240,100	8,986,800	802,100	178,000	358,600	180,500	12,627,350
total	78,446,584		19,853,990	294,956,900	132,402,840	8,265,750	15,394,700	8,129,300	557,450,064

Table Ap 6.17(E) Annual budget in 1980
(24 Districts)

(Unit : Baht)

Salary	6,094,500 (4.6)
.Former rate	5,813,540
.Promoting increase	277,160
.Special fund for the veteran	3,800
Permanent wage	64,441,660 (48.7)
.Former rate	61,328,795
.Wage increase	3,099,765
.Special fund for the veteran	13,100
Temporary wage	20,635,240 (15.6)
Compensation	25,384,000 (19.2)
Daily expenditure	55,200 (0.0)
Raw material expense	5,122,460 (3.9)
Durable assets expenditure	9,409,780 (7.1)
Land & construction	1,260,000 (1.0)
Total	132,402,840 (100.0%)

Appendix 6.15 キャシュフロー

Table Ap 6.18(A) Appropriate Master Plan alternative No. 9

(Unit: million Baht)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Sources of funds										
BMA's fund	26.9	-	-	50.1	-	-	23.2	320.0	-	28.0
Foreign loan								6.6	49.5	41.1
Local loan	107.7	-	-	31.6	51.0	117.7	-	11.1	69.8	168.2
Bank overdrafts	25.4	2.3	2.2	3.0	-	0.5	1.1	1.3	2.0	2.2
Operating revenue	30.2	33.2	38.0	45.9	53.4	58.6	64.6	71.4	79.4	88.2
Total sources	190.2	35.5	40.2	130.6	104.4	176.8	88.9	410.4	200.7	327.7
Applications of funds										
Capital expenditure	134.6	-	-	81.7	51.0	117.7	23.2	337.7	119.3	237.3
Current assets increase	25.4	2.3	2.2	3.0	-	0.5	1.1	1.3	2.0	2.2
Management cost	276.2	303.7	326.6	352.0	338.1	348.7	362.7	378.2	401.8	428.7
Total debt service	3.8	31.2	29.8	28.6	31.7	37.9	54.1	52.7	53.3	83.9
Amortization of principal	0.0	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	30.8
Payment of interest	3.8	20.4	19.0	17.8	20.9	27.1	43.3	41.9	42.5	53.1
Total applications	440.0	337.2	358.6	465.3	420.8	504.8	441.1	769.9	576.4	752.1
BMA's current financing burden	249.8	301.7	318.4	334.7	316.4	328.0	352.2	359.5	375.7	424.4

Table Ap 6.18(A) Appropriate Master Plan alternative No. 9 (cont'd)

(Unit: million Baht)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Sources of funds										
BMA's fund	159.6	9.1	-	111.2	-	-	-	431.2		
Foreign loan	3.0	30.9	61.2	76.6	-	-	-			
Local loan	251.8	60.1	84.2	387.2	-	164.8	-	586.3		
Bank overdrafts	2.9	4.3	1.2	1.4	2.9	1.4	1.0	2.0	-	1.6
Operating revenue	102.1	113.8	127.3	142.7	168.4	188.6	211.5	237.9	241.1	244.1
Total sources	519.4	218.2	273.9	719.1	171.3	354.8	212.5	1,257.4	241.1	245.7
Applications of funds										
Capital expenditure	414.4	100.1	145.4	575.0	-	164.8	-	1,017.5	-	-
Current assets increase	2.9	4.3	1.2	1.4	2.9	1.4	1.0	2.0	-	1.6
Management cost	450.9	503.1	517.4	534.1	542.7	558.6	571.1	594.8	595.7	614.0
Total debt service	117.3	164.0	179.4	183.5	241.8	230.3	268.6	255.8	389.3	381.5
Amortization of principal	42.0	56.4	70.1	70.1	78.1	78.1	103.2	105.6	166.7	183.2
Payment of interest	75.3	107.6	109.3	113.4	163.7	152.2	165.4	150.2	222.6	198.3
Total applications	985.5	771.5	843.4	1,294.0	784.4	955.1	840.7	1,870.1	985.0	997.1
BMA's current financing burden	466.1	553.3	569.5	574.9	616.1	600.3	628.2	612.7	743.9	751.4

Table Ap 6.18(A) Appropriate Master Plan alternative No. 9 (cont'd)

(Unit: million Baht)

	2003	2004	2005	2006	2007	2008	2009	2010	Sulvage value	Total
Sources of funds										
BMA's fund										1,159.3
Foreign loan									-153.5	115.4
Local loan									-36.6	2,054.9
Bank overdrafts	1.0	1.4	1.0	0.8	3.2	1.5	0.9	0.9	-69.4	0.0
Operating revenue	247.6	250.8	262.7	265.6	268.5	271.1	274.1	287.0		4,467.8
Total sources	248.6	252.2	263.7	266.4	271.7	272.6	275.0	287.9	-259.5	7,797.4
Applications of funds										
Capital expenditure	-	-	-	-	-	-	-	-	-858.6	2,661.1
Current assets increase	1.0	1.4	1.0	0.8	3.2	1.5	0.9	0.9	-69.4	0.0
Management cost	626.5	643.0	655.2	664.9	703.7	721.2	731.7	742.6	-563.8	13,924.1
Total debt service	347.9	301.8	266.5	247.0	220.0	201.7	158.3	143.7		4,705.4
Amortization of principal	176.3	155.4	141.7	141.7	133.8	133.8	108.6	108.6		2,170.6
Payment of interest	171.6	146.4	124.8	105.3	86.2	67.9	49.7	35.1		2,534.8
Total applications	975.4	946.2	922.7	912.7	926.9	924.4	890.9	887.2	-1,491.8	21,290.6
BMA's current financing burden	726.8	694.0	659.0	646.3	655.2	651.8	615.9	599.3	-1,232.3	13,493.2

Table Ap 6.18(B) Appropriate Master Plan alternative No. 13

(Unit: million Baht)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Sources of funds										
BMA's fund	34.1	-	75.6	339.2	92.9	22.3	-	293.8	198.5	141.0
Foreign loan	-	-	-	-	160.1	576.3	576.3	144.0	-	285.1
Local loan	136.3	-	-	1.7	36.3	343.3	221.1	60.8	-	-
Bank overdrafts	25.2	2.3	2.2	3.0	-	0.2	0.6	1.3	1.0	4.0
Operating revenue	30.2	33.2	38.0	45.9	53.4	58.6	64.6	71.4	105.3	114.1
Total sources	225.8	35.5	115.8	389.8	342.7	1,000.7	862.6	571.3	304.8	544.2
Applications of funds										
Capital expenditure	170.4	-	75.6	340.9	289.3	941.9	797.4	498.6	198.5	426.1
Current assets increase	25.2	2.3	2.2	3.0	-	0.2	0.6	1.3	1.0	4.0
Management cost	273.8	301.3	324.1	349.5	335.6	343.4	350.2	365.7	377.2	424.9
Total debt service	3.8	38.1	36.5	34.9	33.1	41.3	108.1	156.7	216.4	226.0
Amortization of principal	0.0	13.6	13.6	13.6	13.6	13.6	13.6	13.6	61.7	79.9
Payment of interest	3.8	24.5	22.9	21.3	19.5	27.7	94.5	143.1	154.7	146.1
Total applications	473.2	341.7	438.4	728.3	658.0	1,326.8	1,256.3	1,022.3	793.1	1,081.0
BMA's current financing burden	247.4	306.2	322.6	338.5	315.3	326.1	393.7	451.0	488.3	536.8

Table Ap 6.18(B) Appropriate Master Plan alternative No. 13 (cont'd)

(Unit: million Baht)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Sources of funds										
BMA's fund	393.2	49.9	27.8	65.4	173.9	202.0	73.3	332.3		
Foreign loan	1,028.4	1,028.4	256.9	6.6	194.8	585.6	574.8	204.8		
Local loan	154.7	312.3	101.6	11.1	69.8	178.5	188.3	346.1		
Bank overdrafts	2.6	4.6	0.2	0.9	2.8	2.6	3.5	2.7	2.9	3.8
Operating revenue	124.4	136.1	149.6	205.1	222.6	242.8	269.3	295.7	325.8	328.8
Total sources	1,703.3	1,531.3	536.1	289.1	663.9	1,211.5	1,109.2	1,181.6	328.7	332.6
Applications of funds										
Capital expenditure	1,576.3	1,390.6	386.3	83.1	438.5	966.1	836.4	883.2		
Current assets increase	2.6	4.6	0.2	0.9	2.8	2.6	3.5	2.7	2.9	3.8
Management cost	456.2	510.6	513.0	522.2	555.1	587.1	617.2	649.1	656.9	701.4
Total debt service	222.9	267.0	332.5	385.4	405.6	438.6	469.0	493.3	530.2	555.9
Amortization of principal	79.9	81.2	81.2	123.2	159.6	196.0	202.2	202.2	202.2	248.9
Payment of interest	143.0	185.8	251.3	262.2	246.0	242.6	266.8	291.1	328.0	307.0
Total applications	2,258.0	2,172.8	1,232.0	991.6	1,402.0	1,994.4	1,926.1	2,028.3	1,190.0	1,261.1
BMA's current financing burden	554.7	641.5	695.9	702.5	738.1	782.9	816.9	846.7	861.3	928.5

Table Ap 6.18(B) Appropriate Master Plan alternative No. 13 (cont'd)

(Unit: million Baht)

	2003	2004	2005	2006	2007	2008	2009	2010	Sulvage value	Total
Sources of funds										
BMA's fund										2,515.2
Foreign loan									-3,255.3	2,366.8
Local loan									-50.3	2,111.6
Bank overdrafts	1.9	2.4	1.4	0.9	3.5	1.1	1.1	1.1	-79.8	0.0
Operating revenue	332.3	335.5	347.4	350.3	353.2	355.8	358.8	371.7		5,719.9
Total sources	334.2	337.9	348.8	351.2	356.7	356.9	359.9	372.8	-3,385.4	12,713.5
Applications of funds										
Capital expenditure									-2,867.4	7,431.8
Current assets increase	1.9	2.4	1.4	0.9	3.5	1.1	1.1	1.1	-79.8	0.0
Management cost	724.3	753.9	770.5	781.0	822.8	836.1	850.1	862.8	-442.1	15,173.9
Total debt service	624.4	583.5	559.4	495.7	517.3	534.3	508.0	488.8		9,306.7
Amortization of principel	339.0	324.2	324.2	284.6	323.8	360.5	354.3	354.3		4,478.3
Payment of interest	285.4	259.3	235.2	211.1	193.5	173.8	153.7	134.5		4,828.4
Total applications	1,350.6	1,339.8	1,331.3	1,277.6	1,343.6	1,371.5	1,359.2	1,352.7	-3,389.3	31,912.4
BMA's current financing burden	1,016.4	1,001.9	982.5	926.4	986.9	1,014.6	999.3	979.9	-3.9	19,198.9

Table Ap 6.18(C) Appropriate Master Plan alternative No. 19-(2)

(Unit: million Baht)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Sources of funds										
BMA's fund	31.0	-	75.6	337.0	92.9	22.3	-	289.2	317.7	80.2
Foreign loan	-	-	-	-	160.1	576.3	576.3	144.0	-	160.1
Local loan	124.1	-	-	12.7	35.3	324.2	221.1	60.8	-	-
Bank overdrafts	25.2	2.3	2.2	3.0	-	0.2	0.6	1.3	1.0	4.0
Operating revenue	30.2	33.2	38.0	45.9	53.4	58.6	64.6	71.4	105.3	114.1
Total sources	210.5	35.5	115.8	398.6	341.7	981.6	862.6	566.7	424.0	358.4
Applications of funds										
Capital expenditure	155.1	-	75.6	349.7	288.3	922.8	797.4	494.0	317.7	240.3
Current assets increase	25.2	2.3	2.2	3.0	-	0.2	0.6	1.3	1.0	4.0
Management cost	273.8	301.3	324.5	349.5	335.6	343.4	350.2	365.7	377.2	424.9
Total debt service	3.8	35.1	33.7	32.2	32.2	40.5	104.6	153.4	213.3	222.1
Amortization of principal	0.0	12.4	12.4	12.4	12.4	12.4	12.4	12.4	60.5	77.8
Payment of interest	3.8	22.7	21.3	19.8	19.8	28.1	92.2	141.0	152.8	144.3
Total applications	457.9	338.7	436.0	734.4	656.1	1,306.9	1,252.8	1,014.4	909.2	891.3
BMA's current financing burden	247.4	303.2	320.2	335.8	314.4	325.3	390.2	447.7	485.2	532.9

Table Ap 6.18(C) Appropriate Master Plan alternative No. 19-(2) (cont'd)

(Unit: million Baht)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Sources of funds										
BMA's fund	111.7	-	23.2	35.4	96.6	29.8	-	397.5		
Foreign loan	576.3	576.3	144.0	6.6	52.5	72.0	61.2	76.6		
Local loan	316.9	220.2	62.8	11.1	69.8	198.9	84.2	559.3		
Bank overdrafts	2.6	4.6	0.2	0.8	1.3	2.5	3.2	2.1	4.6	1.5
Operating revenue	124.4	136.1	149.6	190.8	208.3	228.5	255.0	281.4	292.8	295.8
Total sources	1,131.9	937.2	379.8	244.7	428.5	531.7	403.6	1,316.9	297.4	297.3
Applications of funds										
Capital expenditure	1,004.9	796.5	230.0	53.1	218.9	300.7	145.4	1,033.4		
Current assets increase	2.6	4.6	0.2	0.8	1.3	2.5	3.2	2.1	4.6	1.5
Management cost	456.2	510.6	513.0	522.3	537.5	568.0	594.1	619.6	648.4	665.4
Total debt service	215.7	273.8	311.8	356.6	376.3	404.7	424.5	417.0	492.6	487.9
Amortization of principal	77.8	82.1	82.1	125.4	161.8	198.2	206.5	206.5	217.4	236.4
Payment of interest	137.9	191.7	229.7	231.2	214.5	206.5	218.0	210.5	275.2	251.5
Total applications	1,679.4	1,585.5	1,055.0	932.8	1,134.0	1,275.9	1,167.2	2,072.1	1,145.6	1,154.8
BMA's current financing burden	547.5	648.3	675.2	688.1	705.5	744.2	763.6	755.2	848.2	857.5

Table Ap 6.18(C) Appropriate Master Plan alternative No. 19-(2) (Cont'd)

(Unit: million Baht)

	2003	2004	2005	2006	2007	2008	2009	2010	Sulvage value	Total
Sources of funds										
BMA's fund										1,940.1
Foreign loan									-1,528.0	1,654.3
Local loan									-50.3	2,251.1
Bank overdrafts	1.4	1.3	1.1	0.9	2.7	1.3	0.9	1.3	-74.1	0.0
Operating revenue	299.3	302.5	314.4	317.3	320.2	322.8	325.8	338.7		5,318.4
Total sources	300.7	303.8	315.5	318.2	322.9	324.1	326.7	340.0	-1,652.4	11,163.9
Applications of funds										
Capital expenditure									-1,806.4	5,617.4
Current assets increase	1.4	1.3	1.1	0.9	2.7	1.3	0.9	1.3	-74.1	0.0
Management cost	682.4	698.2	711.4	722.5	754.7	769.8	781.4	797.0	-468.2	14,530.4
Total debt service	526.8	483.1	458.6	393.1	381.8	367.8	341.1	323.9		7,908.0
Amortization of principal	298.0	281.3	281.3	240.4	247.1	251.4	243.2	243.2		3,905.2
Payment of interest	228.8	201.8	177.3	152.7	134.7	116.4	97.9	80.7		4,002.8
Total applications	1,210.6	1,182.6	1,171.1	1,116.5	1,139.2	1,138.9	1,123.4	1,122.2	-2,348.7	28,055.8
BMA's current financing burden	909.9	878.8	855.6	798.3	816.3	814.8	796.7	782.2	-696.3	16,891.9

Appendix 6.16 年次別プロジェクト費用

Table Ap 6.19(A) Appropriate Master Plan alternative No. 9

(Unit : million Baht)

		1983	1984	1985	1986	1987	1988	1989	1990	1980~90	1991	1992
Facilities construction cost	T	134.6			5.8	51.0	117.7		322.3	496.8	119.3	166.1
	F/C	6.2			-	3.3	7.0		193.3	203.6	49.5	44.2
	L/C	128.4			5.8	47.7	110.7		129.0	293.2	69.8	121.9
Plant*	T								37.7	37.7	119.3	166.1
	F/C								6.6	6.6	49.5	44.2
	L/C								31.1	31.1	69.8	121.9
Final disposal site	T	134.6			5.8	51.0	117.7			174.5		
	F/C	6.2			-	3.3	7.0			10.3		
	L/C	128.4			5.8	47.7	110.7			164.2		
Major repair of the existing compost plant	T								284.6	284.6		
	F/C								186.7	186.7		
	L/C								97.9	97.9		
Land aquisition cost	T.L/				75.9			23.2	15.4	114.5		71.2
Plant*	T.L/				-			23.2	15.4	38.6		71.2
Final disposal site	T.L/				75.9			-	-	75.9		-
Management cost	T	276.2	303.7	326.6	352.0	338.1	348.7	362.7	378.2	1,779.7	401.8	428.7
	F/C	66.6	77.1	80.6	84.0	75.0	81.4	88.5	90.6	419.5	104.6	119.8
	L/C	209.6	226.6	246.0	268.0	263.1	267.3	274.2	287.6	1,360.2	297.2	308.9
Total project cost	T	410.8	303.7	326.6	433.7	389.1	466.4	385.9	715.9	2,391.0	521.1	666.0
	F/C	72.8	77.1	80.6	84.0	78.3	88.4	88.5	283.9	623.1	154.1	164.0
	L/C	338.0	226.6	246.0	349.7	310.8	378.0	297.4	432.0	1,767.9	367.0	502.0
W.P.P	T	270.7	298.2	321.4	423.1	332.5	343.0	357.1	657.2	2,112.9	396.2	423.1
A.S.P	T	140.1	5.5	5.2	10.6	56.6	123.4	28.8	58.7	278.1	124.9	242.9

Note: *Parking lots are included.
T: Total F/C: Foreign currency L/C: Local currency
W.P.P: Without-project case portion
A.S.P: Additional system portion

Table Ap 6.19(A) Appropriate Master Plan alternative No. 9

(Unit : million Baht)

		1993	1994	1995	1991~95	1996	1997	1998	1999	2000	1996~2000	Total
Facilities construction cost	T	255.4	100.1	145.4	786.3	248.5		164.8		1,017.5	1,430.8	2,848.5
	F/C	17.2	30.9	61.2	203.0	79.7		10.0		230.3	320.0	732.8
	L/C	238.2	69.2	84.2	583.3	168.8		154.8		787.2	1,110.8	2,115.7
Plant*	T	22.8	100.1	145.4	553.7	248.5					248.5	839.9
	F/C	3.0	30.9	61.2	188.8	79.7					79.7	275.1
	L/C	19.8	69.2	84.2	364.9	168.8					168.8	564.8
Final disposal site	T	232.6			232.6			164.8		732.9	897.7	1,439.4
	F/C	14.2			14.2			10.0		43.6	53.6	84.3
	L/C	218.4			218.4			154.8		689.3	844.1	1,355.1
Major repair of the existing compost plant	T									284.6	284.6	569.2
	F/C									186.7	186.7	373.4
	L/C									97.9	97.9	195.8
Land aquisition cost	T.L/C	159.0			230.2	326.5					326.5	671.2
Plant*	T.L/C	76.8			148.0	34.3					34.3	220.9
Final disposal site	T.L/C	82.2			82.2	292.2					292.2	450.3
Management cost	T	450.9	503.1	517.4	2,301.9	534.1	542.7	558.6	571.1	594.8	2,801.3	7,789.4
	F/C	123.8	155.3	158.0	661.5	161.5	149.4	152.1	151.8	154.2	769.0	2,074.3
	L/C	327.1	347.8	359.4	1,640.4	372.6	393.3	406.5	419.3	440.6	2,032.3	5,715.1
Total project cost	T	865.3	603.2	662.8	3,318.4	1,109.1	542.7	723.4	571.1	1,612.3	4,558.6	11,309.1
	F/C	141.0	186.2	219.2	864.5	241.2	149.4	162.1	151.8	384.5	1,089.0	2,807.1
	L/C	724.3	417.0	443.6	2,453.9	867.9	393.3	561.3	419.3	1,227.8	3,469.6	8,502.0
W.P.P	T	517.3	488.8	502.1	2,327.5	820.0	521.0	531.8	543.4	849.4	3,265.6	8,596.3
A.S.P	T	348.0	114.4	160.7	990.9	289.1	21.7	191.6	27.7	762.9	1,293.0	2,712.8

Note: *Parking lots are included.
T: Total F/C: Foreign currency L/C: Local currency
W.P.P: Without-project case portion
A.S.P: Additional system portion

Table AP 6.19(B). Appropriate Master Plan alternative No. 13

(Unit : million Baht)

		1983	1984	1985	1986	1987	1988	1989	1990	1986~90	1991	1992
Facilities construction cost	T	170.4		4.6	13.0	289.3	941.9	797.4	498.6	2,540.2	11.0	426.1
	F/C	9.7		3.7	-	162.6	585.4	576.3	338.1	1,662.4	-	285.1
	L/C	160.7		0.9	13.0	126.7	356.5	221.1	160.5	877.8	11.0	141.0
Plant	T			4.6	9.8	253.0	797.4	797.4	214.0	2,071.6	11.0	426.1
	F/C			3.7	-	160.1	576.3	576.3	151.4	1,464.1	-	285.1
	L/C			0.9	9.8	92.9	221.1	221.1	62.6	607.5	11.0	141.0
Final disposal site	T	170.4			3.2	36.3	144.5			184.0		
	F/C	9.7			-	2.5	9.1			11.6		
	L/C	160.7			3.2	33.8	135.4			172.4		
Major repair of the existing compost plant	T								284.6	284.6		
	F/C								186.7	186.7		
	L/C								97.9	97.9		
Land aquisition cost	T.L/C			71.0	327.9					327.9	187.5	
Plant	T.L/C			71.0	283.8					283.8	187.5	
Final disposal site	T.L/C			-	44.1					44.1	-	
Management cost	T	273.8	301.3	324.1	349.5	335.6	343.4	350.2	365.7	1,744.4	377.2	424.9
	F/C	66.6	77.1	80.6	84.0	75.0	79.0	79.8	81.9	399.7	91.3	125.1
	L/C	207.2	224.2	243.5	265.5	260.6	264.4	270.4	283.8	1,344.7	285.9	299.8
Total project cost	T	444.2	301.3	399.7	690.4	624.9	1,285.3	1,147.6	864.3	4,612.5	575.7	851.0
	F/C	76.3	77.1	84.3	84.0	237.6	664.4	656.1	420.0	2,062.1	91.3	410.2
	L/C	367.9	224.2	315.4	606.4	387.3	620.9	491.5	444.3	2,550.4	484.4	440.8
W.P.P	T	270.7	298.2	321.4	423.1	332.5	343.0	357.1	657.2	2,112.9	396.2	423.1
A.S.P	T	173.5	3.1	78.3	267.3	292.4	942.3	790.5	207.1	2,499.6	179.5	427.9

Note: T: Total F/C: Foreign currency L/C: Local currency
W.P.P: Without-project case portion
A.S.P: Additional system portion

Table Ap 6.19(B) Appropriate Master Plan alternative No. 13

(Unit : million Baht)

		1993	1994	1995	1991~95	1996	1997	1998	1999	2000	1996 ~ 2000	Total
Facilities construction cost	T	1,552.9	1,390.6	363.1	3,743.7	45.0	361.7	966.1	836.4	883.2	3,092.4	9,551.3
	F/C	1,038.8	1,028.4	260.6	2,612.9	6.6	194.8	590.6	574.8	407.1	1,773.9	6,062.6
	L/C	514.1	362.2	102.5	1,130.8	38.4	166.9	375.5	261.6	476.1	1,318.5	3,488.7
Plant	T	1,390.6	1,390.6	363.1	3,581.4	45.0	361.7	888.4	836.4	360.6	2,492.1	8,149.7
	F/C	1,028.4	1,028.4	260.6	2,602.5	6.6	194.8	585.6	574.8	204.8	1,566.6	5,636.9
	L/C	362.2	362.2	102.5	978.9	38.4	166.9	302.8	261.6	155.8	925.5	2,512.8
Final disposal site	T	162.3			162.3			77.7		238.0	315.7	832.4
	F/C	10.4			10.4			5.0		15.6	20.6	52.3
	L/C	151.9			151.9			72.7		222.4	295.1	780.1
Major repair of the existing compost plant	T									284.6	284.6	569.2
	F/C									186.7	186.7	373.4
	L/C									97.9	97.9	195.8
Land aquisition cost	T.L/C	23.4		23.2	234.1	38.1	76.8				114.9	747.9
Plant	T.L/C	-		23.2	210.7	38.1	76.8				114.9	680.4
Final disposal site	T.L/C	23.4		-	23.4	-	-				-	67.5
Management cost	T	456.2	510.6	513.0	2,281.9	522.2	555.1	587.1	617.2	649.1	2,930.7	7,856.2
	F/C	144.0	176.8	168.7	705.9	179.8	199.2	215.7	225.2	235.5	1,055.4	2,385.3
	L/C	312.2	333.8	344.3	1,576.0	342.4	355.9	371.4	392.0	413.6	1,875.3	5,470.9
Total project cost	T	2,032.5	1,901.2	899.3	6,259.7	605.3	993.6	1,553.2	1,453.6	1,532.3	6,138.0	18,155.4
	F/C	1,182.8	1,205.2	429.3	3,318.8	186.4	394.0	806.3	800.0	642.6	2,829.3	8,447.9
	L/C	849.7	696.0	470.0	2,940.9	418.9	599.6	746.9	653.6	889.7	3,308.7	9,707.5
W.P.P	T	517.3	488.8	502.1	2,327.5	820.0	521.0	531.8	543.4	849.4	3,265.6	8,596.3
A.S.P	T	1,515.2	1,412.4	397.2	3,932.2	-214.7	472.6	1,021.4	910.2	682.9	2,872.4	9,559.1

Note: T: Total F/C: Foreign currency L/C: Local currency
W.P.P: Without-project case portion
A.S.P: Additional system portion

Table AP 6.19(C) Appropriate Master Plan alternative No. 19-(2)

(Unit : million Baht)

		1993	1994	1995	1991~95	1996	1997	1998	1999	2000	1996 ~ 2000	Total
Facilities construction cost	T	959.9	796.5	206.8	2,208.7	37.7	142.1	300.7	145.4	947.1	1,573.0	6,457.6
	F/C	586.6	576.3	144.0	1,467.0	6.6	52.5	78.6	61.2	293.3	492.2	3,628.3
	L/C	373.3	220.2	62.8	741.7	31.1	89.6	222.1	84.2	653.8	1,080.8	2,829.3
Plant	T	796.5	796.5	206.8	2,045.3	37.7	142.1	197.4	145.4	183.6	706.2	4,823.1
	F/C	576.3	576.3	144.0	1,456.7	6.6	52.5	72.0	61.2	76.6	268.9	3,189.7
	L/C	220.2	220.2	62.8	588.6	31.1	89.6	125.4	84.2	107.0	437.3	1,633.4
Final disposal site	T	163.4			163.4			103.3		478.9	582.2	1,065.3
	F/C	10.3			10.3			6.6		30.0	36.6	65.2
	L/C	153.1			153.1			96.7		448.9	545.6	1,000.1
Major repair of the existing compost plant	T									284.6	284.6	569.2
	F/C									186.7	186.7	373.4
	L/C									97.9	97.9	195.8
Land aquisition cost	T.L/C	45.0		23.2	380.7	15.4	76.8			86.3	178.5	966.2
Plant	T.L/C	-		23.2	335.7	15.4	76.8			-	92.2	782.7
Final disposal site	T.L/C	45.0		-	45.0	-	-			86.3	86.3	183.5
Management cost	T	456.2	510.6	513.0	2,281.9	522.3	537.5	568.0	594.1	619.6	2,841.5	7,767.4
	F/C	144.0	176.8	168.7	705.9	180.3	183.4	198.7	205.1	210.0	977.5	2,307.4
	L/C	312.2	333.8	344.3	1,576.0	342.0	354.1	369.3	389.0	409.6	1,864.0	5,460.0
Total project cost	T	1,461.1	1,307.1	743.0	4,871.3	575.4	756.4	868.7	739.5	1,653.0	4,593.0	15,191.2
	F/C	730.6	753.1	312.7	2,172.9	186.9	235.9	277.3	266.3	503.3	1,469.7	5,935.7
	L/C	730.5	554.0	430.3	2,698.4	388.5	520.5	591.4	473.2	1,149.7	3,123.3	9,255.5
W.P.P	T	517.3	488.8	502.1	2,327.5	820.0	521.0	531.8	543.4	849.4	3,265.6	8,596.3
A.S.P	T	943.8	818.3	240.9	2,543.8	-244.6	235.4	336.9	196.1	803.6	1,327.4	6,594.9

Note: T: Total F/C: Foreign currency L/C: Local currency
W.P.P: Without-project case portion
A.S.P: Additional system portion

Table Ap 6.19(C) Appropriate Master Plan alternative No. 19-(2)

(Unit : million Baht)

		1983	1984	1985	1986	1987	1988	1989	1990	1986~90	1991	1992
Facilities construction cost	T	155.1		4.6	13.7	288.3	922.8	797.4	494.0	2,516.2	5.2	240.3
	F/C	8.2		3.7	-	162.5	584.0	576.3	334.4	1,657.2	-	160.1
	L/C	146.9		0.9	13.7	125.8	338.8	221.1	159.6	859.0	5.2	80.2
Plant	T			4.6	9.8	253.0	797.4	797.4	209.4	2,067.0	5.2	240.3
	F/C			3.7	-	160.1	576.3	576.3	147.7	1,460.4	-	160.1
	L/C			0.9	9.8	92.9	221.1	221.1	61.7	606.6	5.2	80.2
Final disposal site	T	155.1			3.9	35.3	125.4			164.6		
	F/C	8.2			-	2.4	7.7			10.1		
	L/C	146.9			3.9	32.9	117.7			154.5		
Major repair of the existing compost plant	T								284.6	284.6		
	F/C								186.7	186.7		
	L/C								97.9	97.9		
Land aquisition cost	T.L/C			71.0	336.0					336.0	312.5	
Plant	T.L/C			71.0	283.8					283.8	312.5	
Final disposal site	T.L/C			-	52.2					52.2	-	
Management cost	T	273.8	301.3	324.5	349.5	335.6	343.4	350.2	365.7	1,744.4	377.2	424.9
	F/C	66.6	77.1	80.6	84.0	75.0	79.0	79.8	81.9	399.7	91.3	125.1
	L/C	207.2	224.2	243.9	265.5	260.6	264.4	270.4	283.8	1,344.7	285.9	299.8
Total project cost	T	428.9	301.3	400.1	699.2	623.9	1,266.2	1,147.6	859.7	4,596.6	694.9	665.2
	F/C	74.8	77.1	84.3	84.0	237.5	663.0	656.1	416.3	2,056.9	91.3	285.2
	L/C	354.1	224.2	315.8	615.2	386.4	603.2	491.5	443.4	2,539.7	603.6	380.0
W.P.P	T	270.7	298.2	321.4	423.1	332.5	343.0	357.1	657.2	2,112.9	396.2	423.1
A.S.P	T	158.2	3.1	78.7	276.1	291.4	923.2	790.5	202.5	2,483.7	298.7	242.1

Note: T: Total F/C: Foreign currency L/C: Local currency
W.P.P: Without-project case portion
A.S.P: Additional system portion

第7章　環境影響評価

Appendix 7.1　既存コンポスト工場の現況

Nong Khaem コンポスト工場付帯焼却炉のごみおよび排ガス性状調査を１９８１年６月と７月に実施した。以下にその概要を述べる。

(1)　焼却ごみの性状

焼却対象ごみは、精選別機により選別されたコンポスト不適ごみである。

このごみの組成（平均値）は水分６４％、灰分８％、可燃分２８％である。可燃分の８０％は草木、繊維、およびプラスチックでしめられている。

平均ごみ発熱量は、1,145 kcal/kg である。

(2)　ごみピット汚水の性状

ごみピット汚水の性状（平均値）は PH 6.5、BOD 23,600 ppm、蒸発残留物 45,800 ppm、蒸発残留物の熱しゃく減量 24,000 ppm で有機性の汚水である。また重金属等有害物質も含まれている。

(3)　燃焼排ガスの性状

煙突からの有害物の排出濃度は、NOx が３０～５９ppm（平均値４２ppm）、SO_2 が不検出、CO が 0.093～0.17％（平均値 0.14％）であり、高濃度の CO ガスが排出されている。

(4)　焼却残渣冷却汚水の性状

焼却残渣冷却汚水の性状は PH １０～１１、BOD ２１５～1,150 ppm、COD５３～３３４ppm とかなり高い値を示しており、変動巾も大きい汚水と言える。

焼却残渣冷却汚水は、系外に放流しないシステムであるため、蒸発残留物の濃度も５７,００～１４,３００ppm と高い。また、冷却水中に重金属類もかなり溶出しているが、これらは焼却残渣に移行し系外に排出される。

(5)　焼却残渣の性状

焼却残渣の熱しゃく減量（平均値）は２０.２％（不燃物含む）と高く、ごみ焼却が不完全であることを示している。このため、アルキル水銀（0.028 mg/kg）や有機りん化物（0.018mg/L）が検出され、通常の燃焼管理が行なわれている焼却炉に較べ高い値を示している。またシアン化合物の濃度も５２ppm（平均値）と高い値を示している。

Appendix 7.2　タイ国の環境関連法令

Table AP 7.1 Environmental laws and regulations in Thailand

Laws in Thailand	Environmental factor										Responsible Ministry
	Living env.						Natural env.		Socio-economic env.		
	Air pollution	Water pollution	Noise	Bank odour	Vibration	Waste treatment	Wild life preservation	Aquatic life preservation	Land use	Historical place	
Public Health Act B.E. 2484 (1941)	×	×	×			×			×		MOPH
Factory Act B.E. 2512 (1969)	×	×	×	×	×				×		MOI
Motor Vehicle Act B.E. 2522 (1979)	×		×								MOPH
Act for Land Transport B.E. 2522 (1979)	×										MOC
Act for Medicine B.E. 2510 (1978)	×										MOPH
Notification of the Revolution Party No. 16	×		×								MOInt
Notification of Traffic officials in the Kingdom	×		×								MOInt
Act for Local Administration B.E. 2457 (1914)		×									MOInt
Municipal Act B.E. 2496 (1953)		×									MOInt
Sanitary Act B.E. 2495 (1952)		×									MOInt
Commercial Codes		×					×				MOJ
Criminal Codes		×	×								MOInt/MOJ
Act for the Cleanliness and Orderliness of the Country B.E. 2503 (1960)		×							×		MOInt
Irrigation Act B.E. 2482 (1939)		×							×		MOA/CO
Royal Irrigation Act B.E. 2485 (1942)		×							×		MOA/CO
Act for Water Supply Canal B.E. 2446 (1903)		×							×		MOA/CO
Act for Navigation in Thai Territorial Waters B.E. 2456 (1913)/Amendment B.E. 2522 (1979)		×	×					×	×		MOC
Mining Act B.E. 2461 (1918)		×							×		MOA/CO/MOI
Canal Maintenance Act Ratanakosin Era 121		×									MOA/CO
Communicable Disease Act B.E. 2477 (1934)		×									MOInt/MOPH
Act for Petroleum of Thailand B.E. 2521 (1978)		×						×			MOI
National Parks Act B.E. 2404 (1961)		×					×				MOA/CO
Fishery Act B.E. 2490 (1947)		×						×			MOA
Act for Land Traffic B.E. 2521 (1978)			×								MOPH
Notification of the Harbour Department Dated 21, Feb. 1971			×								MOC
Act for Wild Life Conservation and Protection B.E. 2503 (1960)							×				MOA/CO
Act for Animal Breed Nourishment B.E. 2509 (1966)							×				MOA/CO
Act for Wild Elephant Conservation B.E. 2464 (1921)							×				MOInt
Act for Animal Epidemic B.E. 2499 (1956)							×				MOA/CO
Swallow's Nest Act B.E. 2482 (1939)							×				MOF
Royal Decree Specifying Buildings where Swallow Naturally Builts its Nest as Restricted Area B.E. 2454 (1911)							×				MOA/CO
Act for Ancient Remain, Antique, Art Works, and National Museum B.E. 2504 (1961)										×	MOE
Town and Country Planning Act B.E. 2518 (1975)									×		MOInt
Act for Land Reform for Agriculture B.E. 2518 (1975)									×		MOA/CO
Act for Land Management for Agriculture B.E. 2517 (1974)									×		MOA/CO
Land Code B.E. 2497 (1954)									×		MOInt
Building Control Act B.E. 2522									×		MOI
Act for Industrial Estates of Thailand B.E. 2522 (1979)									×		MOI
Mineral Act B.E. 2510 (1967)									×		MOI
Notification of the Revolution Party No. 655									×		MOC/MOInt

Note :

Abbreviation	Full name
MOPH	Ministry of Public Health
MOInt	Ministry of Interior
MOC	Ministry of Communications
MOJ	Ministry of Justice
MOA/CO	Ministry of Agriculture and Co-operatives
MOF	Ministry of Finance
MOE	Ministry of Education
MOI	Ministry of Industry