

WASTE SETTLEMENT ANALYSIS
AS PERFORMED BY RESTORATION CONTRACTOR

DESIGN TASK
STATEMENT

NWNT Landfills & Gin Drinkers Bay Landfill Restoration Detailed Design	Job no. 0293/B01 Number of Pages
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Task	WBS	Task No	
Description SHORT TERM AND LONG TERM WASTE SETTLEMENT CALCULATIONS FOR NEARLY TAM MEI	Issue Date		Signed off Date
	PEM		
	Verification		
	Review		
	Chk Eng	RCC	LS
Design eng	CKK	Chi	3/99

Output required

1	Calculations		3	Figure/Table	
2	Drawing		4	Report	

Project Constraints/Interfaces		chk	chk
1.	REFERENCE TO "RAO S.K. et al (1971) SETTLEMENT OF REFUSE (LANDFILLS, PROC. CONF GEO-TECHNICAL PRACTICE FOR THE DISPOSAL OF SOLID WASTE MATERIALS, NY, ACCE." &		SETTLEMENT AND THE IMPACT ON SITE CAPACITY AND REFUSE HYDRAULIC CONDUCTIVITY, WASTE MANAGEMENT & RESEARCH VOL. (3, 535-554)
2.	"BIETIKER P.F. et al (1995) LANDFILL		

Assumptions		chk	chk
1.	$C_{\alpha} = 0.14$ (BACK CALCULATED FROM SETTLEMENT DATA GIVEN IN EPD INTERNAL TECHNICAL PAPER (REPORT NO. EPD/ITP14/99)		
2.	$\gamma_{SOIL} = 19 \text{ KN/m}^2$, $\gamma_{WASTE} = 14 \text{ KN/m}^2$		
3.	THICKNESS OF CAP = 3m		
4.	ASSUMED $t_i = 80$ days		

Procedure		chk	chk
1.	PRIMARY SETTLEMENT FOR VARIOUS LOCATIONS DUE TO LOWERING OF LEACHATE -CENTRAL VALLEY, WEST PLATFORM & EAST PLATFORM		2. PREDICTED SECONDARY SETTLEMENT FOR VARIOUS LOCATIONS FROM 1998 to 2048 -CENTRAL VALLEY, WEST PLATFORM & EAST PLATFORM

Design Eng Remarks

Checks

1	Constraints		4	Application	
2	Assumptions		5	Numerical	
3	Theory		6		

Checking Eng Remarks

Interface Eng Remarks

Computer File
DTASKS.XLS

Filed in:

0293 /

Date

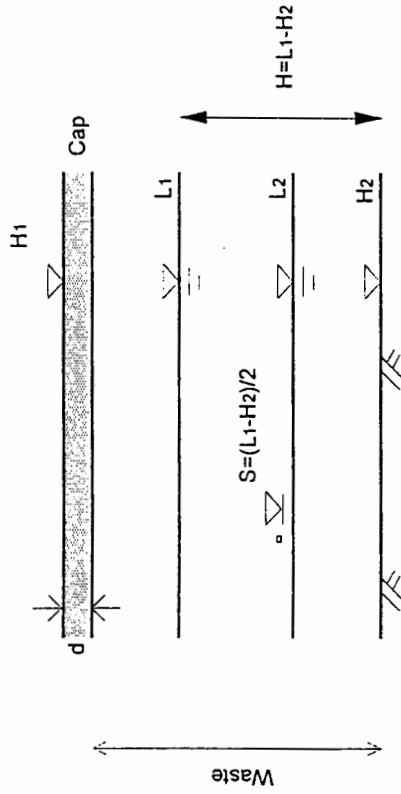
Primary settlement for Ngau Tam Mei due to lowering of leachate

- γ_{water} = 10 kN/m³
- γ_{soil} = 19 kN/m³
- γ_{waste} = 14 kN/m³
- Thickness of cap = 3 m

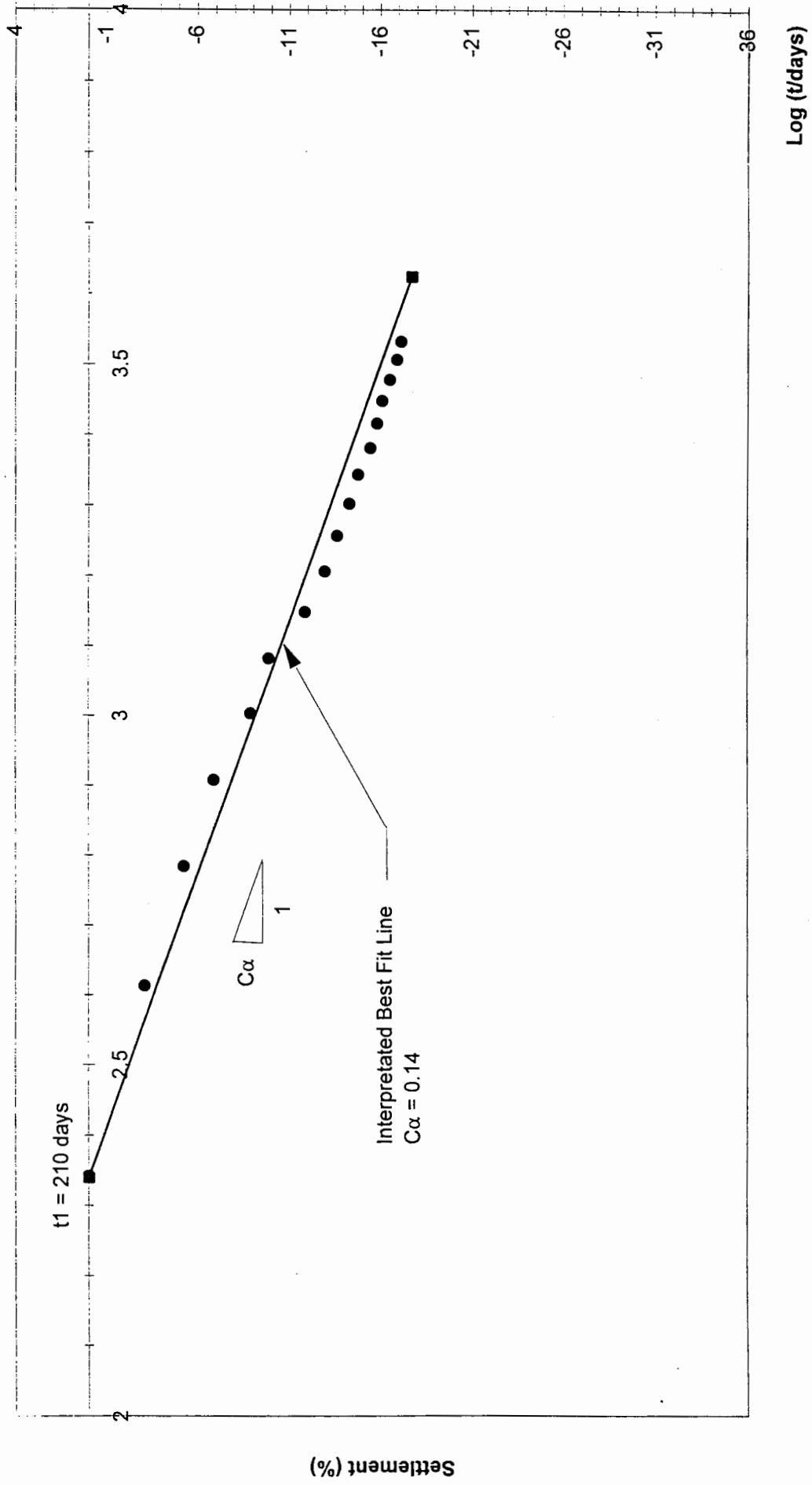
Location	H1(mPD)	H2(mPD)	L1(mPD)	L2(mPD)	S(mPD)	σ_v (kN/m ²)	u (kN/m ²)	σ_v (kN/m ²)	$\Delta\sigma_v$ (kN/m ²)	a	H(m)	Δu (kN/m ²)	$\Delta\sigma_v$ (kN/m ²)	δ (m)
DH401	34.73	19.28	22.73	22	21.005	207.15	17.25	189.9	7.3	6.00E-04	3.45	7.3	6.53	0.0135
DH402	26.03	15.03	21.43	20	18.23	124.2	32	92.2	14.3	1.10E-03	6.4	14.3	12.70	0.0894

- L1(mPD) — Current leachate level
- L2(mPD) — Final leachate level
- H1(mPD) — Contour level of waste
- H2(mPD) — Bottom of waste
- d(m) — Thickness of cap
- S(mPD) — Mid depth between the current leachate level & the bottom of the waste

Coefficient a obtained from Fig.2 Blieker et al (1995)

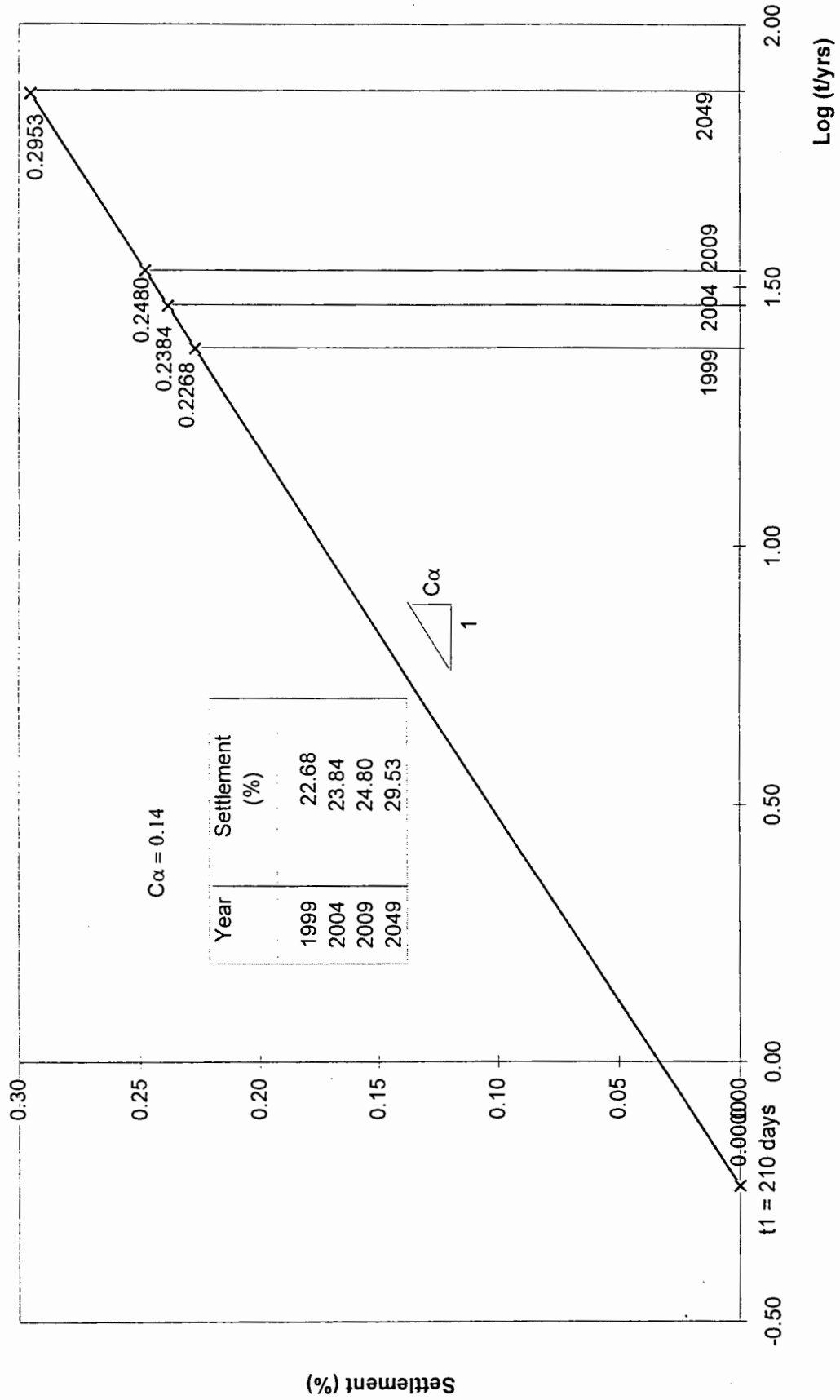


Long Term Settlement at Ngau Tam Mei



Average values of markers SM1, SM2, SM4, SM5, SM6 are adopted.
 Reference: EPD Internal Technical Paper (Report no. EPD/ITP14/89)

Long Term Settlement at Ngau Tam Mei

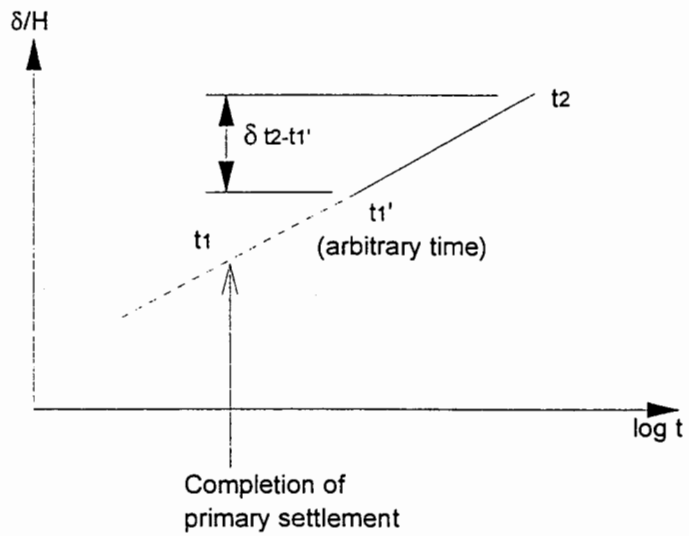


Predicted Secondary Settlement for various locations are tabulated in the following tables:

At Ngau Tam Mei

Location	Depth of waste(m) (H1-d-H2)	Expected Additional Settlement(m) from 1999		
		Year 2004	Year 2009	Year 2049
DH401	15.45	0.18	0.33	1.06
DH402	11	0.13	0.23	0.75

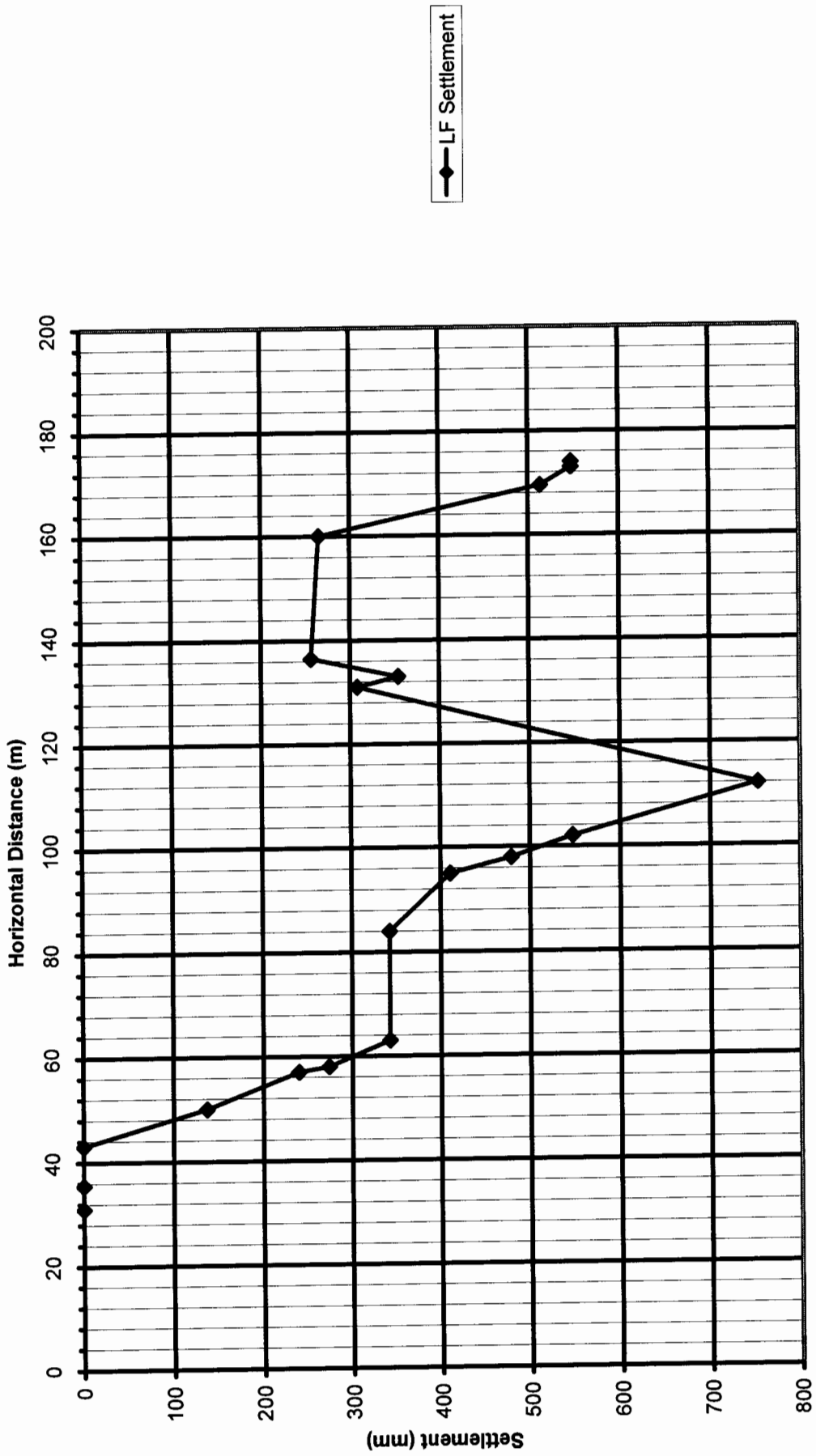
$$\frac{\delta_{t_2-t_1'}}{H} = C_\alpha \log \frac{t_2}{t_1'}$$



- δ (m) — Secondary settlement
- H (m) — Thickness of waste
- C_α — Coefficient of secondary settlement
- t_2 — Time after completion
- t_1' — Time at present (1999)

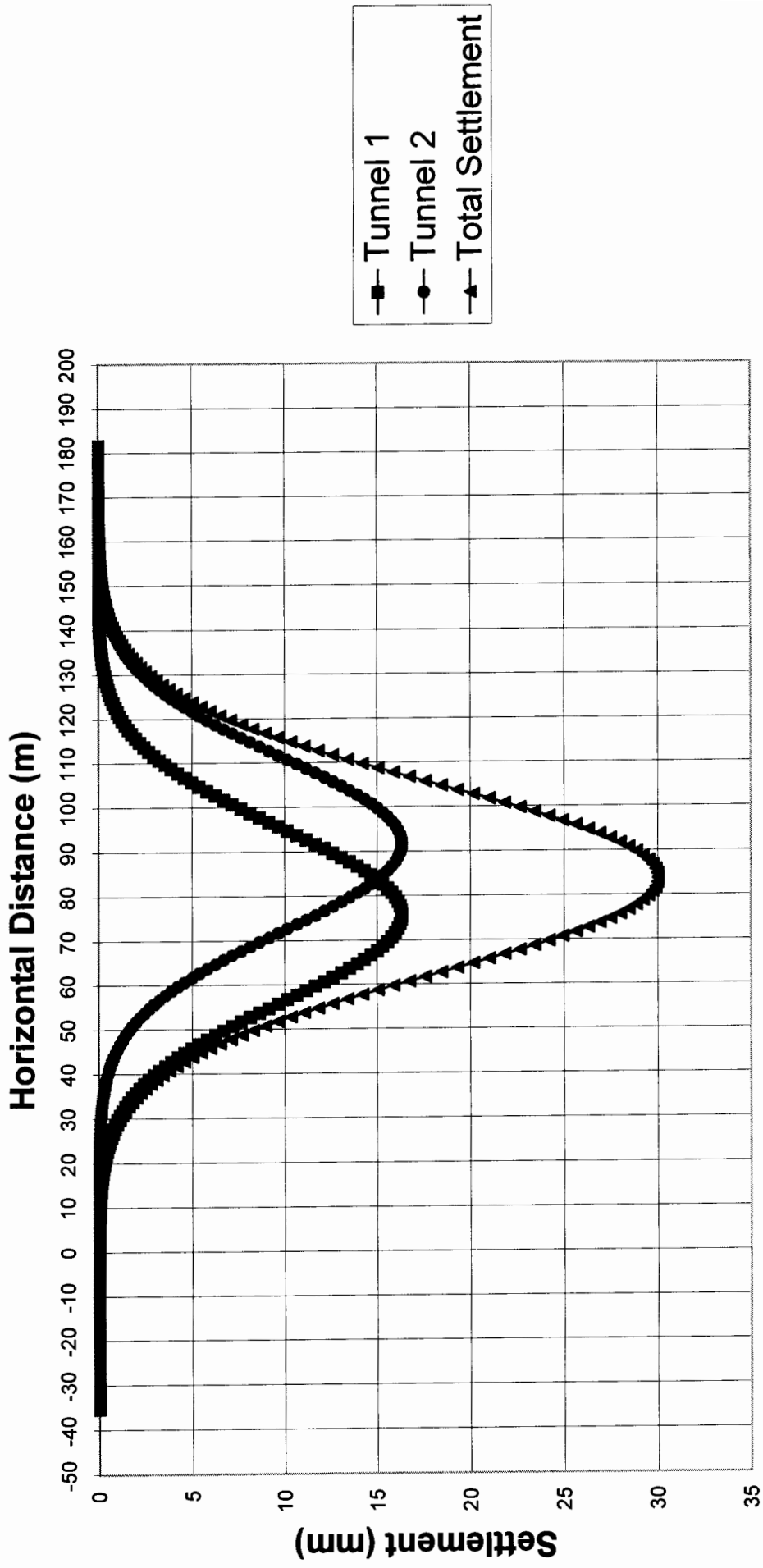
WASTE SETTLEMENT ANALYSIS
SETTLEMENT FROM WASTE DECOMPOSITION
AND
TUNNEL FORMATION

Restored Ngau Tam Meil Landfill
 Estimated Waste Decomposition Settlement Only



—◆— LF Settlement

Restored Ngau Tam Mei Landfill Estimated Settlement From Tunnel Only



**Restored Ngau Tam Meil Landfill
Waste Decomposition and Tunnel Settlement**

