

### **7.3 Rough Cost Estimation of Each Candidate Site**

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**Table 7.3-1 Construction & Unit Cost of the Candidate Landfill Sites**

NO.	Location (Distance from residential area)	Land use	Capacity (million m <sup>3</sup> ) *Remark	Construction Cost Unit:1000\$		Priority
				Case 1 (US\$ / m <sup>3</sup> )	Case 2 (US\$ / m <sup>3</sup> )	
1	BALACEANCA about 800m A	Swanpy Land A	4.2 ***	9,534 (2.30)	17,110 (4.12)	1
2	CRETULEASCA More than 1000m A	Agriculture Area B	1.4 ***	5,039 (3.50)	8,177 (5.68)	2
3	BERCENI More than 1,000m A	Agriculture Area B	1.6 **	3,623 (2.26)	6,077 (3.80)	3
4	JILAVA about 500m A	Agriculture Area B	2.8 **	6,183 (2.21)	11,918 (3.78)	4
5	AFUMATI about 400m A	Agriculture Area B	2.4 **	5,617 (2.34)	10,502 (4.38)	5
6	POPESTI - LEORDENI II about 200m B	Agriculture Area B	7.2	7,434 (1.03)	15,812 (2.20)	6
7	POPESTI - LEORDENI I about 200m B	Agriculture Area B	3.0	4,307 (1.44)	7,611 (2.54)	7
8	FUNDENI about 200m B	Agriculture Area B	2.4	5,688 (2.37)	10,573 (4.41)	8
9	VIDORA about 1000m A	Agriculture Area B	5.1	15,788 (3.10)	25,429 (4.99)	9
10	CHIAJNA about 500m *Water Resource Area B	Reed Plain and Agriculture Land B	3.0	6,254 (2.08)	13,240 (4.41)	10
11	DUDU About 400m *Water Resource Area B	Borrow Pit and Fish Pond B	1.5	4,661 (3.11)	7,965 (5.31)	11

Note : Grading

A : Good

B : Acceptable

Remark : \*\*\* : The 1st priority sites studied in the current feasibility study.

\*\* : The 2nd priority sites to be chosen

**Table 7.3-2 (1) - Rough Cost Estimation of Each Candidate Site**

**No.1 Balaceanca**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2)
1. Access Road	271 \$/m	5,060	1,371,260	
2. Management Road	121 \$/m	2,710	327,910	
3. On-site Road	167 \$/m	2,410	402,470	
4. Drainage Ditch	38 \$/m	2,920	112,420	
5. Net Fence	24.8 \$/m	-	79,372	
6. Embankment				
- Material	4.1 \$/m3	123,500	505,115	
- Earth Work	1.0 \$/m3	-	78,798	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m3	-	15,986	
- Disposal	0.6 \$/m3	30,000	18,000	
- Lining	3 \$/m2	10,516	31,548	
8. Leachate collection system	55 \$/m	-	112,311	Same as Left
9. Excavation	0.45 \$/m3	-	-	
10. Disposal	0.6 \$/m3	-	-	
11. Contoroll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	-	2,436,725	
14. Leachate Treatment Facility	17,000 \$/m3	( 284 )	0	4,828,000
15. Electric Work		-	25,000	Same as left
16. Gate		-	8,520	
17. Pipeline	40.1 \$/m	3,670	147,167	0
18. Others			37,843	Same as left
Direct Cost			5,859,685	10,509,685
Include Overhead			7,030,000	12,610,000
Include Contingency			8,080,000	14,500,000
Add TVA			9,534,400	17,110,000

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )

Case 2 : on-site treatment ( both biological & chemical )

**Table 7.3-2 (2) Rough Cost Estimation of Each Candidate Site**

**No.2 Cretuleasca**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2 )
1. Access Road	271 \$/m	620	168,020	Same as left
2. Management Road	121 \$/m	2,440	295,240	
3. On-site Road	167 \$/m	1,250	201,235	
4. Drainage Ditch	38 \$/m	-	162,300	
5. Net Fence	24.8 \$/m	-	72,277	
6. Embankment			460,719	
- Material	4.1 \$/m3	-	-	
- Earth Work	1.0 \$/m3	-	-	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m3	-	12,970	
- Disposal	0.6 \$/m3	-	-	
- Lining	3 \$/m2	7,955	23,865	
8. Leachate collection system	55 \$/m	-	93,549	
9. Excavation	0.45 \$/m3	-	-	
10. Disposal	0.6 \$/m3	-	-	
11. Contoroll Office		1	54,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	-	1,217,818	
14. Leachate Treatment Facility	17,000 \$/m3	( 126 )	0	2,142,000
15. Electric Work		1	25,000	Same as left
16. Gate			8,520	
17. Pipeline			182,856	0
18. Others			82,920	
Direct Cost			3,096,529	5,024,715
Include Overhead			3,716,000	6,030,000
Include Contingency			4,270,000	6,930,000
Add TVA			5,038,600	8,11,400

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )  
 Case 2 : on-site treatment ( both biological & chemical )

**Table 7.3-2 (3) Rough Cost Estimation of Each Candidate Site**

**No.3 Bercent**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2 )
1. Access Road	271 \$/m	480	130,080	
2. Management Road	121 \$/m	2,410	291,610	
3. On-site Road	167 \$/m	150	25,050	
4. Drainage Ditch	38 \$/m	2,410	91,580	
5. Net Fence	24.8 \$/m	2,350	58,280	
6. Embankment				
- Material	4.1 \$/m3	0		
- Earth Work	1.0 \$/m3	50 x 230	11,500	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m3	15,750	7,087	
- Disposal	0.6 \$/m3			
- Lining	3 \$/m2	6,300	18,900	
8. Leachate collection system	55 \$/m	700	38,500	Same as Left
9. Excavation	0.45 \$/m3	400,000	180,000	
10. Disposal	0.6 \$/m3	64,303	38,581	
11. Contorroll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	160,000	816,000	
14. Leachate Treatment Facility	17,000\$/m3	101	0	1,717,000
15. Electric Work	27,000 \$	1	27,000	Same as Left
16. Gate	130,000 \$	1	130,000	
17. Pipe Line			214,000	0
Direct Cost			2,227,408	3,730,408
Include Overhead			2,670,000	4,476,000
Include Contingency			3,070,000	5,150,000
Add TVA			3,622,600	6,077,000

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )

Case 2 : on-site treatment ( both biological & chemical )

**Table 7.3-2 (4) Rough Cost Estimation of Each Candidate Site**

**No.4 Jllava**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2 )
1. Access Road	271 \$/m	570	154,470	
2. Management Road	121 \$/m	2,730	330,330	
3. On-site Road	167 \$/m	380	63,460	
4. Drainage Ditch	38 \$/m	2,880	109,440	
5. Net Fence	24.8 \$/m	2,880	71,424	
6. Embankment				
- Material	4.1 \$/m3		0	
- Earth Work	1.0 \$/m3	773 x 50m2	38,650	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m3	60,000	27,000	
- Disposal	0.6 \$/m3	60,000	180,000	
- Lining	3 \$/m2	24,000	72,000	
8. Leachate collection system	55 \$/m	2,200	121,000	Same as Left
9. Excavation	0.45 \$/m3	700,000	315,000	
10. Disposal	0.6 \$/m3	12,757	7,654	
11. Contoroll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	350,000	1,785,000	
14. Leachate Treatment Facility	17,000 \$/m3	221	0	3,757,000
15. Electric Work	27,000 \$	1	27,000	Same as Left
16. Gate	130,000 \$	1	130,000	
17. Pipe Line			214,000	0
Direct Cost			3,795,668	7,338,668
Include Overhead			4,555,000	8,806,000
Include Contingency			5,240,000	10,100,000
Add TVA			6,183,200	11,918,000

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )

Case 2 : on-site treatment ( both biological & chemical )

**Table 7.3-2 (5) Rough Cost Estimation of Each Candidate Site**

**No.5 Afumati**

Item	Unit Cost	Quantity	Cost (Case-1)	Cost (Case-2)
1. Access Road	271 \$/m	970	262,870	Same as Left
2. Management Road	121 \$/m	3,080	372,680	
3. On-site Road	167 \$/m	440	73,400	
4. Drainage Ditch	38 \$/m	2,550	96,900	
5. Net Fence	24.8 \$/m	2,550	63,240	
6. Embankment				
- Material	4.1 \$/m3	0		
- Earth Work	1.0 \$/m3	50 x 250	12,500	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m3	38,000	17,100	
- Disposal	0.6 \$/m3	38,000	11,400	
- Lining	3 \$/m2	15,200	45,600	
8. Leachate collection system	55 \$/m	2,050	112,750	
9. Excavation	0.45 \$/m3	600,000	270,000	
10. Disposal	0.6 \$/m3	107,500	64,500	
11. Controll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	300,000	1,530,000	
14. Leachate Treatment Facility	17,000 \$/m3	189	0	3,213,000
15. Electric Work	27,000 \$	1	27,000	Same as Left
16. Gate	130,000 \$	1	130,000	
17. Pipe Line			214,000	0
Direct Cost			3,453,180	6,452,180
Include Overhead			4,144,000	7,740,000
Include Contingency			4,760,000	8,900,000
Add TVA			5,616,800	10,502,000

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )

Case 2 : on-site treatment ( both biological & chemical )

**Table 7.3-2 (6) Rough Cost Estimation of Each Candidate Site**

**No.6 Popestl-Leordeni II**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2 )
1. Access Road	271 \$/m	1,650	447,150	
2. Management Road	121 \$/m	3,050	369,050	
3. On-site Road	167 \$/m	650	108,550	
4. Drainage Ditch	38 \$/m	3,050	115,900	
5. Net Fence	24.8 \$/m	3,050	75,640	
6. Embankment				
- Material	4.1 \$/m <sup>3</sup>	178 x 50	36,490	
- Earth Work	1.0 \$/m <sup>3</sup>	1,350 x 50	67,500	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m <sup>3</sup>	80,000	36,000	
- Disposal	0.6 \$/m <sup>3</sup>	0	0	
- Lining	3 \$/m <sup>2</sup>	32,000	96,000	
8. Leachate collection system	55 \$/m	2,600	143,000	Same as Left
9. Excavation	0.45 \$/m <sup>3</sup>	0	0	
10. Disposal	0.6 \$/m <sup>3</sup>	0	0	
11. Contoroll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	500,000	2,550,000	
14. Leachate Treatment Facility	17,000 \$/m <sup>3</sup>	315	0	5,355,000
15. Electric Work	27,000 \$	1	27,000	Same as Left
16. Gate	130,000 \$	1	130,000	
17. Pipe Line			214,000	0
Direct Cost			4,565,520	9,706,520
Include Overhead			5,480,000	11,650,000
Include Contingency			6,300,000	13,400,000
Add TVA			7,434,000	15,812,000
Total Cost				

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )  
 Case 2 : on-site treatment ( both biological & chemical )



**Table 7.3-2 (7) Rough Cost Estimation of Each Candidate Site**

**No.7 Popesti-Leordeni I**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2 )
1. Access Road	271 \$/m	1,170	317,070	
2. Management Road	121 \$/m	1,720	208,120	
3. On-site Road	167 \$/m	300	50,100	
4. Drainage Ditch	38 \$/m	2,330	88,540	
5. Net Fence	24.8 \$/m	2,330	57,784	
6. Embankment				
- Material	4.1 \$/m3	868 x 50	177,940	
- Earth Work	1.0 \$/m3	1,150 x 50	57,500	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m3	19,250	8,662	
- Disposal	0.6 \$/m3	0	0	
- Lining	3 \$/m2	7,700	23,100	
8. Leachate collection system	55 \$/m	1,200	66,000	Same as Left
9. Excavation	0.45 \$/m3	0	0	
10. Disposal	0.6 \$/m3	0	0	
11. Contorroll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	210,000	1,071,000	
14. Leachate Treatment Facility	17,000 \$/m3	132	0	2,244,000
15. Electric Work	27,000 \$	1	27,000	Same as Left
16. Gate	130,000 \$	1	130,000	
			214,000	0
Direct Cost			2,646,056	4,676,056
Include Overhead			3,175,000	5,610,000
Include Contingency			3,650,000	6,450,000
Add TVA			4,307,000	7,611,000

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )

Case 2 : on-site treatment ( both biological & chemical )

**Table 7.3-2 (8) Rough Cost Estimation of Each Candidate Site**

**No.8 Fundent**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2)
1. Access Road	271 \$/m	1,100	298,100	Same as Left
2. Management Road	121 \$/m	2,980	360,580	
3. On-site Road	167 \$/m	750	125,250	
4. Drainage Ditch	38 \$/m	2,410	91,580	
5. Net Fence	24.8 \$/m	2,410	59,768	
6. Embankment				
- Material	4.1 \$/m3		0	
- Earth Work	1.0 \$/m3	200	200	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m3	42,000	18,900	
- Disposal	0.6 \$/m3	0	0	
- Lining	3 \$/m2	16,800	50,400	
8. Leachate collection system	55 \$/m	1,980	108,900	
9. Excavation	0.45 \$/m3	600,000	270,000	
10. Disposal	0.6 \$/m3	106,350	63,810	
11. Contoroll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	300,000	1,530,000	
14. Leachate Treatment Facility	17,000 \$/m3	189	0	3,213,000
15. Electric Work	27,000 \$	1	27,000	Same as Left
16. Gate	130,000 \$	1	130,000	
17. Pipe Line			214,000	0
Direct Cost			3,494,728	6,493,728
Include Overhead			4,194,000	7,790,000
Include Contingency			4,820,000	8,960,000
Add TVA			5,687,600	10,572,800

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )  
 Case 2 : on-site treatment ( both biological & chemical )

**Table 7.3-2 (9) Rough Cost Estimation of Each Candidate Site**

**No.9 Vidra**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2 )
1. Access Road	271 \$/m	1,430	387,530	Same as Left
2. Management Road	121 \$/m	4,620	559,020	
3. On-site Road	167 \$/m	900	150,300	
4. Drainage Ditch	38 \$/m	4,620	175,560	
5. Net Fence	24.8 \$/m	4,510	111,848	
6. Embankment				
- Material	4.1 \$/m3	0	0	
- Earth Work	1.0 \$/m3	4,610 x 50	230,500	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m3	64,350	28,957	
- Disposal	0.6 \$/m3			
- Lining	3 \$/m2	25,740	77,220	
8. Leachate collection system	55 \$/m	6,300	346,500	
9. Excavation	0.45 \$/m3	4,580,000	2,061,000	
10. Disposal	0.6 \$/m3	3,550,000	2,130,000	
11. Contoroll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	572,000	2,917,200	
14. Leachate Treatment Facility	17,000 \$/m3	361	0	6,137,000
15. Electric Work	27,000 \$	1	27,000	Same as Left
16. Gate	130,000 \$	1	130,000	
17. Pipe Line			214,000	0
Direct Cost			9,695,815	15,618,815
Include Overhead			11,635,000	18,740,000
Include Contingency			13,380,000	21,550,000
Add TVA			15,788,400	25,429,000

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )

Case 2 : on-site treatment ( both biological & chemical )

**Table 7.3-2 (10) Rough Cost Estimation of Each Candidate Site**

**No.10 Chlajna**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2)
1. Access Road	271 \$/m	580	157,180	
2. Management Road	121 \$/m	2,860	346,060	
3. On-site Road	167 \$/m	670	111,890	
4. Drainage Ditch	38 \$/m	3,360	127,680	
5. Net Fence	24.8 \$/m	3,060	75,888	
6. Embankment				
- Material	4.1 \$/m <sup>3</sup>	773 x 50	158,465	
- Earth Work	1.0 \$/m <sup>3</sup>	773 x 50	38,650	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m <sup>3</sup>	36,000	16,200	
- Disposal	0.6 \$/m <sup>3</sup>	0	0	
- Lining	3 \$/m <sup>2</sup>	14,400	43,200	
8. Leachate collection system	55 \$/m	1,920	105,600	Same as Left
9. Excavation	0.45 \$/m <sup>3</sup>	0	0	
10. Disposal	0.6 \$/m <sup>3</sup>	0	0	
11. Contoroll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	420,000	2,142,000	
14. Leachate Treatment Facility	17,000 \$/m <sup>3</sup>	265	0	4,505,000
15. Electric Work	27,000 \$	1	27,000	Same as Left
16. Gate	130,000 \$	1	130,000	
17. Pipe Line			214,000	0
Direct Cost			3,843,053	8,134,053
Include Overhead			4,611,000	9,760,000
Include Contingency			5,300,000	11,220,000
Add TVA			6,254,000	13,239,600

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )

Case 2 : on-site treatment ( both biological & chemical )

**Table 7.3-2 (11) Rough Cost Estimation of Each Candidate Site**

**No.11 Dudu**

Item	Unit Cost	Quantity	Cost ( Case-1 )	Cost (Case-2 )
1. Access Road	271 \$/m	1,950	528,450	
2. Management Road	121 \$/m	1,800	217,800	
3. On-site Road	167 \$/m	450	75,150	
4. Drainage Ditch	38 \$/m	2,160	82,080	
5. Net Fence	24.8 \$/m	2,160	53,568	
6.Embankment				
- Material	4.1 \$/m3	830 x 50	170,150	
- Earth Work	1.0 \$/m3	830 x 50	41,500	
7. Leachate Storage Pond				
- Excavation	0.45 \$/m3	18,750	8,438	
- Disposal	0.6 \$/m3	0	0	
- Lining	3 \$/m2	7,500	22,500	
8. Leachate collection system	55 \$/m	1,330	73,150	Same as Left
9. Excavation	0.45 \$/m3	0	0	
10. Disposal	0.6 \$/m3	0	0	
11. Contorroll Office	114,000 \$	1	114,000	
12. Truck Scale	35,240 \$	1	35,240	
13. Liner	5.1 \$	210,000	1,071,000	
14. Leachate Treatment Facility	17,000 \$/m3	132	0	2,244,000
15. Electric Work	27,000 \$	1	27,000	Same as Left
16. Gate	130,000 \$	1	130,000	
17. Pipe Line			214,000	0
Direct Cost			2,863,966	4,893,966
Include Overhead			3,437,000	5,870,000
Include Contingency			3,950,000	6,750,000
Add TVA			4,661,000	7,965,000

Note) Case 1 : off-site treatment ( connection to public sewer line for leachate treatment at the Glina Treatment Plant )

Case 2 : on-site treatment ( both biological & chemical )

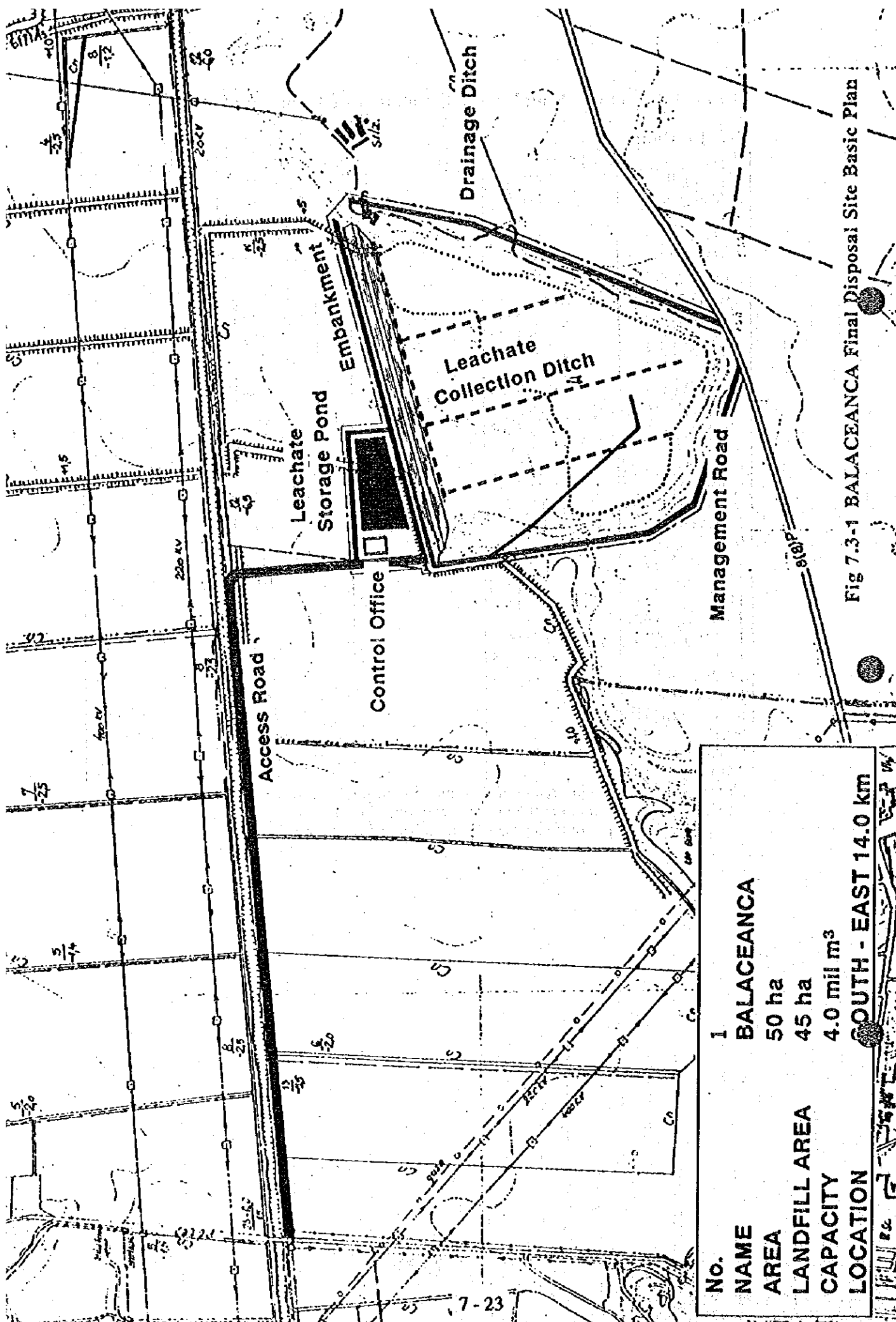


Fig 7.3-1 BALACEANCA Final Disposal Site Basic Plan

No.	1
NAME	BALACEANCA
AREA	50 ha
LANDFILL AREA	45 ha
CAPACITY	4.0 mil m <sup>3</sup>
LOCATION	SOUTH - EAST 14.0 km

No.	2
NAME	CRETULEASCA
AREA	24 ha
LANDFILL AREA	20 ha
CAPACITY	1.2 mil m <sup>3</sup>
LOCATION	WEST - EAST 12.0 km

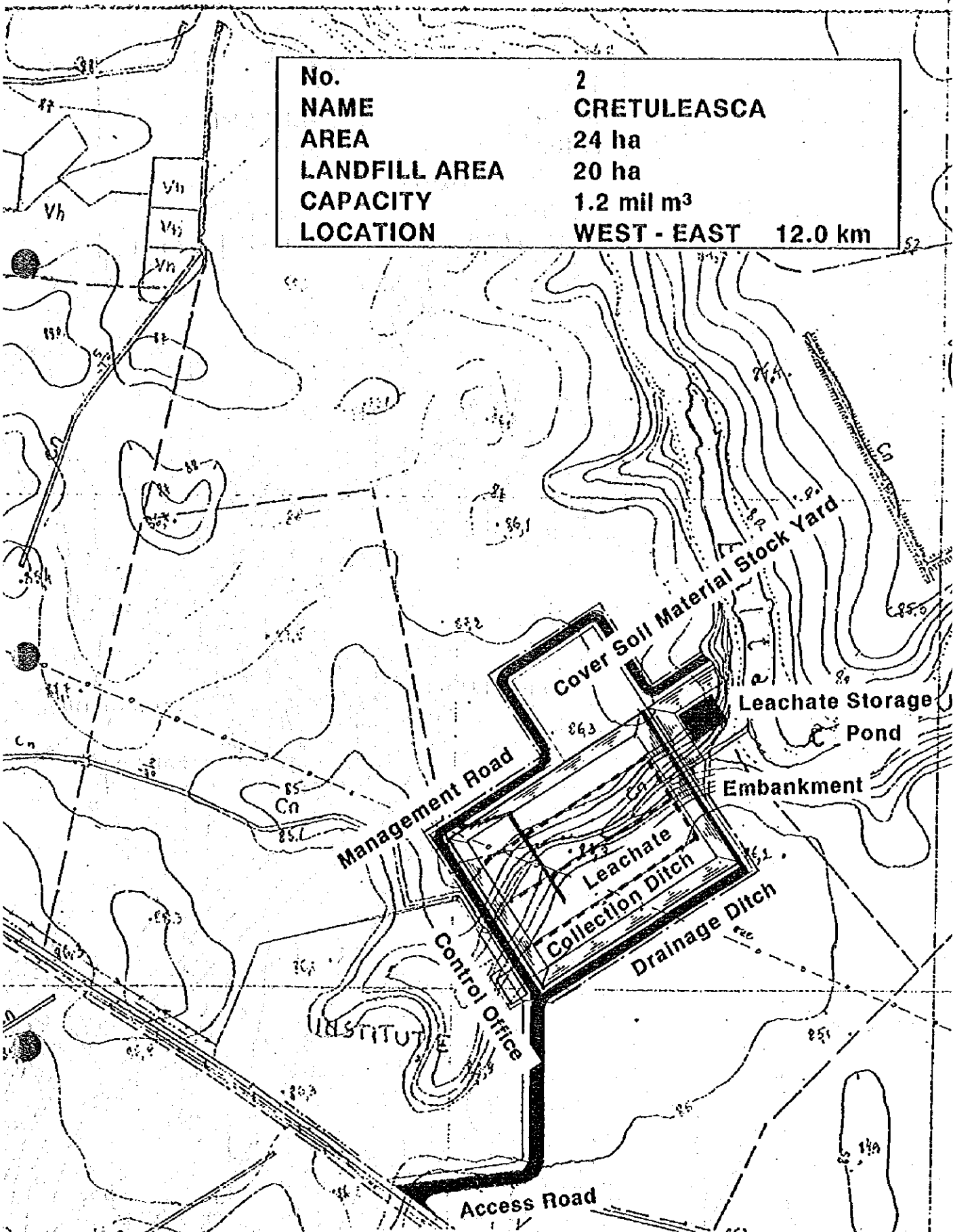


Fig 7.3-2 CRETULEASCA Final Disposal Site Basic Plan

No.	3
NAME	BERCENI
AREA	20 ha
LANDFILL AREA	16 ha
CAPACITY	1.6 mil m <sup>3</sup>
LOCATION	SOUTH 12.0 km

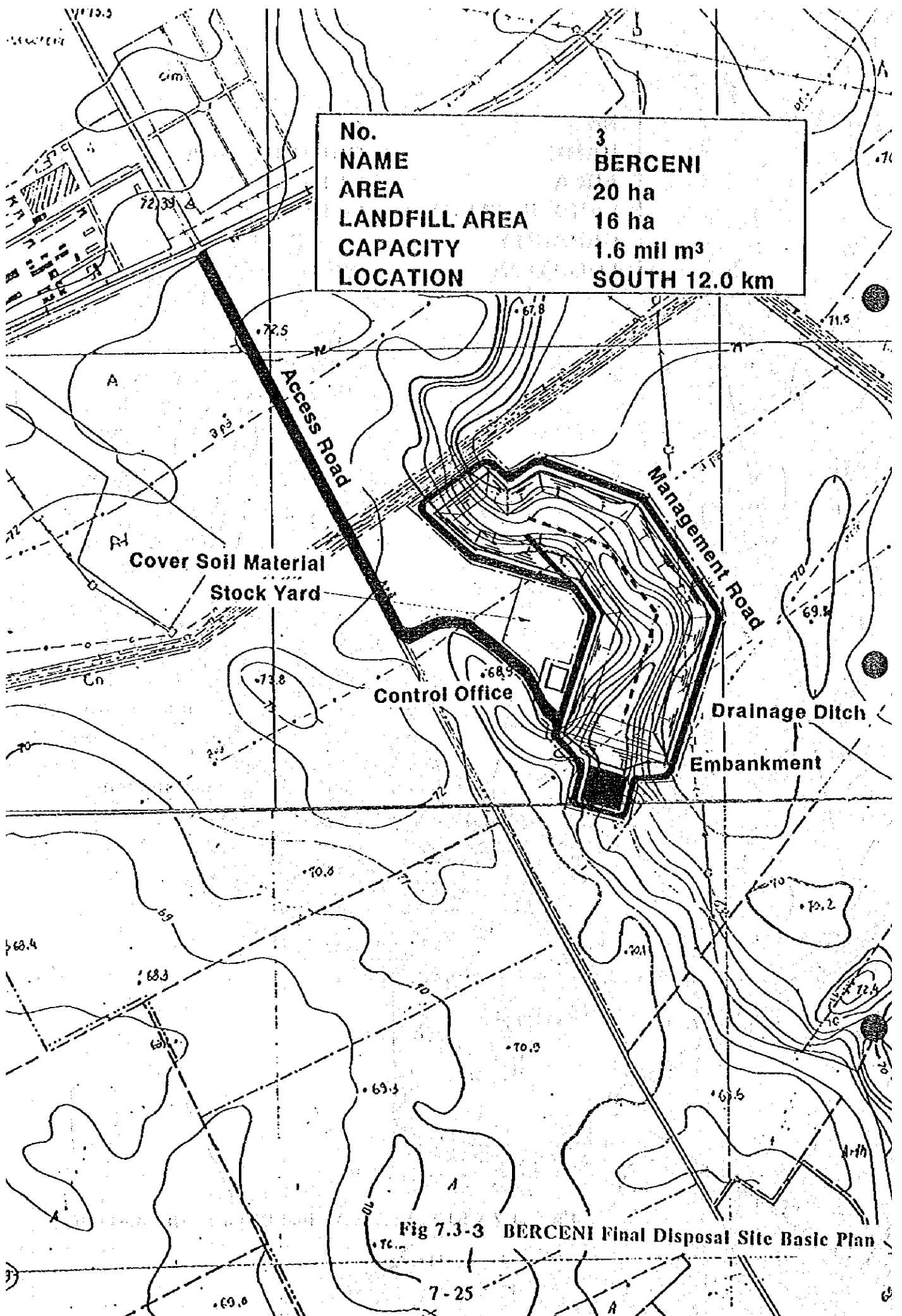


Fig 7.3-3 BERCENI Final Disposal Site Basic Plan



No.	4
NAME	JILAVA
AREA	43 ha
LANDFILL AREA	35 ha
CAPACITY	2.8 mil m <sup>3</sup>
LOCATION	SOUTH 9.0 km

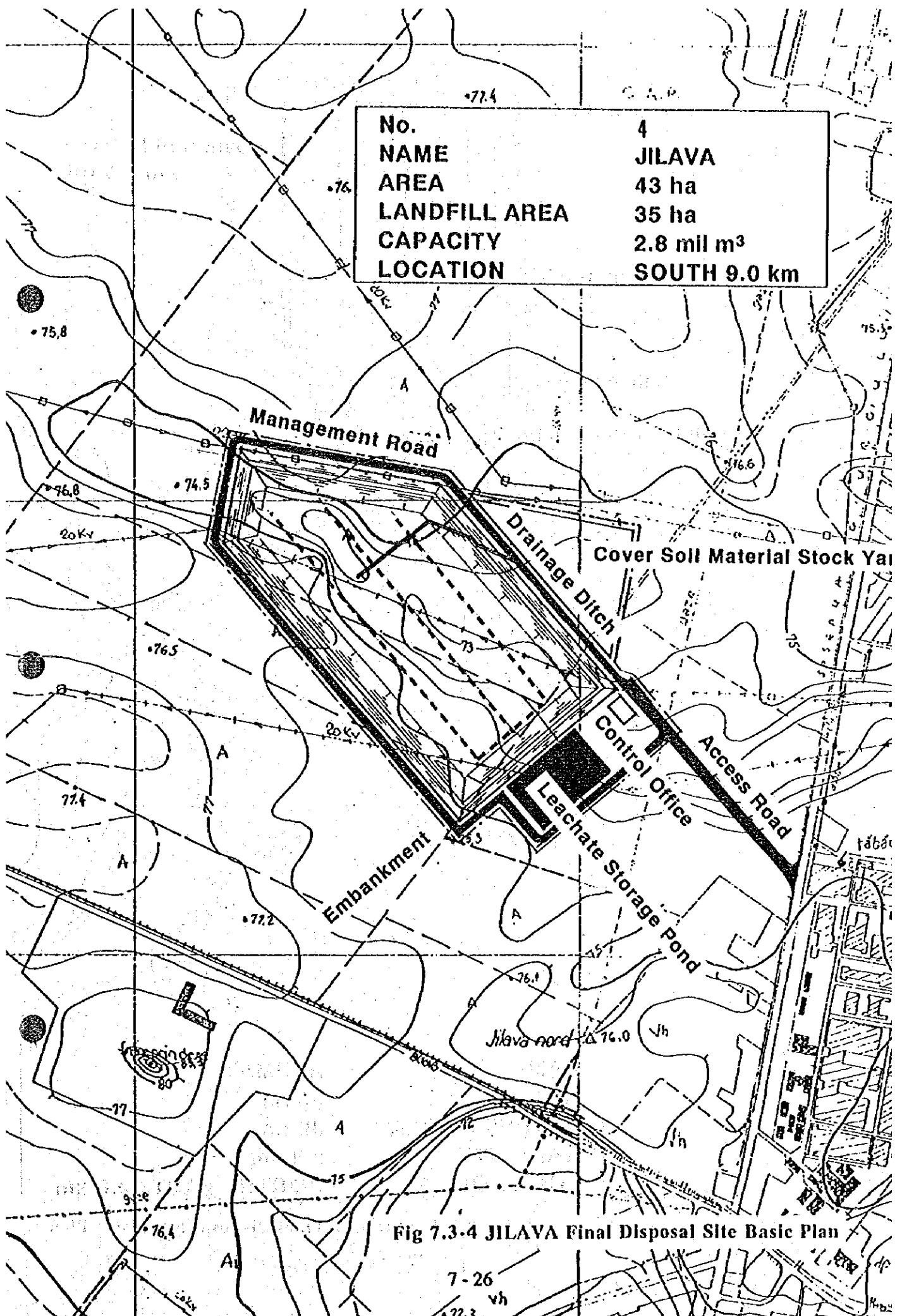
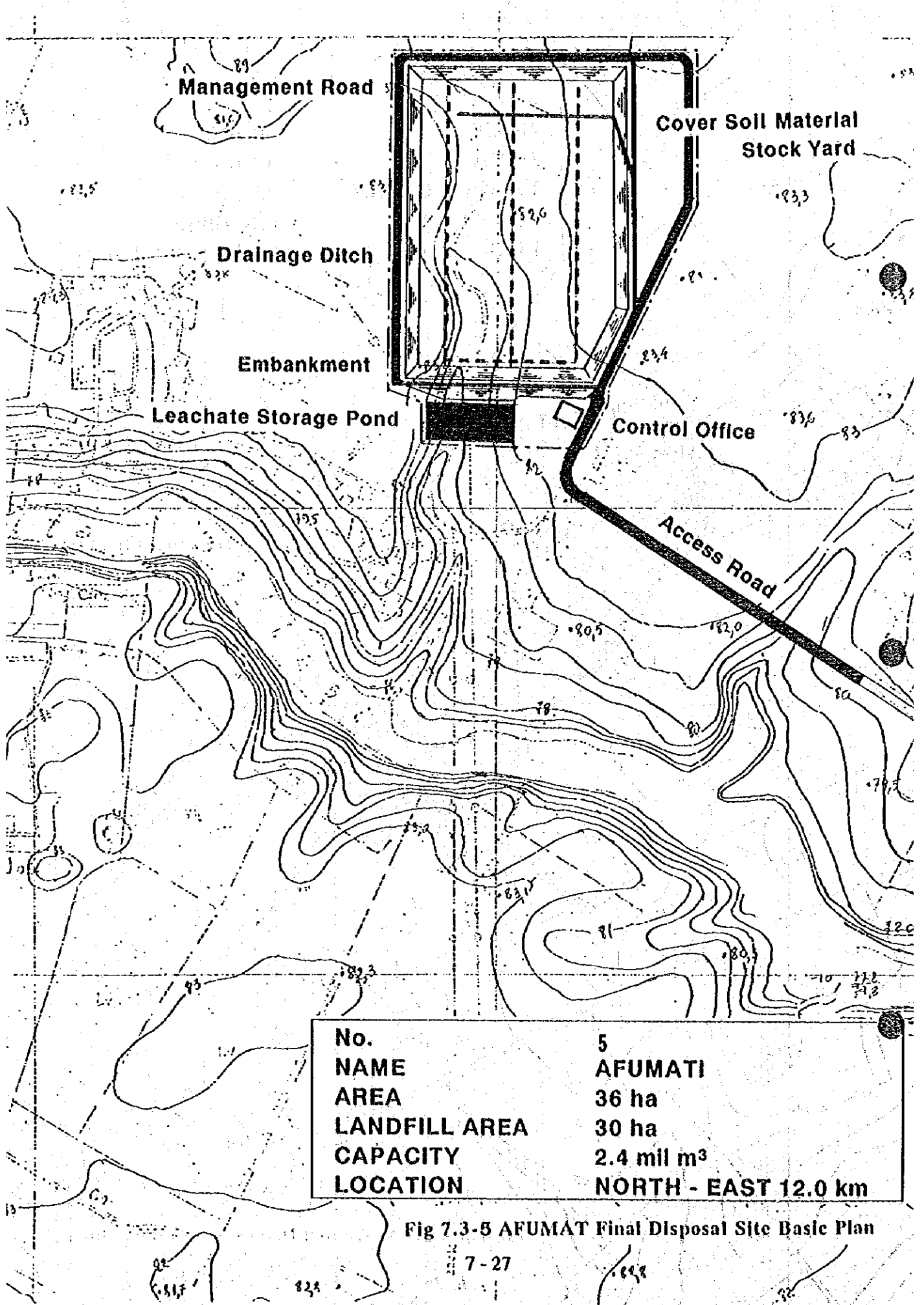
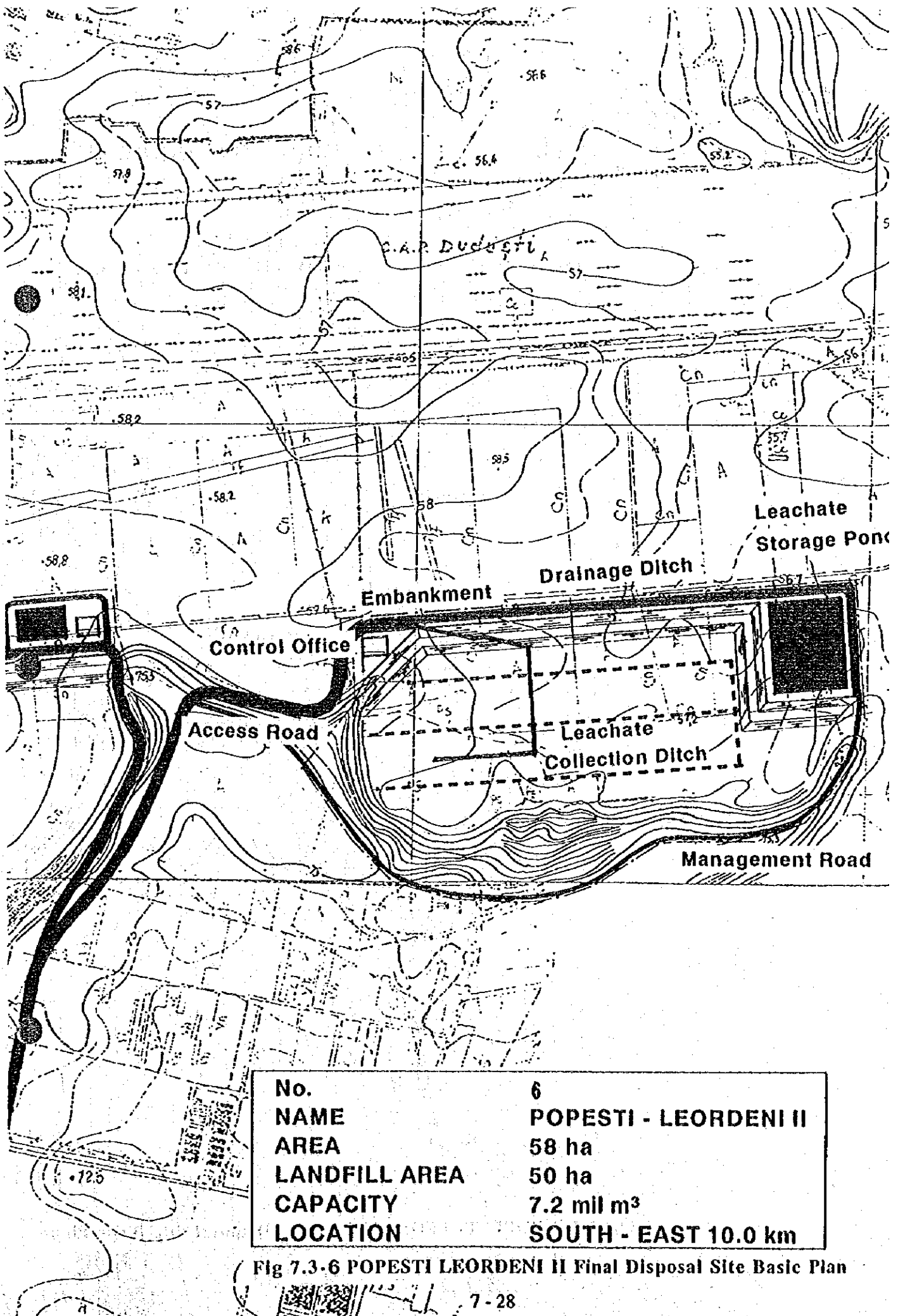


Fig 7.3-4 JILAVA Final Disposal Site Basic Plan



<b>No.</b>	5
<b>NAME</b>	AFUMATI
<b>AREA</b>	36 ha
<b>LANDFILL AREA</b>	30 ha
<b>CAPACITY</b>	2.4 mil m <sup>3</sup>
<b>LOCATION</b>	NORTH - EAST 12.0 km

Fig 7.3-5 AFUMAT Final Disposal Site Basic Plan



( Fig 7.3-6 POPESTI LEORDENI II Final Disposal Site Basic Plan

No.	7
NAME	POPESTI LEORDENI I
AREA	25 ha
LANDFILL AREA	21 ha
CAPACITY	3.0 mll m <sup>3</sup>
LOCATION	SOUTH - EAST 7.0 km

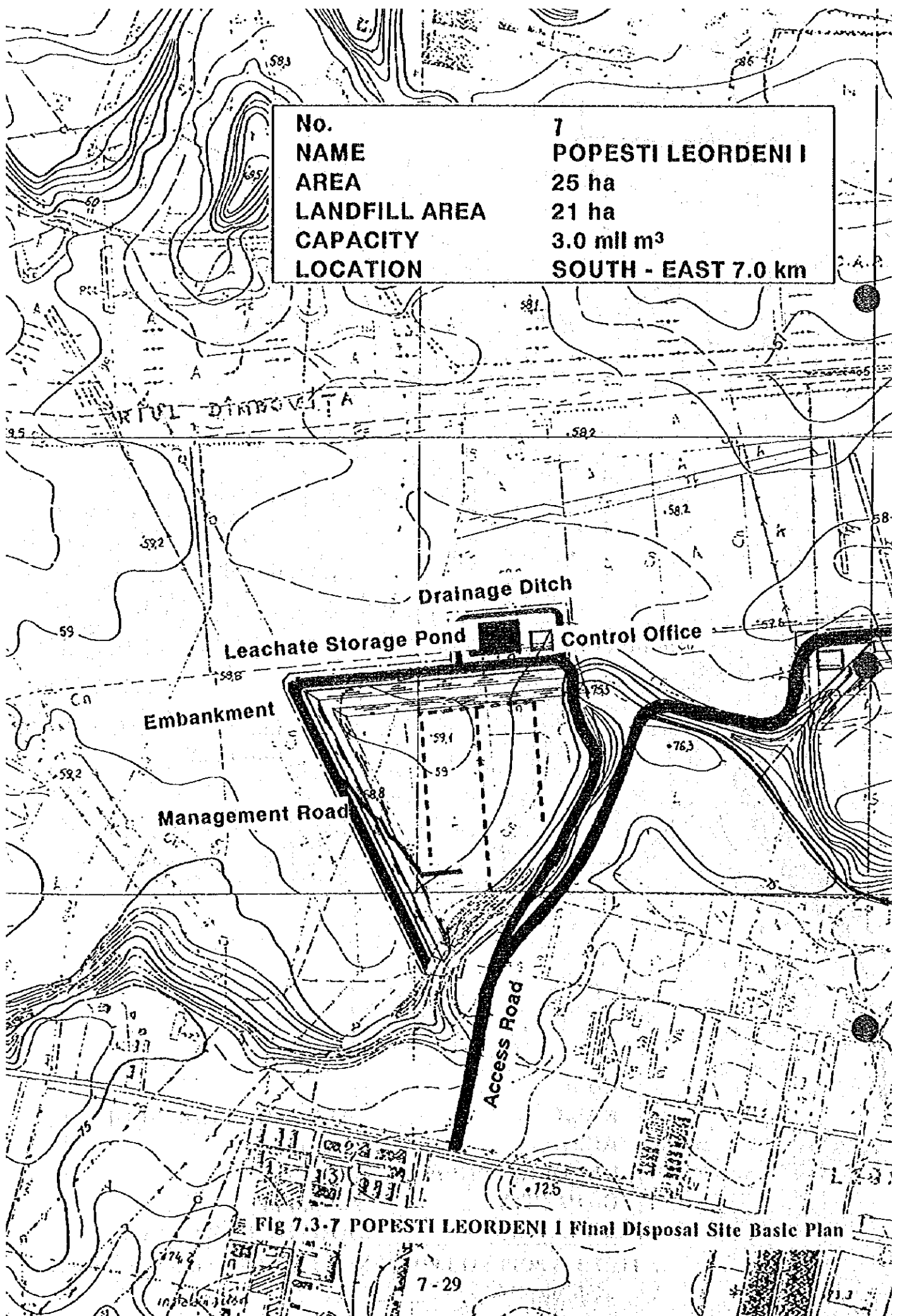
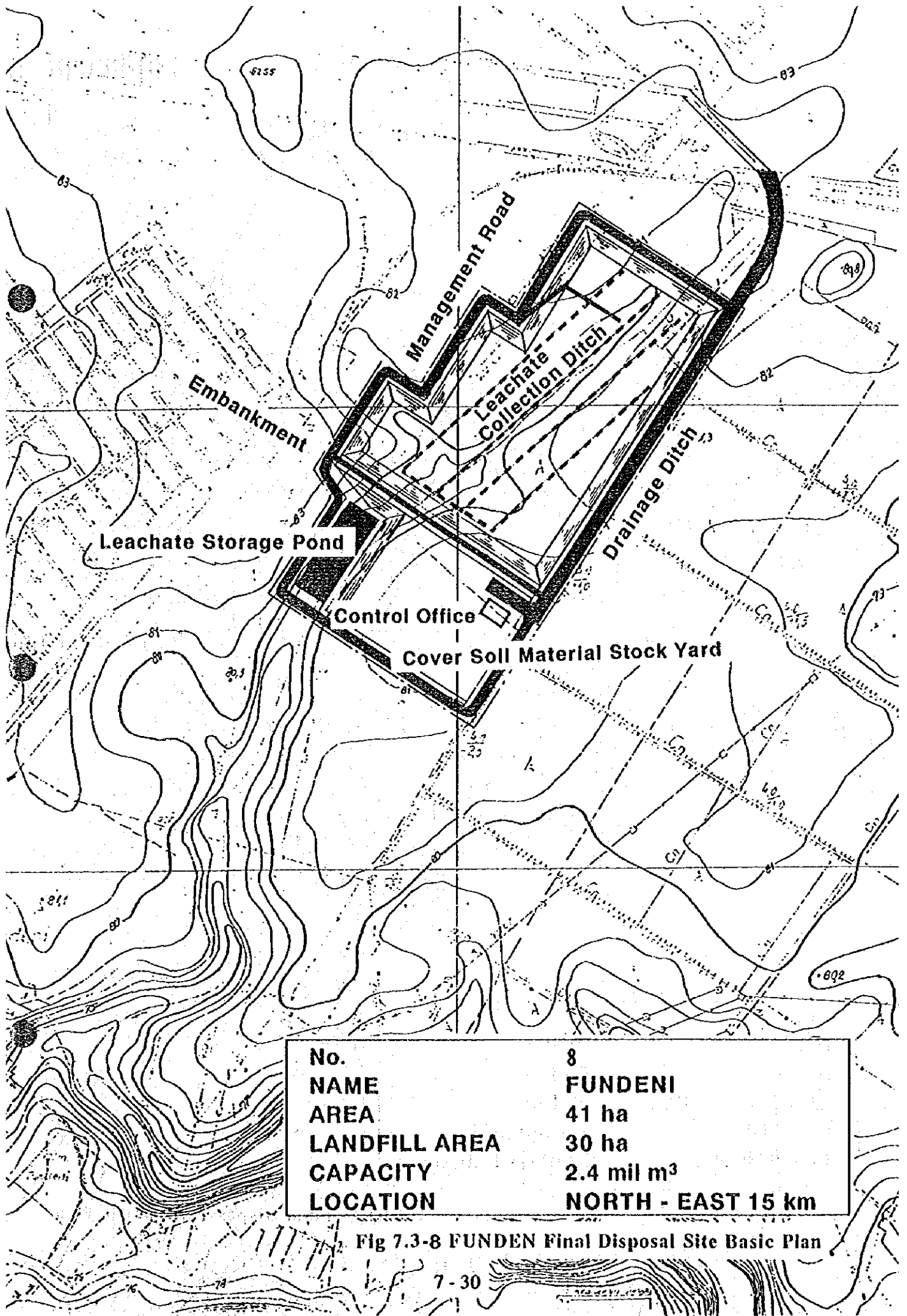
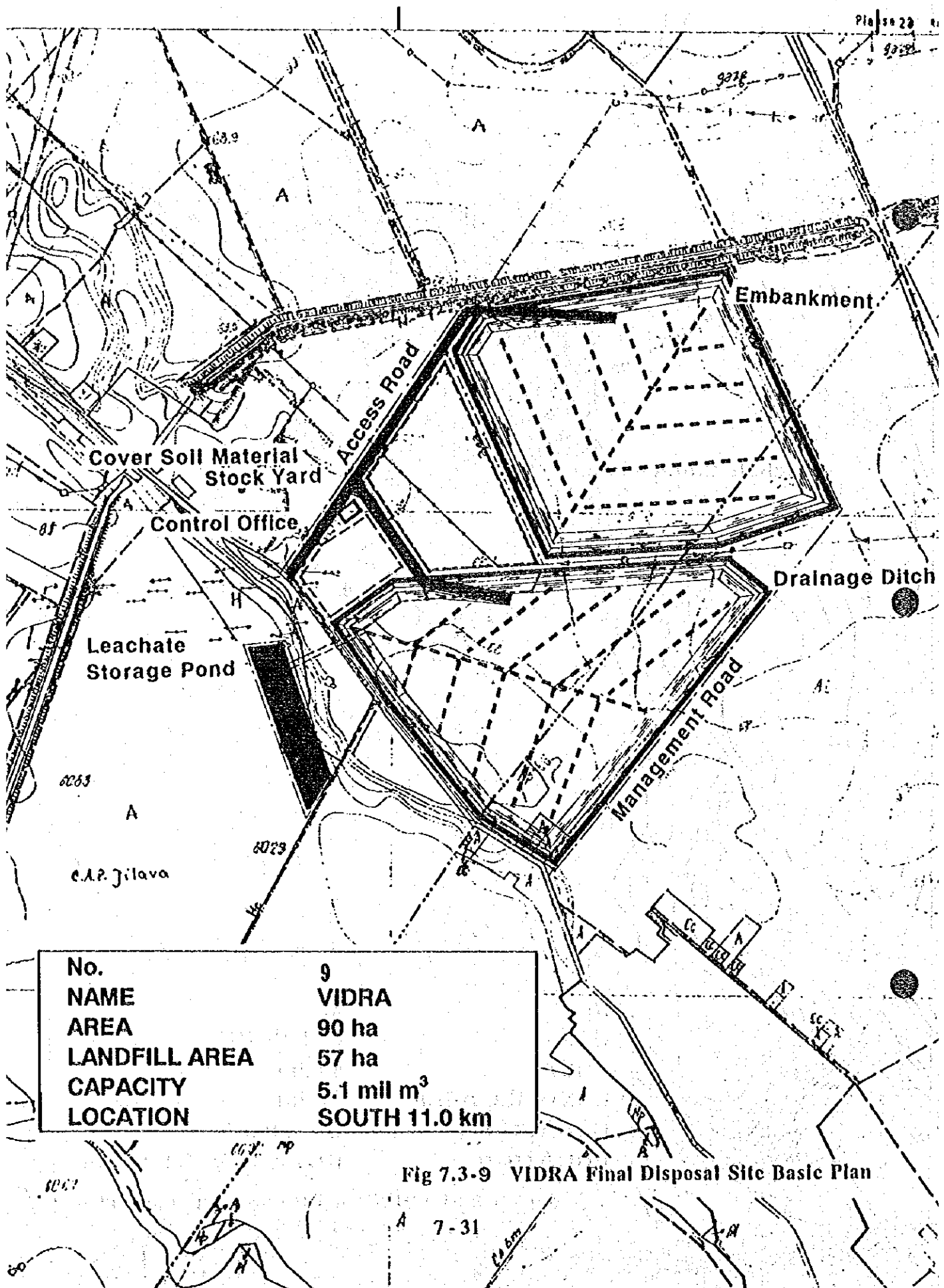


Fig 7.3-7 POPESTI LEORDENI I Final Disposal Site Basic Plan



<b>No.</b>	8
<b>NAME</b>	<b>FUNDEN</b>
<b>AREA</b>	41 ha
<b>LANDFILL AREA</b>	30 ha
<b>CAPACITY</b>	2.4 mil m <sup>3</sup>
<b>LOCATION</b>	<b>NORTH - EAST 15 km</b>

Fig 7.3-8 FUNDEN Final Disposal Site Basic Plan



No.	9
NAME	VIDRA
AREA	90 ha
LANDFILL AREA	57 ha
CAPACITY	5.1 mil m <sup>3</sup>
LOCATION	SOUTH 11.0 km

Fig 7.3-9 VIDRA Final Disposal Site Basic Plan

No.	10
NAME	CHIAJNA
AREA	50 ha
LANDFILL AREA	42 ha
CAPACITY	3.0 mil m <sup>3</sup>
LOCATION	WEST 11.5 km

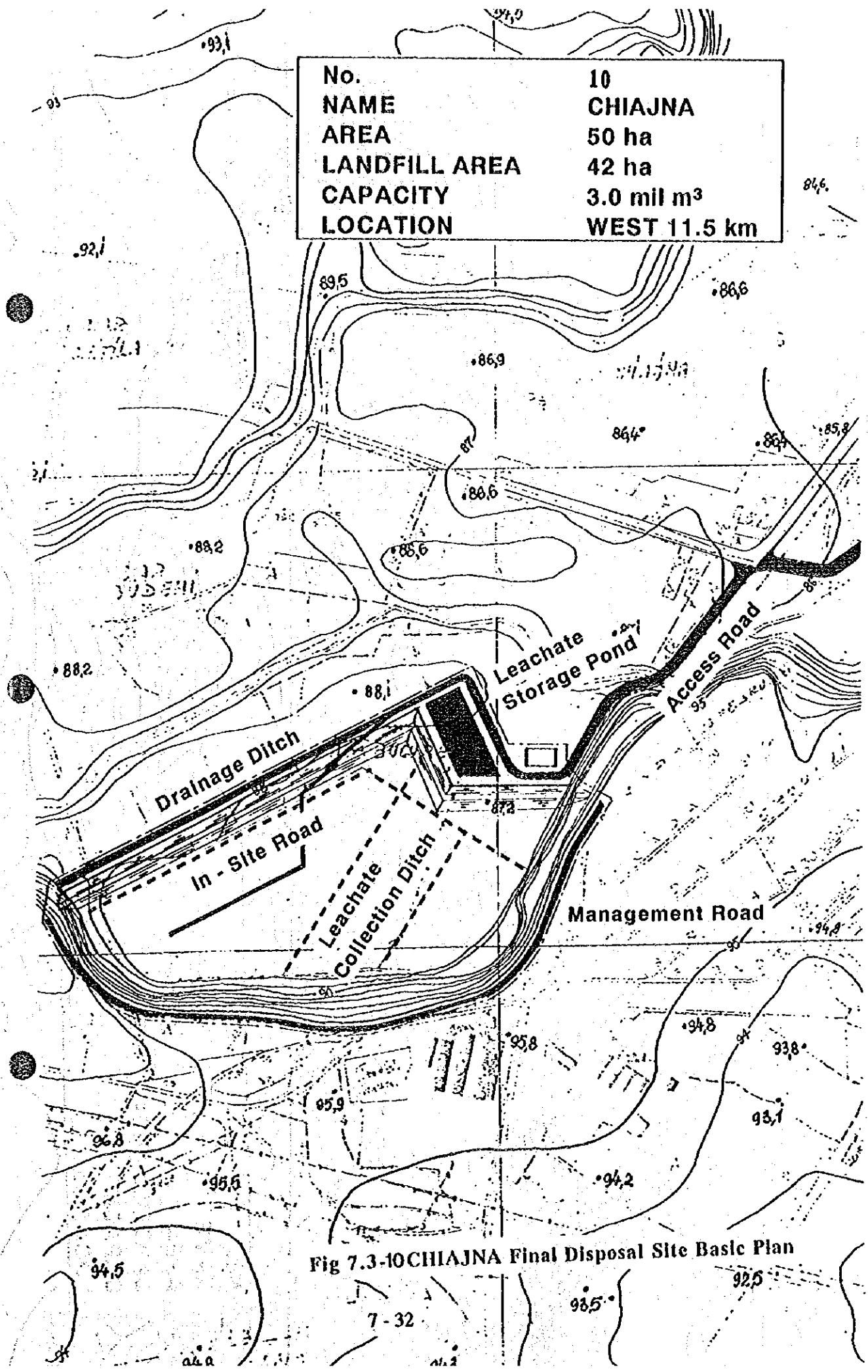


Fig 7.3-10 CHIAJNA Final Disposal Site Basic Plan

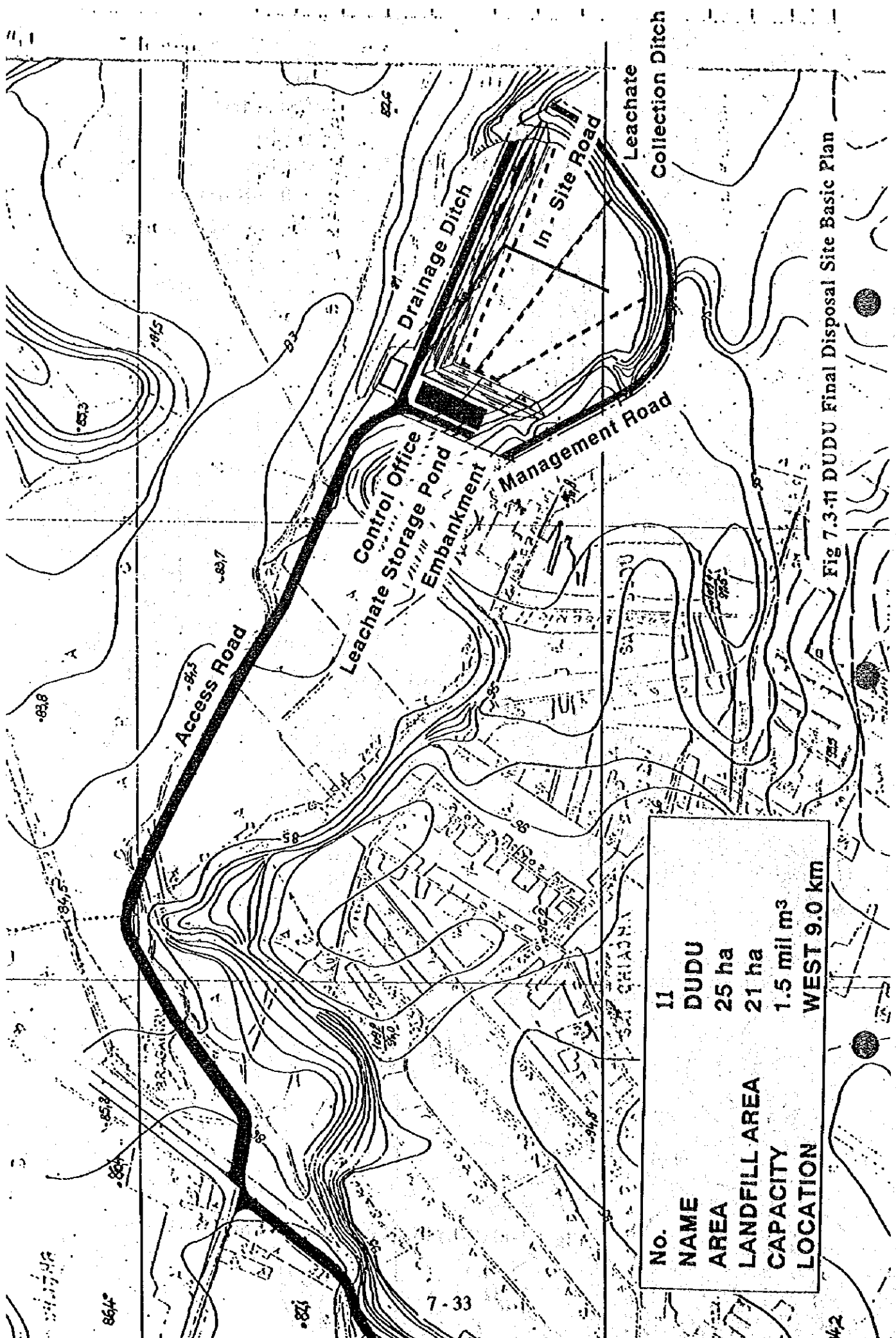


Fig 7.3-11 DUDU Final Disposal Site Basic Plan



## 7.4 Calculation for Leachate Quantity

### 1. Climatic Condition

Bucharest is located at 44° 22' N.L. and 26° 5' E.L. .

The climate is continental and is influenced by southerly and westerly air currents. According to the Romanian Statistical Yearbook, the annual average rainfall was 589 mm and the annual average temperature was 11°C between 1901 and 1990. The monthly average of this period is given in Table 7.4-1.

**Table 7.4-1. Average Temperature and Rainfall of Each Month**

Month	1	2	3	4	5	6	7	8	9	10	11	12	Ave. Total
Average temperature (°C)	-2.4	-0.3	5.2	11.6	16.9	20.6	22.8	22.3	17.8	11.8	5.5	0.4	11.0
Quantity of rainfall (mm)	41	34	37	44	68	86	58	51	39	41	49	41	589

(1901~1990: Romanian Statistical Yearbook)

### 2. Evaporation

Evaporation is calculated from data of monthly average temperature and monthly total rainfall.

< Thornthwaite - Formula >

$$E_p = 0.533D_j (10t_j / J)^a$$

$$a = 0.000000675J^3 - 0.0000771J^2 + 0.01792J + 0.49239$$

12

$$J = \sum_{j=1}^{12} (t_j / 5)^{1.514}$$

j=1

:  $E_p$  : Level of average monthly evaporation (mm / day)

$D_j$  : j - monthly hours sunshine of per day (12hrs / day = 1.0)

$T_j$  : j - monthly average temperature (°C)

In general, there is a difference between the calculated result and the actual measurement. Therefore, recalculation is needed to determine the correct evaporation. The coefficients of each month are given in Table 7.4-2.

**Table 7.4-2. The Coefficients of Each Month for Correct Evaporation**

Month	1	2	3	4	5	6	7	8	9	10	11	12
Coefficient (1)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Coefficient (2)	0.4	0.4	0.5	0.6	0.6	0.7	0.8	0.8	0.8	0.8	0.6	0.5

Note : C (1) Calculation result  $\times$  0.9 = Actual evaporation

C (2) Land condition (Field)

Calculation result is described as Table 7.4-3.

**Table 7.4-3. Capability of Evaporation in Bucharest .**

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
Ep	0	0	17.4	52.5	99.2	125.7	149.4	133.9	84.0	46.5	14.2	0.5	723.3
E <sup>1</sup>	0	0	15.7	47.3	89.3	113.1	134.8	120.5	75.6	41.9	12.8	0.5	651.5
E	0	0	7.8	28.4	53.6	79.2	107.9	96.4	60.5	33.5	7.7	0.3	475.3

Note : E<sup>1</sup> = Ep  $\times$  C (1)

E = E<sup>1</sup>  $\times$  C (2)

### 3. Leachate Quantity

Surface water from rainfall is separated in 3 ways: permeation to groundwater, evaporation and surface water to rivers. In this case, if permeation to groundwater is omitted from the calculation then the leachate quantity increased. Calculated with the following formula. The result is described as Table 7.4-4.

<Calculation - formulae>

$$Q = A / 1,000 (i - E)$$

Q : Leachate Quantity (m<sup>3</sup> / day)

A : Area (m<sup>2</sup>)

i : Rainfall (mm / month)

E : Evaporation (mm / month)

**Table 7.4-4. Leachate Quantity**

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
① Rainfall (mm)	41	34	37	44	68	86	58	51	39	41	49	41	589
② Evaporation (mm)	0	0	7.8	28.4	53.6	79.2	107.9	96.4	60.5	33.5	7.7	0.3	475.3
③ Leachate (mm)	41	34	39.2	15.6	14.4	6.8	0	0	0	7.5	41.3	40.7	230.5
④ Leachate (m <sup>3</sup> / month)	410	340	292	156	144	68	0	0	0	75	413	407	230.5
⑤ Leachate (m <sup>3</sup> / day)	13.2	12.1	9.4	5.2	4.6	2.3	0	0	0	2.4	13.8	13.1	6.3

Note : ④, ⑤ unit is (/ ha)

The result shows annual average leachate quantity is 6.3 m<sup>3</sup> / ha / day, and the quantity of maximum month is 13.8 m<sup>3</sup> / ha / day . And, in the summer season there is no leachate in Bucharest.

#### 4. Leachate Storage Pond Capacity

There is a seasonal change in the leachate quantity, according to Table 7.4-4. It is necessary to control the leachate effluent, to protect agricultural drainage age water against contamination. In this case, the optional capacity must ensure that the annual average leachate quantity (6.3 m<sup>3</sup> d / ha) can flow out continuously, and the annual total leachate quantity can also flow out. The relation between leachate quantity and effluent quantity is shown as Fig. 7.4-1. The figure shows that the storage pond needs 986 m<sup>3</sup> / ha capacity. The construction area is calculated is Table 7.4-5. And, in future we can use the storage pond as a aerobic pond.

**Table 7.4-5. Area of the Storage pond**

Case	Content	Area (m <sup>2</sup> )	Size(m)	Ratio for Landfill Area (%)
	Depth = 1.0 m	986	31 × 31	9.9 %
	Depth = 2.0 m	493	22 × 22	4.9 %
	Depth = 3.0 m	329	18 × 18	3.3%

**Note :** Preliminary design requires that 4% of the landfill area is used for the storage pond, which means that the depth is about 2.5 m.

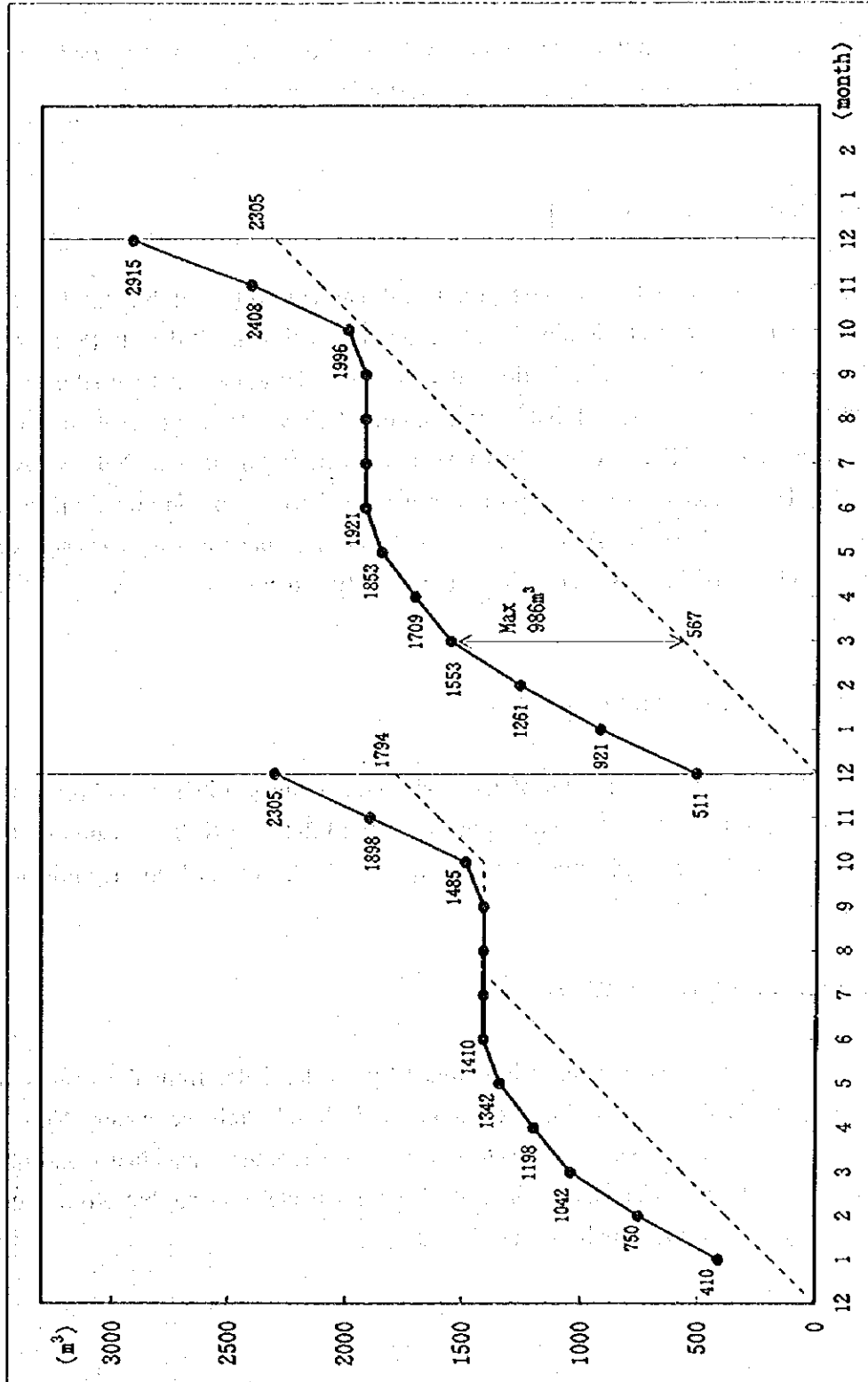


Fig 7.4-1 Relation Between Leachate Quantity and Effluent Quantity

## **7.5. Evaluation of Leachate and Surface Water Quality at Glna Site**

Leachate and the surrounding site surface water quality analysis was carried out at sampling points as shown in Fig. 7.5-1. The results are given in Table 7.5-1. ~Table 7.5-3.

### **1. Leachate Quality Analysis**

Leachate was sampled at the numbered points of 4,5,9 and 10 (See Table 7.4-1.). The result shows BOD and COD is low density compared with general density (See Table 7.5-4.), because there is a constant flow of water from the terrace into the site. In the case where the disposal site is filled up with combustible waste, the leachate indicates that the density of BOD is higher than COD. However, in Glna site, BOD is lower than COD. This indicates that the deposited waste has become low in organic material because of natural burning. And the leachate character is the same as leachate from uncombustible landfill disposal site. Fortunately, there is no heavy metal contamination.

### **2. Surface Water Quality Analysis**

The surface water analysis results of the agricultural drainage ditch, neighboring the site, is give in Table 7.5-2. Sampling points are No3,2-1 and 8. The results of the analysis suggest that the agriculture drainage water near the site is being significantly polluted by the leachate.

### **3. Impacts on Surface Water**

We know the surface water quality is polluted by the leachate, from the results of No.7,8,6 (See Table 7.5-3). No.7 is natural agricultural drainage water, No8 is agriculture water contaminated by leachate and No.6 is where the contaminated and non contaminated water meet. The results indicate that No.7 water is clean, but No.6 water is polluted by No.8 water which includes leachate.

**Table 7.5-1. Leachate Quality Analysis**

Sampling Point No. Item	No.4	No.5	No.9	No.10
BOD	93.6	156.7	3.85	16.41
COD	550.8	652.8	30.6	91.8
O <sub>2</sub> /L/R	0.16	0.24	0.12	0.17
PH	7.0	7.01	6.70	6.71
OIL	318	288	145	95
Pb	<0.1	0.2	<0.1	0.1
Cd	0.1	0.05	<0.05	0.05
Hg	<0.3	<0.3	<0.3	<0.3
As	<0.1	0.1	<0.1	0.1

**Table 7.5-2. Surface Water Quality Analysis (I)**

Sampling Point No. Item	No.3	No.2	No.1	No.8
BOD	27.18	47.24	40.95	43.65
COD	132.6	173.4	183.6	173.4
O <sub>2</sub> /L/R	0.20	0.27	0.22	0.25
PH	6.75	7.01	6.72	6.68
OIL	315	280	644	136
Pb	0.2	0.2	0.2	0.2
Cd	0.05	0.05	0.05	0.05
Hg	<0.3	<0.3	<0.3	<0.3
As	<0.1	<0.1	<0.1	<0.1

**Table 7.5-3. Surface Water Quality Analysis (2)**

Sampling Point No. Item	No.8	No.7	No.6
BOD	43.65	3.8	32.4
COD	173.4	20.4	112.2
O <sub>2</sub> /L/R	0.25	0.18	0.28
PH	6.68	6.43	6.74
OIL	136	145	355
Pb	0.2	0.2	<0.1
Cd	0.05	<0.05	0.05
Hg	<0.3	<0.3	<0.3
As	<0.1	<0.1	<0.1

**Table 7.5-4. General Density of Leachate**

Content Item	Combustible waste	Uncombustible waste	Mixed waste
PH	5.0~8.6	4.0~9.0	4.0~8.6
BOD (mg /l)	250~2,500 (1,000)	10~2,200 (500)	500~1,000 (500)
COD (mg /l)	200~800 (400)	20~3,600 (400)	450~500 (400)

Note : ( ) the center value



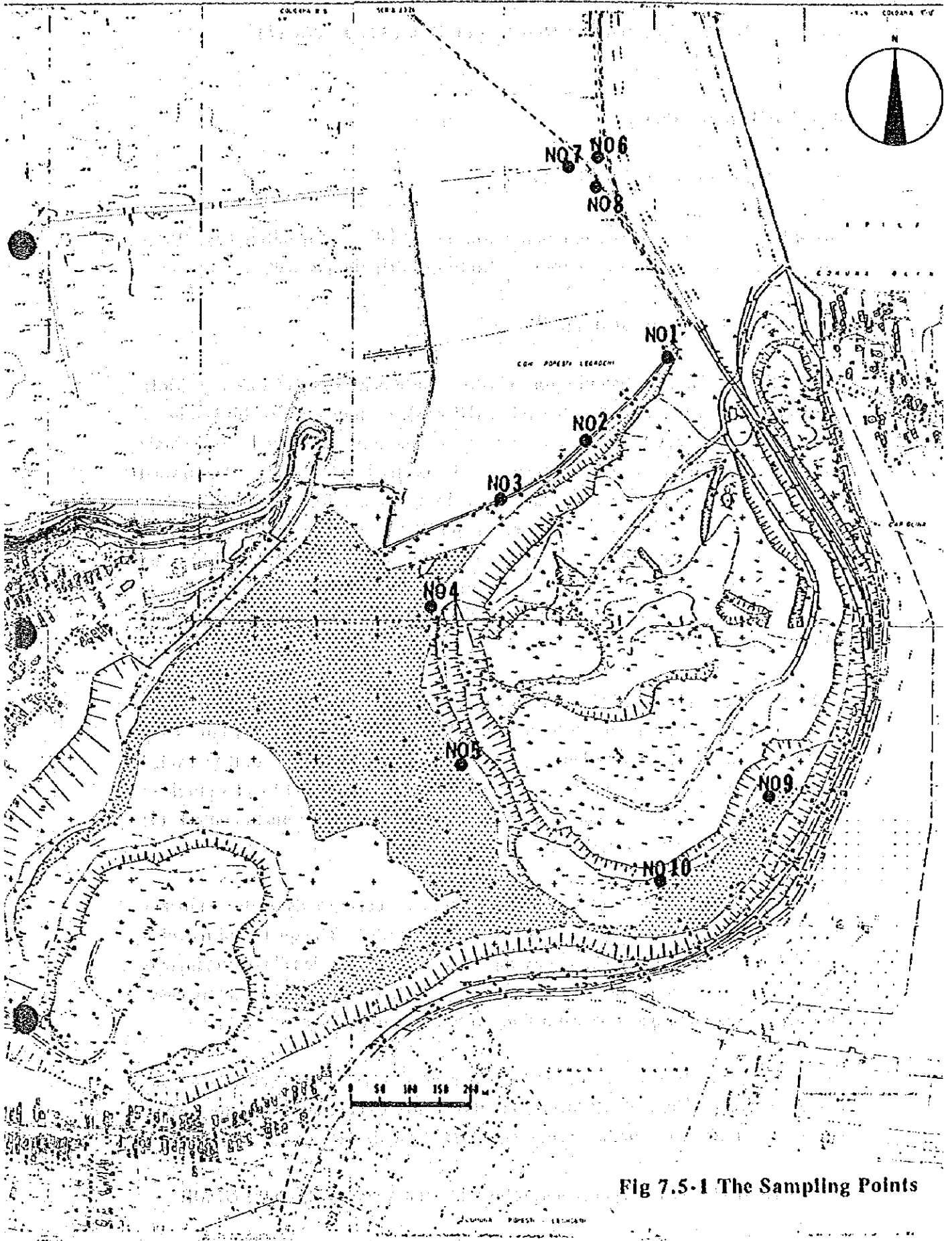


Fig 7.5-1 The Sampling Points

## **8. INDUSTRIAL, HAZARDOUS and HOSPITAL WASTE MANAGEMENT**

### **8.1 Industrial Waste**

#### **1) Definition of Industrial Waste**

According to the Bucharest Sanitation Norm, industrial waste is defined as "Waste which comes from process of enterprises". No further definition is made.

#### **2) Collection of Industrial Waste**

Central government responsibility for industrial waste is Ministry of Industry (MoI). National Commission of Material Recycling (NCOMR), a commission established in the MoI, prepares strategy to promote material recycling at national level. Recyclable materials such as metal scraps are collected and processed by REMAT, a state-owned company established in 1949 under the National Commission for Material Recycling. REMAT is financially independent. There are 44 REMAT in the country. Principally one county has one REMAT, but in Bucharest there are two REMAT, REMAT sud (south) and REMAT nord (north). Recently, majority of REMAT are in the process of privatization. Furthermore, there are more than 200 private companies who collect industrial waste.

Materials collected by REMAT are iron, copper, brass, lead, aluminum, glass, textile and waste paper. REMAT collects these materials by its own cars. REMAT buys scrap from factories at pre-determined prices, process and then sell it to users of the recycled materials. The prices are reviewed every two or three months. REMAT's purchase price of iron scrap is lower than the international rate. The government controls the export of these recyclable materials.

REMAT separates and sorts collected metals by kinds, cuts, grinds, bails and makes them briquettes. Its sorting process is not so sophisticated. The quality of recycled metals does not seem to be high. For example, the purity of recycled aluminum ingot is not high. It seems that volume of waste aluminum is physically reduced only for easy-handling. It needs re-separation and melting to eliminate impurities.

Factories receive recycled and processed materials in exchange with recyclable materials of the same value. Normally REMAT sends its cars to collect scrap. If a factory brings scrap by itself, REMAT reimburses transportation cost to the factory.

Current REMAT's business generates profits without any subsidy from the NCOMR.

### **3) Treatment and Disposal of Industrial Waste**

Every factory is responsible for treatment and disposal of its own industrial waste. Ministry of Water, Forest and Environmental Protection (MoWFEP) has an authority to control facilities for industrial waste treatment and disposal. According to statistics on waste in Romania and the statistics of Bucharest city, waste treatment and disposal methods are classified into two categories; controlled landfilling and uncontrolled landfilling.

However, in reality, all non-recyclable waste generated from factories is brought to Glina disposal site without being classified as industrial waste.

According to the Study Team's interview with a factory, non-recyclable waste material, plastic and kitchen garbage are transported to the Glina site by its own trucks. According to an agreement between the factory and RASUB, the factory does not pay any tipping fee to RASUB, while RGR pays 770 lei/m<sup>3</sup>. This factory has 2,000 employees. 10 tones of waste metal is collected a week from this factory according to a reliable record of REMAT, while generation of other types of waste ranges from 5 to 10 tons a week, which are estimated based on the fact that 5 tons trucks collect their waste once or twice a week.

## **8.2 Hazardous Waste**

### **1) Definition of Hazardous Waste**

Central government responsibility for hazardous waste MoWFEP. Hazardous has not been defined clearly by law. Actually MoWFEP follows the classification of Basel Convention. This classification is already used in the record of waste control which is presented by the Bucharest local environmental agency under the MoWFEP.

### **2) Management of Hazardous Waste**

MoWFEP is responsible for approval of hazardous waste treatment facilities for large factories, while local agencies of MoWFEP are responsible for medium and small factories. Technical standards applied to the treatment facilities are provided by MoWFEP in agreement with Ministry of Technology and Research.

Both MoWFEP and its local agencies have inspection units. In principle, they examine and inspect the facilities not only at the time of construction but also during operation, but in fact local environmental agency in Bucharest seems to examine the facilities only at the time of construction. The local environmental agency in Bucharest only suppose

that every factory merely stores its hazardous waste due to lack of treatment methodology and technology. In addition, the following facts may be the reasons:

- the local agency has only five to six staff
- the local agency's staff said that they have no authority to confirm the factory's answer on its industrial waste.
- an officer of MoWFEP mentioned that there is a social resistance (this may mean industry's resistance) against environmental protection

It seems that no control system for hazardous waste management is established. There is no person responsible for management of hazardous waste treatment in the factory. Besides, the local environmental agency seems to have no authority to inspect a factory when the factory illegally disposes their hazardous industrial waste at Glina site.

### **8.3 Hospital Waste**

#### **1) Definition of Hospital Waste**

Central government responsibility for hospital waste management is Ministry of Health (MoH). MoH has their own internal norm, in which hospital waste seems to include all the waste generated by hospitals.

#### **2) Hospital Waste Management**

There is no person in hospital who is responsible for waste control. The Study Team observed that untreated cotton, gauze and disposable injection cylinge are thrown into containers located in hospitals.

Every hospital should have its own incinerator in compliance with the internal norm, and should incinerate hospital waste, but in reality incineration is poorly practiced. An incinerator that the Study Team visited was not capable of burning waste. It only toasted the waste by gas burner. In such circumstance, temperature is not enough to sterilize inside the waste, though the surface can only partly be sterilized. Residue of incinerated hospital waste is thrown into containers of 4 cubic meters and RASUB collects and disposes at Glina disposal site.

Amount of waste discharged from hospitals with 300 to 700 beds, are estimated to be 60 to 70 m<sup>3</sup> per month. This is estimated by number of trip, that is, 20 trips of four cubic meter container per month. Collection fees paid to RASUB is 600,000 to 700,000 lei per month.

## **9. INSTITUTIONAL ARRANGEMENTS**

### **9.1 Introduction**

The institutional arrangements for Solid Waste Management in Bucharest are undergoing fundamental change. Under the Central Government's Ordinance No 69, MB is required to liquidate the Autonomous Regie RASUB, and replace it with a new body.

The evaluation of institutional arrangements considers the role of national bodies, MB and RASUB, and takes account of the implications of Ordinance 69.

Based on the evaluation we have presented proposals for institutional reform. Proposals for organisational and management strengthening of MB and RASUB are separately dealt with in Chapter 3.

Although the scope of the analysis covers collection, disposal and street cleansing, our approach for Progress Report 2 is to focus on collection and haulage services. Disposal and street cleansing arrangements will be covered in more detail in the Interim Report. We have therefore presented outline proposals in Progress Report 2 in two ways/parts:

Firstly we have considered and evaluated a range of contracting options for collection and haulage. The objective here is to provide a framework for guiding and informing the debate on what the most appropriate contracting is for MB, not only for its current needs but also for future requirements.

Secondly we have summarised and briefly evaluated MB's latest draft proposal (at 5/11/94) for Ordinance 69, giving outline recommendations.

Not surprisingly it has been difficult for MB to assess and identify the optimal institutional solution to Ordinance 69. However, MB is confident that its proposed arrangements will improve the quality of collection and disposal services, foster competition and improve cost efficiency.

At the Interim Report we will propose a detailed solution(s). This will set out detailed responsibilities and organisational arrangements for both MB and the new Provider, as well as defining a contractual structure. Disposal and street cleaning will be covered.

## **9.2 Evaluation of Current Institutional Arrangements**

### **9.2.1 National Overview**

A preliminary evaluation of the institutional framework of SWM showed that there are a number of major responsibilities at national level and in Bucharest that are either fragmented across institutions or are not being performed.

Table 9.1 below is an Institutional Responsibilities Matrix for Solid Waste and shows the main institutional responsibilities and which institutions undertake them. Both central government as well as local institutions are shown. Responsibilities for non-municipal waste, including hazardous waste, are shown in *italics*.

The following issues were identified:

#### **1) Policy and Planning**

Formulation of policy and planning is very weak at both the national and local level and is fragmented across institutions. No central government body is assigned with responsibility for SWM policy development, planning or the preparation of national standards and guidelines. Ministries pursue their own initiatives but do not coordinate.

#### **2) Legislation**

There is no national law on SWM yet. However, we understand that the MoE is taking the lead (supported by the MoI) in formulating a new waste law under a joint program with the Secretariat of the Basel Convention.

Legislation on recycling is similarly deficient, but the MoI's NCMR has recently elaborated the proposed Law Concerning Material Recycling.

#### **3) Setting Standards and Formulating Regulations/Norms**

There is fragmentation of responsibilities between the MoE, MoI and MB in setting SWM standards and formulating regulations for municipal waste. These activities should be coordinated or rationalised at national level, once it has been established who will take the lead role in SWM policy and planning.

#### **4) Issuing Permits/Licensing and Enforcement**

There is a fragmentation of responsibility for issuing permits/licenses for SWM activities. MPLAT and MoE issue licenses for landfill sites. MoI issues permits for recycling.

#### **5) Contracting**

MB wishes to contract out the SWM service. Although there are national laws governing contracting arrangements, there is no responsibility at central government level to give guidance to local government or to monitor contracting arrangements. A watch dog body like a National Audit Office would usually be responsible for this.

#### **6) Linkages Between Institutions**

There are very few institutional linkages between institutions involved with SWM. Coordination of policy, planning, legislation and service provision is virtually non-existent.

There are no linkage between MB and central government for SWM. Nor are there any reporting line responsibilities between RASUB and central government.

There are, however, a number linkages between RASUB and MB, e.g. appointment of RASUB's Council, investment approval etc., but in practice these are weak. RASUB enjoys a high degree of autonomy.

Table 9.1 Institutional Responsibilities Matrix for Solid Waste

Institutional responsibilities	MB	RASUB	Private Sector RGR	MPLAT	Ministry of Water, Forest & Environmental Protection	Ministry of Health	Ministry of Industry
Policy and planning	Public Services Department (PSD)				1. municipal waste 2. other waste (including hazardous)	for hospital waste only	industrial waste? recycling
Legislation	Local Council Decisions				lead ministry for proposed SWM law covering all wastes including municipal	for hospital waste only	industrial waste? recycling
Setting standards and formulating regulations /norms	regulation and sanitary norms				issues regulations and technical standards on waste	for hospital waste only	industrial waste? recycling
Issuing permits/licensing and enforcement				1. for siting of landfill sites 2. no enforcement	1. for landfill sites 2. Environmental Protection Agencies enforce	1. for hospital waste only 2. Sanitary Police enforce	NCMK issue permits for recycling enforcement?
Managing private sector contracting - procurement - monitoring - enforcement	1. PSD, Legal and Economic Depts are jointly responsible 2. PSD monitor and enforce						
Provision of services - collection and haulage - treatment and disposal	monitor RASUBS's activities	municipal solid waste	collection and transfer only			hospitals responsible	1. REMAT enterprises responsible for recycling 2. industrial state companies are responsible for their wastes including hazardous waste
Investment planning				Foreign investment only			
Financing - capital investment - operating expenditure	1. investment financed from municipal revenues 2. no opex subsidisation	1. capex financed by MB 2. opex recovered through tariffs					
Research and Development				own research institutes	ICIM research institute	own research institutes	NCMK coordinate research programs
Street sweeping	provided through ADRs						



### **9.2.2 The Role of the Municipality in SWM**

MB is primarily responsible for the provision of SWM services to the citizens of Bucharest. These responsibilities are set out in Law 10, 1982 which concerns obligations for municipal waste and Law 69, 1991 which concerns municipal governance.

MB's duty is to administer SWM services including investment financing. Its main responsibilities may be summarised as:

1. planning and policy development;
2. setting standards and formulating norms;
3. approval and financing of RASUB's investment plans; and
4. monitoring of service levels and enforcement of the norms.

However, MB is not able to discharge these responsibilities and legal obligations properly. The quality of the SWM service has deteriorated and is poor.

The collection service is characterised by low frequency, poor reliability and a significant amount of illegal dumping.

The disposal service is characterised by deficient infrastructure and poor operational standards. There is no access road at Glina site and environmental protection measures are lacking with implications for environment and public health. A detailed evaluation of deficiencies in collection and the disposal is provided in Chapter 5.

There are a number of reasons for which MB lacks the capacity to discharge these duties.

**Firstly**, MB has no hands on experience of managing the service. The service is provided by RASUB which is autonomous of local government. As a result MB is unable to effectively regulate and control RASUB to ensure good service delivery, efficient operational practices, resource effectiveness and proper financial management.

In particular MB lacks the power to sanction RASUB when it breaches the Bucharest Sanitation Norm. This is due to the lack of a robust mechanism by which penalties can be enforced.

**Secondly**, MB is primarily responsible to invest in SWM because central government does not finance RASUB's capital investment (capex). However MB's local source revenue base is so constrained that it is now unable to finance any of RASUB's capex. The reason for this is local government's lack of financial autonomy.

**Thirdly**, MB lacks the staff in its PSD to effectively monitor RASUB's services. MB is constrained by central government laws on the number of staff it may employ.

**Lastly**, MB does carry out proper short or medium term planning of SWM.

To a certain extent it can be argued that planning will be ineffective because the other constraints and uncertainties to service provision are so overwhelming. However good planning and objective setting are essential to foster management and regulatory discipline. It would be appropriate if formalised planning procedures were developed.

Most of the reasons described above are clearly beyond MB's control.

### **9.2.3 The Role of RASUB**

RASUB is established under Law 15 and MB's Local Council Decision No 1190, 1990 under which RASUB is responsible to provide SWM services to the citizens of Bucharest.

RASUB enjoys a high degree of autonomy. Through its Administrative Council and Board of Directors, it is free to manage its affairs, to finance its operating costs from tariffs, and to hire and employ its own staff.

However RASUB is not able to discharge its SWM responsibilities properly. As discussed above service levels are very deficient. The main reasons for which MB lacks the capacity to discharge its duties are:

**Firstly**, operational delivery is poor. Collection coverage is low and illegal dumping is significantly high. This is primarily due to a shortage of bins and secondly to low vehicle utilisation. Management weakness is also a significant contributory factor. Vehicle condition is poor and maintenance is inadequate, and operational management is weak.

**Secondly**, there are a number of management weaknesses:

**Secondly**, there are a number of management weaknesses:

Senior management is bureaucratic and ineffective. The Council of Administration has not resolved the major issues facing RASUB, nor has it implemented a strategic planning framework or developed practical policies. Its main concern appears to be to carry out its minimal statutory responsibilities rather than to manage and improve RASUB's services.

The Directors Board cannot act like a management board because it has too few powers; under Law 15, 1990 it is assigned the day to day management of RASUB only.

There is virtually no formalised planning capability in RASUB by which annual, medium and long term plans are prepared and implemented. Only a simple annual investment plan and a rudimentary budget are produced.

There is no MIS capability under which information is periodically reported to managers to enable them to make effective decisions and efficiently carry out their responsibilities.

Lastly, there is no budgetary planning and control system for either recurrent or non recurrent expenditure. This is vitally necessary to foster financial discipline and cost efficiencies, and to support the implementation of the annual and medium term financial plans.

**Thirdly**, RASUB is financially constrained. Under Art6 of Law 15, 1990 it must cover its opex costs through its tariffs. However the tariffs which are set with MB and MoF approval, do not appear to be sufficient to cover all its costs. In particular maintenance spend is too low for operational requirements.

Although Art9 permits RASUB to borrow from banks to cover negative cashflows, in practice it is reluctant to do because of high financing costs.

For its capex spend RASUB relies almost entirely on MB to finance it. As discussed above MB is now unable to finance RASUB at all.

#### **9.2.4 The Role of the Private Sector in SWM**

**A detailed assessment of the role of the private sector will be given after Interim Report.**

**This will include:**

- a) an assessment of RGR.**
- b) opportunities and constraints to private sector development in Bucharest**
  - i) economic environment**
  - ii) legal framework**
  - iii) capital requirements**

**Background data on RGR is given in Appendix 3.6.**

## **9.3 Proposed Institutional Reform of SWM for Bucharest**

### **9.3.1 Outline Options for Restructuring Collection and Haulage**

#### **1) Introduction**

It is generally assumed that contracting services to the private sector, the "Provider", which could be SALUB, RGR, or other companies, is the best solution to improving service quality and reducing costs. Empirical evidence suggests so and we have made this assumption in developing options for restructuring collection and haulage.

Contractual arrangements cover different alternatives in which the responsibility and the financial commitment of MB may be more or less prominent, and vice versa for the Provider.

Different types of contracts also imply different organisational responsibilities and structures. It is therefore necessary to identify and to define the type of contractual relationship between MB and the Provider before their respective organisational requirements can be defined.

The purpose of this analysis is to identify an optimal contracting solution for current needs by:

- identifying a range of options;
- specifying criteria for choosing between options; and
- presenting an evaluation and selecting a preferred option(s).

It is emphasised that at this stage the recommendations given may be subject to modification at the Interim Report. Detailed organisational requirements for the preferred solution will be presented in the Interim Report.

At that time we will also propose a future structure and outline a possible transition path from the current situation. The future structure is a goal which MB should aim for.

## **2) Range of Options**

The range of contracting possibilities for MB is categorised into 5 options given below. One of these is a non contracting scenario, i.e. MB provides all SWM in house. This is included for comparative purposes only.

1. no contract scenario - MB provides SWM service;
2. a management contract;
3. a leasehold contract;
4. concessions; and
5. franchising.

We have not considered full privatisation to be a viable option. This is not only because it is too risky. It is considered inappropriate for SWM because it requires regulatory arrangements which are unnecessarily complicated and costly to maintain for a service at this level. Contracts between MB and Providers are easier to manage. On economic grounds alone privatisation appears to be unjustified.

The contracting options are based on commonly accepted contract structures which are employed in a number of countries, e.g. the Japan, USA, UK and Malaysia. These options are evaluated in Section 4 below against the selection criteria which are defined in section 3 below.

A brief description of each option are given below in terms of the main obligations and financial commitments. MB can choose to carry out these tasks itself or contract them out in whole or in part to a private sector Provider. They can be summarised as:

1. capital investment (capex) financing and construction;
2. operation and maintenance;
3. setting and approval of tariffs or fees;
4. obtaining payment from citizens;

### **a. No Change Scenario**

MB provides the whole SWM service itself and finances it from a local waste tax (fee). MB therefore bears all the risks

**b. Management Contract**

The Provider is only responsible for operation and maintenance, and MB retains the responsibility for capex financing and construction. MB is responsible to collect revenues from citizens by a waste tax (fee) or from general taxation.

The MB can remunerate the Provider by a number of methods. Generally two approaches are available:

Firstly, the Provider's work is remunerated according to physical parameters such as quantity of waste collected, the number of customers, route length etc, or a combination of them. Maintenance expenses can be absorbed in this formula or reimbursed by MB against certified statements.

Alternatively, a lump sum can be negotiated based on full costings, with a price formula to absorb uncontrollable cost increases, e.g. utilities and collective pay increases.

This appears to be preferred by MB because it is easier to price the contract on the existing tariff and revenue base since reliable costing data cannot be supplied from RASUB.

However, we would recommend using the quantity of waste, because this incentivises the Provider to increase the amount collected. This is very appropriate for Bucharest where waste collection rates are very low.

Whatever the pricing structure the Provider assumes overall responsibility for the operation and maintenance of MB 's assets and is free to manage the business but without bearing the commercial risks: MB bears the revenue collection risk. However a profit-sharing arrangement, under which the private firm would bear a small part of the risk, can be included.

The duration of management contracts is can be set from 1 to 3 years. Provisions for non performance of contract conditions service can be included to terminate the contract.

**c. Lease or 'Affermage' Contract**

The commercial risk for the Provider increases. MB also contracts the collection of tariffs and customer relations to Provider, as well as, contracting the operation and maintenance

responsibilities. The Provider is remunerated through the tariff and bears the risk of revenue collection from citizens. The tariff is set in the contract by MB after negotiation with the Provider and should be based on full opex cost recovery.

MB is fully responsible for capex and retains title to assets MB may also wish to include a surcharge in the tariff to cover the amortisation costs of its new investment it makes.

#### **d. Concession**

MB not only contracts out operation and maintenance but also capex financing and construction to a single private Provider. The Provider, the "concessionaire", finances, constructs, or sub-contracts the purchase (equipment) or construction of (infrastructure), and operates at its own risk, all capex for supplying collection and haulage services to the citizens.

Strictly speaking a concession involves a company setting up and operating a facility under a long terms contract. However for the purposes of simplifying the number of options we are also defining a concession where equipment i.e. collection trucks are also financed by the Provider, with or without building a facility e.g. maintenance workshop or transfer stations.

Upon expiration of the concession, the facilities but not necessary the equipment must be returned in perfect condition to MB. This means that while the concession is in effect, the Provider must bear the cost of replacing worn-out equipment & facilities maintenance costs, and the purchase of new capex and recover these costs, including financing costs.

Like the "affermage" the Provider could be remunerated through a tariff and bears the revenue collection risk. The responsibility for setting the tariff remains with MB after negotiation with the Provider and is set in the contract.

Alternatively, the Provider could be remunerated from a fixed price contract with provisions for "build", "own" & "operate" investment.

It is usual for the tariff or price to be stated in a formula which includes a return on investment and takes account of economic variables, e.g. opex and capex inflation, tax rates, and other unavoidable costs. In this way annual price changes can be easily calculated.



A concession contract is generally concluded for the medium to long term. In the case of SWM it could be for 3 to 10 years, depending on the level of facilities investment.

MB retains title to the existing assets and obtains title to the concessionaires assets when the concession expires.

**e. Franchise**

MB awards a franchise for a designated area, e.g. a sector, under which the company has monopoly rights to provide the SWM service to the designated area. The Provider assumes full operational and financial responsibility for the service. Its responsibilities include and go beyond those of the Concessionaire. It now sets its own tariffs and has title to the fixed assets.

MB's role is reduced to exercising control through the franchise agreement which might include some form of price regulation. Assets and service responsibility are not usually transferred back to government, but there may be periodic refranchisement over the medium or long term.

Each of the options is now compared in the Table 9.2. below, in terms of main responsibilities and financial relationships.

**Table:9.2 Comparison of the main features of each contracting option**

<b>Contracting Options</b>	<b>No change scenario</b>	<b>Management Contract</b>	<b>Lease or "Affermage"</b>	<b>Concession</b>	<b>Franchise</b>
	<i>Increasing privatisation</i>				
<b>Who finances capex ?</b>	MB	MB	MB	Provider	Provider
<b>Citizen pays</b>	MB	(4) Waste tax (fee) to MB	Tariff to Provider	(4) Tariff to Provider or waste tax to MB	(4) Tariff to Provider or waste tax to MB
<b>Who sets fees/tariffs ?</b>	MB	MB <sup>(1)</sup>	MB according to contract	MB according to contract	Provider according to Franchise agreement
<b>Tariff basis</b>	-	opex cost recovery	opex cost recovery + amortisation	opex cost recovery + amortisation	full cost recovery
<b>Citizens contractually bound to</b>	MB	MB	Provider	Provider	Provider
<b>Provider remuneration</b>	-	Disbursements from MB as set in contract	via tariffs or fixed price contract	via tariffs or fixed price contract	via tariffs
<b>MB's costs recovered from</b>	fee	MB <sup>(2)</sup> fees/tariffs	surcharge on <sup>(2)</sup> tariff	surcharge on <sup>(3)</sup> tariff	not applicable
<b>Duration of the contract</b>	-	2 - 5 year	2 - 5 years	3 - 10years	5 - 15 years
<b>Responsibility of the provider</b>	-	average	high	higher	very high
<b>Financial commitment of the provider</b>	-	average	high	very high	very high

**Note:**

- (1) MB collects through a waste tax (fee) without contract.
- (2) Costs include contract management costs & amortisation of fixed assets
- (3) Costs include contract management costs only
- (4) Source can also be general taxation

Table 9.2 shows how the Provider's financial risks and responsibilities increase from Contract Management to Franchise options. These risks and financial responsibilities should be considered when evaluating the options.

### 3) Criteria

Our objective is to select the option(s) which produces services of the highest net benefit at least cost.

The criteria used are given in Table 9.3 below and are divided into three groups. The first group concerns providing people with services they value and involves responsiveness to citizens.

The second group concerns service efficiency and involves efficient operation, efficient investment decision making, and efficient funding mechanisms.

The third group concerns transition issues. Some of these are specific to Romania's history and current transition. They are concerned with achieving worthwhile reform without overburdening MB or the Provider.

**Table 9.3 - Evaluation Criteria**

<p><b><u>1 Giving people what they want:</u></b></p> <ul style="list-style-type: none"><li>• responsive to consumer needs</li><li>• deals with externalities efficiently (e.g. effects on environment and public health)</li></ul> <p><b><u>2 Doing it efficiently:</u></b></p> <ul style="list-style-type: none"><li>• operates at least cost</li><li>• makes least cost investments</li><li>• finances opex efficiently</li><li>• finances capex efficiently</li></ul> <p><b><u>3 Feasible transition:</u></b></p> <ul style="list-style-type: none"><li>• low implementation costs</li><li>• consistent with other reforms</li><li>• builds on existing strengths: only makes changes where necessary</li><li>• feasible given current institutional capabilities</li><li>• timing: a fast, practical implementation path</li><li>• flexible: keeps options open</li></ul> <p><b><u>4 Capital Investment:</u></b></p> <ul style="list-style-type: none"><li>• provides effective capital investment opportunities</li></ul>
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## **5) Evaluation of Options**

The effectiveness and efficiency of any structure for SWM is crucially dependent on its financial and institutional design, and the competence of the human resources.

International experience shows that private operators tend to be more efficient than government. And competition between private providers is a good way to ensure that consumers get what they want.

However, the type of private sector involvement has to clearly fit the requirements of Bucharest. A solution with high risks may threaten service continuity or impose onerous implementation costs.

To identify the most suitable option for current circumstances we have evaluated the 5 options using the criteria. The results are summarised in Table 9.4 below.

In general terms, the result shows that Management Contract and "Affermage" are acceptable options. They are the least risky, promote competition and therefore cost minimisation, and are the easiest to implement but they do not address the problem of providing capital investment. Concessions are more risky but are very efficient at providing capital investment. The Private Sector appears to be the only way in which capital investment in SWM is possible at the current time. Franchising has the highest risk.

The evaluation is briefly considered under main criteria groupings.

**a. Giving People What They Want**

Providers responsiveness to citizens will be greatly increased if there is competition combined with good contract monitoring.

Currently provision of SWM in Bucharest is virtually the monopoly of RASUB and as such the incentives to be responsive to the citizens are greatly diminished, since the citizens cannot use an alternative service.

The Management Contract and Affermage options are likely to be the most responsive to citizens' needs because the frequency of competitive tendering these services is high. If service levels are poor Providers will lose their contracts. This assumes that there are a sufficient number of providers to provide real competition.

Under the Franchise options there is less incentive to respond to citizens needs because the level of competition is less.

	MB	Contract management	Affermage	Concession	Franchise
<b>Contract Options</b>					
Objectives					
<b>Giving people what they want</b>					
responsive to consumer needs	X	3	3	3	-
deals with externalities (e.g. effects on environment or public health) efficiently	X	3	3	3	-
<b>Summary:</b>	X	3	3	3	-
<b>Doing it efficiently</b>					
operates at least cost	X	3	3	3	-
makes least cost investments	X	-	-	3	3
finances opex efficiently	X	3	3	3	3
finances investments efficiently	X	-	-	3	3
<b>Summary:</b>	X	3	3	3	3
<b>Feasible transition</b>					
low implementation costs	3	3	3	3	-
consistent with other reforms	X	3	3	3	3
builds on existing strengths only makes changes where necessary	3	3	3	-	X
feasible given current institutional capabilities	3	3	3	-	X
timing: a fast, practical implementation path	3	3	-	-	X
flexible: keeps options open	3	3	3	-	X
<b>Summary:</b>	3	3	3	-	X
<b>Capital investment</b>					
provides effective capital investment opportunities	X	X	X	3	3
<b>Summary:</b>	X	X	X	3	3

**KEY:**

- 3 contributes to objective
- neutral
- X detracts from objective

## **b. Efficiency**

Private Providers have a direct incentive to reduce costs, in order to maximize profits. This incentive is lacking in the MB option, indeed there may be an incentive to increase costs to obtain larger budget funds. Capex efficiencies will be also higher in the Concession option.

However private provision alone does not achieve cost minimization. Healthy competition is also required, because it provides a benchmark against which owners and workers can compare their companies' performance. It also gives workers and managers a greater incentive to reduce costs, since if they do not, they may lose the contract, and thus their jobs.

Cost efficiencies and competition are more likely where the Provider must periodically compete for the contract i.e. in the Management Contract and Affermage options. But capex cost efficiencies will be highest under the concession.

## **c. Feasible Transition**

Because the MB option involves the least change, it scores highly because it places the least demands on institutional and reform capabilities. It also has lowest implementation costs. However, it is not consistent with the government's strategy of privatization and decentralization.

At the other end Franchising has much higher implementation costs, and requires quite a high level of management and technical expertise and therefore has the highest risk.

The Contract Management and Affermage options are consistent with reforms, and allow for a more flexible transition path. The Concession option is also feasible.

## **d. Conclusion**

Give the current financial situation of MB it would appear that the Concession option is the best because:

1. it will mobilise private sector funds for capex investment;
2. financing is efficient;

3. responsiveness to citizens is high;
4. cost efficiencies are high;
5. private sector management will improve operational efficiency.

However, before their option is seriously considered, contract management capabilities must be well established in MB.

It may be preferable for MB to collect the proposed waste fee and remunerate the "Provider" for a negotiate lump sum.

The Provider would provide all the collection trucks.

Additionally the concession could include the building or upgradation of maintenance workshop and facilities and transfer stations.

### **9.3.2 Summary of MB's Latest Proposals for Reorganising SWM Services in Bucharest**

Under MB's latest proposals for reorganising SWM (at 5/11/94) under Ordinance 69, RASUB will be closed down, the collection and disposal activities split, and the ADPs activities reorganised.

In essence this means that the existing RASUB with most of its existing staff and its structure will be renamed and given a new corporate identity.

These arrangements are still subject to the approval Local Council and the consent of the Prefect.

#### **1) Disposal**

Disposal will become a public service function, subsumed under MB as an Administration and headed by a director. The intention is to transform the Administration into an SC in the long term.



## **2) Collection and Haulage**

Collection and disposal will be jointly provided with street sweeping and snow clearing by one SC. The SC (commercial enterprise) will be created by MB and will be called SALUB. It will be given Sectors 1 to 5 under an operating contract. Sector 6 remains with RGR. MB will own a controlling interest in the new SALUB's shares. Asset ownership will be retained by MB.

There are two alternative ways to forming SALUB - under Law 15 or under Law 31. The preferred option is to use Law 31 because under Law 15 the share capital of the new SC will be owned by the state (70%) and private (30%) mutual funds, whereas under Law 31 the MB can own the share capital with four other shareholders. It is proposed that minority shareholdings will be held by the other Regies, i.e. RADET, RGA, RATB and DRUPO. MB's ultimate objective is to sell SALUB's shares to the private sector, i.e. privatise SALUB.

The original proposal to split RASUB up into 4 or 5 SCs was dropped because:

1. the diseconomies of scale would be too high for setting up several SALUBs and the cost impact might be so large that they could not be adequately financed;
2. the reorganisation would be too difficult for MB to handle with possible discontinuity of service; and
3. unions would be very opposed.

## **3) New Competitive Tendering Arrangements**

New arrangements will be introduced under which the combined service can be competitively let by sector or subsector (not defined but could be canton size). This will enable MB to contract whole sectors, to monitor at the subsector level and to recontract subsectors if the service is poor. As a result competition and cost efficiencies will be developed. RGR will be allowed to compete for SALUB's work.

Pre tendering criteria are established. The Provider must demonstrate that:

1. he is capable of providing the service with proper equipment;
2. he has the right of access to a disposal site; and show which roads he will use to transport the waste.

#### **4) Assets**

RASUB's and the ADP's assets will be vested in MB. MB have assumed this under Law 15 which gave MB the right to create and assign assets to RASUB. It is implied that by liquidating RASUB the reverse occurs. No other laws cover this situation. The General Mayor will organise a committee to decide how to split the assets within RASUB and the ADPs.

Shares held by RASUB in RGR and 3D (animal control) will be transferred to MB as required under the joint venture contract.

#### **5) Organisational Arrangements**

No decision has been made on how to split RASUB between disposal and collection. Some staff functions may be subsumed under MB. Similarly there is no decision on how to split the ADPs'. The ADPs green spaces and roads maintenance functions will be organised under MB. Animal control will also be subsumed under MB.

The internal organisation of SALUB will be decided by SALUB's new Council of Administration. It is proposed that the SC will have a non executive Administration Council appointed by MB and a Board of Directors.

In MB new contracting arrangements will be implemented by MB and SALUB's services will be monitored carried out at the Sector level.

### **9.3.4 Comments on MB's Proposed Arrangements**

#### **1) Feasibility and Institutional Arrangements**

The proposal is low risk and easily implementable within current institutional capabilities. Costs of implementation are low.

It is correct for MB to retain responsibility for disposal. Disposal is too risky to contract out and it is debatable whether it should ever be contracted out given the environmental and social responsibilities involved. The private sector is largely motivated by market forces and profit making, rather than public or environmental values for which local government is responsible.

Contracting collection and haulage to SALUB is sound. It is a sensible first step towards further "privatisation" of the collection and haulage service. Letting franchise is too ambitious at this time without proven expertise and skills, and good justification.

This arrangement will give MB the opportunity to develop contracting skills and expertise before it tries anything more ambitious.

Another positive feature of the proposal is that subsectors will be recontracted if the service is poor. This will encourage SALUB or the Provider(s) to maintain good levels of service or risk being picked off subsector by subsector by competitors. This will also increase cost efficiencies and spur competition.

Smaller companies will also be encouraged to enter the market because they are able to service the smaller cantons. This will spur development of the private sector.

## **2) Financing SWM**

SALUB will not collect tariffs. Instead MB will set and collect fees. These will not be passed through to SALUB which will be remunerated under a contract.

The method by which fees will be set has not been decided. We recommend that a full costing of the service is prepared by MB to estimate the revenue and fee levels which will provide reasonable cost recovery.

## **3) SALUB's Remuneration**

Likewise the method of remunerating SALUB has not been determined. One short term (1 or 2 years) possibility is to base the contract price on the quantity of waste collected to encourage SALUB to improve its collection frequency and reliability. After collection levels have improved the contract should be negotiated on the basis of fully costed service costs as well as service performance measures.

## **10. MANAGEMENT AND ORGANISATION**

### **10.1 Bucharest Municipality SWM Responsibilities**

#### **10.1.1 Evaluation of Current Organisational and Management Capacity**

A high level analysis of the current organisational and management arrangements is presented below. Although a number of deficiencies have been identified these are not intended to be critical and should be considered in the light of the difficulties municipal government has faced in establishing itself. It is not surprising that MB lacks organisational capabilities when it is so financially constrained and still lacks of autonomy from central government.

#### **1) Organisational Issues**

##### **a. Introduction**

An efficient organisational structure has clear reporting lines, rational departmentation, reasonable spans of control and number of levels of managers and supervisors, and an appropriate senior management structure. Organisational charts of MB and the PSD are given below in Figures 1, and 2 respectively.

##### **b. Spans of Control and Vertical Structure**

An analysis of the organisational structure of the Public Services Department (PSD) shows that the spans of control were reasonable. The vertical structure had 5 levels from the Chief of Department down to the inspector level. There doesn't appear to be a need for a vice director of each division and four levels might be appropriate.

##### **c. Function Departmentation**

The existing functions within the PSD appeared to be adequately organised and rational for its current requirements. However its contract management capabilities are very weak which the PSD recognises. It would be appropriate to strengthen the PSD's legal capabilities with a legal expert whilst arrangements for contracting are being developed. The legal expert could report to the Chief of the PSD to provide him with legal support. Contracting will need substantial development.

# MUNICIPALITY OF BUCHAREST - ORGANIZATION CHART

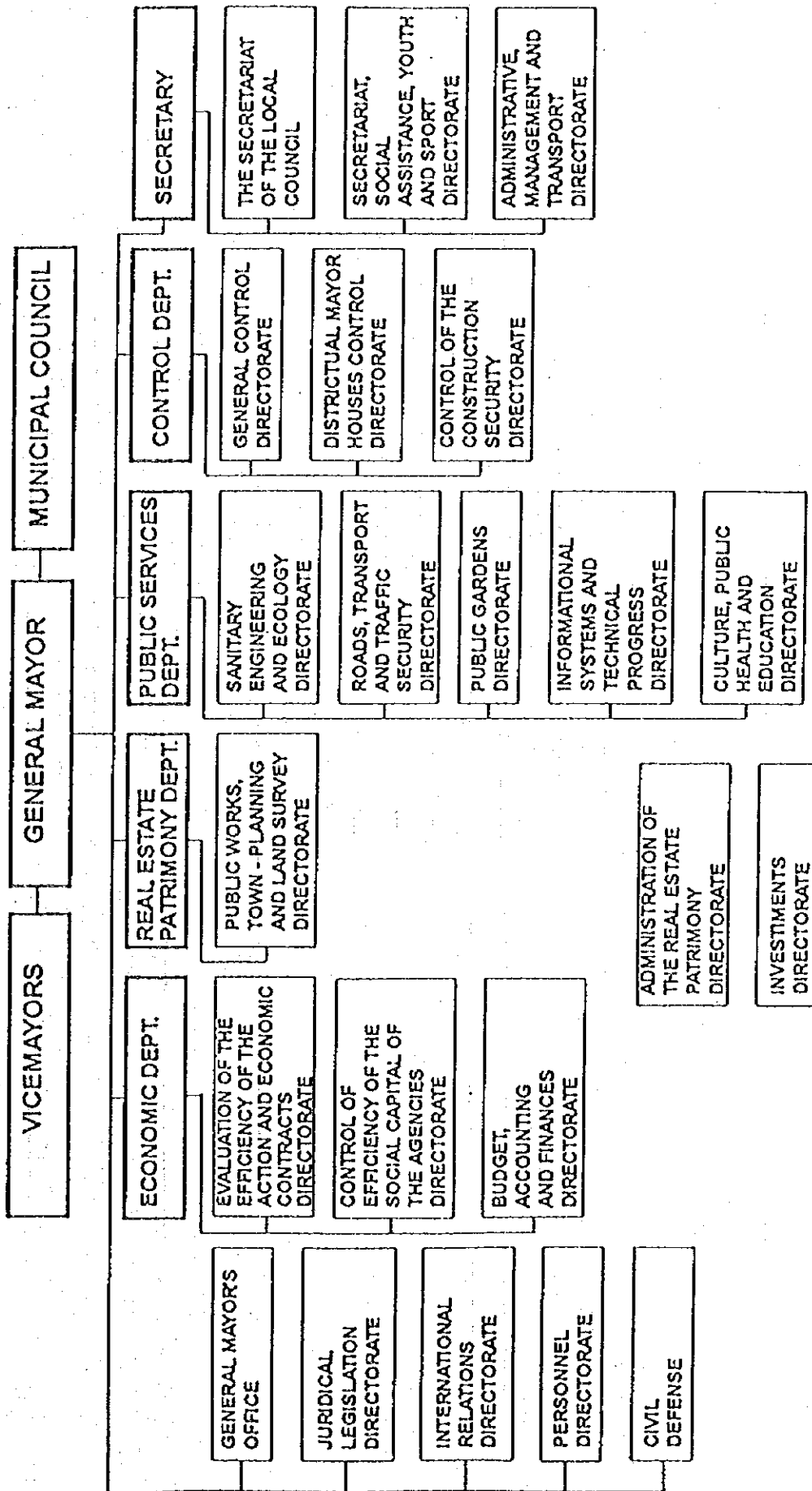


Fig. 10.1-1 Municipality of Bucharest - Organization Chart

# DEPARTMENT OF PUBLIC SERVICES

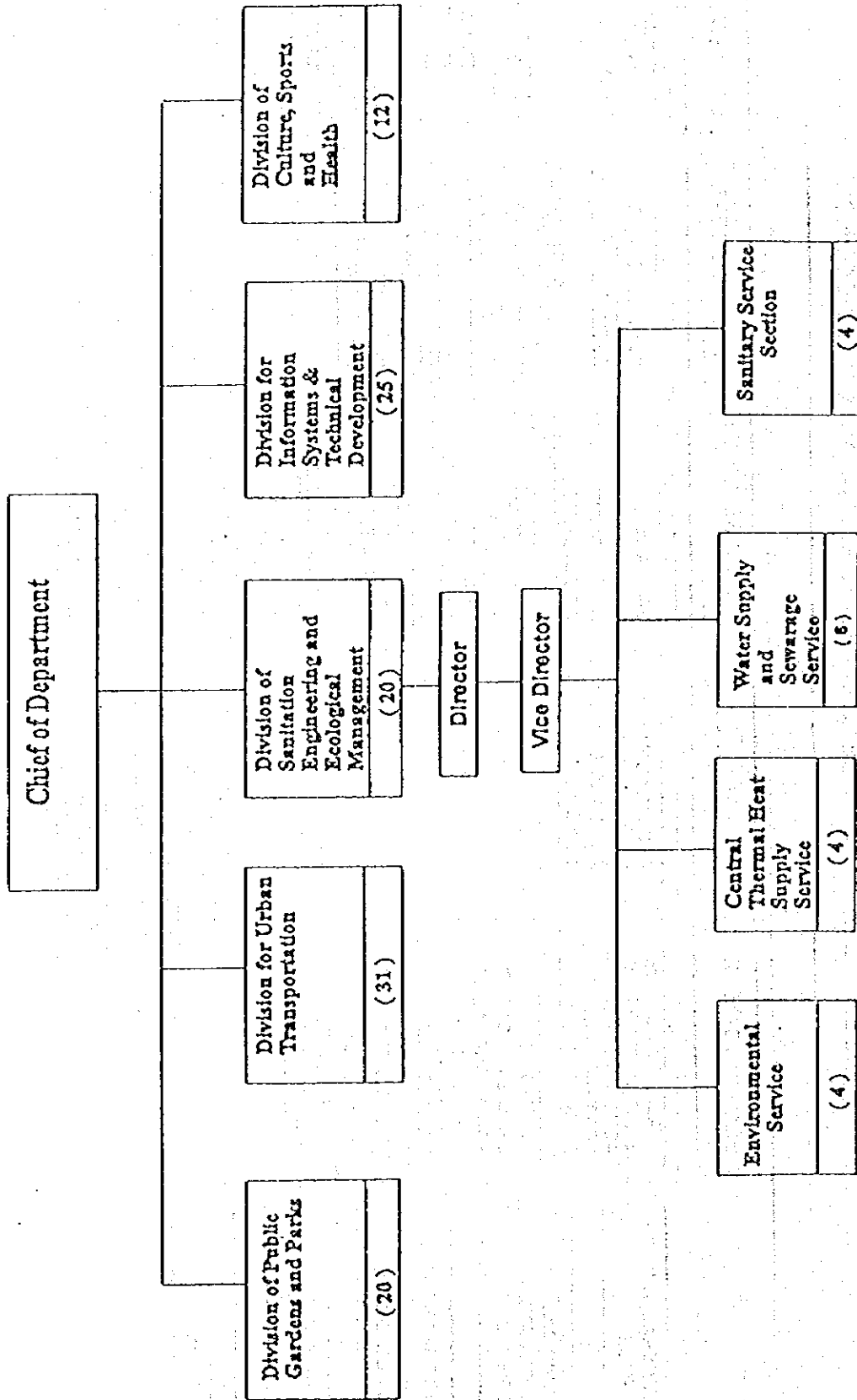


Fig. 10.1-2 Department of Public Services

Functional responsibilities of the department and its sections are defined in internal regulations which are very bureaucratic. It appears that they are not put into practice.

**d. Delegation and Assignment of Responsibilities**

Job descriptions are prepared for individual staff members and describe responsibilities of managers and supervisors. But in practice there is little accountability for individual performance and some staff are carrying out duties beyond the scope of their job descriptions.

**2) Policy and Planning Capacity:**

**a. Planning and Policy Processes/Procedures**

Effective planning and policy formulation should include preparation of medium/long term strategic plans as well as annual operational plans.

In MB there is no formalised periodic planning capability by which annual, medium and long term SWM plans are prepared and periodically assessed by the Public Service Department. The planning scope should include a mission statement, objectives, policy statements, performance targets, action plans and scheduling for operational, technical, human resources and financial components. It should also contain a resourcing plan including a financing plan. The financial forecasts will contain operating revenues and costs as well as investment plans.

MB prepared its first annual plan in 1994. This is a very welcome step and reflects the new initiatives that MB is taking. The plan contains objectives, a summarised annual investment plan and a summary of international studies in progress. Although this is a very good step, expertise and planning capabilities need to be developed. We understand that the financial uncertainties facing MB act as a disincentive to preparing plans.

**b. Investment Planning**

The investment planning process is reasonably well defined & bureaucratic. However, MB seriously lacks the autonomy to appraise, approve and competitively procure its investments.

Procedures are very bureaucratic for approving and tendering civil works and equipment procurement. The MoF controls the approval of feasibility studies and tendering large for civil works. Equipment procurement is similarly processed.

A more detailed evaluation is given in Chapter 4.

#### **d. Objective Setting and Performance Measurement**

There are no procedures to set and monitor objectives from the strategic level down to middle managers and supervisors. There should be a periodic assessment of managers performance against agreed performance targets and objectives.

### **3) Management Decision Making Capacity**

Management decision making capacities are constrained by bureaucratic procedures. This means that in a number of areas management decisions cannot be made by the PSD alone but are diffused through MB. e.g. the approval of Bucharest Sanitation Norm is not only approved by the PSD, but also by other relevant Departments, the Mayor and the Council.

This lack of focus impedes management effectiveness.

### **4) Systems and MIS**

Management needs appropriate management information systems and relevant and regular information to enable them to make effective decisions and to efficiently carry out their responsibilities.

However there is a virtually no MIS capability at MB which is aggravated by the reluctance of departments within MB to share information with each other. An information culture is therefore lacking.

Monitoring of RASUB is weak because of a lack of appropriate data. This is not MB's fault. MB does not have free access to RASUB's data and has to rely on very basic daily activity data sent by RASUB. From this the PSD prepares weekly activity reports which give:

1. the number of collection trucks in daily operation, split by sectors;
2. the amount of petrol consumption per day for the whole city; and
3. a daily record of streets where collection services failed to be provided.



This information is insufficient to properly monitor RASUB's activities and MB considers that it is inaccurate. Proper service quality data is not requested from RASUB. As a result PSD rely upon complaints from the public or from the ADPs to monitor service levels which is wholly inadequate.

No other data is produced.

#### **5) Human Resource Capabilities**

There is a formal manpower establishment for the PSD. The establishment of 5 people for the Sanitary Service section is wholly inappropriate to carry out its responsibilities of monitoring RASUB, the ADPs (street cleansing), RGR and 3DB (vermin control). This is recognised by the PSD which is proposing new monitoring arrangements.

Many of the staff are qualified as engineers and lack management or financial skills. Contract management expertise is totally deficient and it will be necessary to train at least one manager and a subordinate in these skills.

Lastly there is no human resources development program or training provided to staff except for basic computer skills.

None of these deficiencies is surprising. Local government is only just beginning to establish itself after years of centralised control and neglect.

#### **6) Contract Management Capabilities**

Procedures to competitively tender collection and street cleansing services and to monitor contracts have not been set up yet. Currently RGR and 3D are the only service contracts to have been let. Both of these are joint venture arrangements which terms and conditions are given in the joint venture agreements to set up the companies.

The likely contracting procedures for letting the SWM service to the new SALUB have been assessed.

The responsibility for preselection and procurement will be split amongst the PSD, The Economic Department and the Legal Directorate.

However the Economics Department will have responsibility for managing the tendering process according to strict procedures laid down by MB and the law. The opportunity to develop and change the tendering process is therefore limited. These are similar to those for the procurement of civil works and equipment.

The Tendering section in the Economics Department will be responsible to draft the pretendering documentation, the tenders and the contract.

A tendering commission will be set up to award the contract. The Mayor and the Council must also approve the final selection.

The area where MB has room to develop its capability is in the design of the contract rather than the tendering process.

There is little expertise at MB in contract design, formulation of performance measures, and managing the procurement process, i.e. preparing the Specification tendering documents; bid evaluation and selection & the contract. Skills and practical knowledge must be developed.

Responsibility for monitoring and enforcement is also the PSD's, but again the Sanitary Services Section lacks staff numbers and the expertise to do this.

### **10.1.2 Proposed Management and Organisational Arrangements**

Brief recommendations are presented below for each of the main organisational and management areas.

#### **1) Organisation**

##### **a. Spans of Control and Vertical Structure**

The basic vertical and horizontal structures appear sufficient for current needs.

**b. Function Departmentation**

Contract management capabilities are very weak. We recommend that a contract management capability is set up. Substantial development will be required.

**c. Delegation and Assignment of Responsibilities**

Although job descriptions are prepared for individual staff members there is a complete lack of accountability for individual performance. Accountability can be improved by setting tasks for subordinates and monitoring results, periodic monitoring of individual performance against agreed performance objectives/targets and giving more responsibility to staff. Over supervision stifles enterprise and initiative.

**2) Policy and Planning Capacity:**

**a. Planning and Policy Processes/Procedures**

MB prepared its first annual plan in 1994. This is a very welcome step and reflects the new initiatives that MB is taking. Although this is very promising, planning capabilities still need to be developed.

The planning scope should include a mission statement, objectives, policy statements, performance targets, action plans with indicative scheduling for: operational, technical, human resources and financial planning components. It should also contain a resourcing plan including a financing plan. The financial forecasts will contain operating revenues and costs as well as investment forecasts.

**b. Objective Setting and Performance Measurement**

There are no procedures to set and monitor objectives from the strategic level down to middle managers and supervisors. There should be a periodic assessment of managers performance against agreed performance targets and objectives.

### **3) Management Decision Making Capacity**

Above a certain level management decisions have to be jointly coordinated between executive departments and with the political structures of MB. This is unavoidable and as a result we cannot make recommendations here. Decision making within the PSD.

### **4) MIS**

Detailed MIS systems and information needs will be defined in the Interim Report. These will centre around providing information to monitor the service contract. For the moment we recommend that the following data is prepared to properly monitor RASUB.

1. Service frequency (by zone) and streets where service frequencies were not achieved
2. Coverage rate
3. Collection quantity by zone
4. Collection quantity by workshop
5. Collection quantity by types of waste
6. Unit costs of waste collected & hauled by sector / zone and truck type
7. Rate of vehicle utilisation
8. Average number of trips made by vehicle groups, sector & zone
9. Number of complaints by sector & zone
10. Results of environmental monitoring e.g. leachate quality

### **5) Human Resource Capabilities**

Contract management skills of staff involved in the tendering, negotiation and monitoring need to be developed.

### **6) Proposed Contract Management Arrangements**

Proposed organisational arrangements to manage contracts and service procurement will be presented in the Interim Report.

## **10.2 RASUB**

### **10.2.1 Evaluation of Current Organisational and Management Capacity**

The evaluation has taken into account RASUB's proposed transformation into SALUB. Whatever new entity is created out of the old RASUB, the evaluation and the proposals made below will still remain valid for it.

#### **1) Organisation**

##### **a. Introduction**

An efficient organisational structure should have clear reporting lines, rational departmentation, reasonable spans of control, an appropriate number of staffing levels, and an appropriate senior management structure. Our evaluation of RASUB's organisational structure is based on these broad criteria.

Although a number of deficiencies have been identified these are not intended to be critical and should be considered in the light of the many difficulties RASUB faces. In particular it is severely financially constrained.

RASUB's also inherited an organisational structure and procedures which reflect a command and control culture and are not suitable for efficient management. This structure is almost identical to other Romanian public service or industrial enterprises.

RASUB's Organisation Chart, given below, shows a well defined structure comprising a Technical Department, a Production Department and an Economic Department. Staff functions (support) are provided by "compartments" and line (operational) by "sections". The senior management comprises the Council of Administration and a Directors Board, headed by the General Manager, which is subordinate to the Council.

##### **b. Structure**

###### **i) Spans of Control and Vertical Structure**

The current structure is given in Figure 3 below.

SECTIONS

COMPARTMENTS

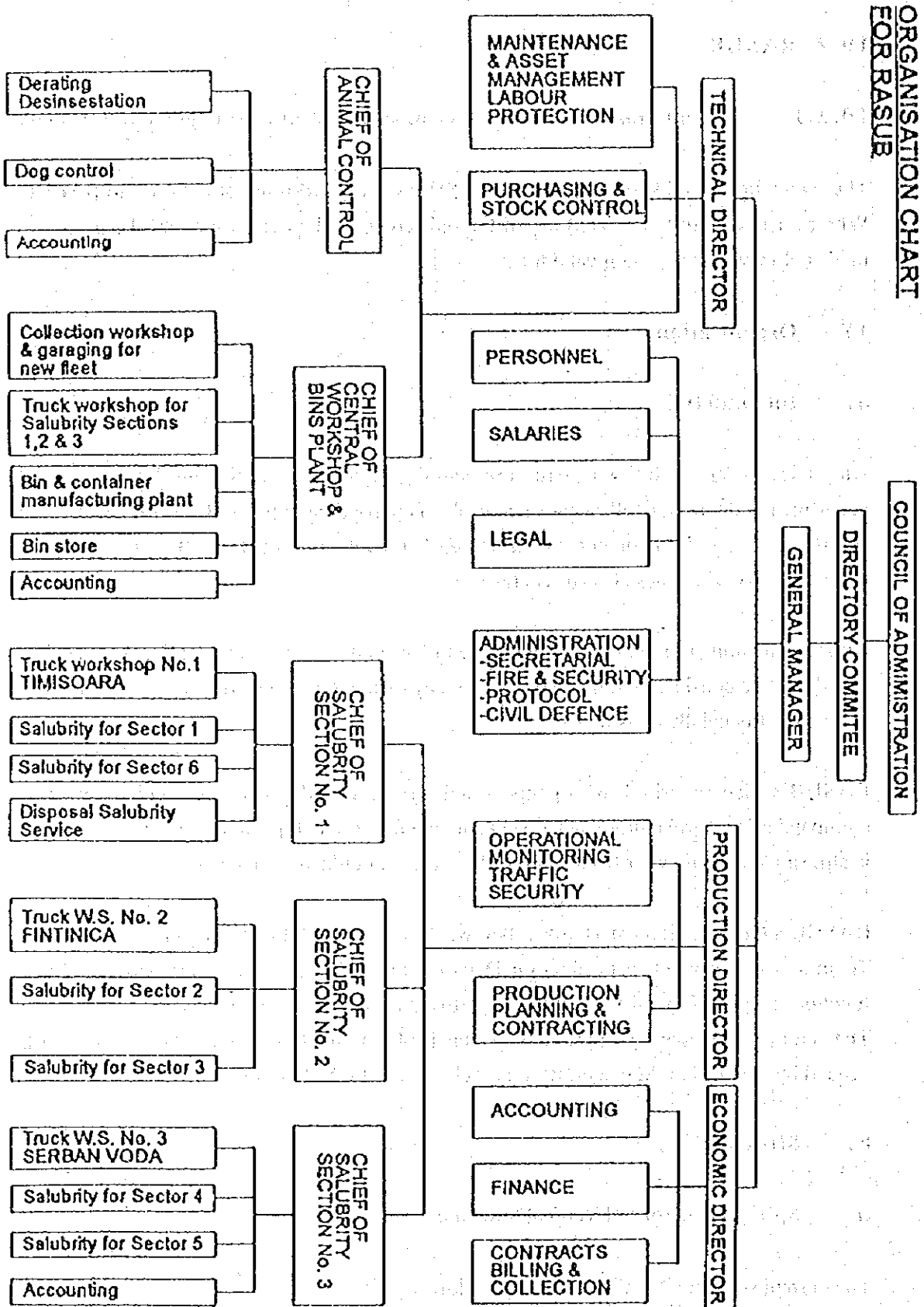


Fig. 10.2-1 Organization Chart for RASUB

As a rule of thumb the span of control (the number of people subordinate to one manager or supervisor) should not exceed 5 or 6 subordinates. As the span widens management efforts are increasingly scattered and management effectiveness declines.

The span of control for the Managing Director is 7. This is too wide. 4 of these are support compartments i.e. personnel, salaries, legal; and general administration. These should be reduced in number. This is discussed in section d below.

Generally the spans of control are reasonable for staff functions except in a) the billing and collection and b) the maintenance and asset management compartments. In billing and collection one chief manages about 55 cash collectors who are all at the same responsibility level. Likewise the maintenance and asset management compartment is managed by a chief who supervises about 25 maintenance workers at the same level.

Spans of control for line functions are generally reasonable. Typically a chief of section has anything between 3 to 6 subordinates underneath him. An exception is the animal control section whose chief manages 9 subordinates but this is not onerous. Below the level of foreman the spans widen but this is unavoidable.

The vertical structure of the support staff and line staff appears reasonable. For line staff there are typically 5 levels beneath both the Technical Director and the Production Director, i.e. chief of section, chief of workshop, foreman, team leaders and then the workforce - mechanics, waste collectors or disposal staff.

#### ii) Staff and Line Balance

The total number of support staff is 214 out of a total of 1659 (actual in post at 8/9/94). The ratio of line to support staff is about 1 to 7. This is a reasonable balance.

#### c. Senior Management

Senior management is bureaucratic and ineffective. The Council of Administration has not resolved the major issues facing RASUB, nor has it implemented a strategic planning framework or developed practical policies. Its main concern is to carry out its minimal statutory responsibilities rather than to manage and improve RASUB's services.

Its responsibilities are set out in Law 15 and Law 69 and include the annual approval of the budget, the investment plan and the Financial Statements. During the year it also approves collective pay increases with the Unions and periodically reviews activity reports.

One reason given for the Council's ineffectiveness is that the Unions are powerful and prevent the Council from exercising control. Another reason is that the Council members lack management expertise and skills. Furthermore they do not delegate management tasks down to the Board which as the executive body should be responsible for the greater part of planning, policy formulation and other main management tasks.

However the executive board cannot act like a management board because it has too few powers; under Law 15, 1990 it is assigned the day to day management of RASUB only.

#### **d. Functional Departmentation**

The main functions were evaluated to ascertain whether the departmentation was rational, relevant and whether any functions were missing. Functional responsibilities are documented for each compartment and section.

Many of the issues identified below involved a fragmentation of responsibilities across the organisation. There were also some functional omissions. We recognise that this is primarily due to the way in which state enterprises were organised under the centrally planned economy and does not reflect on senior management's capabilities in any way.

##### **i) Management of Collection, Haulage and Disposal**

Management of both maintenance and collection services is fragmented. Currently the collection, excluding that provided by the new truck fleet, and routine maintenance functions are jointly managed in three Salubrity sections which are under the Production Director. One of these sections also manages the disposal function.

This arrangement makes it difficult for each of the three salubrity chiefs to divide their management time and responsibilities between maintenance and service provision. It is felt that this impacts on service quality.

In addition collection, provided by the new truck fleet, and major overhaul maintenance (capital repairs) are similarly organised in the central workshop under the Technical



Director. The workshop is also used for bin and container manufacturing. Again management time and responsibilities are divided across collection, maintenance and manufacturing activities with impact on service quality.

Maintenance and collection services should be separately managed.

ii) Financial Accounting

The accounting function is fragmented across a number of compartments and sections. Outside the Economics "Department" accounting functions are carried out by the Salaries compartment and by 3 accounting sections, one in Animal Control and one under the Chief of the Central Workshop (both are subordinate to the Technical Director) and the third under the Chief of Sanitary Section No. 3 (subordinate to the Production Director).

This contributes to organisational inefficiency. It is usual for the accounting function to be carried out in one accounting department, organised by main accounting operations and tasks and managed by a Finance Director.

iii) Personnel

Responsibilities for personnel are fragmented between the Personnel Section, Salaries Section and the Operational Monitoring Section under the Production Director.

Personnel's responsibilities are limited to maintaining personnel records, negotiating collective annual salary increases and carrying out limited training and manpower planning. There is no human resources training and development program.

Salaries has a minor role as it is also involved in the collective salary negotiations and checks pay increases comply with legal requirements.

The Operational Monitoring Section prepares job descriptions.

A separate Personnel Department should be established and a Personnel Director appointed.

**iv) Audit**

An internal audit function is carried out by the Legal compartment which comprises one legal officer only. This is insufficient for an organisation of this size. The audit resource should be increased to ensure that the companies financial and non financial assets are properly recorded and physically safe.

**d. Delegation and Assignment of Responsibilities.**

Responsibilities should be clearly assigned and delegated to managers and supervisors with accountability for individual performance.

Job descriptions are prepared for each member of staff setting out their responsibilities. But in practice there is little accountability for individual performance. Increased accountability contributes to better decision making and therefore organisational efficiency.

**2) Policy and Planning Capacity**

**a. Planning Procedures**

Effective planning and policy formulation should include preparation of medium/long term strategic plans as well as annual operational plans.

There is virtually no formalised planning capability in RASUB by which annual, medium and long term plans are prepared and implemented. Only a simple annual investment plan and a rudimentary budget are produced.

This is due primarily to the absence of a strategic planning culture in state enterprises which were subordinated to a centrally planned economy. Additionally the directors board is not assigned any planning responsibilities and is constrained by its limited obligations as defined in Law 15.

As a result there is a limited planning and policy capability and expertise in RASUB. Furthermore there is no budgetary planning and control system for either recurrent or capital expenditure which is vital to underpin the planning process.

## **b. Investment Planning**

Each year RASUB submits its investment plan to MB after it is approved by its Council of Administration.

The annual investment planning process is very bureaucratic and the appraisal methods are basic. These are considered in detail in Chapter 4.

## **c. Objective Setting and Performance Measurement**

There are no procedures to set and monitor objectives from the strategic level down to middle managers and supervisors. Managers must have a clear understanding of their objectives.

## **3) Management Decision Making Capacity**

Management decision making capacities are constrained by bureaucratic procedures and organisational deficiencies. The Board of Directors is constrained under existing laws in its capacity to make management decisions and must defer to the Council of Administration. The Council is too removed from the day to day management to be effective and has not assigned responsibilities to the Board.

This lack of focus impedes management effectiveness.

## **4) Financial Management and Systems**

### **a. Introduction**

Effective financial management requires several objectives to be met. These are to:

1. accurately and promptly record the assets and liabilities, revenues and expenditures and to periodically report financial information;
2. safeguard the assets;
3. provide accurate and relevant financial information to assist managers in the day to day management of the business;
4. develop a financial planning capability to assist management in the preparation and implementation of annual, medium and long term plans;

5. measure financial performance of departments and individuals to assess whether financial objectives are met; and
6. ascertain whether financial assets are being efficiently, effectively and economically used in the business.

To achieve these objectives financial planning must be integrated into the strategic planning process and budgetary planning and control, appropriate accounting systems and audit arrangements should be implemented.

#### **b. Financial Planning**

There is virtually no formalised financial planning capability by which annual or medium term financial planning is carried out. This is due to the lack of a strategic planning framework which is discussed above.

Only a simple revenue and expenditure budget was prepared for 1994 and investment planning procedures are fairly elementary. Investment and financing issues and recommendations are considered in more detail in Chapter 4 below.

Financial planning supports the annual and strategic planning process and involves the estimation of financial costs and revenues required to achieve planned objectives. Financial targets will be identified and set over different periods and compared against outcome. This will enable planning control to be exercised by senior management. None of these is carried out.

#### **c. Budgetary Planning and Control**

There is no budgetary planning and control system for either recurrent or non recurrent expenditure. This is vitally necessary to foster financial discipline and cost efficiencies, and to support the implementation of the annual and medium term financial plans.

#### **d. Accounting Systems**

The accounting systems are largely uncomputerised except for the billing and collection system which is partially computerised. Although systems and procedures are cumbersome and have been developed on bureaucratic lines, this has ensured that there are large number of internal checks and controls in the system.

Internal control is therefore good and in part compensates for the low quality of external audit. The systems and internal controls are documented in accounting regulations rather than in a Accounts Manual which should clearly set out the systems, internal controls in narrative and flow charts and cost structures.

The fragmentation of the accounting function and the need to reorganise the economic compartments are main weaknesses. This has been discussed in the organisational section above.

Financial reports are regularly produced, e.g. quarterly financial statements, cashflow reports, aged debtors listings.

Regular financial reconciliation's of different accounts e.g. cash book to bank statements or sales ledger to debtors ledger, are carried out. Accounting records are recorded and kept up to date on a regular basis.

A new format financial statements, concepts and principles based on the French accounting system, is being introduced this year. Since the audit of the RASUB's financial statements is not carried out at a high standard it is important that RASUB develops a robust internal audit capability.

**e. Working Capital Management (stock, cash, debtors and creditors)**

Working capital management appears to be adequate for cash and stock. Billing & collection is onerous.

1. Billing and collection procedures are cumbersome & onerous. 55 cash collectors have to be employed to collect physical cash from house holds.
2. Physical stock is controlled at 6 main stock holding centres. The stock system is manually recorded. Stock checks are carried out by the Legal officer who prepares an annual stock check program. Stock takes are also regularly carried out by each stock holder. The year end stock take is carried out by the inventory commission.
3. Cash management appears adequate. Bank reconciliations are regularly produced and cashflow forecasts are prepared quarterly.

## **f. Cost Accounting Capabilities**

There is a limited cost accounting capability and a lack of understanding of basic costing concepts and cost structures. As a result there is currently no cost accounting system to cost up services and investments.

E.g. unit costs are not regularly produced and compared to standard costs, and standard costs and charges are not produced.

## **5) MIS**

Currently RASUB has no MIS capability under which information is periodically reported to managers to enable them to make effective decision and efficiently carry out their responsibilities. Daily activity data is produced for the PSD at MB, but it appears that this is not used for RASUB's own purposes. Simple performance measures like labour productivity are not produced. We would recommend that at a minimum the following are produced.

1. Service frequency (by zone) and streets where service frequencies were not achieved
2. Coverage rate
3. Collection quantity by zone
4. Collection quantity by workshop
5. Collection quantity by types of waste
6. Unit costs of waste collected & hauled by sector / zone and truck type
7. Rate of vehicle utilisation
8. Average number of trips made by vehicle groups, sector and zone
9. Number of complaints by sector & zone
10. Results of environmental monitoring e.g. leachate quality

## **6) Human resources Capabilities:**

### **a. Establishment**

There is a formal manpower establishment for RASUB of 1,785 (at September 1994). Actual numbers in place at 8/9/94 were 1,659.

**b. Productivity**

An outline assessment of manpower levels and productivity will be incorporated in the Interim Report. It appears from a preliminary assessment that RASUB's productivity is low when compared to RGR. A comparison between RGR and RASUB will be given at Interim Report subject to the availability of data.

**c. Skills and Expertise**

Most of the managers are qualified as engineers and lack management or financial skills. Contract management expertise is totally deficient and it will be necessary to train at least one manager and a subordinate in these skills.

**d. Training**

Lastly there is no human resources development program or training provided to staff except for basic skills.

None of these deficiencies is surprising after years of centralised control and neglect.

**7) Contract management capabilities:**

There is virtually no contract management capability.

**10.2.2 Proposed Management and Organisational Arrangements**

**1) Organisation**

It is beyond the scope of this study to carry out a detailed review of the organisational structure.

**a. Spans of Control and Vertical Structure**

The basic vertical and horizontal structures appear sufficient for current needs.

## **b. Functional Departmentation**

Many of the issues identified above involve a fragmentation of responsibilities across the organisation. There were also some functional omissions. We recognise that this is primarily due to the way in which all state enterprises were organised under the centrally planned economy.

A number of revisions to the organisation and a suggested organisation chart are given below. We must state that this is a preliminary recommendation only and may be subject to change.

### **i. Management of collection, haulage and disposal**

Management of both maintenance and collection services is fragmented.

We recommend that maintenance and collection services currently provided under the three salubrity sections are split and that both services are separately managed under their own divisions - a new collection division and a new maintenance division.

The new collection division headed by one chief and under Production, would also be responsible for the new truck fleet which would be subsumed as a separate section.

The new maintenance division would be under Production or Technical ?????? However the capital maintenance and manufacturing activities at the central workshop should continue to be independently managed under Technical. Rationalisation of these activities will require a more detailed evaluation and is beyond the scope of this study.

### **ii. Financial accounting**

The accounting function is fragmented across a number of compartments and sections. It is proposed that the accounting function is organised in one accounting department, by main accounting operations and tasks and managed by the Economics Director.

### **iii. Personnel**

We recommend that a separate Personnel Department is established and a Personnel Director is appointed. The departments responsibilities should be developed. A human



resource development plan and an annual staff assessment procedures should be implemented. Under these arrangements each member of staff will have an annual assessment.

**iv. Audit**

To provide an effective internal audit service, two auditors should be recruited to set up a separate audit compartment which will report direct to the Directors Board. An annual internal audit plan should be prepared which covers the main accounting and asset controls. Audit reports should be produced for each task and results reported directly to the Board.

**d. Delegation and Assignment of Responsibilities.**

Accountability is weak and can be improved by setting tasks for subordinates and monitoring results, periodic monitoring of individual performance against agreed performance objectives/targets and giving more responsibility to staff. Over supervision stifles enterprise and initiative.

**2) Policy and Planning Capacity**

**a. Planning Procedures**

At a minimum the planning scope should include a mission statement, objectives, policy statements, performance targets, action plans and scheduling, for operational, technical, human resources and financial components. It should also contain a resourcing plan including a financing plan.

Furthermore a budgetary planning and control system should be implemented to underpin the annual planning process. This is considered further in the financial management section below.

**b. Objectives Setting and Performance Measurement**

There should be a periodic assessment of managers performance against agreed performance targets and objectives.

### **3) Management Decision Making Capacity**

Effective decision making can only come with the assignment of full responsibilities to the Directors Board and to middle managers and supervisors. Senior management also needs to be supported by a good MIS to enable them to make decisions based on accurate and timely information.

### **4) Financial Management and Systems**

#### **a. Financial Planning**

Proper financial planning should be introduced.

Medium term planning for both recurrent and capital spend should be included because this enables RASUB's managers to assess the implications of their current decisions, on the medium term e.g. to estimate Rasub's external financing needs and the level of tariffs for a different levels of investment.

If least cost financial planning is used managers can also make choices between alternative spending plans and optimise the use of financial resources.

We do not, however, recommend that RASUB introduce long term planning . This is too ambitious and would not be of much use.

Financial plans should be modelled on a PC to improve the quality and efficiency of the planning. Planning expertise needs to be developed by a training program.

Recommendations on investment planning are given in Chapter 4.

#### **b. Budgetary Control of Recurrent and Capital Expenditure**

We recommend that a budgetary planning and control system is introduced under which recurrent and capital budgets are established and:

1. budget responsibilities are defined and assigned to individual managers;
2. periodic reporting and monitoring of budgets is carried out where actual results are compared with budgeted amounts; and

3. action is taken where material variances between actual and budget occur.

Budgets should also be subject to regular review to accommodate any revision in plans. The system should be computerised and integrate with the accounting systems proposed below.

**c. Accounting Systems**

The manual accounting systems are cumbersome. We recommend that a new computerised accounting system is introduced based on the new French systems. This should include new accounting formats, controls and procedures. The implementation must include the restructuring of the economics department.

**d. Working Capital Management (stock, cash, debtors and creditors)**

Recommendations for working capital management will be made in the Interim Report.

**5) MIS**

Proposals for a simple MIS system will be included in the Interim Report.

**6) Human Resources Capabilities:**

Management expertise and skills should be developed through a management training program aimed at senior and middle managers. Development of financial management skills is a priority.

In addition a human resources development program should be prepared for the whole staff by the new personnel department. This should identify training needs and set up annual staff assessment procedures.

**7) Contract Management:**

New contract management arrangements will be proposed at the Interim Report.