Discounted Cash Flow Method Case- 1-80-855

Discount rate= 12(%)

B =	247.61	S =	1			
C =	205.53	kW Value	B1=	68 US$/kW	C1=	0.061575991
B/C=	1.204	kWH Value	B2=	0.063 US$/kWH	C2=	0.049496865
B-C=	42.08	kWH Value	B3=	0.005 US$/kWH	C3=	0.035193049

UNIT-Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales			Discounted Benefit Flow			
				Salable Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	24.51	15.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	49.64	28.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	71.00	35.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	110.37	49.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	56.68	22.89	179.00	1041.10	52.00	4.55	2.10	1.42	8.08
1995	9	2.70	0.97	256.00	964.10	69.00	5.81	1.73	1.69	9.24
1996	10	2.70	0.86	333.00	887.10	86.10	6.75	1.42	1.88	10.06
1997	11	8.42	2.42	415.00	805.10	104.20	7.51	1.15	2.03	10.71
1998	12	14.01	3.59	500.00	720.10	123.20	8.08	0.92	2.15	11.15
1999	13	9.65	2.21	588.00	1223.30	143.00	8.48	1.40	2.22	12.11
2000	14	4.05	0.82	680.00	1131.30	163.70	8.76	1.15	2.27	12.20
2001	15	4.05	0.73	776.00	1035.30	185.40	8.93	0.94	2.30	12.18
2002	16	4.05	0.66	876.00	935.30	208.30	9.00	0.76	2.31	12.07
2003	17	4.05	0.58	980.00	831.30	211.20	8.99	0.60	2.09	11.68
2004	18	4.05	0.52	1089.00	722.30	211.20	8.92	0.46	1.86	11.25
2005	19	4.05	0.47	1201.00	610.30	211.20	8.78	0.35	1.66	10.80
2006	20	4.05	0.41	1318.00	493.30	211.20	8.60	0.25	1.48	10.35
2007	21	4.05	0.37	1440.00	371.30	211.20	8.39	0.17	1.32	9.89
2008	22	4.05	0.33	1567.00	244.30	211.20	8.15	0.10	1.18	9.44
2009	23	4.05	0.29	1699.00	112.30	211.20	7.89	0.04	1.05	8.99
2010	24	4.05	0.26	1811.30	0.00	211.20	7.51	0.00	0.94	8.46
2011	25	4.05	0.23	1811.30	0.00	211.20	6.71	0.00	0.84	7.55
2012	26	4.05	0.21	1811.30	0.00	211.20	5.99	0.00	0.75	6.74
2013	27	4.05	0.18	1811.30	0.00	211.20	5.35	0.00	0.67	6.02
2014	28	4.05	0.16	1811.30	0.00	211.20	4.77	0.00	0.60	5.37
2015	29	4.05	0.15	1811.30	0.00	211.20	4.26	0.00	0.53	4.80
2016	30	4.05	0.13	1811.30	0.00	211.20	3.80	0.00	0.47	4.28
2017	31	4.05	0.12	1811.30	0.00	211.20	3.40	0.00	0.42	3.82
2018	32	4.05	0.10	1811.30	0.00	211.20	3.03	0.00	0.38	3.41
2019	33	4.05	0.09	1811.30	0.00	211.20	2.71	0.00	0.34	3.05
2020	34	4.05	0.08	1811.30	0.00	211.20	2.42	0.00	0.30	2.72
2021	35	4.05	0.07	1811.30	0.00	211.20	2.16	0.00	0.27	2.43
2022	36	4.05	0.06	1811.30	0.00	211.20	1.92	0.00	0.24	2.17
2023	37	4.05	0.06	1811.30	0.00	211.20	1.72	0.00	0.21	1.93
2024	38	4.05	0.05	1811.30	0.00	211.20	1.53	0.00	0.19	1.73
2025	39	4.05	0.04	1811.30	0.00	211.20	1.37	0.00	0.17	1.54
2026	40	4.05	0.04	1811.30	0.00	211.20	1.22	0.00	0.15	1.38
2027	41	4.05	0.03	1811.30	0.00	211.20	1.09	0.00	0.13	1.23
2028	42	4.05	0.03	1811.30	0.00	211.20	0.97	0.00	0.12	1.10
2029	43	4.05	0.03	1811.30	0.00	211.20	0.87	0.00	0.10	0.98
2030	44	4.05	0.02	1811.30	0.00	211.20	0.77	0.00	0.09	0.87
2031	45	4.05	0.02	1811.30	0.00	211.20	0.69	0.00	0.08	0.78
2032	46	4.05	0.02	1811.30	0.00	211.20	0.62	0.00	0.07	0.69
2033	47	4.05	0.01	1811.30	0.00	211.20	0.55	0.00	0.06	0.62
2034	48	4.05	0.01	1811.30	0.00	211.20	0.49	0.00	0.06	0.55
2035	49	4.05	0.01	1811.30	0.00	211.20	0.44	0.00	0.05	0.49
2036	50	4.05	0.01	1811.30	0.00	211.20	0.39	0.00	0.04	0.44
2037	51	4.05	0.01	1811.30	0.00	211.20	0.35	0.00	0.04	0.39
2038	52	4.05	0.01	1811.30	0.00	211.20	0.31	0.00	0.03	0.35
2039	53	4.05	0.00	1811.30	0.00	211.20	0.28	0.00	0.03	0.31
2040	54	4.05	0.00	1811.30	0.00	211.20	0.25	0.00	0.03	0.28
2041	55	4.05	0.00	1811.30	0.00	211.20	0.22	0.00	0.02	0.25
2042	56	4.05	0.00	1811.30	0.00	211.20	0.20	0.00	0.02	0.22
2043	57	4.05	0.00	1811.30	0.00	211.20	0.17	0.00	0.02	0.20
Total		573.83	205.53				196.35	13.61	37.64	247.61

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- 1 -80-875

Discount rate= 12(%)

B =	252.63		S =	1		
C =	236.63	kW Value	B1=	68 US$/kW	C1= 0.070158249	
B/C=	1.067	kWH Value	B2=	0.063 US$/kWH	C2= 0.057971944	
B-C=	16.00	kWH Value	B3=	0.005 US$/kWH	C3= 0.040429358	UNIT=Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales			Discounted Benefit Flow			
				Salable Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	29.60	18.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	65.09	36.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	86.55	43.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	120.37	54.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	61.75	24.93	179.00	796.80	52.00	4.55	1.60	1.42	7.59
1995	9	7.22	2.60	256.00	719.80	69.00	5.81	1.29	1.69	8.80
1996	10	13.00	4.18	333.00	642.80	86.10	6.75	1.03	1.88	9.67
1997	11	8.95	2.57	415.00	1046.90	104.20	7.51	1.50	2.03	11.05
1998	12	8.37	2.14	500.00	961.90	123.20	8.08	1.23	2.15	11.47
1999	13	8.05	1.84	588.00	873.90	143.00	8.48	1.00	2.22	11.71
2000	14	6.07	1.24	680.00	1250.80	163.70	8.76	1.27	2.27	12.32
2001	15	4.61	0.84	776.00	1154.80	185.40	8.93	1.05	2.30	12.28
2002	16	4.61	0.75	876.00	1054.80	208.30	9.00	0.86	2.31	12.17
2003	17	4.61	0.67	980.00	950.80	223.60	8.99	0.69	2.21	11.89
2004	18	4.61	0.59	1089.00	841.80	223.60	8.92	0.54	1.97	11.44
2005	19	4.61	0.53	1201.00	729.80	223.60	8.78	0.42	1.76	10.97
2006	20	4.61	0.47	1318.00	612.80	223.60	8.60	0.31	1.57	10.50
2007	21	4.61	0.42	1440.00	490.80	223.60	8.39	0.22	1.40	10.03
2008	22	4.61	0.38	1567.00	363.80	223.60	8.15	0.15	1.25	9.56
2009	23	4.61	0.34	1699.00	231.80	223.60	7.89	0.08	1.12	9.10
2010	24	4.61	0.30	1837.00	93.80	223.60	7.62	0.03	1.00	8.65
2011	25	4.61	0.27	1930.80	0.00	223.60	7.15	0.00	0.89	8.04
2012	26	4.61	0.24	1930.80	0.00	223.60	6.38	0.00	0.79	7.18
2013	27	4.61	0.21	1930.80	0.00	223.60	5.70	0.00	0.71	6.41
2014	28	4.61	0.19	1930.80	0.00	223.60	5.09	0.00	0.63	5.72
2015	29	4.61	0.17	1930.80	0.00	223.60	4.54	0.00	0.56	5.11
2016	30	4.61	0.15	1930.80	0.00	223.60	4.06	0.00	0.50	4.56
2017	31	4.61	0.13	1930.80	0.00	223.60	3.62	0.00	0.45	4.07
2018	32	4.61	0.12	1930.80	0.00	223.60	3.23	0.00	0.40	3.64
2019	33	4.61	0.10	1930.80	0.00	223.60	2.88	0.00	0.36	3.25
2020	34	4.61	0.09	1930.80	0.00	223.60	2.58	0.00	0.32	2.90
2021	35	4.61	0.08	1930.80	0.00	223.60	2.30	0.00	0.28	2.59
2022	36	4.61	0.07	1930.80	0.00	223.60	2.05	0.00	0.25	2.31
2023	37	4.61	0.06	1930.80	0.00	223.60	1.83	0.00	0.22	2.06
2024	38	4.61	0.06	1930.80	0.00	223.60	1.63	0.00	0.20	1.84
2025	39	4.61	0.05	1930.80	0.00	223.60	1.46	0.00	0.18	1.64
2026	40	4.61	0.04	1930.80	0.00	223.60	1.30	0.00	0.16	1.47
2027	41	4.61	0.04	1930.80	0.00	223.60	1.16	0.00	0.14	1.31
2028	42	4.61	0.03	1930.80	0.00	223.60	1.04	0.00	0.13	1.17
2029	43	4.61	0.03	1930.80	0.00	223.60	0.93	0.00	0.11	1.04
2030	44	4.61	0.03	1930.80	0.00	223.60	0.83	0.00	0.10	0.93
2031	45	4.61	0.02	1930.80	0.00	223.60	0.74	0.00	0.09	0.83
2032	46	4.61	0.02	1930.80	0.00	223.60	0.66	0.00	0.08	0.74
2033	47	4.61	0.02	1930.80	0.00	223.60	0.59	0.00	0.07	0.66
2034	48	4.61	0.02	1930.80	0.00	223.60	0.52	0.00	0.06	0.59
2035	49	4.61	0.01	1930.80	0.00	223.60	0.47	0.00	0.05	0.53
2036	50	4.61	0.01	1930.80	0.00	223.60	0.42	0.00	0.05	0.47
2037	51	4.61	0.01	1930.80	0.00	223.60	0.37	0.00	0.04	0.42
2038	52	4.61	0.01	1930.80	0.00	223.60	0.33	0.00	0.04	0.37
2039	53	4.61	0.01	1930.80	0.00	223.60	0.29	0.00	0.03	0.33
2040	54	4.61	0.01	1930.80	0.00	223.60	0.26	0.00	0.03	0.30
2041	55	4.61	0.00	1930.80	0.00	223.60	0.23	0.00	0.02	0.26
2042	56	4.61	0.00	1930.80	0.00	223.60	0.21	0.00	0.02	0.23
2043	57	4.61	0.00	1930.80	0.00	223.60	0.19	0.00	0.02	0.21
Total		659.20	236.63				200.49	13.35	38.78	252.63

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- 1-80-S

Discount rate= 12(%)

B =	209.11		S =	1			
C	180.00	kW Value	B1=	68 US$/kW	C1=	0.063375943	
B/C	1.161	kWH Value	B2=	0.063 US$/kWH	C2=	0.052328944	
B-C=	29.11	kWH Value	B3=	0.005 US$/kWH	C3=	0.043436698	UNIT=Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales			Discounted Benefit Flow			
				Salable Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	20.64	13.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	38.65	21.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	55.65	28.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	96.69	43.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	49.95	20.17	179.00	686.80	52.00	4.55	1.38	1.42	7.36
1995	9	7.05	2.54	256.00	609.80	69.00	5.81	1.09	1.69	8.60
1996	10	12.68	4.08	333.00	532.80	86.10	6.75	0.85	1.88	9.49
1997	11	8.92	2.56	415.00	450.80	99.40	7.51	0.64	1.94	10.10
1998	12	3.53	0.90	500.00	365.80	99.40	8.08	0.46	1.73	10.28
1999	13	3.53	0.80	588.00	697.20	143.00	8.48	0.79	2.22	11.51
2000	14	3.53	0.72	680.00	605.20	149.10	8.76	0.61	2.07	11.45
2001	15	3.53	0.64	776.00	509.20	149.10	8.93	0.46	1.85	11.24
2002	16	3.53	0.57	876.00	409.20	149.10	9.00	0.33	1.65	10.98
2003	17	3.53	0.51	980.00	305.20	149.10	8.99	0.22	1.47	10.69
2004	18	3.53	0.45	1089.00	196.20	149.10	8.92	0.12	1.31	10.36
2005	19	3.53	0.40	1201.00	84.20	149.10	8.78	0.04	1.17	10.01
2006	20	3.53	0.36	1285.20	0.00	149.10	8.39	0.00	1.05	9.44
2007	21	3.53	0.32	1285.20	0.00	149.10	7.49	0.00	0.93	8.43
2008	22	3.53	0.29	1285.20	0.00	149.10	6.69	0.00	0.83	7.52
2009	23	3.53	0.26	1285.20	0.00	149.10	5.97	0.00	0.74	6.72
2010	24	3.53	0.23	1285.20	0.00	149.10	5.33	0.00	0.66	6.00
2011	25	3.53	0.20	1285.20	0.00	149.10	4.76	0.00	0.59	5.35
2012	26	3.53	0.18	1285.20	0.00	149.10	4.25	0.00	0.53	4.78
2013	27	3.53	0.16	1285.20	0.00	149.10	3.79	0.00	0.47	4.27
2014	28	3.53	0.14	1285.20	0.00	149.10	3.39	0.00	0.42	3.81
2015	29	3.53	0.13	1285.20	0.00	149.10	3.02	0.00	0.37	3.40
2016	30	3.53	0.11	1285.20	0.00	149.10	2.70	0.00	0.33	3.04
2017	31	3.53	0.10	1285.20	0.00	149.10	2.41	0.00	0.30	2.71
2018	32	3.53	0.09	1285.20	0.00	149.10	2.15	0.00	0.26	2.42
2019	33	3.53	0.08	1285.20	0.00	149.10	1.92	0.00	0.24	2.16
2020	34	3.53	0.07	1285.20	0.00	149.10	1.71	0.00	0.21	1.93
2021	35	3.53	0.06	1285.20	0.00	149.10	1.53	0.00	0.19	1.72
2022	36	3.53	0.05	1285.20	0.00	149.10	1.36	0.00	0.17	1.54
2023	37	3.53	0.05	1285.20	0.00	149.10	1.22	0.00	0.15	1.37
2024	38	3.53	0.04	1285.20	0.00	149.10	1.09	0.00	0.13	1.22
2025	39	3.53	0.04	1285.20	0.00	149.10	0.97	0.00	0.12	1.09
2026	40	3.53	0.03	1285.20	0.00	149.10	0.87	0.00	0.10	0.97
2027	41	3.53	0.03	1285.20	0.00	149.10	0.77	0.00	0.09	0.87
2028	42	3.53	0.03	1285.20	0.00	149.10	0.69	0.00	0.08	0.78
2029	43	3.53	0.02	1285.20	0.00	149.10	0.61	0.00	0.07	0.69
2030	44	3.53	0.02	1285.20	0.00	149.10	0.55	0.00	0.06	0.62
2031	45	3.53	0.02	1285.20	0.00	149.10	0.49	0.00	0.06	0.55
2032	46	3.53	0.01	1285.20	0.00	149.10	0.44	0.00	0.05	0.49
2033	47	3.53	0.01	1285.20	0.00	149.10	0.39	0.00	0.04	0.44
2034	48	3.53	0.01	1285.20	0.00	149.10	0.35	0.00	0.04	0.39
2035	49	3.53	0.01	1285.20	0.00	149.10	0.31	0.00	0.03	0.35
2036	50	3.53	0.01	1285.20	0.00	149.10	0.28	0.00	0.03	0.31
2037	51	3.53	0.01	1285.20	0.00	149.10	0.25	0.00	0.03	0.28
2038	52	3.53	0.00	1285.20	0.00	149.10	0.22	0.00	0.02	0.25
2039	53	3.53	0.00	1285.20	0.00	149.10	0.19	0.00	0.02	0.22
2040	54	3.53	0.00	1285.20	0.00	149.10	0.17	0.00	0.02	0.20
2041	55	3.53	0.00	1285.20	0.00	149.10	0.15	0.00	0.01	0.17
2042	56	3.53	0.00	1285.20	0.00	149.10	0.14	0.00	0.01	0.15
2043	57	3.53	0.00	1285.20	0.00	149.10	0.12	0.00	0.01	0.14
Total		498.56	180.00				171.89	7.07	30.14	209.11

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- 1-80-K

Discount rate= 12(%)

B =	247.67		S =	1			
C =	200.12	kW Value	B1=	68	US$/kW	C1=	0.059839744
B/C=	1.237	kWH Value	B2=	0.063	US$/kWH	C2=	0.047742994
B-C=	47.55	kWH Value	B3=	0.005	US$/kWH	C3=	0.034266461

UNIT=Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales			Discounted Benefit Flow			
				Salable Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	23.51	14.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	45.83	26.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	67.63	34.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	109.30	49.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	56.00	22.61	179.00	1041.10	52.00	4.55	2.10	1.42	8.08
1995	9	2.67	0.96	256.00	964.10	69.00	5.81	1.73	1.69	9.24
1996	10	2.67	0.85	333.00	887.10	86.10	6.75	1.42	1.88	10.06
1997	11	8.34	2.39	415.00	805.10	104.20	7.51	1.15	2.03	10.71
1998	12	13.99	3.59	500.00	720.10	123.20	8.08	0.92	2.15	11.15
1999	13	9.63	2.20	588.00	1223.30	143.00	8.48	1.40	2.22	12.11
2000	14	4.00	0.81	680.00	1131.30	163.70	8.76	1.15	2.27	12.20
2001	15	4.00	0.73	776.00	1035.30	185.40	8.93	0.94	2.30	12.18
2002	16	4.00	0.65	876.00	935.30	208.30	9.00	0.76	2.31	12.07
2003	17	4.00	0.58	980.00	831.30	211.80	8.99	0.60	2.09	11.69
2004	18	4.00	0.52	1089.00	722.30	211.80	8.92	0.46	1.87	11.26
2005	19	4.00	0.46	1201.00	610.30	211.80	8.78	0.35	1.67	10.81
2006	20	4.00	0.41	1318.00	493.30	211.80	8.60	0.25	1.49	10.35
2007	21	4.00	0.37	1440.00	371.30	211.80	8.39	0.17	1.33	9.90
2008	22	4.00	0.33	1567.00	244.30	211.80	8.15	0.10	1.19	9.44
2009	23	4.00	0.29	1699.00	112.30	211.80	7.89	0.04	1.06	9.00
2010	24	4.00	0.26	1811.30	0.00	211.80	7.51	0.00	0.94	8.46
2011	25	4.00	0.23	1811.30	0.00	211.80	6.71	0.00	0.84	7.55
2012	26	4.00	0.21	1811.30	0.00	211.80	5.99	0.00	0.75	6.74
2013	27	4.00	0.18	1811.30	0.00	211.80	5.35	0.00	0.67	6.02
2014	28	4.00	0.16	1811.30	0.00	211.80	4.77	0.00	0.60	5.38
2015	29	4.00	0.14	1811.30	0.00	211.80	4.26	0.00	0.53	4.80
2016	30	4.00	0.13	1811.30	0.00	211.80	3.80	0.00	0.48	4.28
2017	31	4.00	0.11	1811.30	0.00	211.80	3.40	0.00	0.42	3.82
2018	32	4.00	0.10	1811.30	0.00	211.80	3.03	0.00	0.38	3.41
2019	33	4.00	0.09	1811.30	0.00	211.80	2.71	0.00	0.34	3.05
2020	34	4.00	0.08	1811.30	0.00	211.80	2.42	0.00	0.30	2.72
2021	35	4.00	0.07	1811.30	0.00	211.80	2.16	0.00	0.27	2.43
2022	36	4.00	0.06	1811.30	0.00	211.80	1.92	0.00	0.24	2.17
2023	37	4.00	0.06	1811.30	0.00	211.80	1.72	0.00	0.21	1.94
2024	38	4.00	0.05	1811.30	0.00	211.80	1.53	0.00	0.19	1.73
2025	39	4.00	0.04	1811.30	0.00	211.80	1.37	0.00	0.17	1.54
2026	40	4.00	0.04	1811.30	0.00	211.80	1.22	0.00	0.15	1.38
2027	41	4.00	0.03	1811.30	0.00	211.80	1.09	0.00	0.13	1.23
2028	42	4.00	0.03	1811.30	0.00	211.80	0.97	0.00	0.12	1.10
2029	43	4.00	0.03	1811.30	0.00	211.80	0.87	0.00	0.11	0.98
2030	44	4.00	0.02	1811.30	0.00	211.80	0.77	0.00	0.09	0.87
2031	45	4.00	0.02	1811.30	0.00	211.80	0.69	0.00	0.08	0.78
2032	46	4.00	0.02	1811.30	0.00	211.80	0.62	0.00	0.07	0.69
2033	47	4.00	0.01	1811.30	0.00	211.80	0.55	0.00	0.07	0.62
2034	48	4.00	0.01	1811.30	0.00	211.80	0.49	0.00	0.06	0.55
2035	49	4.00	0.01	1811.30	0.00	211.80	0.44	0.00	0.05	0.49
2036	50	4.00	0.01	1811.30	0.00	211.80	0.39	0.00	0.04	0.44
2037	51	4.00	0.01	1811.30	0.00	211.80	0.35	0.00	0.04	0.39
2038	52	4.00	0.01	1811.30	0.00	211.80	0.31	0.00	0.03	0.35
2039	53	4.00	0.00	1811.30	0.00	211.80	0.28	0.00	0.03	0.31
2040	54	4.00	0.00	1811.30	0.00	211.80	0.25	0.00	0.03	0.28
2041	55	4.00	0.00	1811.30	0.00	211.80	0.22	0.00	0.02	0.25
2042	56	4.00	0.00	1811.30	0.00	211.80	0.20	0.00	0.02	0.22
2043	57	4.00	0.00	1811.30	0.00	211.80	0.17	0.00	0.02	0.20
Total		561.52	200.12				196.35	13.61	37.70	247.67

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- B - 60

Discount rate 12(%)

B =	212.08		S =	1			
C =	195.84	kW Value	B1=	68	US$/kW	C1= 0.068261793	
B/C=	1.082	kWH Value	B2=	0.063	US$/kWH	C2= 0.057085530	
B-C=	16.24	kWH Value	B3=	0.005	US$/kWH	C3= 0.044251650	UNIT=Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales			Discounted Benefit Flow			
				Salable Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	22.47	14.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	44.67	25.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	64.78	32.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	105.54	47.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	53.88	21.76	179.00	691.10	52.00	4.55	1.39	1.42	7.37
1995	9	7.38	2.66	256.00	614.10	69.00	5.81	1.10	1.69	8.61
1996	10	13.19	4.24	333.00	537.10	86.10	6.75	0.86	1.88	9.50
1997	11	9.35	2.68	415.00	888.50	104.20	7.51	1.27	2.03	10.83
1998	12	3.80	0.97	500.00	803.50	123.20	8.08	1.03	2.15	11.26
1999	13	3.80	0.87	588.00	715.50	143.00	8.48	0.81	2.22	11.53
2000	14	3.80	0.77	680.00	623.50	149.40	8.76	0.63	2.07	11.48
2001	15	3.80	0.69	776.00	527.50	149.40	8.93	0.48	1.85	11.26
2002	16	3.80	0.61	876.00	427.50	149.40	9.00	0.34	1.65	11.00
2003	17	3.80	0.55	980.00	323.50	149.40	8.99	0.23	1.47	10.70
2004	18	3.80	0.49	1089.00	214.50	149.40	8.92	0.13	1.32	10.38
2005	19	3.80	0.44	1201.00	102.50	149.40	8.78	0.05	1.17	10.02
2006	20	3.80	0.39	1303.50	0.00	149.40	8.51	0.00	1.05	9.56
2007	21	3.80	0.35	1303.50	0.00	149.40	7.60	0.00	0.94	8.54
2008	22	3.80	0.31	1303.50	0.00	149.40	6.78	0.00	0.83	7.62
2009	23	3.80	0.28	1303.50	0.00	149.40	6.05	0.00	0.74	6.80
2010	24	3.80	0.25	1303.50	0.00	149.40	5.41	0.00	0.66	6.07
2011	25	3.80	0.22	1303.50	0.00	149.40	4.83	0.00	0.59	5.42
2012	26	3.80	0.19	1303.50	0.00	149.40	4.31	0.00	0.53	4.84
2013	27	3.80	0.17	1303.50	0.00	149.40	3.85	0.00	0.47	4.32
2014	28	3.80	0.15	1303.50	0.00	149.40	3.43	0.00	0.42	3.86
2015	29	3.80	0.14	1303.50	0.00	149.40	3.06	0.00	0.37	3.44
2016	30	3.80	0.12	1303.50	0.00	149.40	2.74	0.00	0.33	3.08
2017	31	3.80	0.11	1303.50	0.00	149.40	2.44	0.00	0.30	2.75
2018	32	3.80	0.10	1303.50	0.00	149.40	2.18	0.00	0.27	2.45
2019	33	3.80	0.09	1303.50	0.00	149.40	1.95	0.00	0.24	2.19
2020	34	3.80	0.08	1303.50	0.00	149.40	1.74	0.00	0.21	1.95
2021	35	3.80	0.07	1303.50	0.00	149.40	1.55	0.00	0.19	1.74
2022	36	3.80	0.06	1303.50	0.00	149.40	1.38	0.00	0.17	1.56
2023	37	3.80	0.05	1303.50	0.00	149.40	1.23	0.00	0.15	1.39
2024	38	3.80	0.05	1303.50	0.00	149.40	1.10	0.00	0.13	1.24
2025	39	3.80	0.04	1303.50	0.00	149.40	0.98	0.00	0.12	1.11
2026	40	3.80	0.04	1303.50	0.00	149.40	0.88	0.00	0.10	0.99
2027	41	3.80	0.03	1303.50	0.00	149.40	0.78	0.00	0.09	0.88
2028	42	3.80	0.03	1303.50	0.00	149.40	0.70	0.00	0.08	0.79
2029	43	3.80	0.02	1303.50	0.00	149.40	0.62	0.00	0.07	0.70
2030	44	3.80	0.02	1303.50	0.00	149.40	0.56	0.00	0.06	0.63
2031	45	3.80	0.02	1303.50	0.00	149.40	0.50	0.00	0.06	0.56
2032	46	3.80	0.02	1303.50	0.00	149.40	0.44	0.00	0.05	0.50
2033	47	3.80	0.01	1303.50	0.00	149.40	0.39	0.00	0.04	0.44
2034	48	3.80	0.01	1303.50	0.00	149.40	0.35	0.00	0.04	0.40
2035	49	3.80	0.01	1303.50	0.00	149.40	0.31	0.00	0.03	0.35
2036	50	3.80	0.01	1303.50	0.00	149.40	0.28	0.00	0.03	0.31
2037	51	3.80	0.01	1303.50	0.00	149.40	0.25	0.00	0.03	0.28
2038	52	3.80	0.01	1303.50	0.00	149.40	0.22	0.00	0.02	0.25
2039	53	3.80	0.00	1303.50	0.00	149.40	0.20	0.00	0.02	0.22
2040	54	3.80	0.00	1303.50	0.00	149.40	0.18	0.00	0.02	0.20
2041	55	3.80	0.00	1303.50	0.00	149.40	0.16	0.00	0.01	0.18
2042	56	3.80	0.00	1303.50	0.00	149.40	0.14	0.00	0.01	0.16
2043	57	3.80	0.00	1303.50	0.00	149.40	0.12	0.00	0.01	0.14
Total		542.01	195.84				172.99	8.39	30.69	212.08

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- B - 70

Discount rate 12(%)

B	228.20		S =	1			
C	201.57	kW Value	B1=	68 US$/kW	C1=	0.065465495	
B/C	1.132	kWH Value	B2=	0.063 US$/kWH	C2=	0.053882473	
B-C	26.62	kWH Value	B3=	0.005 US$/kWH	C3=	0.040292552	UNIT=Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales			Discounted Benefit Flow			
				Salable Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	23.10	14.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	46.98	26.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	68.75	34.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	109.39	49.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	55.79	22.53	179.00	836.10	52.00	4.55	1.68	1.42	7.67
1995	9	2.62	0.94	256.00	759.10	69.00	5.81	1.36	1.69	8.87
1996	10	7.74	2.49	333.00	682.10	86.10	6.75	1.09	1.88	9.73
1997	11	13.55	3.89	415.00	600.10	104.20	7.51	0.86	2.03	10.41
1998	12	9.58	2.45	500.00	1014.40	123.20	8.08	1.30	2.15	11.53
1999	13	3.93	0.90	588.00	926.40	143.00	8.48	1.06	2.22	11.77
2000	14	3.93	0.80	680.00	834.40	163.70	8.76	0.85	2.27	11.89
2001	15	3.93	0.71	776.00	738.40	174.90	8.93	0.67	2.17	11.77
2002	16	3.93	0.64	876.00	638.40	174.90	9.00	0.52	1.94	11.46
2003	17	3.93	0.57	980.00	534.40	174.90	8.99	0.38	1.73	11.11
2004	18	3.93	0.51	1089.00	425.40	174.90	8.92	0.27	1.54	10.74
2005	19	3.93	0.45	1201.00	313.40	174.90	8.78	0.18	1.38	10.34
2006	20	3.93	0.40	1318.00	196.40	174.90	8.60	0.10	1.23	9.94
2007	21	3.93	0.36	1440.00	74.40	174.90	8.39	0.03	1.10	9.53
2008	22	3.93	0.32	1514.40	0.00	174.90	7.88	0.00	0.98	8.86
2009	23	3.93	0.28	1514.40	0.00	174.90	7.03	0.00	0.87	7.91
2010	24	3.93	0.25	1514.40	0.00	174.90	6.28	0.00	0.78	7.06
2011	25	3.93	0.23	1514.40	0.00	174.90	5.61	0.00	0.69	6.31
2012	26	3.93	0.20	1514.40	0.00	174.90	5.01	0.00	0.62	5.63
2013	27	3.93	0.18	1514.40	0.00	174.90	4.47	0.00	0.55	5.03
2014	28	3.93	0.16	1514.40	0.00	174.90	3.99	0.00	0.49	4.49
2015	29	3.93	0.14	1514.40	0.00	174.90	3.56	0.00	0.44	4.01
2016	30	3.93	0.13	1514.40	0.00	174.90	3.18	0.00	0.39	3.58
2017	31	3.93	0.11	1514.40	0.00	174.90	2.84	0.00	0.35	3.19
2018	32	3.93	0.10	1514.40	0.00	174.90	2.53	0.00	0.31	2.85
2019	33	3.93	0.09	1514.40	0.00	174.90	2.26	0.00	0.28	2.54
2020	34	3.93	0.08	1514.40	0.00	174.90	2.02	0.00	0.25	2.27
2021	35	3.93	0.07	1514.40	0.00	174.90	1.80	0.00	0.22	2.03
2022	36	3.93	0.06	1514.40	0.00	174.90	1.61	0.00	0.20	1.81
2023	37	3.93	0.05	1514.40	0.00	174.90	1.44	0.00	0.17	1.62
2024	38	3.93	0.05	1514.40	0.00	174.90	1.28	0.00	0.16	1.44
2025	39	3.93	0.04	1514.40	0.00	174.90	1.14	0.00	0.14	1.29
2026	40	3.93	0.04	1514.40	0.00	174.90	1.02	0.00	0.12	1.15
2027	41	3.93	0.03	1514.40	0.00	174.90	0.91	0.00	0.11	1.02
2028	42	3.93	0.03	1514.40	0.00	174.90	0.81	0.00	0.10	0.91
2029	43	3.93	0.03	1514.40	0.00	174.90	0.72	0.00	0.09	0.82
2030	44	3.93	0.02	1514.40	0.00	174.90	0.65	0.00	0.08	0.73
2031	45	3.93	0.02	1514.40	0.00	174.90	0.58	0.00	0.07	0.65
2032	46	3.93	0.02	1514.40	0.00	174.90	0.51	0.00	0.06	0.58
2033	47	3.93	0.01	1514.40	0.00	174.90	0.46	0.00	0.05	0.52
2034	48	3.93	0.01	1514.40	0.00	174.90	0.41	0.00	0.05	0.46
2035	49	3.93	0.01	1514.40	0.00	174.90	0.36	0.00	0.04	0.41
2036	50	3.93	0.01	1514.40	0.00	174.90	0.33	0.00	0.04	0.37
2037	51	3.93	0.01	1514.40	0.00	174.90	0.29	0.00	0.03	0.33
2038	52	3.93	0.01	1514.40	0.00	174.90	0.26	0.00	0.03	0.29
2039	53	3.93	0.00	1514.40	0.00	174.90	0.23	0.00	0.02	0.26
2040	54	3.93	0.00	1514.40	0.00	174.90	0.20	0.00	0.02	0.23
2041	55	3.93	0.00	1514.40	0.00	174.90	0.18	0.00	0.02	0.21
2042	56	3.93	0.00	1514.40	0.00	174.90	0.16	0.00	0.02	0.18
2043	57	3.93	0.00	1514.40	0.00	174.90	0.14	0.00	0.01	0.16
Total		560.30	201.57				183.96	10.41	33.82	228.20

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- II - 80

Discount rate= 12(%)

B =	242.02		S =	1			
C =	207.05	kW Value	B1=	68 US$/kW	C1=	0.063543053	
B/C=	1.168	kWH Value	B2=	0.063 US$/kWH	C2=	0.051582336	
B-C=	34.96	kWH Value	B3=	0.005 US$/kWH	C3=	0.037301072	UNIT=Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales			Discounted Benefit Flow			
				Salable Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	23.67	15.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	49.08	27.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	72.41	36.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	113.06	51.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	57.72	23.31	179.00	980.70	52.00	4.55	1.98	1.42	7.96
1995	9	2.71	0.97	256.00	903.70	69.00	5.81	1.62	1.69	9.13
1996	10	2.71	0.87	333.00	826.70	86.10	6.75	1.33	1.88	9.97
1997	11	8.25	2.37	415.00	744.70	104.20	7.51	1.07	2.03	10.62
1998	12	14.06	3.60	500.00	659.70	123.20	8.08	0.84	2.15	11.08
1999	13	9.72	2.22	588.00	1133.60	143.00	8.48	1.29	2.22	12.01
2000	14	4.07	0.83	680.00	1041.60	163.70	8.76	1.06	2.27	12.10
2001	15	4.07	0.74	776.00	945.60	185.40	8.93	0.86	2.30	12.09
2002	16	4.07	0.66	876.00	845.60	201.00	9.00	0.68	2.22	11.92
2003	17	4.07	0.59	980.00	741.60	201.00	8.99	0.54	1.99	11.52
2004	18	4.07	0.52	1089.00	632.60	201.00	8.92	0.41	1.77	11.11
2005	19	4.07	0.47	1201.00	520.60	201.00	8.78	0.30	1.58	10.67
2006	20	4.07	0.42	1318.00	403.60	201.00	8.60	0.20	1.41	10.23
2007	21	4.07	0.37	1440.00	281.60	201.00	8.39	0.13	1.26	9.79
2008	22	4.07	0.33	1567.00	154.60	201.00	8.15	0.06	1.12	9.35
2009	23	4.07	0.30	1699.00	22.60	201.00	7.89	0.00	1.00	8.91
2010	24	4.07	0.26	1721.60	0.00	201.00	7.14	0.00	0.90	8.04
2011	25	4.07	0.23	1721.60	0.00	201.00	6.38	0.00	0.80	7.18
2012	26	4.07	0.21	1721.60	0.00	201.00	5.69	0.00	0.71	6.41
2013	27	4.07	0.19	1721.60	0.00	201.00	5.08	0.00	0.64	5.72
2014	28	4.07	0.17	1721.60	0.00	201.00	4.54	0.00	0.57	5.11
2015	29	4.07	0.15	1721.60	0.00	201.00	4.05	0.00	0.51	4.56
2016	30	4.07	0.13	1721.60	0.00	201.00	3.62	0.00	0.45	4.07
2017	31	4.07	0.12	1721.60	0.00	201.00	3.23	0.00	0.40	3.63
2018	32	4.07	0.10	1721.60	0.00	201.00	2.88	0.00	0.36	3.24
2019	33	4.07	0.09	1721.60	0.00	201.00	2.57	0.00	0.32	2.90
2020	34	4.07	0.08	1721.60	0.00	201.00	2.30	0.00	0.28	2.59
2021	35	4.07	0.07	1721.60	0.00	201.00	2.05	0.00	0.25	2.31
2022	36	4.07	0.06	1721.60	0.00	201.00	1.83	0.00	0.23	2.06
2023	37	4.07	0.06	1721.60	0.00	201.00	1.63	0.00	0.20	1.84
2024	38	4.07	0.05	1721.60	0.00	201.00	1.46	0.00	0.18	1.64
2025	39	4.07	0.04	1721.60	0.00	201.00	1.30	0.00	0.16	1.46
2026	40	4.07	0.04	1721.60	0.00	201.00	1.16	0.00	0.14	1.31
2027	41	4.07	0.03	1721.60	0.00	201.00	1.04	0.00	0.13	1.17
2028	42	4.07	0.03	1721.60	0.00	201.00	0.92	0.00	0.11	1.04
2029	43	4.07	0.03	1721.60	0.00	201.00	0.82	0.00	0.10	0.93
2030	44	4.07	0.02	1721.60	0.00	201.00	0.74	0.00	0.09	0.83
2031	45	4.07	0.02	1721.60	0.00	201.00	0.66	0.00	0.08	0.74
2032	46	4.07	0.02	1721.60	0.00	201.00	0.59	0.00	0.07	0.66
2033	47	4.07	0.01	1721.60	0.00	201.00	0.52	0.00	0.06	0.59
2034	48	4.07	0.01	1721.60	0.00	201.00	0.47	0.00	0.05	0.53
2035	49	4.07	0.01	1721.60	0.00	201.00	0.42	0.00	0.05	0.47
2036	50	4.07	0.01	1721.60	0.00	201.00	0.37	0.00	0.04	0.42
2037	51	4.07	0.01	1721.60	0.00	201.00	0.33	0.00	0.04	0.37
2038	52	4.07	0.01	1721.60	0.00	201.00	0.29	0.00	0.03	0.33
2039	53	4.07	0.01	1721.60	0.00	201.00	0.26	0.00	0.03	0.30
2040	54	4.07	0.00	1721.60	0.00	201.00	0.23	0.00	0.03	0.26
2041	55	4.07	0.00	1721.60	0.00	201.00	0.21	0.00	0.02	0.23
2042	56	4.07	0.00	1721.60	0.00	201.00	0.19	0.00	0.02	0.21
2043	57	4.07	0.00	1721.60	0.00	201.00	0.16	0.00	0.02	0.19
Total		578.42	207.05				192.95	12.44	36.63	242.02

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- B - 90

Discount rate= 12(%)

B =	250.57		S =	1			
C =	217.46	kW Value	B1=	68	US$/kW	C1=	0.064839325
B/C=	1.152	kWH Value	B2=	0.063	US$/kWH	C2=	0.052477766
B-C=	33.10	kWH Value	B3=	0.005	US$/kWH	C3=	0.037238889

UNIT=Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales			Discounted Benefit Flow			
				Salable Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	24.60	15.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	52.06	29.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	76.71	38.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	116.10	52.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	59.10	23.86	179.00	799.80	52.00	4.55	1.61	1.42	7.59
1995	9	7.08	2.55	256.00	722.80	69.00	5.81	1.30	1.69	8.81
1996	10	13.06	4.20	333.00	645.80	86.10	6.75	1.03	1.88	9.67
1997	11	8.88	2.55	415.00	1047.10	104.20	7.51	1.50	2.03	11.05
1998	12	8.17	2.09	500.00	962.10	123.20	8.08	1.23	2.15	11.47
1999	13	8.04	1.84	588.00	874.10	143.00	8.48	1.00	2.22	11.71
2000	14	5.87	1.20	680.00	1242.10	163.70	8.76	1.27	2.27	12.31
2001	15	4.34	0.79	776.00	1146.10	185.40	8.93	1.04	2.30	12.28
2002	16	4.34	0.70	876.00	1046.10	208.30	9.00	0.85	2.31	12.16
2003	17	4.34	0.63	980.00	942.10	224.80	8.99	0.68	2.22	11.90
2004	18	4.34	0.56	1089.00	833.10	224.80	8.92	0.54	1.98	11.45
2005	19	4.34	0.50	1201.00	721.10	224.80	8.78	0.41	1.77	10.97
2006	20	4.34	0.44	1318.00	604.10	224.80	8.60	0.31	1.58	10.50
2007	21	4.34	0.40	1440.00	482.10	224.80	8.39	0.22	1.41	10.03
2008	22	4.34	0.35	1567.00	355.10	224.80	8.15	0.14	1.26	9.56
2009	23	4.34	0.32	1699.00	223.10	224.80	7.89	0.08	1.12	9.10
2010	24	4.34	0.28	1837.00	85.10	224.80	7.62	0.02	1.00	8.65
2011	25	4.34	0.25	1863.20	58.90	224.80	6.90	0.01	0.89	7.82
2012	26	4.34	0.22	1863.20	58.90	224.80	6.16	0.01	0.80	6.98
2013	27	4.34	0.20	1863.20	58.90	224.80	5.50	0.01	0.71	6.23
2014	28	4.34	0.18	1863.20	58.90	224.80	4.91	0.01	0.64	5.56
2015	29	4.34	0.16	1863.20	58.90	224.80	4.38	0.01	0.57	4.97
2016	30	4.34	0.14	1863.20	58.90	224.80	3.91	0.00	0.51	4.43
2017	31	4.34	0.12	1863.20	58.90	224.80	3.49	0.00	0.45	3.96
2018	32	4.34	0.11	1863.20	58.90	224.80	3.12	0.00	0.40	3.53
2019	33	4.34	0.10	1863.20	58.90	224.80	2.78	0.00	0.36	3.15
2020	34	4.34	0.09	1863.20	58.90	224.80	2.48	0.00	0.32	2.82
2021	35	4.34	0.08	1863.20	58.90	224.80	2.22	0.00	0.28	2.51
2022	36	4.34	0.07	1863.20	58.90	224.80	1.98	0.00	0.25	2.24
2023	37	4.34	0.06	1863.20	58.90	224.80	1.77	0.00	0.23	2.00
2024	38	4.34	0.05	1863.20	58.90	224.80	1.58	0.00	0.20	1.79
2025	39	4.34	0.05	1863.20	58.90	224.80	1.41	0.00	0.18	1.60
2026	40	4.34	0.04	1863.20	58.90	224.80	1.26	0.00	0.16	1.42
2027	41	4.34	0.04	1863.20	58.90	224.80	1.12	0.00	0.14	1.27
2028	42	4.34	0.03	1863.20	58.90	224.80	1.00	0.00	0.13	1.13
2029	43	4.34	0.03	1863.20	58.90	224.80	0.89	0.00	0.11	1.01
2030	44	4.34	0.02	1863.20	58.90	224.80	0.80	0.00	0.10	0.90
2031	45	4.34	0.02	1863.20	58.90	224.80	0.71	0.00	0.09	0.81
2032	46	4.34	0.02	1863.20	58.90	224.80	0.63	0.00	0.08	0.72
2033	47	4.34	0.02	1863.20	58.90	224.80	0.57	0.00	0.07	0.64
2034	48	4.34	0.01	1863.20	58.90	224.80	0.50	0.00	0.06	0.57
2035	49	4.34	0.01	1863.20	58.90	224.80	0.45	0.00	0.05	0.51
2036	50	4.34	0.01	1863.20	58.90	224.80	0.40	0.00	0.05	0.46
2037	51	4.34	0.01	1863.20	58.90	224.80	0.36	0.00	0.04	0.41
2038	52	4.34	0.01	1863.20	58.90	224.80	0.32	0.00	0.04	0.36
2039	53	4.34	0.01	1863.20	58.90	224.80	0.28	0.00	0.03	0.32
2040	54	4.34	0.00	1863.20	58.90	224.80	0.25	0.00	0.03	0.29
2041	55	4.34	0.00	1863.20	58.90	224.80	0.23	0.00	0.03	0.26
2042	56	4.34	0.00	1863.20	58.90	224.80	0.20	0.00	0.02	0.23
2043	57	4.34	0.00	1863.20	58.90	224.80	0.18	0.00	0.02	0.20
Total		612.24	217.46				198.21	13.46	38.89	250.57

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- B - 100

Discount rate: 12(%)

B =	254.41		S =	1			
C =	226.53	kW Value	B1=	68	US$/kW	C1=	0.067188234
B/C=	1.123	kWH Value	B2=	0.063	US$/kWH	C2=	0.054138751
B-C=	27.87	kWH Value	B3=	0.005	US$/kWH	C3=	0.036682687

UNIT=Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales			Discounted Benefit Flow			
				Salable Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	25.18	16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	54.38	30.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	80.62	40.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	120.16	54.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	61.10	24.67	179.00	908.50	52.00	4.55	1.83	1.42	7.81
1995	9	2.34	0.84	256.00	831.50	69.00	5.81	1.49	1.69	9.00
1996	10	7.42	2.38	333.00	754.50	86.10	6.75	1.21	1.88	9.85
1997	11	13.31	3.82	415.00	672.50	104.20	7.51	0.96	2.03	10.51
1998	12	9.25	2.37	500.00	1118.50	123.20	8.08	1.43	2.15	11.67
1999	13	8.59	1.96	588.00	1030.50	143.00	8.48	1.18	2.22	11.89
2000	14	18.20	3.72	680.00	938.50	163.70	8.76	0.96	2.27	12.00
2001	15	12.94	2.36	776.00	1330.20	185.40	8.93	1.21	2.30	12.45
2002	16	4.68	0.76	876.00	1230.20	208.30	9.00	1.00	2.31	12.31
2003	17	4.68	0.68	980.00	1126.10	232.30	8.99	0.82	2.30	12.11
2004	18	4.68	0.60	1089.00	1017.20	250.40	8.92	0.66	2.21	11.79
2005	19	4.68	0.54	1201.00	905.20	250.40	8.78	0.52	1.97	11.28
2006	20	4.68	0.48	1318.00	788.20	250.40	8.60	0.40	1.76	10.78
2007	21	4.68	0.43	1440.00	666.20	250.40	8.39	0.30	1.57	10.28
2008	22	4.68	0.38	1567.00	539.20	250.40	8.15	0.22	1.40	9.78
2009	23	4.68	0.34	1699.00	407.20	250.40	7.89	0.15	1.25	9.30
2010	24	4.68	0.30	1837.00	269.20	250.40	7.62	0.08	1.12	8.83
2011	25	4.68	0.27	1863.20	243.00	250.40	6.90	0.07	1.00	7.97
2012	26	4.68	0.24	1863.20	243.00	250.40	6.16	0.06	0.89	7.12
2013	27	4.68	0.21	1863.20	243.00	250.40	5.50	0.05	0.79	6.35
2014	28	4.68	0.19	1863.20	243.00	250.40	4.91	0.05	0.71	5.67
2015	29	4.68	0.17	1863.20	243.00	250.40	4.38	0.04	0.63	5.07
2016	30	4.68	0.15	1863.20	243.00	250.40	3.91	0.04	0.56	4.52
2017	31	4.68	0.13	1863.20	243.00	250.40	3.49	0.03	0.50	4.04
2018	32	4.68	0.12	1863.20	243.00	250.40	3.12	0.03	0.45	3.60
2019	33	4.68	0.11	1863.20	243.00	250.40	2.78	0.02	0.40	3.22
2020	34	4.68	0.09	1863.20	243.00	250.40	2.48	0.02	0.36	2.87
2021	35	4.68	0.08	1863.20	243.00	250.40	2.22	0.02	0.32	2.56
2022	36	4.68	0.07	1863.20	243.00	250.40	1.98	0.02	0.28	2.29
2023	37	4.68	0.07	1863.20	243.00	250.40	1.77	0.01	0.25	2.04
2024	38	4.68	0.06	1863.20	243.00	250.40	1.58	0.01	0.22	1.82
2025	39	4.68	0.05	1863.20	243.00	250.40	1.41	0.01	0.20	1.63
2026	40	4.68	0.05	1863.20	243.00	250.40	1.26	0.01	0.18	1.45
2027	41	4.68	0.04	1863.20	243.00	250.40	1.12	0.01	0.16	1.30
2028	42	4.68	0.04	1863.20	243.00	250.40	1.00	0.01	0.14	1.16
2029	43	4.68	0.03	1863.20	243.00	250.40	0.89	0.00	0.13	1.03
2030	44	4.68	0.03	1863.20	243.00	250.40	0.80	0.00	0.11	0.92
2031	45	4.68	0.02	1863.20	243.00	250.40	0.71	0.00	0.10	0.82
2032	46	4.68	0.02	1863.20	243.00	250.40	0.63	0.00	0.09	0.73
2033	47	4.68	0.02	1863.20	243.00	250.40	0.57	0.00	0.08	0.65
2034	48	4.68	0.02	1863.20	243.00	250.40	0.50	0.00	0.07	0.58
2035	49	4.68	0.01	1863.20	243.00	250.40	0.45	0.00	0.06	0.52
2036	50	4.68	0.01	1863.20	243.00	250.40	0.40	0.00	0.05	0.46
2037	51	4.68	0.01	1863.20	243.00	250.40	0.36	0.00	0.05	0.41
2038	52	4.68	0.01	1863.20	243.00	250.40	0.32	0.00	0.04	0.37
2039	53	4.68	0.01	1863.20	243.00	250.40	0.28	0.00	0.04	0.33
2040	54	4.68	0.01	1863.20	243.00	250.40	0.25	0.00	0.03	0.29
2041	55	4.68	0.00	1863.20	243.00	250.40	0.23	0.00	0.03	0.26
2042	56	4.68	0.00	1863.20	243.00	250.40	0.20	0.00	0.02	0.23
2043	57	4.68	0.00	1863.20	243.00	250.40	0.18	0.00	0.02	0.21
Total		656.00	226.53				198.21	15.14	41.05	254.41

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- III - 120

Discount rate= 12 (%) S = 1

B = 370.42 kW Value B1= 68 US$/kW

C = 229.12 kWH Value B2= 0.063 US$/kWH C1= 0.039282102

B/C= 1.616 kWH Value B3= 0.048 US$/kWH C2= 0.031454502

B-C= 141.30 kWH Value B4= 0.005 US$/kWH C3= 0.033578778 UNIT= Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales				Discounted Benefit Flow				
				Salable Domestic Energy (GWH/Yr)	Salable Export Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Domestic Energy	Salable Export Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	22.56	14.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	44.85	25.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	65.08	32.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	105.75	47.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	57.18	23.09	179.00	0.00	691.10	52.00	4.55	0.00	1.39	1.42	7.37
1995	9	14.56	5.25	256.00	0.00	614.10	69.00	5.81	0.00	1.10	1.69	8.61
1996	10	19.40	6.24	333.00	0.00	537.10	86.10	6.75	0.00	0.86	1.88	9.50
1997	11	58.72	16.88	415.00	0.00	888.50	104.20	7.51	0.00	1.27	2.03	10.83
1998	12	39.37	10.10	500.00	0.00	803.50	123.20	8.08	0.00	1.03	2.15	11.26
1999	13	8.60	1.97	588.00	1843.30	0.00	143.00	8.48	20.27	0.00	2.22	30.99
2000	14	5.13	1.04	680.00	1751.30	0.00	163.70	8.76	17.20	0.00	2.27	28.24
2001	15	5.13	0.93	776.00	1655.30	0.00	185.40	8.93	14.51	0.00	2.30	25.75
2002	16	5.13	0.83	876.00	1555.30	0.00	208.30	9.00	12.17	0.00	2.31	23.49
2003	17	5.13	0.74	980.00	1451.30	0.00	232.30	8.99	10.14	0.00	2.30	21.43
2004	18	5.13	0.66	1089.00	1342.30	0.00	257.50	8.92	8.37	0.00	2.27	19.57
2005	19	5.13	0.59	1201.00	1230.30	0.00	283.80	8.78	6.85	0.00	2.24	17.88
2006	20	5.13	0.53	1318.00	1113.30	0.00	298.80	8.60	5.53	0.00	2.10	16.25
2007	21	5.13	0.47	1440.00	991.30	0.00	298.80	8.39	4.40	0.00	1.88	14.68
2008	22	5.13	0.42	1567.00	864.30	0.00	298.80	8.15	3.42	0.00	1.67	13.26
2009	23	5.13	0.37	1699.00	732.30	0.00	298.80	7.89	2.59	0.00	1.49	11.99
2010	24	5.13	0.33	1837.00	594.30	0.00	298.80	7.62	1.87	0.00	1.33	10.84
2011	25	5.13	0.30	1863.20	568.10	0.00	298.80	6.90	1.60	0.00	1.19	9.70
2012	26	5.13	0.26	1863.20	568.10	0.00	298.80	6.16	1.43	0.00	1.06	8.66
2013	27	5.13	0.24	1863.20	568.10	0.00	298.80	5.50	1.27	0.00	0.95	7.73
2014	28	5.13	0.21	1863.20	568.10	0.00	298.80	4.91	1.14	0.00	0.85	6.90
2015	29	5.13	0.19	1863.20	568.10	0.00	298.80	4.38	1.01	0.00	0.75	6.16
2016	30	5.13	0.17	1863.20	568.10	0.00	298.80	3.91	0.91	0.00	0.67	5.50
2017	31	5.13	0.15	1863.20	568.10	0.00	298.80	3.49	0.81	0.00	0.60	4.91
2018	32	5.13	0.13	1863.20	568.10	0.00	298.80	3.12	0.72	0.00	0.54	4.38
2019	33	5.13	0.12	1863.20	568.10	0.00	298.80	2.78	0.64	0.00	0.48	3.91
2020	34	5.13	0.10	1863.20	568.10	0.00	298.80	2.48	0.57	0.00	0.43	3.49
2021	35	5.13	0.09	1863.20	568.10	0.00	298.80	2.22	0.51	0.00	0.38	3.12
2022	36	5.13	0.08	1863.20	568.10	0.00	298.80	1.98	0.46	0.00	0.34	2.78
2023	37	5.13	0.07	1863.20	568.10	0.00	298.80	1.77	0.41	0.00	0.30	2.49
2024	38	5.13	0.06	1863.20	568.10	0.00	298.80	1.58	0.36	0.00	0.27	2.22
2025	39	5.13	0.06	1863.20	568.10	0.00	298.80	1.41	0.32	0.00	0.24	1.98
2026	40	5.13	0.05	1863.20	568.10	0.00	298.80	1.26	0.29	0.00	0.21	1.77
2027	41	5.13	0.04	1863.20	568.10	0.00	298.80	1.12	0.26	0.00	0.19	1.58
2028	42	5.13	0.04	1863.20	568.10	0.00	298.80	1.00	0.23	0.00	0.17	1.41
2029	43	5.13	0.03	1863.20	568.10	0.00	298.80	0.89	0.20	0.00	0.15	1.26
2030	44	5.13	0.03	1863.20	568.10	0.00	298.80	0.80	0.18	0.00	0.13	1.12
2031	45	5.13	0.03	1863.20	568.10	0.00	298.80	0.71	0.16	0.00	0.12	1.00
2032	46	5.13	0.02	1863.20	568.10	0.00	298.80	0.63	0.14	0.00	0.11	0.89
2033	47	5.13	0.02	1863.20	568.10	0.00	298.80	0.57	0.13	0.00	0.09	0.80
2034	48	5.13	0.02	1863.20	568.10	0.00	298.80	0.50	0.11	0.00	0.08	0.71
2035	49	5.13	0.01	1863.20	568.10	0.00	298.80	0.45	0.10	0.00	0.07	0.63
2036	50	5.13	0.01	1863.20	568.10	0.00	298.80	0.40	0.09	0.00	0.07	0.57
2037	51	5.13	0.01	1863.20	568.10	0.00	298.80	0.36	0.08	0.00	0.06	0.50
2038	52	5.13	0.01	1863.20	568.10	0.00	298.80	0.32	0.07	0.00	0.05	0.45
2039	53	5.13	0.01	1863.20	568.10	0.00	298.80	0.28	0.06	0.00	0.05	0.40
2040	54	5.13	0.01	1863.20	568.10	0.00	298.80	0.25	0.05	0.00	0.04	0.36
2041	55	5.13	0.01	1863.20	568.10	0.00	298.80	0.23	0.05	0.00	0.03	0.32
2042	56	5.13	0.00	1863.20	568.10	0.00	298.80	0.20	0.04	0.00	0.03	0.28
2043	57	5.13	0.00	1863.20	568.10	0.00	298.80	0.18	0.04	0.00	0.03	0.25
Total		707.74	229.12					198.21	122.01	5.67	44.52	370.42

C1: average net cost of useful salable energy and capacity

C2: average net cost of useful salable energy

C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- Ⅲ - 140

Discount rate= 12 (%) S = 1

B = 402.55 kW Value B1= 68 US$/kW

C = 237.72 kWH Value B2= 0.063 US$/kWH C1= 0.036836160

B/C= 1.693 kWH Value B3= 0.048 US$/kWH C2= 0.029274397

B-C= 164.82 kWH Value B4= 0.005 US$/kWH C3= 0.031503644 UNIT= Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales				Discounted Benefit Flow				
				Salable Domestic Energy (GWH/Yr)	Salable Export Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Domestic Energy	Salable Export Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	23.19	14.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	47.16	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	69.04	34.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	109.58	49.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	59.49	24.02	179.00	0.00	836.10	52.00	4.55	0.00	1.68	1.42	7.67
1995	9	10.66	3.84	256.00	0.00	759.10	69.00	5.81	0.00	1.36	1.69	8.87
1996	10	21.26	6.84	333.00	0.00	682.10	86.10	6.75	0.00	1.09	1.88	9.73
1997	11	64.86	18.64	415.00	0.00	600.10	104.20	7.51	0.00	0.86	2.03	10.41
1998	12	42.27	10.84	500.00	0.00	1014.40	123.20	8.08	0.00	1.30	2.15	11.53
1999	13	9.04	2.07	588.00	2122.60	0.00	143.00	8.48	23.34	0.00	2.22	34.06
2000	14	5.35	1.09	680.00	2030.60	0.00	163.70	8.76	19.94	0.00	2.27	30.98
2001	15	5.35	0.97	776.00	1934.60	0.00	185.40	8.93	16.96	0.00	2.30	28.20
2002	16	5.35	0.87	876.00	1834.60	0.00	208.30	9.00	14.36	0.00	2.31	25.67
2003	17	5.35	0.77	980.00	1730.60	0.00	232.30	8.99	12.09	0.00	2.30	23.39
2004	18	5.35	0.69	1089.00	1621.60	0.00	257.50	8.92	10.12	0.00	2.27	21.32
2005	19	5.35	0.62	1201.00	1509.60	0.00	283.80	8.78	8.41	0.00	2.24	19.43
2006	20	5.35	0.55	1318.00	1392.60	0.00	311.30	8.60	6.92	0.00	2.19	17.73
2007	21	5.35	0.49	1440.00	1270.60	0.00	340.10	8.39	5.64	0.00	2.14	16.18
2008	22	5.35	0.44	1567.00	1143.60	0.00	349.80	8.15	4.53	0.00	1.96	14.66
2009	23	5.35	0.39	1699.00	1011.60	0.00	349.80	7.89	3.58	0.00	1.75	13.23
2010	24	5.35	0.35	1837.00	873.60	0.00	349.80	7.62	2.76	0.00	1.56	11.95
2011	25	5.35	0.31	1863.20	847.40	0.00	349.80	6.90	2.39	0.00	1.39	10.69
2012	26	5.35	0.28	1863.20	847.40	0.00	349.80	6.16	2.13	0.00	1.24	9.55
2013	27	5.35	0.25	1863.20	847.40	0.00	349.80	5.50	1.90	0.00	1.11	8.52
2014	28	5.35	0.22	1863.20	847.40	0.00	349.80	4.91	1.70	0.00	0.99	7.61
2015	29	5.35	0.20	1863.20	847.40	0.00	349.80	4.38	1.52	0.00	0.88	6.79
2016	30	5.35	0.17	1863.20	847.40	0.00	349.80	3.91	1.35	0.00	0.79	6.06
2017	31	5.35	0.15	1863.20	847.40	0.00	349.80	3.49	1.21	0.00	0.70	5.41
2018	32	5.35	0.14	1863.20	847.40	0.00	349.80	3.12	1.08	0.00	0.63	4.83
2019	33	5.35	0.12	1863.20	847.40	0.00	349.80	2.78	0.96	0.00	0.56	4.32
2020	34	5.35	0.11	1863.20	847.40	0.00	349.80	2.48	0.86	0.00	0.50	3.85
2021	35	5.35	0.10	1863.20	847.40	0.00	349.80	2.22	0.77	0.00	0.45	3.44
2022	36	5.35	0.09	1863.20	847.40	0.00	349.80	1.98	0.68	0.00	0.40	3.07
2023	37	5.35	0.08	1863.20	847.40	0.00	349.80	1.77	0.61	0.00	0.35	2.74
2024	38	5.35	0.07	1863.20	847.40	0.00	349.80	1.58	0.54	0.00	0.32	2.45
2025	39	5.35	0.06	1863.20	847.40	0.00	349.80	1.41	0.48	0.00	0.28	2.18
2026	40	5.35	0.05	1863.20	847.40	0.00	349.80	1.26	0.43	0.00	0.25	1.95
2027	41	5.35	0.05	1863.20	847.40	0.00	349.80	1.12	0.39	0.00	0.22	1.74
2028	42	5.35	0.04	1863.20	847.40	0.00	349.80	1.00	0.34	0.00	0.20	1.55
2029	43	5.35	0.04	1863.20	847.40	0.00	349.80	0.89	0.31	0.00	0.18	1.39
2030	44	5.35	0.03	1863.20	847.40	0.00	349.80	0.80	0.27	0.00	0.16	1.24
2031	45	5.35	0.03	1863.20	847.40	0.00	349.80	0.71	0.24	0.00	0.14	1.10
2032	46	5.35	0.02	1863.20	847.40	0.00	349.80	0.63	0.22	0.00	0.12	0.99
2033	47	5.35	0.02	1863.20	847.40	0.00	349.80	0.57	0.19	0.00	0.11	0.88
2034	48	5.35	0.02	1863.20	847.40	0.00	349.80	0.50	0.17	0.00	0.10	0.78
2035	49	5.35	0.02	1863.20	847.40	0.00	349.80	0.45	0.15	0.00	0.09	0.70
2036	50	5.35	0.01	1863.20	847.40	0.00	349.80	0.40	0.14	0.00	0.08	0.62
2037	51	5.35	0.01	1863.20	847.40	0.00	349.80	0.36	0.12	0.00	0.07	0.56
2038	52	5.35	0.01	1863.20	847.40	0.00	349.80	0.32	0.11	0.00	0.06	0.50
2039	53	5.35	0.01	1863.20	847.40	0.00	349.80	0.28	0.10	0.00	0.05	0.44
2040	54	5.35	0.01	1863.20	847.40	0.00	349.80	0.25	0.08	0.00	0.05	0.39
2041	55	5.35	0.01	1863.20	847.40	0.00	349.80	0.23	0.07	0.00	0.04	0.35
2042	56	5.35	0.00	1863.20	847.40	0.00	349.80	0.20	0.07	0.00	0.04	0.31
2043	57	5.35	0.00	1863.20	847.40	0.00	349.80	0.18	0.06	0.00	0.03	0.28
Total		737.90	237.72					198.21	150.51	6.31	47.50	402.55

C1: average net cost of useful salable energy and capacity

C2: average net cost of useful salable energy

C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- III - 160

Discount rate= 12 (%) S = 1

B = 428.78 kW Value B1= 68 US$/kW

C = 245.49 kWH Value B2= 0.063 US$/kWH C1= 0.035027288

B/C= 1.746 kWH Value B3= 0.048 US$/kWH C2= 0.028022935

B-C= 183.29 kWH Value B4= 0.005 US$/kWH C3= 0.029995237 UNIT= Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales				Discounted Benefit Flow				
				Salable Domestic Energy (GWH/Yr)	Salable Export Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Domestic Energy	Salable Export Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	23.69	15.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	49.10	27.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	72.47	36.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	112.97	51.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	61.61	24.88	179.00	0.00	980.70	52.00	4.55	0.00	1.98	1.42	7.96
1995	9	11.33	4.08	256.00	0.00	903.70	69.00	5.81	0.00	1.62	1.69	9.13
1996	10	17.16	5.52	333.00	0.00	826.70	86.10	6.75	0.00	1.33	1.88	9.97
1997	11	69.43	19.95	415.00	0.00	744.70	104.20	7.51	0.00	1.07	2.03	10.62
1998	12	46.95	12.05	500.00	0.00	659.70	123.20	8.08	0.00	0.84	2.15	11.08
1999	13	10.65	2.44	588.00	2372.30	0.00	143.00	8.48	26.09	0.00	2.22	36.81
2000	14	5.57	1.13	680.00	2280.30	0.00	163.70	8.76	22.39	0.00	2.27	33.44
2001	15	5.57	1.01	776.00	2184.30	0.00	185.40	8.93	19.15	0.00	2.30	30.38
2002	16	5.57	0.90	876.00	2084.30	0.00	208.30	9.00	16.31	0.00	2.31	27.63
2003	17	5.57	0.81	980.00	1980.30	0.00	232.30	8.99	13.84	0.00	2.30	25.13
2004	18	5.57	0.72	1089.00	1871.30	0.00	257.50	8.92	11.68	0.00	2.27	22.87
2005	19	5.57	0.64	1201.00	1759.30	0.00	283.80	8.78	9.80	0.00	2.24	20.83
2006	20	5.57	0.57	1318.00	1642.30	0.00	311.30	8.60	8.17	0.00	2.19	18.97
2007	21	5.57	0.51	1440.00	1520.30	0.00	340.10	8.39	6.75	0.00	2.14	17.29
2008	22	5.57	0.46	1567.00	1393.30	0.00	354.00	8.15	5.52	0.00	1.98	15.67
2009	23	5.57	0.41	1699.00	1261.30	0.00	354.00	7.89	4.46	0.00	1.77	14.14
2010	24	5.57	0.36	1837.00	1123.30	0.00	354.00	7.62	3.55	0.00	1.58	12.76
2011	25	5.57	0.32	1863.20	1097.10	0.00	354.00	6.90	3.09	0.00	1.41	11.41
2012	26	5.57	0.29	1863.20	1097.10	0.00	354.00	6.16	2.76	0.00	1.26	10.19
2013	27	5.57	0.26	1863.20	1097.10	0.00	354.00	5.50	2.46	0.00	1.12	9.10
2014	28	5.57	0.23	1863.20	1097.10	0.00	354.00	4.91	2.20	0.00	1.00	8.12
2015	29	5.57	0.20	1863.20	1097.10	0.00	354.00	4.38	1.96	0.00	0.89	7.25
2016	30	5.57	0.18	1863.20	1097.10	0.00	354.00	3.91	1.75	0.00	0.80	6.47
2017	31	5.57	0.16	1863.20	1097.10	0.00	354.00	3.49	1.56	0.00	0.71	5.78
2018	32	5.57	0.14	1863.20	1097.10	0.00	354.00	3.12	1.40	0.00	0.64	5.16
2019	33	5.57	0.13	1863.20	1097.10	0.00	354.00	2.78	1.25	0.00	0.57	4.61
2020	34	5.57	0.11	1863.20	1097.10	0.00	354.00	2.48	1.11	0.00	0.51	4.11
2021	35	5.57	0.10	1863.20	1097.10	0.00	354.00	2.22	0.99	0.00	0.45	3.67
2022	36	5.57	0.09	1863.20	1097.10	0.00	354.00	1.98	0.89	0.00	0.40	3.28
2023	37	5.57	0.08	1863.20	1097.10	0.00	354.00	1.77	0.79	0.00	0.36	2.93
2024	38	5.57	0.07	1863.20	1097.10	0.00	354.00	1.58	0.70	0.00	0.32	2.61
2025	39	5.57	0.06	1863.20	1097.10	0.00	354.00	1.41	0.63	0.00	0.28	2.33
2026	40	5.57	0.05	1863.20	1097.10	0.00	354.00	1.26	0.56	0.00	0.25	2.08
2027	41	5.57	0.05	1863.20	1097.10	0.00	354.00	1.12	0.50	0.00	0.23	1.86
2028	42	5.57	0.04	1863.20	1097.10	0.00	354.00	1.00	0.45	0.00	0.20	1.66
2029	43	5.57	0.04	1863.20	1097.10	0.00	354.00	0.89	0.40	0.00	0.18	1.48
2030	44	5.57	0.03	1863.20	1097.10	0.00	354.00	0.80	0.35	0.00	0.16	1.32
2031	45	5.57	0.03	1863.20	1097.10	0.00	354.00	0.71	0.32	0.00	0.14	1.18
2032	46	5.57	0.03	1863.20	1097.10	0.00	354.00	0.63	0.28	0.00	0.13	1.05
2033	47	5.57	0.02	1863.20	1097.10	0.00	354.00	0.57	0.25	0.00	0.11	0.94
2034	48	5.57	0.02	1863.20	1097.10	0.00	354.00	0.50	0.22	0.00	0.10	0.84
2035	49	5.57	0.02	1863.20	1097.10	0.00	354.00	0.45	0.20	0.00	0.09	0.75
2036	50	5.57	0.01	1863.20	1097.10	0.00	354.00	0.40	0.18	0.00	0.08	0.67
2037	51	5.57	0.01	1863.20	1097.10	0.00	354.00	0.36	0.16	0.00	0.07	0.59
2038	52	5.57	0.01	1863.20	1097.10	0.00	354.00	0.32	0.14	0.00	0.06	0.53
2039	53	5.57	0.01	1863.20	1097.10	0.00	354.00	0.28	0.12	0.00	0.05	0.47
2040	54	5.57	0.01	1863.20	1097.10	0.00	354.00	0.25	0.11	0.00	0.05	0.42
2041	55	5.57	0.01	1863.20	1097.10	0.00	354.00	0.23	0.10	0.00	0.04	0.38
2042	56	5.57	0.00	1863.20	1097.10	0.00	354.00	0.20	0.09	0.00	0.04	0.34
2043	57	5.57	0.00	1863.20	1097.10	0.00	354.00	0.18	0.08	0.00	0.03	0.30
Total		766.39	245.49					198.21	175.99	6.85	47.71	428.78

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- B - 180

Discount rate= 12 (%) S = 1

B = 424.16 kW Value B1= 68 US$/kW

C = 260.41 kWH Value B2= 0.063 US$/kWH C1= 0.037725133

B/C= 1.628 kWH Value B3= 0.048 US$/kWH C2= 0.030601720

B-C= 163.74 kWH Value B4= 0.005 US$/kWH C3= 0.031008604 UNIT= Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales				Discounted Benefit Flow				
				Salable Domestic Energy (GWH/Yr)	Salable Export Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Domestic Energy	Salable Export Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	24.69	15.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	52.25	29.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	77.05	39.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	116.30	52.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	63.76	25.75	179.00	0.00	799.80	52.00	4.55	0.00	1.61	1.42	7.59
1995	9	17.04	6.14	256.00	0.00	722.80	69.00	5.81	0.00	1.30	1.69	8.81
1996	10	23.70	7.63	333.00	0.00	645.80	86.10	6.75	0.00	1.03	1.88	9.67
1997	11	71.41	20.52	415.00	0.00	1047.10	104.20	7.51	0.00	1.50	2.03	11.05
1998	12	53.21	13.65	500.00	0.00	962.10	123.20	8.08	0.00	1.23	2.15	11.47
1999	13	11.80	2.70	588.00	0.00	874.10	143.00	8.48	0.00	1.00	2.22	11.71
2000	14	7.40	1.51	680.00	2506.90	0.00	163.70	8.76	24.62	0.00	2.27	35.66
2001	15	6.06	1.10	776.00	2410.90	0.00	185.40	8.93	21.14	0.00	2.30	32.37
2002	16	6.06	0.98	876.00	2310.90	0.00	208.30	9.00	18.09	0.00	2.31	29.40
2003	17	6.06	0.88	980.00	2206.90	0.00	232.30	8.99	15.42	0.00	2.30	26.72
2004	18	6.06	0.78	1089.00	2097.90	0.00	257.50	8.92	13.09	0.00	2.27	24.29
2005	19	6.06	0.70	1201.00	1985.90	0.00	283.80	8.78	11.06	0.00	2.24	22.09
2006	20	6.06	0.62	1318.00	1868.90	0.00	311.30	8.60	9.29	0.00	2.19	20.10
2007	21	6.06	0.56	1440.00	1746.90	0.00	340.10	8.39	7.76	0.00	2.14	18.29
2008	22	6.06	0.50	1567.00	1619.90	0.00	354.00	8.15	6.42	0.00	1.98	16.57
2009	23	6.06	0.44	1699.00	1487.90	0.00	354.00	7.89	5.26	0.00	1.77	14.94
2010	24	6.06	0.39	1837.00	1349.90	0.00	354.00	7.62	4.26	0.00	1.58	13.47
2011	25	6.06	0.35	1863.20	1323.70	0.00	354.00	6.90	3.73	0.00	1.41	12.05
2012	26	6.06	0.31	1863.20	1323.70	0.00	354.00	6.16	3.33	0.00	1.26	10.76
2013	27	6.06	0.28	1863.20	1323.70	0.00	354.00	5.50	2.97	0.00	1.12	9.61
2014	28	6.06	0.25	1863.20	1323.70	0.00	354.00	4.91	2.66	0.00	1.00	8.58
2015	29	6.06	0.22	1863.20	1323.70	0.00	354.00	4.38	2.37	0.00	0.89	7.66
2016	30	6.06	0.20	1863.20	1323.70	0.00	354.00	3.91	2.12	0.00	0.80	6.84
2017	31	6.06	0.18	1863.20	1323.70	0.00	354.00	3.49	1.89	0.00	0.71	6.10
2018	32	6.06	0.16	1863.20	1323.70	0.00	354.00	3.12	1.69	0.00	0.64	5.45
2019	33	6.06	0.14	1863.20	1323.70	0.00	354.00	2.78	1.50	0.00	0.57	4.87
2020	34	6.06	0.12	1863.20	1323.70	0.00	354.00	2.48	1.34	0.00	0.51	4.34
2021	35	6.06	0.11	1863.20	1323.70	0.00	354.00	2.22	1.20	0.00	0.45	3.88
2022	36	6.06	0.10	1863.20	1323.70	0.00	354.00	1.98	1.07	0.00	0.40	3.46
2023	37	6.06	0.09	1863.20	1323.70	0.00	354.00	1.77	0.95	0.00	0.36	3.09
2024	38	6.06	0.08	1863.20	1323.70	0.00	354.00	1.58	0.85	0.00	0.32	2.76
2025	39	6.06	0.07	1863.20	1323.70	0.00	354.00	1.41	0.76	0.00	0.28	2.46
2026	40	6.06	0.06	1863.20	1323.70	0.00	354.00	1.26	0.68	0.00	0.25	2.20
2027	41	6.06	0.05	1863.20	1323.70	0.00	354.00	1.12	0.60	0.00	0.23	1.96
2028	42	6.06	0.05	1863.20	1323.70	0.00	354.00	1.00	0.54	0.00	0.20	1.75
2029	43	6.06	0.04	1863.20	1323.70	0.00	354.00	0.89	0.48	0.00	0.18	1.56
2030	44	6.06	0.04	1863.20	1323.70	0.00	354.00	0.80	0.43	0.00	0.16	1.40
2031	45	6.06	0.03	1863.20	1323.70	0.00	354.00	0.71	0.38	0.00	0.14	1.25
2032	46	6.06	0.03	1863.20	1323.70	0.00	354.00	0.63	0.34	0.00	0.13	1.11
2033	47	6.06	0.02	1863.20	1323.70	0.00	354.00	0.57	0.30	0.00	0.11	0.99
2034	48	6.06	0.02	1863.20	1323.70	0.00	354.00	0.50	0.27	0.00	0.10	0.88
2035	49	6.06	0.02	1863.20	1323.70	0.00	354.00	0.45	0.24	0.00	0.09	0.79
2036	50	6.06	0.02	1863.20	1323.70	0.00	354.00	0.40	0.21	0.00	0.08	0.70
2037	51	6.06	0.01	1863.20	1323.70	0.00	354.00	0.36	0.19	0.00	0.07	0.63
2038	52	6.06	0.01	1863.20	1323.70	0.00	354.00	0.32	0.17	0.00	0.06	0.56
2039	53	6.06	0.01	1863.20	1323.70	0.00	354.00	0.28	0.15	0.00	0.05	0.50
2040	54	6.06	0.01	1863.20	1323.70	0.00	354.00	0.25	0.13	0.00	0.05	0.45
2041	55	6.06	0.01	1863.20	1323.70	0.00	354.00	0.23	0.12	0.00	0.04	0.40
2042	56	6.06	0.01	1863.20	1323.70	0.00	354.00	0.20	0.11	0.00	0.04	0.35
2043	57	6.06	0.00	1863.20	1323.70	0.00	354.00	0.18	0.09	0.00	0.03	0.32
Total		825.14	260.41					198.21	170.52	7.69	47.71	424.16

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

Discounted Cash Flow Method Case- II - 200

Discount rate= 12 (%) S = 1

B = 443.66 kW Value B1= 68 US$/kW

C = 269.03 kWH Value B2= 0.063 US$/kWH C1= 0.096765376

B/C= 1.649 kWH Value B3= 0.048 US$/kWH C2= 0.030040847

B-C= 174.63 kWH Value B4= 0.005 US$/kWH C3= 0.030842876 UNIT= Million US$

Year	Serial Number	Cost Flow	Discounted Cost Flow	Project Sales				Discounted Benefit Flow				
				Salable Domestic Energy (GWH/Yr)	Salable Export Energy (GWH/Yr)	Surplus Energy (GWH/Yr)	Useful Capacity (MW)	Salable Domestic Energy	Salable Export Energy	Surplus Energy	Useful Capacity	Total
1987	1	4.81	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	2	19.57	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	3	21.57	15.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	4	25.28	16.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	5	54.56	30.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	6	80.90	40.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	7	120.14	54.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	8	66.11	26.70	179.00	0.00	908.50	52.00	4.55	0.00	1.83	1.42	7.81
1995	9	12.91	4.65	256.00	0.00	831.50	69.00	5.81	0.00	1.49	1.69	9.00
1996	10	24.98	8.04	333.00	0.00	754.50	86.10	6.75	0.00	1.21	1.88	9.85
1997	11	77.73	22.34	415.00	0.00	672.50	104.20	7.51	0.00	0.96	2.03	10.51
1998	12	57.01	14.63	500.00	0.00	1118.50	123.20	8.08	0.00	1.43	2.15	11.67
1999	13	12.35	2.83	588.00	0.00	1090.50	143.00	8.48	0.00	1.18	2.22	11.89
2000	14	7.69	1.57	680.00	2716.40	0.00	163.70	8.76	26.67	0.00	2.27	37.72
2001	15	6.29	1.14	776.00	2620.40	0.00	185.40	8.93	22.97	0.00	2.30	34.21
2002	16	6.29	1.02	876.00	2520.40	0.00	208.30	9.00	19.73	0.00	2.31	31.04
2003	17	6.29	0.91	980.00	2416.40	0.00	232.30	8.99	16.89	0.00	2.30	28.18
2004	18	6.29	0.81	1089.00	2307.40	0.00	257.50	8.92	14.40	0.00	2.27	25.60
2005	19	6.29	0.73	1201.00	2195.40	0.00	283.80	8.78	12.23	0.00	2.24	23.26
2006	20	6.29	0.65	1318.00	2078.40	0.00	311.30	8.60	10.34	0.00	2.19	21.14
2007	21	6.29	0.58	1440.00	1956.40	0.00	340.10	8.39	8.69	0.00	2.14	19.22
2008	22	6.29	0.51	1567.00	1829.40	0.00	354.00	8.15	7.25	0.00	1.98	17.40
2009	23	6.29	0.46	1699.00	1697.40	0.00	354.00	7.89	6.01	0.00	1.77	15.68
2010	24	6.29	0.41	1837.00	1559.40	0.00	354.00	7.62	4.93	0.00	1.58	14.14
2011	25	6.29	0.36	1863.20	1533.20	0.00	354.00	6.90	4.32	0.00	1.41	12.64
2012	26	6.29	0.33	1863.20	1533.20	0.00	354.00	6.16	3.86	0.00	1.26	11.29
2013	27	6.29	0.29	1863.20	1533.20	0.00	354.00	5.50	3.45	0.00	1.12	10.08
2014	28	6.29	0.26	1863.20	1533.20	0.00	354.00	4.91	3.08	0.00	1.00	9.00
2015	29	6.29	0.23	1863.20	1533.20	0.00	354.00	4.38	2.75	0.00	0.89	8.03
2016	30	6.29	0.20	1863.20	1533.20	0.00	354.00	3.91	2.45	0.00	0.80	7.17
2017	31	6.29	0.18	1863.20	1533.20	0.00	354.00	3.49	2.19	0.00	0.71	6.40
2018	32	6.29	0.16	1863.20	1533.20	0.00	354.00	3.12	1.95	0.00	0.64	5.72
2019	33	6.29	0.14	1863.20	1533.20	0.00	354.00	2.78	1.74	0.00	0.57	5.10
2020	34	6.29	0.13	1863.20	1533.20	0.00	354.00	2.48	1.56	0.00	0.51	4.56
2021	35	6.29	0.11	1863.20	1533.20	0.00	354.00	2.22	1.39	0.00	0.45	4.07
2022	36	6.29	0.10	1863.20	1533.20	0.00	354.00	1.98	1.24	0.00	0.40	3.63
2023	37	6.29	0.09	1863.20	1533.20	0.00	354.00	1.77	1.11	0.00	0.36	3.24
2024	38	6.29	0.08	1863.20	1533.20	0.00	354.00	1.58	0.99	0.00	0.32	2.89
2025	39	6.29	0.07	1863.20	1533.20	0.00	354.00	1.41	0.88	0.00	0.28	2.58
2026	40	6.29	0.06	1863.20	1533.20	0.00	354.00	1.26	0.79	0.00	0.25	2.31
2027	41	6.29	0.06	1863.20	1533.20	0.00	354.00	1.12	0.70	0.00	0.23	2.06
2028	42	6.29	0.05	1863.20	1533.20	0.00	354.00	1.00	0.63	0.00	0.20	1.84
2029	43	6.29	0.04	1863.20	1533.20	0.00	354.00	0.89	0.56	0.00	0.18	1.64
2030	44	6.29	0.04	1863.20	1533.20	0.00	354.00	0.80	0.50	0.00	0.16	1.46
2031	45	6.29	0.03	1863.20	1533.20	0.00	354.00	0.71	0.44	0.00	0.14	1.31
2032	46	6.29	0.03	1863.20	1533.20	0.00	354.00	0.63	0.40	0.00	0.13	1.17
2033	47	6.29	0.03	1863.20	1533.20	0.00	354.00	0.57	0.35	0.00	0.11	1.04
2034	48	6.29	0.02	1863.20	1533.20	0.00	354.00	0.50	0.31	0.00	0.10	0.93
2035	49	6.29	0.02	1863.20	1533.20	0.00	354.00	0.45	0.28	0.00	0.09	0.83
2036	50	6.29	0.02	1863.20	1533.20	0.00	354.00	0.40	0.25	0.00	0.08	0.74
2037	51	6.29	0.01	1863.20	1533.20	0.00	354.00	0.36	0.22	0.00	0.07	0.66
2038	52	6.29	0.01	1863.20	1533.20	0.00	354.00	0.32	0.20	0.00	0.06	0.59
2039	53	6.29	0.01	1863.20	1533.20	0.00	354.00	0.28	0.18	0.00	0.05	0.52
2040	54	6.29	0.01	1863.20	1533.20	0.00	354.00	0.25	0.16	0.00	0.05	0.47
2041	55	6.29	0.01	1863.20	1533.20	0.00	354.00	0.23	0.14	0.00	0.04	0.42
2042	56	6.29	0.01	1863.20	1533.20	0.00	354.00	0.20	0.12	0.00	0.04	0.37
2043	57	6.29	0.00	1863.20	1533.20	0.00	354.00	0.18	0.11	0.00	0.03	0.33
Total		856.08	269.03					198.21	189.60	8.13	47.71	443.66

C1: average net cost of useful salable energy and capacity
C2: average net cost of useful salable energy
C3: average net cost of total energy and capacity

D. DESIGN DATA

D. DESIGN DATA

D.1 Rating Curve at Dam Site

(1) Formula

$$Q = AV = A \frac{1}{n} I^{\frac{1}{2}} R^{\frac{2}{3}}$$

where

Q: Discharge (m^3/s)
A: Cross Sectional Area (m^2)
V: Flow Velocity (m/s)
n: Coefficient of Roughness 0.045, 0.035,
I: Hydraulic Gradient 1/100
R: Hydraulic Radius

(2) Rating Curve

Results are shown in Table - D-1, - D-2 and Fig. D-1. The symbols in the Tables are as following

F : Froude Number
SQ : Discharge = Q (m^3/s)

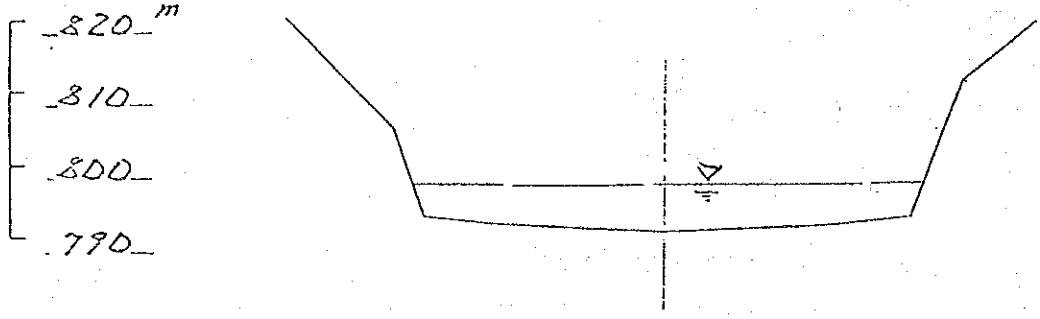


Table D-1

n = 0.045 1 / 100

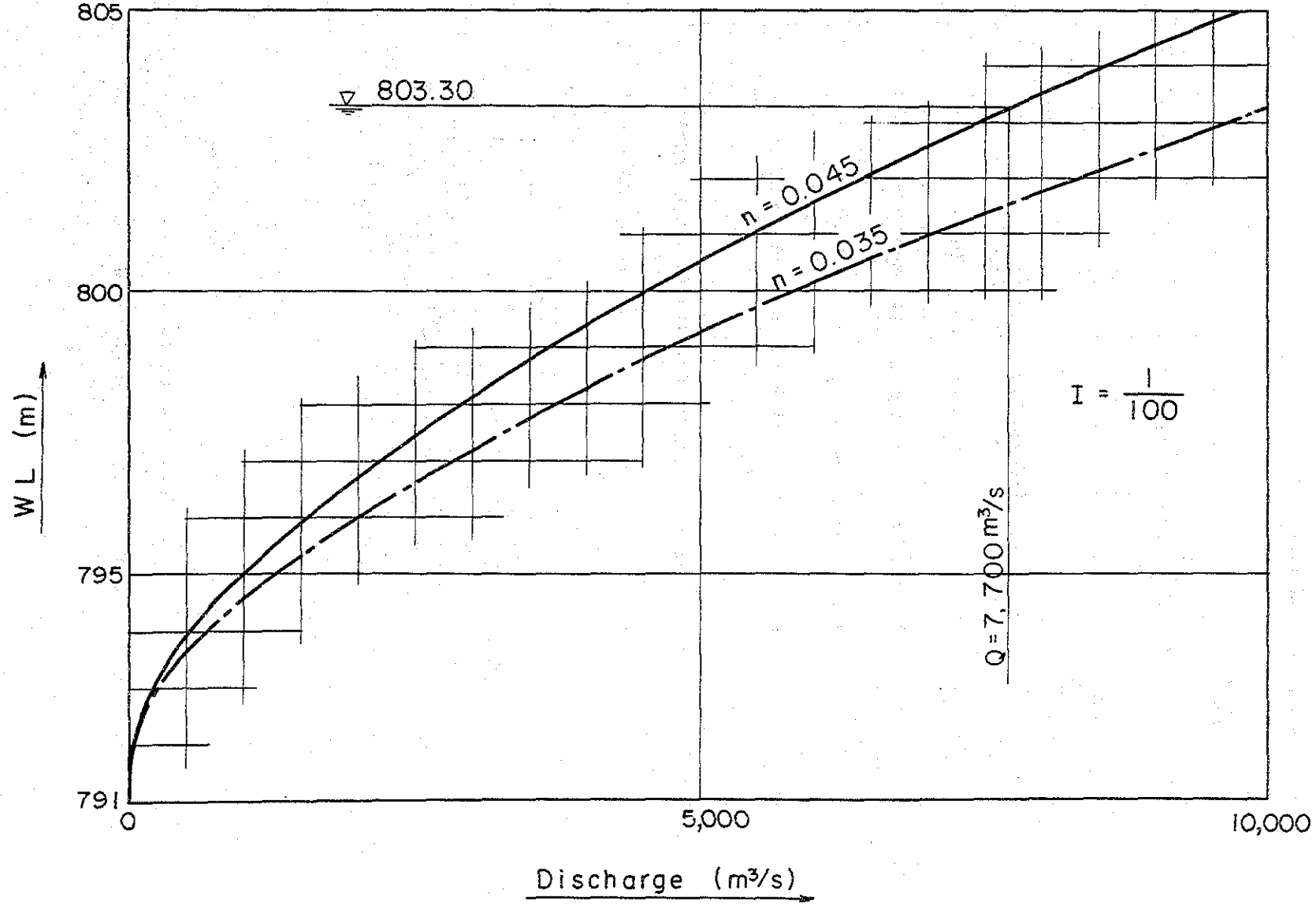
EL. (m)	D (m)	A (m²)	P (m)	R (m)	n	V (m/s)	F	SQ (m³/s)	Q (m³/s)
792.000	0.500	23.500	47.043	0.500	0.045	1.399	0.663	32.878	32.878
793.000	1.201	80.500	67.142	1.199	0.045	2.508	0.767	201.891	201.891
794.000	2.184	147.851	69.262	2.135	0.045	3.684	0.835	544.708	544.708
795.000	3.156	215.904	71.382	3.025	0.045	4.648	0.876	1003.450	1003.450
796.000	4.119	284.658	73.502	3.873	0.045	5.480	0.905	1560.010	1560.010
797.000	5.073	354.114	75.622	4.683	0.045	6.220	0.925	2202.570	2202.570
798.000	6.017	424.272	77.741	5.457	0.045	6.888	0.941	2922.540	2922.540
799.000	6.953	495.132	79.861	6.200	0.045	7.500	0.953	3713.340	3713.340
800.000	7.880	566.693	81.981	6.913	0.045	8.064	0.962	4569.750	4569.750
801.000	8.799	638.956	84.101	7.598	0.045	8.588	0.970	5487.480	5487.480
802.000	9.710	711.921	86.221	8.257	0.045	9.078	0.976	6462.990	6462.990
803.000	10.614	785.588	88.340	8.893	0.045	9.538	0.981	7493.290	7493.290
804.000	11.509	859.956	90.460	9.506	0.045	9.972	0.985	8575.840	8575.840
805.000	12.397	935.026	92.580	10.100	0.045	10.383	0.988	9708.440	9708.440

Table D-2

n = 0.035 1 / 100

EL. (m)	D (m)	A (m²)	P (m)	R (m)	n	V (m/s)	F	SQ (m³/s)	Q (m³/s)
792.000	0.500	23.500	47.043	0.500	0.035	1.799	0.852	42.272	42.272
793.000	1.201	80.500	67.142	1.199	0.035	3.225	0.986	259.574	259.574
794.000	2.184	147.851	69.262	2.135	0.035	4.737	1.074	700.339	700.339
795.000	3.156	215.904	71.382	3.025	0.035	5.976	1.127	1290.150	1290.150
796.000	4.119	284.658	73.502	3.873	0.035	7.046	1.163	2005.730	2005.730
797.000	5.073	354.114	75.622	4.683	0.035	7.997	1.190	2831.870	2831.870
798.000	6.017	424.272	77.741	5.457	0.035	8.856	1.210	3757.550	3757.550
799.000	6.953	495.132	79.861	6.200	0.035	9.642	1.225	4774.300	4774.300
800.000	7.880	566.693	81.981	6.913	0.035	10.368	1.237	5875.390	5875.390
801.000	8.799	638.956	84.101	7.598	0.035	11.042	1.247	7055.330	7055.330
802.000	9.710	711.921	86.221	8.257	0.035	11.672	1.255	8309.560	8309.560
803.000	10.614	785.588	88.340	8.893	0.035	12.264	1.261	9634.240	9634.240
804.000	11.509	859.956	90.460	9.506	0.035	12.822	1.266	%11026.100	%11026.100
805.000	12.397	935.026	92.580	10.100	0.035	13.350	1.270	%12482.300	%12482.300

Fig. D-1 Rating Curve at Dam Site



D.2 Discharge Capacity of Diversion Tunnel

(1) Open flow condition

Formula

$$H = hc + \frac{V_c^2}{2g}(1+fe) + Hc$$

where

H: Water Surface EL.

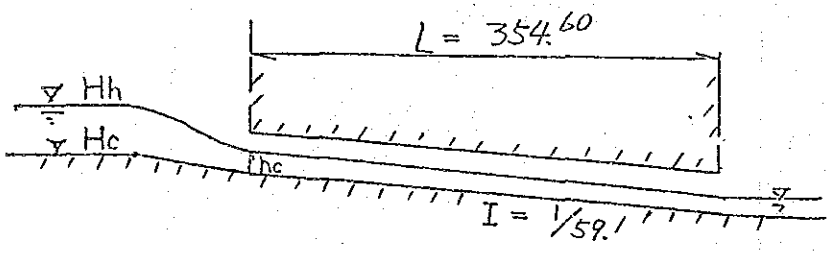
hc: Critical depth of flow at Inlet

Hc: EL. of Inlet invert (EL. 800.0m)

Vc: Critical Velocity

fe: Coefficient of Head Loss due to Entrance (fe = 0.20)

g: Acceleration of Gravity (g = 9.8 m/s^2)



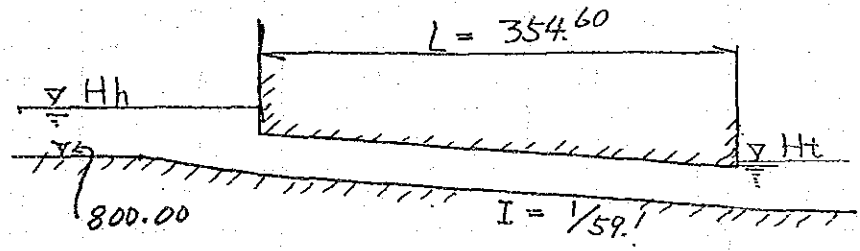
Calculations

Table D-3

Q (m^3/s)	h_c (m)	V_c (m/s)	$\frac{V_{c2}}{2g}(1+fe)$	H (m)
50	1.79	3.99	0.89	802.68
100	3.00	4.76	1.27	804.27
150	3.61	5.94	1.98	805.59
200	4.51	6.34	2.26	806.77
250	5.23	6.83	2.62	807.85
300	5.91	7.25	2.95	808.86
350	6.55	7.63	3.27	809.82
400	7.16	7.98	3.57	810.73
450	7.74	8.31	3.88	811.62

(2) Pipe flow condition

Formula



$$Hh = \frac{v^2}{2g}(1+fe+f_l+fb) + Ht$$

where

Hh: Water level at Inlet (EL.)

Ht: Water level at Outlet (EL.) (= 800.00m)

fe: Coefficient of head loss due to entrance

$$fe = 0.1$$

f_ℓ: Coefficient of head loss due to friction

$$f_\ell = \frac{122.0 \times n^2 \times L}{D^{4/3}}$$

$$n = 0.015$$

fb: Coefficient of head loss due to bend

$$fb = 0.064$$

$$Hh = \frac{v^2}{2g}(1+0.1+0.727+0.064) + 800$$

$$= 0.096\ v^2 + 800$$

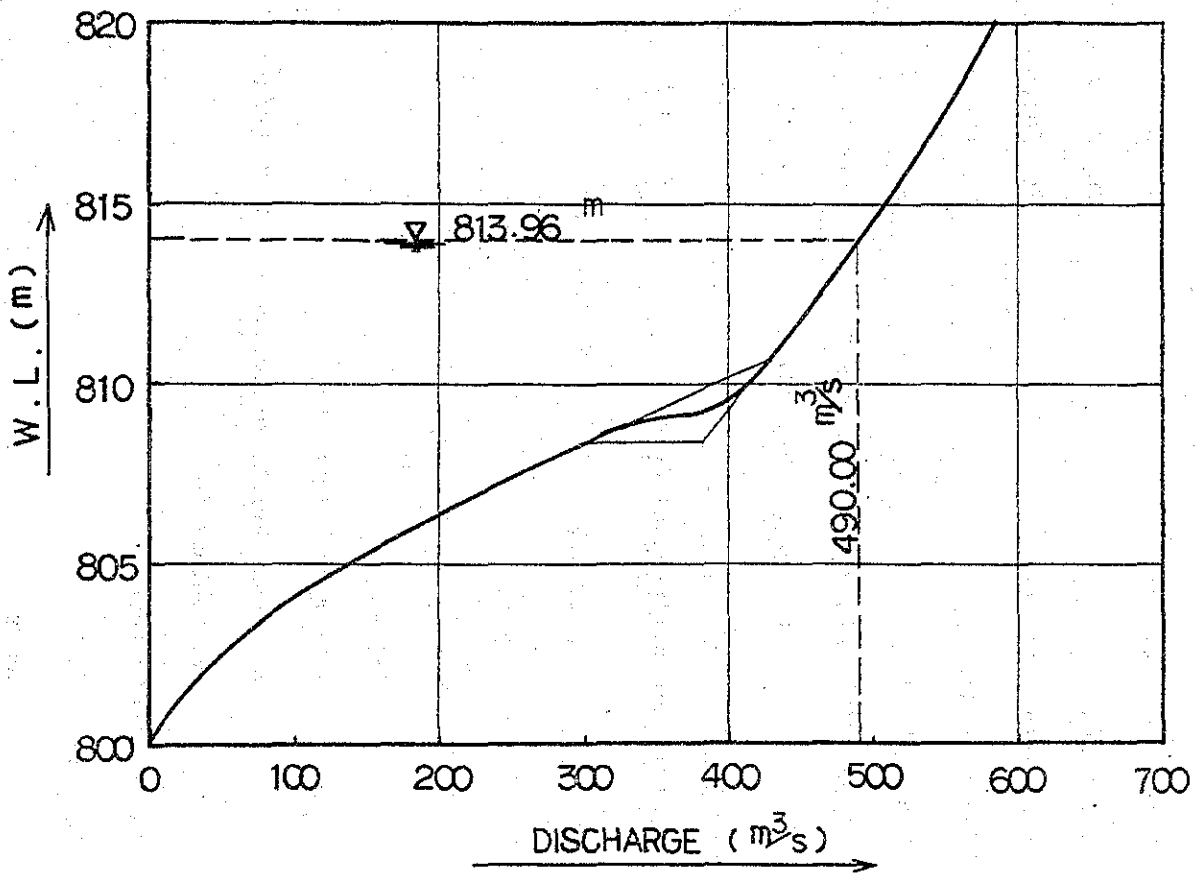
$$v = Q/A = Q/40.633$$

Calculations

Table D-4

Q (m^3/s)	V (m/s)	$(1+fe+f+fb)\frac{v^2}{2g}$	Ht (m)	Hb (m)
300	7.383	5.233	800.00	805.23
350	8.614	7.123	"	807.12
400	9.844	9.303	"	809.30
450	11.075	11.775	"	811.78
500	12.305	14.536	"	814.54
550	13.536	17.589	"	817.59
600	14.766	20.931	"	820.93
650	15.997	24.567	"	824.57
700	17.227	28.490	"	828.49

Fig. D-2 DISCHARGE CURVE OF DIVERSION TUNNEL



D.3 Stability Analysis of Dam

1. Design Conditions

Unit Weight of Water	$Wo = 1.0\ t/m^3$
Unit Weight of Concrete	$Wc = 2.30\ t/m^3$
Unit Weight of Sediment (Submerged)	$Wl = 1.1\ t/m^3$
Coefficient of Sediment Pressure	$Ce = 0.5$
Seismic Coefficient	$K = 0.12$
Crest EL.	EL. 846.0 m
Foundation Rock EL.	EL. 781.0 m
Sediment EL.	EL. 828.0 m
Slope (D/S)	m = 1:0.9
Slope (U/S) EL. 846.0 - EL. 806.0	Vertical
EL. 806.0 - EL. 781.0	n = 1:0.3
Shear Strength	$\tau_0 = 150\ t/m^2$
Coefficient of Internal Friction	f = 0.75

2. Load and Calculations

(1) Body Weight

$Wc = wc.V$

where

Wc: Body Weight (t)

wc: Unit Weight of Concrete = 2.30 (t/m^3)

V: Volume (m^3)

(2) Seismic Force

$Hc = Wc.K$

where

Hc: Seismic Force (t)

K: Seismic Coefficient

(3) Hydrostatic Pressure

$P = wo.h$

where

P: Hydrostatic Pressure (t/m2)

wo: Unit Weight of Water = 1.00 (t/m3)

h: Water Depth (m)

1) Upstream

Normal High W.L = 842.00 + 1.50[1)] + 0.50[2)] = 844.0 m

2) Downstream W.L

Downstream Bed EL + 2.0 m = 795.0 m

(4) Sediment Pressure

$Pe = Ce.wi.d$

where

Pe: Sediment Pressure in Horizontal Direction (t/m^2)

Ce: Coefficient of Sediment Pressure = 0.50

wl: Unit Weight of Sediment (Submerged) (t/m^3)

$wl = w - (1-\nu).wo$

w: Apparent Unit Weight of Sediment = 1.80 (t/m^3)

ν: Porosity of Sediment = 0.30

$wl = 1.80 - (1-0.3) \times 1.00 = 1.1$ (t/m^3)

d: Sediment Depth (m)

Note 1) Wave height induced by wind
2) Wave height induced by earthquake

(5) Uplift pressure

Heel : Upstream Water Pressure

Drainage: Downstream water pressure plus over 1/5 of the difference between upstream and downstream ends

Toe : Downstream Water Pressure

Waves and effects of instantaneous change of reservoir W.L are not considered in the water pressures above mentioned.

(6) Hydrodynamic Pressure

$$Pd = \frac{7}{8} \cdot wo.K.H.h$$

where

Pd: Hydrodynamic Pressure (t/m^3)

wo: Unit Weight of Water = 1.00 (t/m^3)

K: Seismic Coefficient

H: Water depth measured from water surface of reservoir to foundation

h: Water depth measured from water surface down to a given point

(7) Miscellaneous

In addition to the aboves, the weight of water, sediment, and weight due to auxiliary structures are considered.

3. Stability Analyses

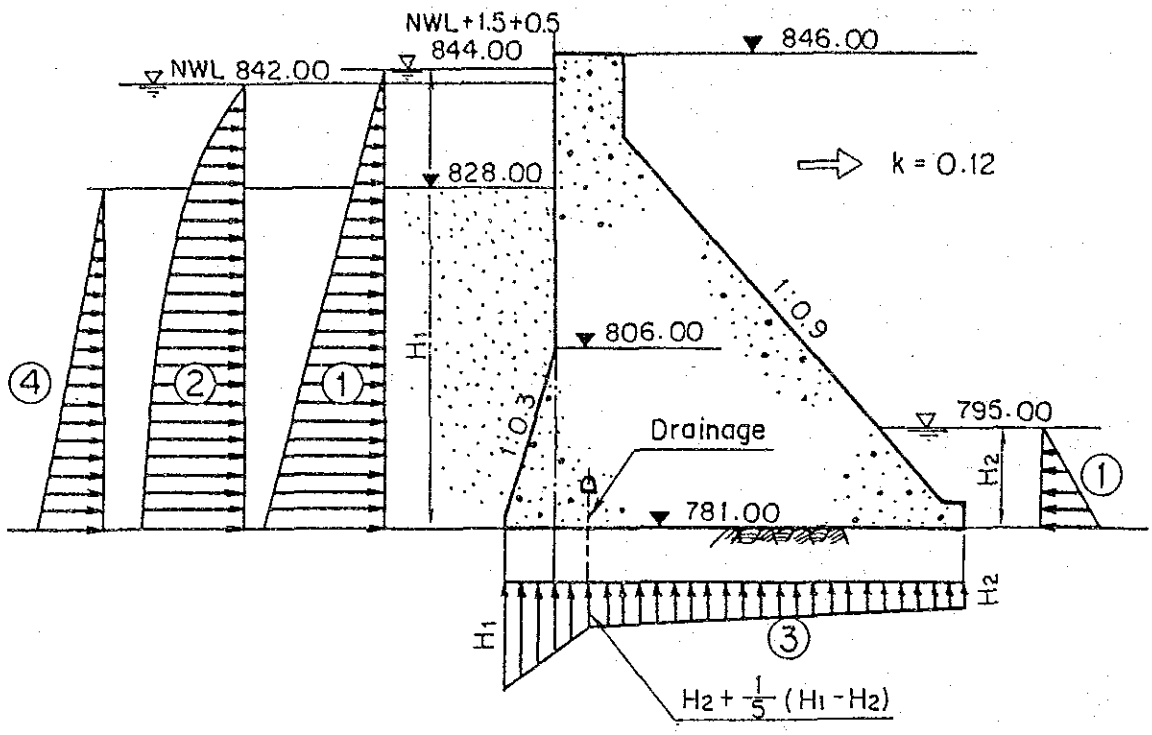
Stability Analyses are carried out by personal computer, on condition that the reservoir is H.W.L and earthquake takes place.

Working Point of Load	$Xo = \frac{M}{V}$ (m)
Distance of Eccentricity	$e = Xo - \frac{L}{2}$ (m)
	L: Bottom Length
Moment around the center of Bottom Section	$Mo = e \cdot V$ (t.m)

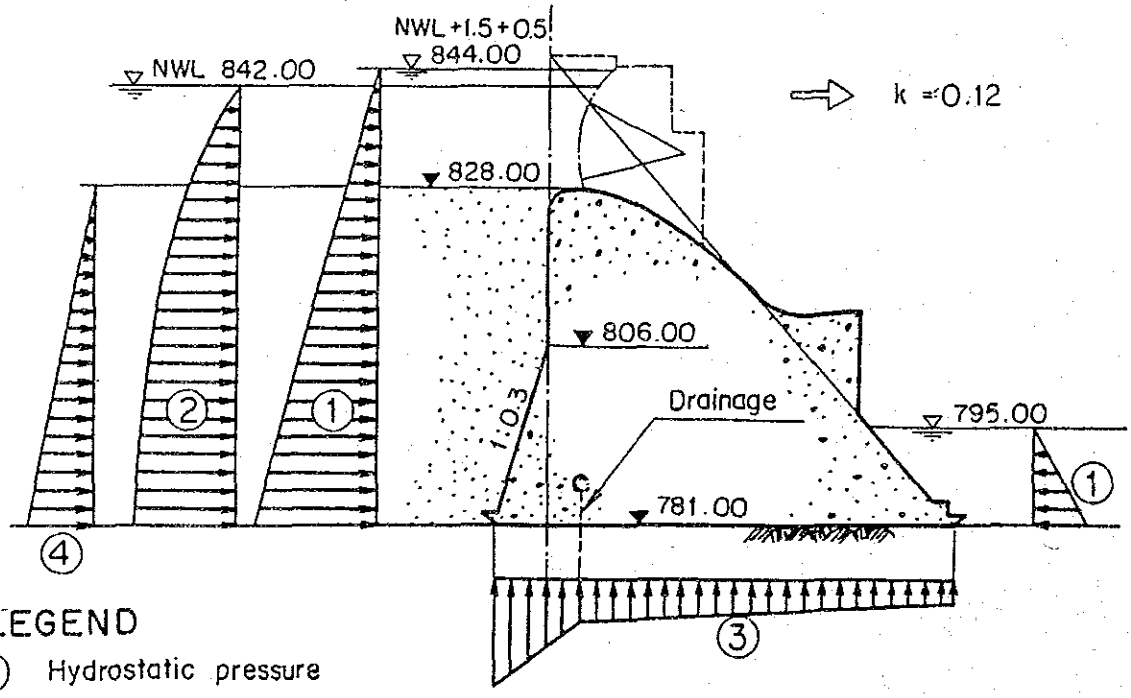
Normal Stress	Heel	$\sigma u = \frac{\Sigma V}{L}\left(1-\frac{6.e}{L}\right)\ (t/m^2)$
	Toe	$\sigma d = \frac{\Sigma V}{L}\left(1+\frac{6.e}{L}\right)\ (t/m^2)$
Safety Factor for Shear Friction		$n = \frac{V.f+\tau_0 L}{H}$

Fig. D-3 Load Diagram for Stability Analysis

● Non-overflow Section



● Overflow Section



LEGEND

① Hydrostatic pressure
② Hydrodynanic pressure
③ Uplift
④ Sediment pressure

4. Calculation Results

4.1 Crest gate type (Non-overflow section)

(1) Dam shape

Point	Y (m)	EL (m)
1	58.500	846.000
2	48.500	846.000
3	48.500	834.889
4	58.500	806.000
5	66.000	781.000
6	0.000	781.000

Note: Foundation Rock EL 781.000

Width of Crest Road 10.000

Slope Upperstream 1:0.000
1:0.300 below EL 806.00

Downstream 1:0.900

(2) Conditions related w.l etc.

Design Discharge W.L EL = 844.20 m

Surcharge W.L = 844.20 m

Normal H.W.L = 842.00 m

Sediment EL = 828.00 m

Downstream W.L

Design Discharge = 803.30 m

Surcharge W.L = 795.00 m

Normal H.W.L = 795.00 m

Empty = 781.00 m

Wave Height

Wind Induced H = 1.50 m

Earthquake Induced = 0.50 m

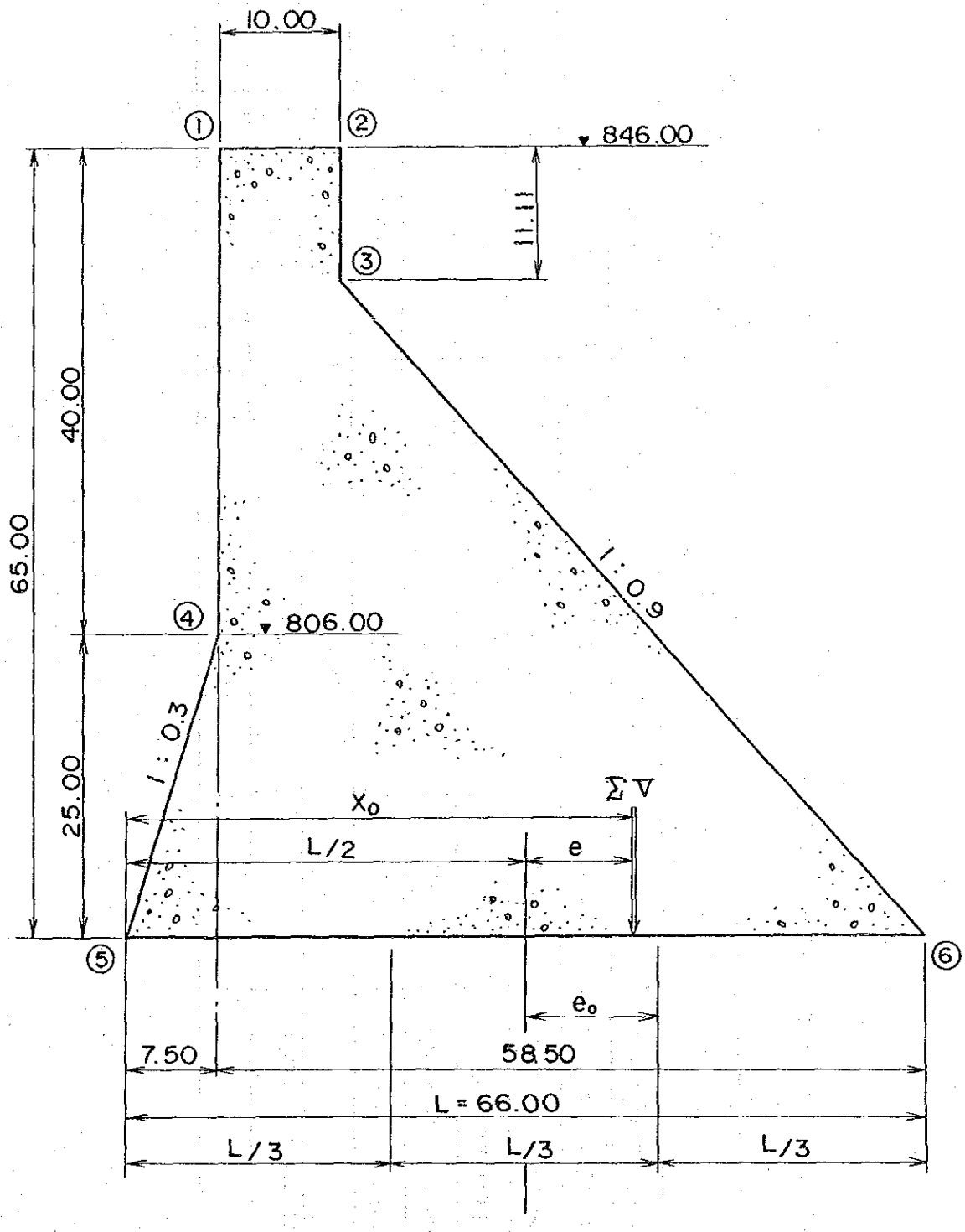
Uplift Pressure: considered

Hydrodynamic Pressure at Downstream: non

Drainage Hole	Y	EL
	53.000	813.000

Seismic Coefficient = 0.120

Fig. D-4 Non - Over Flow Section (Crest Gate Type)



(3) Calculation and Results (Elevation 781.00)

	Working Point Xg (m)	Vertical Force V (t)	Working Point yg (m)	Horizontal Force H (t)	Moment around the Heel M (t.m)
Body weight, seismic force	25.646	4,716.277	22.131	565.953	133,480.885
U/s hydrostatic pressure	3.441	378.750	21.000	1,984.500	42,977.625
U/s hydrodynamic pressure	0.000	0.000	24.400	260.470	6,355.468
Sediment pressure	3.297	284.625	15.667	607.475	10,455.546
D/s hydrostatic pressure	61.800	88.200	4.667	- 98.000	4,993.427
D/s hydrodynamic pressure	0.000	0.000	5.600	0.000	0.000
Uplift	26.069	- 1,527.950	0.000	0.000	- 39,832.858
Adjustment due to irregure shape		0.000		0.000	0.000
Sum		3,939.901		3,320.398	158,430.092

Bottom Length	L(m) = 66.000
Working Point of Load	Xo(m) = 40.212
Middle Third	eo(m) = 11.000
Distance of Eccentricity	e(m) = 7.212
Moment arround the center of Bottom Section	Mo(t.m) = 28,413.343
Coefficient of Internal Friction	f = 0.750
Shear Strength	τ_o = 150.000
Normal Stress	
Heel	σ_u = 20.559 t/m^2
Toe	σ_d = 98.832 t/m^2
Safety Factor for Shear Friction	n = 3.872

(4) Calculation and Results (Elevation 806.00)

	Working Point Xg (m)	Vertical Force V (t)	Working Point yg (m)	Horizontal Force H (t)	Moment around the Heel M (t.m)
Body weight, seismic force	11.618	1,783.777	14.978	214.053	23,929.982
U/s hydrostatic pressure	0.000	0.000	12.667	722.000	9,145.333
U/s hydrodynamic pressure	0.000	0.000	14.400	118.091	1,700.510
Sediment pressure	0.000	0.000	7.333	133.100	976.067
D/s hydrostatic pressure	0.000	0.000	0.000	- 98.000	0.000
D/s hydrodynamic pressure	0.000	0.000	0.000	0.000	0.000
Uplift	8.749	- 219.600	0.000	0.000	- 1,921.200
Adjustment due to irregure shape		0.000		0.000	0.000
Sum		1,564.176		1,187.244	33,830.692

Bottom Length	L(m) = 36.000
Working Point of Load	Xo(m) = 21.628
Middle Third	eo(m) = 6.000
Distance of Eccentricity	e(m) = 3.628
Moment arround the center of Bottom Section	Mo(t.m) = 5,675.515
Coefficient of Internal Friction	f = 0.750
Shear Strength	τ_o = 150.000
Normal Stress	
Heel	σ_u = 17.174 t/m^2
Toe	σ_d = 69.725 t/m^2
Safety Factor for Shear Friction	n = 5.536

4.2 Crest Gate Type (Overflow section)

(1) Dam shape

Point	Y (m)	EL (m)
1	58.500	846.000
2	48.500	846.000
3	48.500	834.889
4	58.500	806.000
5	66.000	781.000
6	0.000	781.000

Note: Foundation Rock EL 781.000

Width of Crest Road 10.000

Slope Upperstream 1:0.000
1:0.300 below 806.00

Downstream 1:0.900

(2) Conditions related w.l etc.

Design Discharge W.L EL = 844.20 m

Surcharge W.L = 844.20 m

Normal H.W.L = 842.00 m

Sediment EL = 828.00 m

Downstream W.L

Design Discharge = 803.30 m

Surcharge W.L = 795.00 m

Normal H.W.L = 795.00 m

Empty = 781.00 m

Wave Height

Wind Induced H = 1.50 m

Earthquake Induced = 0.50 m

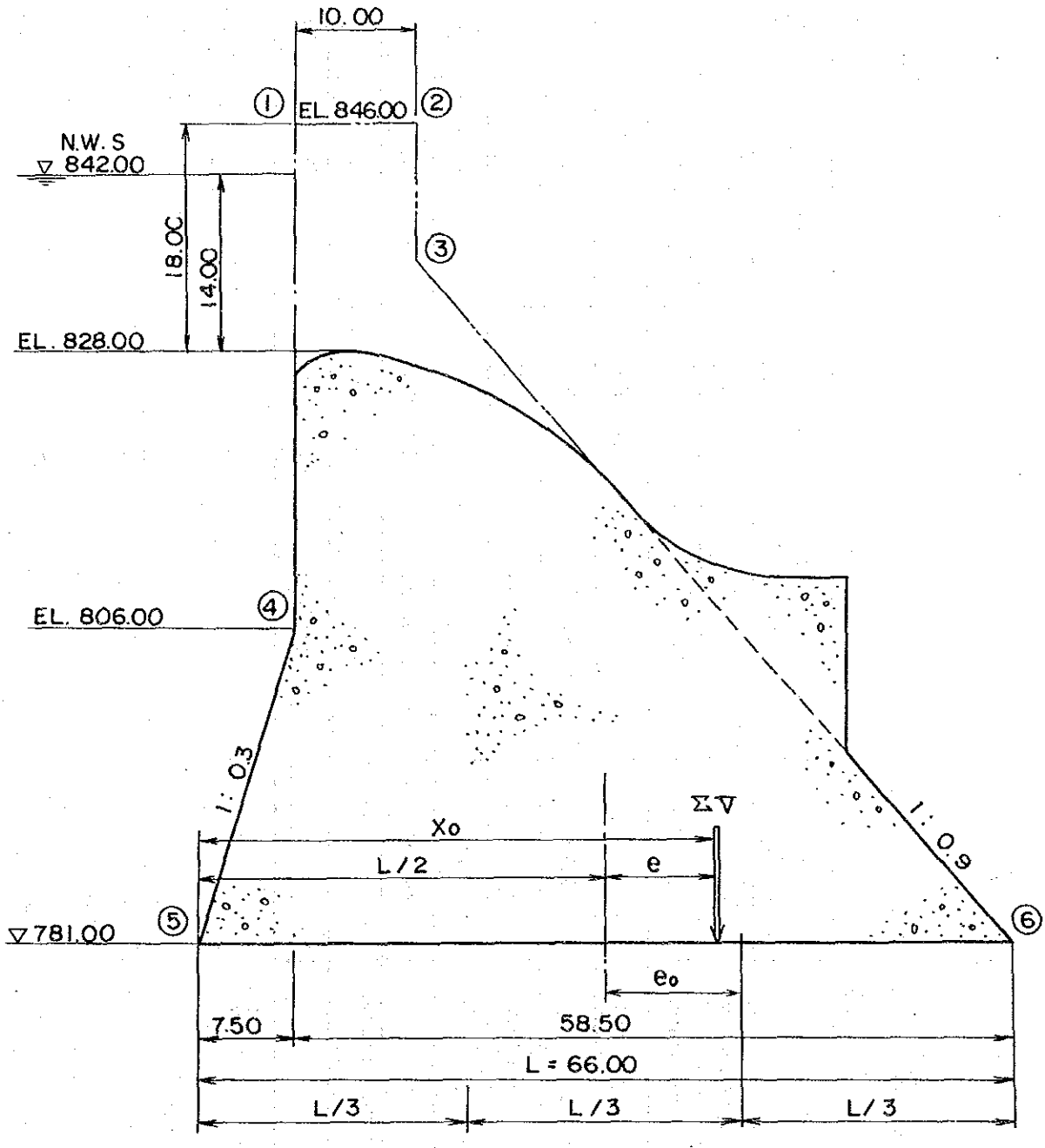
Uplift Pressure: considered

Hydrodynamic Pressure at Downstream: non

Drainage Hole	Y	EL
	53.000	813.000

Seismic Coefficient = 0.120

Fig. D-5 Over Flow Section (Crest Gate Type)



(3) Calculation and Results (Elevation 781.00)

	Working Point Xg (m)	Vertical Force V (t)	Working Point yg (m)	Horizontal Force H (t)	Moment around the Heel M (t.m)
Body weight, seismic force	25.646	4,716.277	22.131	565.953	133,480.885
U/s hydrostatic pressure	3.441	378.750	21.000	1,984.500	42,977.625
U/s hydrodynamic pressure	0.000	0.000	24.400	260.470	6,355.468
Sediment pressure	3.297	284.625	15.667	607.475	10,455.546
D/s hydrostatic pressure	61.800	88.200	4.667	- 98.000	4,993.427
D/s hydrodynamic pressure	0.000	0.000	5.600	0.000	0.000
Uplift	26.069	- 1,527.950	0.000	0.000	- 39,832.858
Adjustment due to irregure shape		- 210.968		- 33.717	1,033.940
Sum		3,728.933		3,286.681	159,464.032

Bottom Length	L(m) = 66.000
Working Point of Load	Xo(m) = 42.764
Middle Third	eo(m) = 11.000
Distance of Eccentricity	e(m) = 9.764
Moment arround the center of Bottom Section	Mo(t.m) = 36,409.227
Coefficient of Internal Friction	f = 0.750
Shear Strength	τ_0 = 150.000
Normal Stress	
Heel	σ_u = 6.349 t/m^2
Toe	σ_d = 106.649 t/m^2
Safety Factor for Shear Friction	n = 3.863

4.3 Bottom Flushing Type (Non-overflow section)

(1) Dam shape

Point	Y (m)	EL (m)
1	58.50	846.000
2	48.50	846.000
3	48.50	834.889
4	58.50	805.000
5	65.70	781.000
6	0.00	781.000

Note: Foundation Rock EL 781.000m
Width of Crest Road 10.000m
Slope Upstream 1:0.00
1:0.30 below EL 805.00
Downstream 1:0.90

(2) Conditions related w.l etc.

Design Discharge W.L EL = 844.20 m

Surcharge W.L = 844.20 m

Normal H.W.L = 842.00 m

Sediment EL = 805.00 m

Downstream W.L

Design Discharge = 803.30 m

Surcharge W.L = 795.00 m

Normal H.W.L = 795.00 m

Empty = 781.00 m

Wave Height

Wind Induced H = 1.50 m

Earthquake Induced = 0.50 m

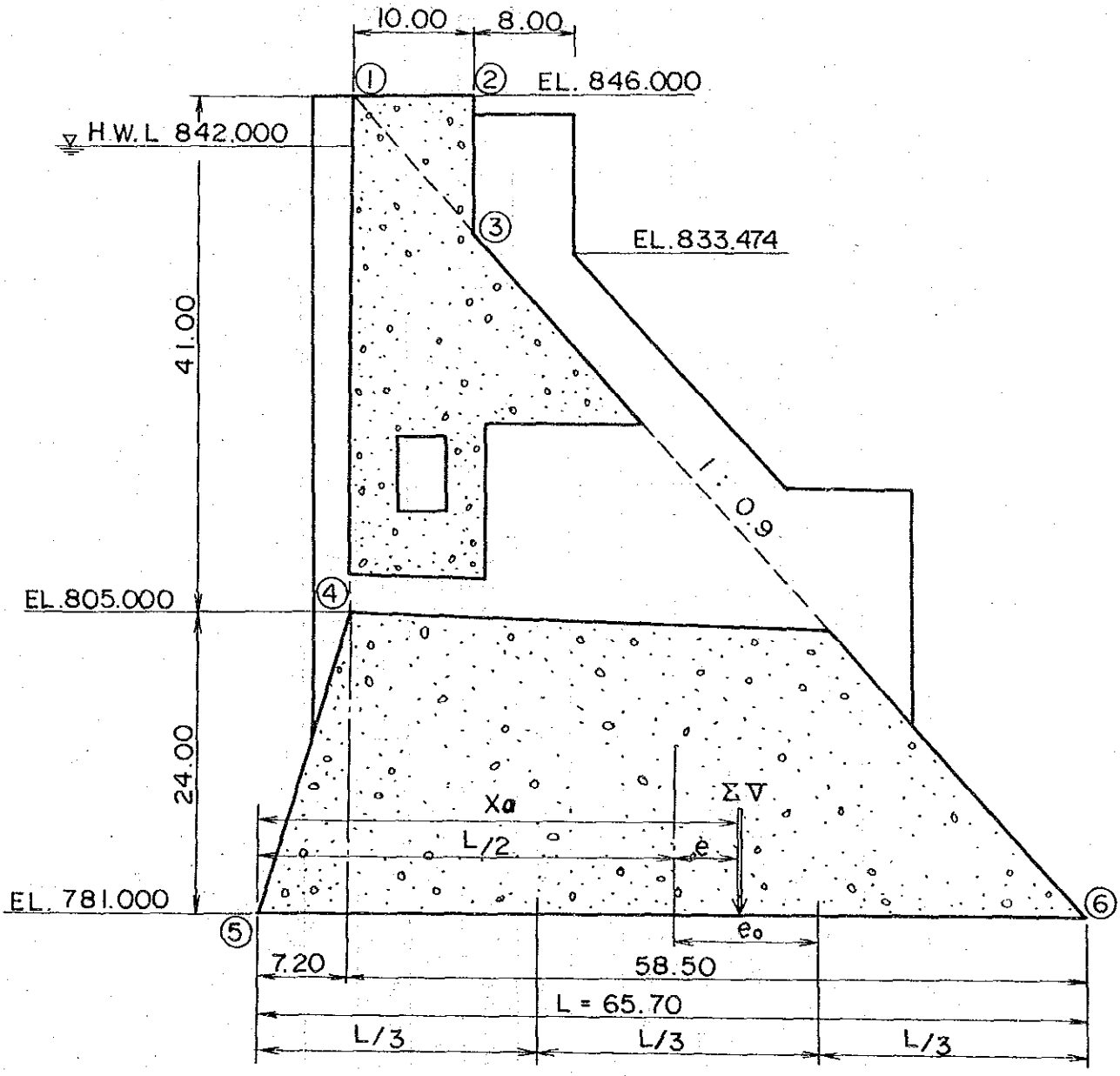
Uplift Pressure: Considered

Hydrodynamic Pressure at Downstream: non

Drainage Hole: Considered

Seismic Coefficient = 0.15

Fig. D-6 Non - Over Flow Section (Bottom Flushing Type)



(3) Calculation and Results (Elevation 781.000)

	Working Point Xg (m)	Vertical Force V (t)	Working Point yg (m)	Horizontal Force H (t)	Moment around the Heel M (t.m)
Body weight, seismic force	25.425	4,699.372	22.166	704.906	135,106.595
U/s hydrostatic pressure	3.318	367.200	21.000	1,984.500	42,892.740
U/s hydrodynamic pressure	0.000	0.000	24.400	325.588	7,944.335
Sediment pressure	2.400	95.040	8.000	158.400	1,495.296
D/s hydrostatic pressure	61.500	88.200	4.667	- 98.000	4,966.967
D/s hydrodynamic pressure	0.000	0.000	5.600	0.000	0.000
Uplift	26.001	- 1,515.290	0.000	0.000	- 39,399.590
Adjustment due to irregure shape		- 210.968		- 42.146	454.747
Sum		3,523.553		3,033.247	153,461.090

Bottom Length	L(m) = 65.700
Working Point of Load	Xo(m) = 43.553
Middle Third	eo(m) = 10.950
Distance of Eccentricity	e(m) = 10.703
Moment arround the center of Bottom Section	Mo(t.m) = 37,712.358
Coefficient of Internal Friction	f = 0.750
Shear Strength	τ_0 = 150.000
Normal Stress	
Heel	σ_u = 1.210 t/m^2
Toe	σ_d = 106.052 t/m^2
Safety Factor for Shear Friction	n = 4.120

D.4 Spillway Discharge Capacity

1. General

Five (5) overflow sections (12.00 m wide each) are arranged as spillway section with crest top of EL 828.00.

The shape of overflow crest consists of a combined curve of Harold's standard crest and circles. This curve is inscribed with the principal triangle of dam body.

2. Calculation Formula

Ishii-Fujimoto's formula is applied.

$$Q = n.c'.B.H^{\frac{3}{2}}$$

$$c' = c.\left\{1-Md\left(\frac{H}{Hd}\right)^{1.5}\right\}$$

$$Md = 0.0756\left(\frac{Hd}{B}\right)^{0.5}$$

when $n=1$ or $n \geqq 2$ and $B/S \geqq 0.8$

$$Md = 0.0756\left(\frac{Hd}{B}\right)^{0.5}\left\{\frac{1}{n} + 1.465\left(\frac{n-1}{n}\right)\left(\frac{b}{s}\right)^{1.7}\right\}$$

..... when $n \geqq 2$ and $B/S < 0.8$

$$c = 1.60\,\frac{1 + 2a\left(\frac{H}{Hd}\right)}{1 + a\left(\frac{H}{Hd}\right)}$$

$$cd = 2{,}200 - 0.0416\left(\frac{Hd}{W}\right)^{0.99}$$

where, Q : Overflow Discharge (m^3/s)

n : Numbers of overflow section (5)

c': Coefficient of discharge, taking effects due to pier and abutment

B : Width of overflow section per one span (m)

H : Overflow head at crest (m)

Md : Adjustment factor

c : Coefficient of discharge without effects due to pier and abutment

Hd : Design head 16 m

: Constant

W : Height of weir

b : Width of pier

s : Surplus length of pier from U/S face of dam body

3. Results

Calculated results are shown in Table D-5 and Fig. D-7.

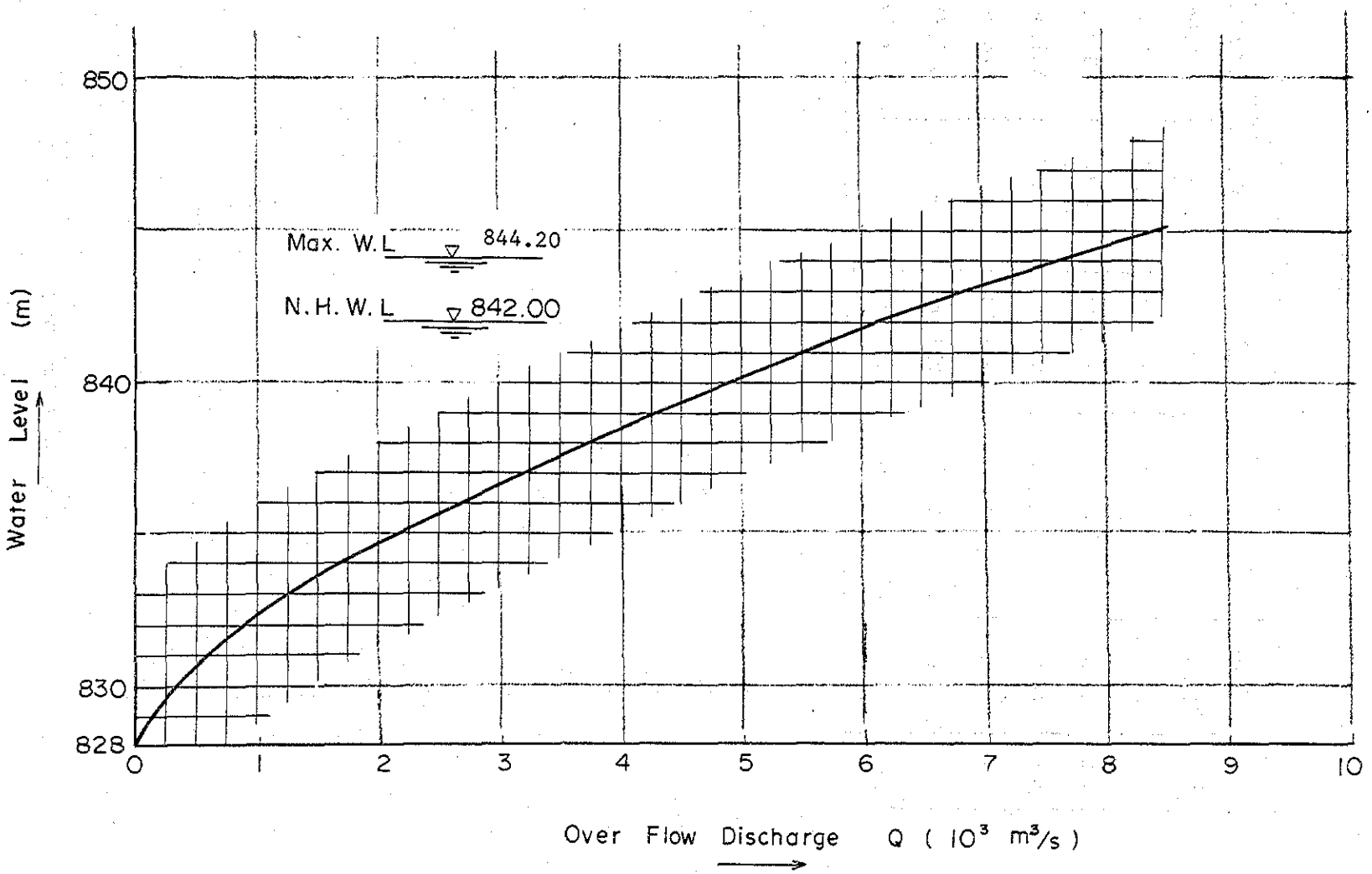
Table D-5 Discharge Calculation

B = 12.000 N = 5 CRELV= 828.000 b = 3.000 S = 3.000

Hd = 16.000 W = 23.000 Cd = 2.171 Al = 0.55484 Md = 0.08730

WL	H	C	C'	Q
828.000	0.000	0.000	0.000	0.00
828.100	0.100	1.606	1.605	3.05
828.200	0.200	1.611	1.611	8.64
828.300	0.300	1.616	1.616	15.93
828.400	0.400	1.622	1.621	24.61
828.500	0.500	1.627	1.626	34.50
828.600	0.600	1.633	1.632	45.50
828.700	0.700	1.638	1.637	57.51
828.800	0.800	1.643	1.642	70.48
828.900	0.900	1.648	1.647	84.35
829.000	1.000	1.654	1.651	99.08
829.100	1.100	1.659	1.656	114.64
829.200	1.200	1.664	1.661	131.00
829.300	1.300	1.669	1.666	148.13
829.400	1.400	1.674	1.670	166.01
829.500	1.500	1.679	1.675	184.62
829.600	1.600	1.684	1.679	203.94
829.700	1.700	1.689	1.684	223.95
829.800	1.800	1.694	1.688	244.65
829.900	1.900	1.699	1.693	266.01
830.000	2.000	1.704	1.697	288.02
842.000	14.000	2.123	1.971	6195.56
842.100	14.100	2.125	1.972	6264.28
842.200	14.200	2.128	1.973	6333.22
842.300	14.300	2.130	1.973	6402.37
842.400	14.400	2.133	1.974	6471.74
842.500	14.500	2.135	1.975	6541.32
842.600	14.600	2.138	1.975	6611.10
842.700	14.700	2.140	1.976	6681.10
842.800	14.800	2.143	1.976	6751.29
842.900	14.900	2.145	1.977	6821.69
843.000	15.000	2.147	1.977	6892.29
843.100	15.100	2.150	1.978	6963.09
843.200	15.200	2.152	1.978	7034.08
843.300	15.300	2.155	1.979	7105.26
843.400	15.400	2.157	1.979	7176.63
843.500	15.500	2.159	1.980	7248.19
843.600	15.600	2.162	1.980	7319.94
843.700	15.700	2.164	1.980	7391.87
843.800	15.800	2.166	1.981	7463.98
843.900	15.900	2.169	1.981	7536.27
844.000	16.000	2.171	1.981	7608.73
844.100	16.100	2.173	1.982	7681.37
844.200	16.200	2.176	1.982	7754.19
844.300	16.300	2.178	1.982	7827.17
844.400	16.400	2.180	1.983	7900.32
844.500	16.500	2.182	1.983	7973.63
844.600	16.600	2.185	1.983	8047.11
844.700	16.700	2.187	1.983	8120.74
844.800	16.800	2.189	1.983	8194.54
844.900	16.900	2.191	1.984	8268.49
845.000	17.000	2.193	1.984	8342.60
845.000	17.000	2.193	1.984	8342.60

Fig. D-7 Spillway Discharge Capacity Curve



D.5 Oscillation Analysis of Surging Water Level

Table D-6 Surging WL Analysis

Case Name	Port Dia	Qm^3/s, t(s)	HW at Reservoir	Surging WL	
				Up	Down
U-1	3.00	80 -> 0, 5.5	842.00	865.02	825.84
U-2	2.40	80 -> 0, 5.5	842.00	859.00	831.30
U-3	2.40	80 -> 57, 0	842.00	844.46	835.00
U-4	2.40	80 -> 0, 0	842.00	858.99	831.30
D-1	3.00	40 -> 80, 5.5	837.00	-	816.24
D-2	2.40	40 -> 80, 5.5	837.00	-	817.71
D-3	2.40	40 -> 80, 0	837.00	-	817.72

Fig. D-8 CASE U-1 Port Diameter 3.00 m

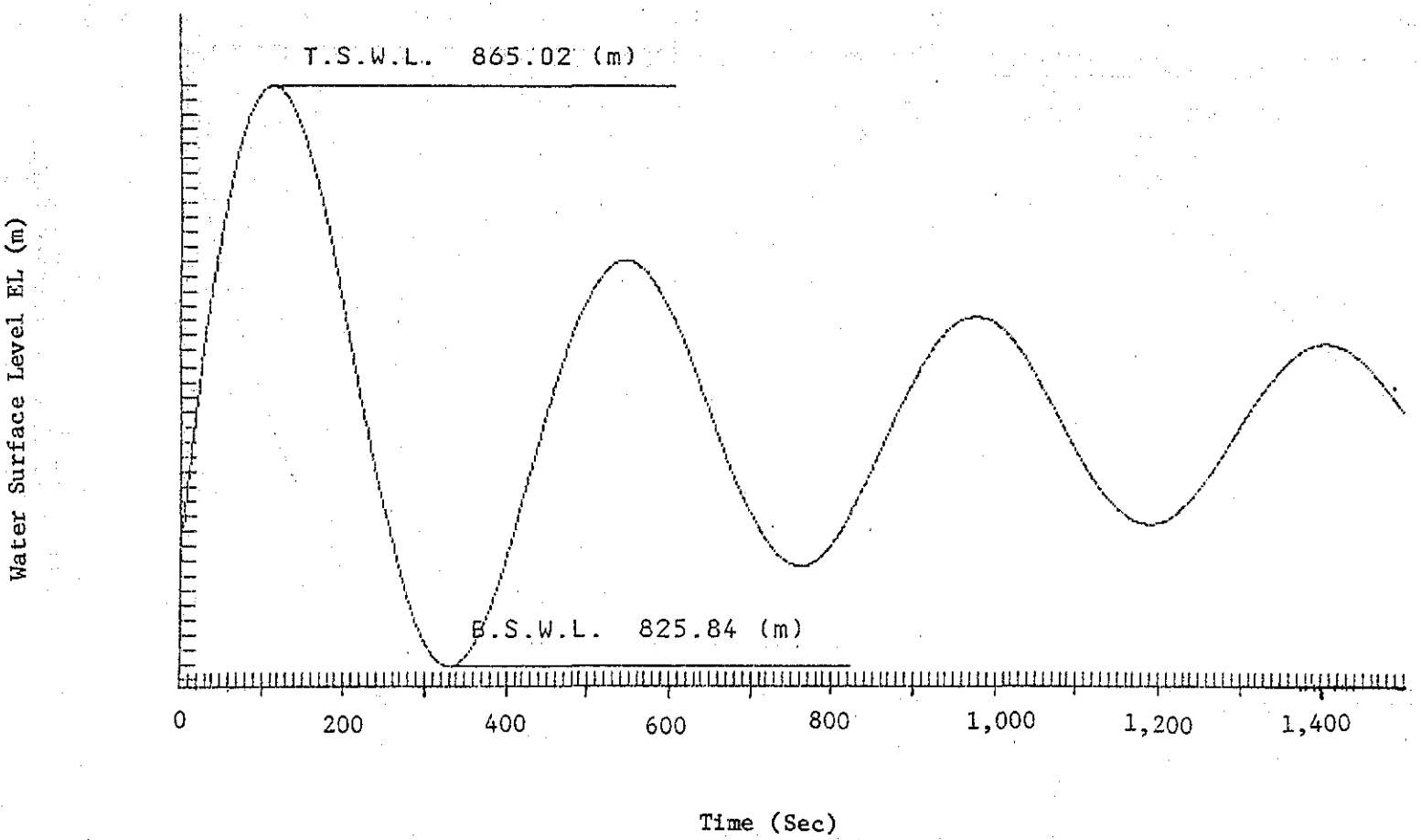


Fig. D-9 CASE U-2 Port Diameter 2.40 m

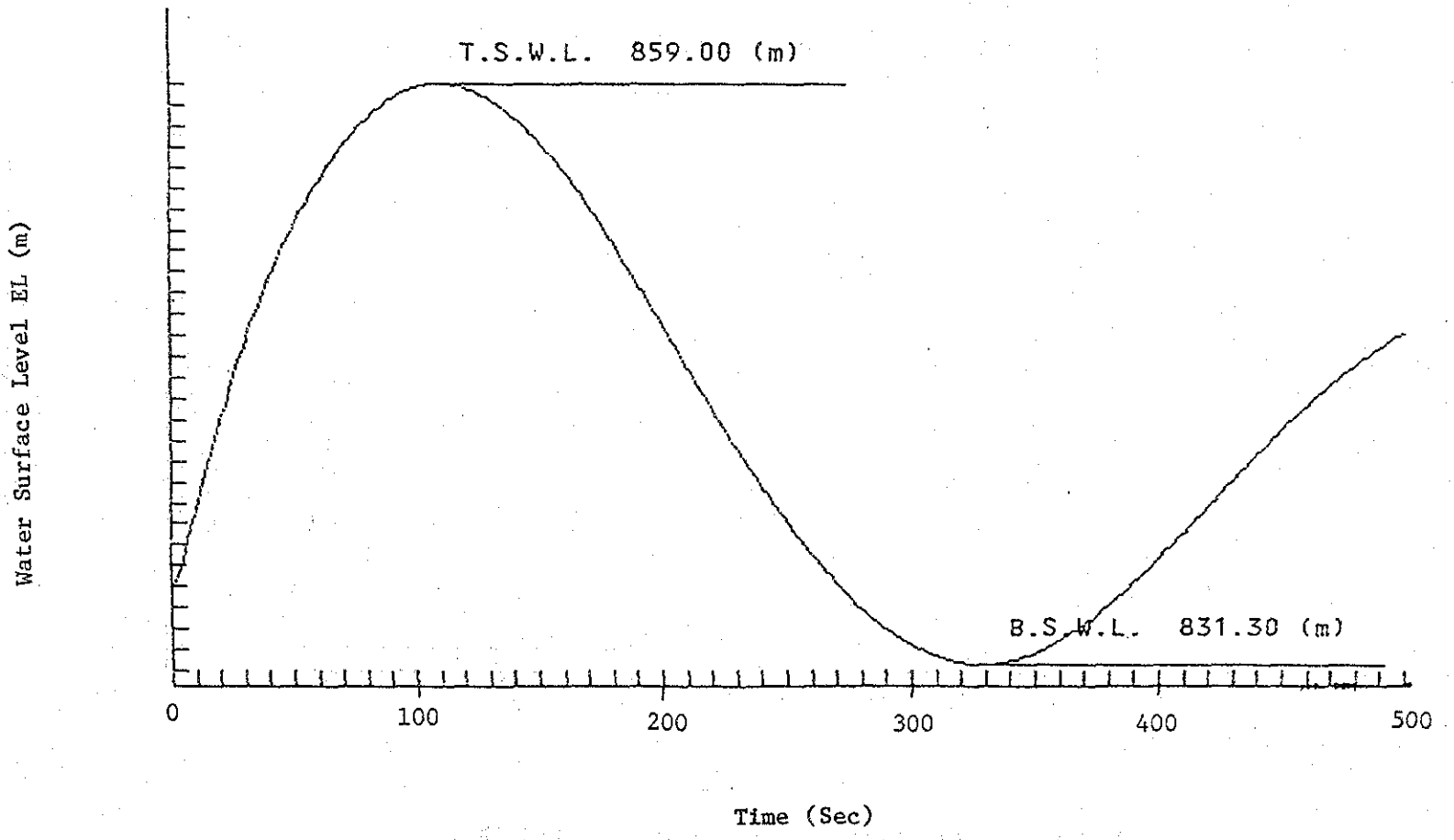


Fig. D-10 CASE U-3 Port Diameter 2.40 m

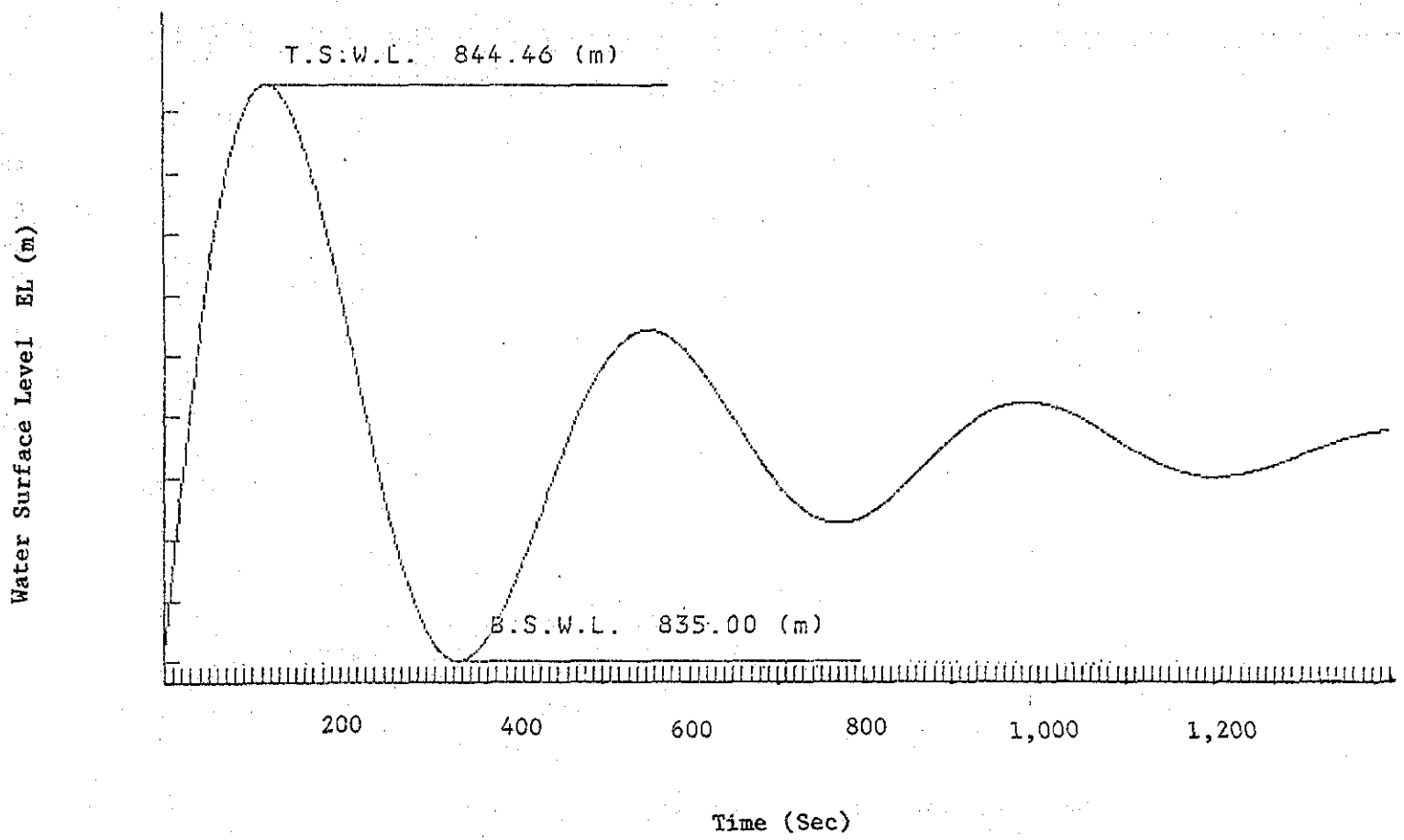


Fig. D-11 CASE U-4 Port Diameter 2.40 m

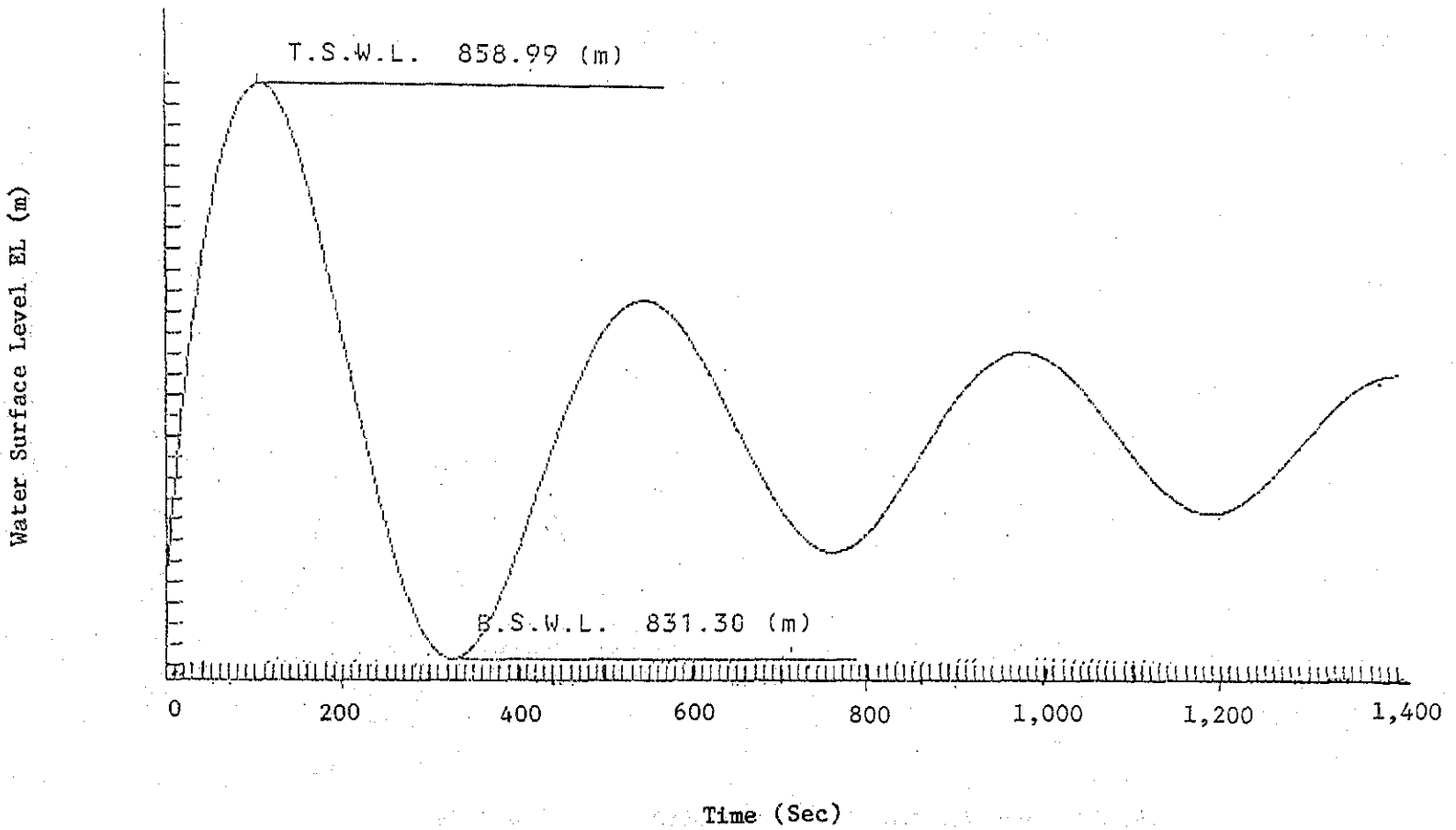


Fig. D-12 CASE D-1 Port Diameter 3.00 m

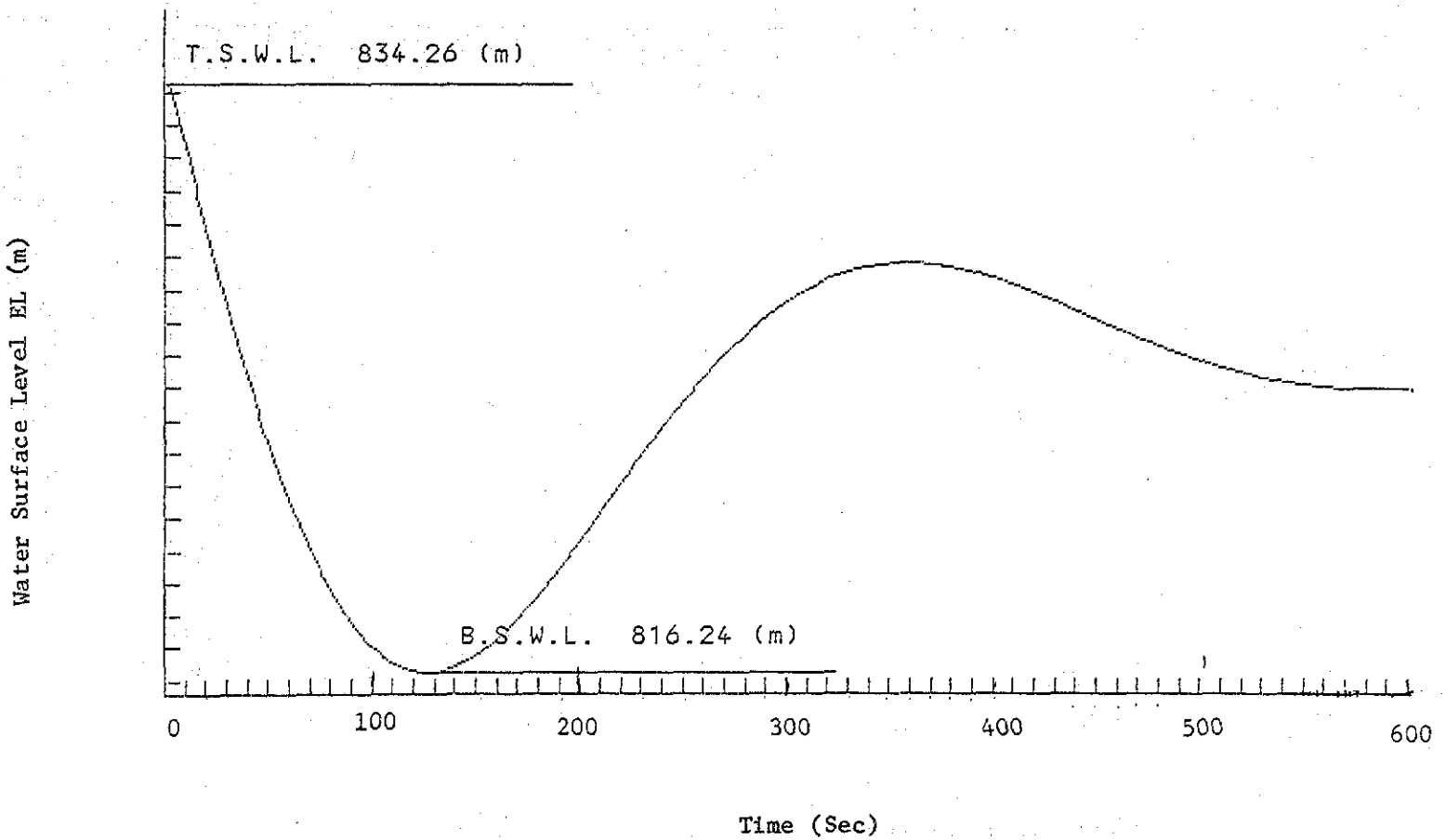


Fig. D-13 CASE D-2 Port Diameter 2.40 m

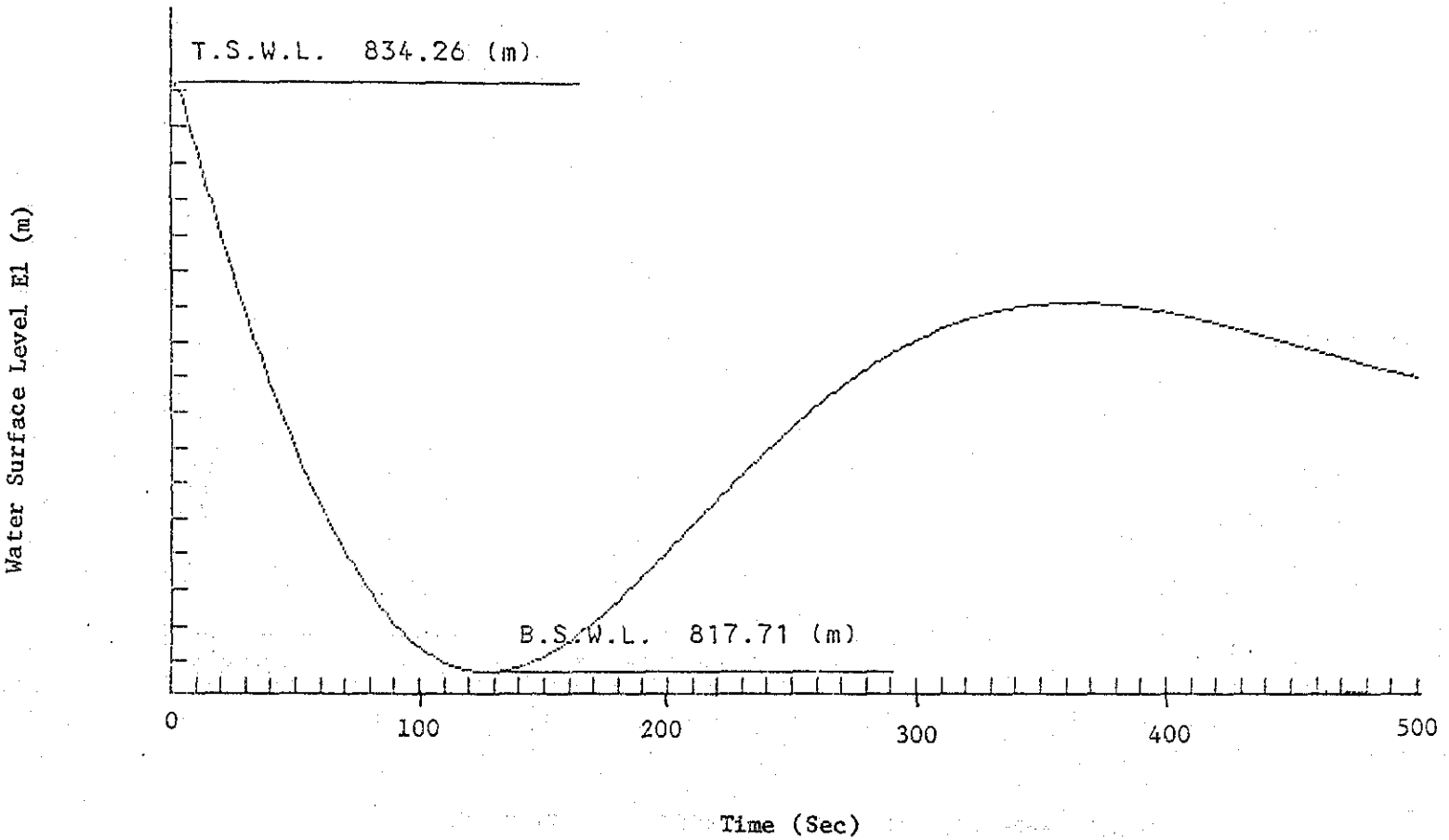
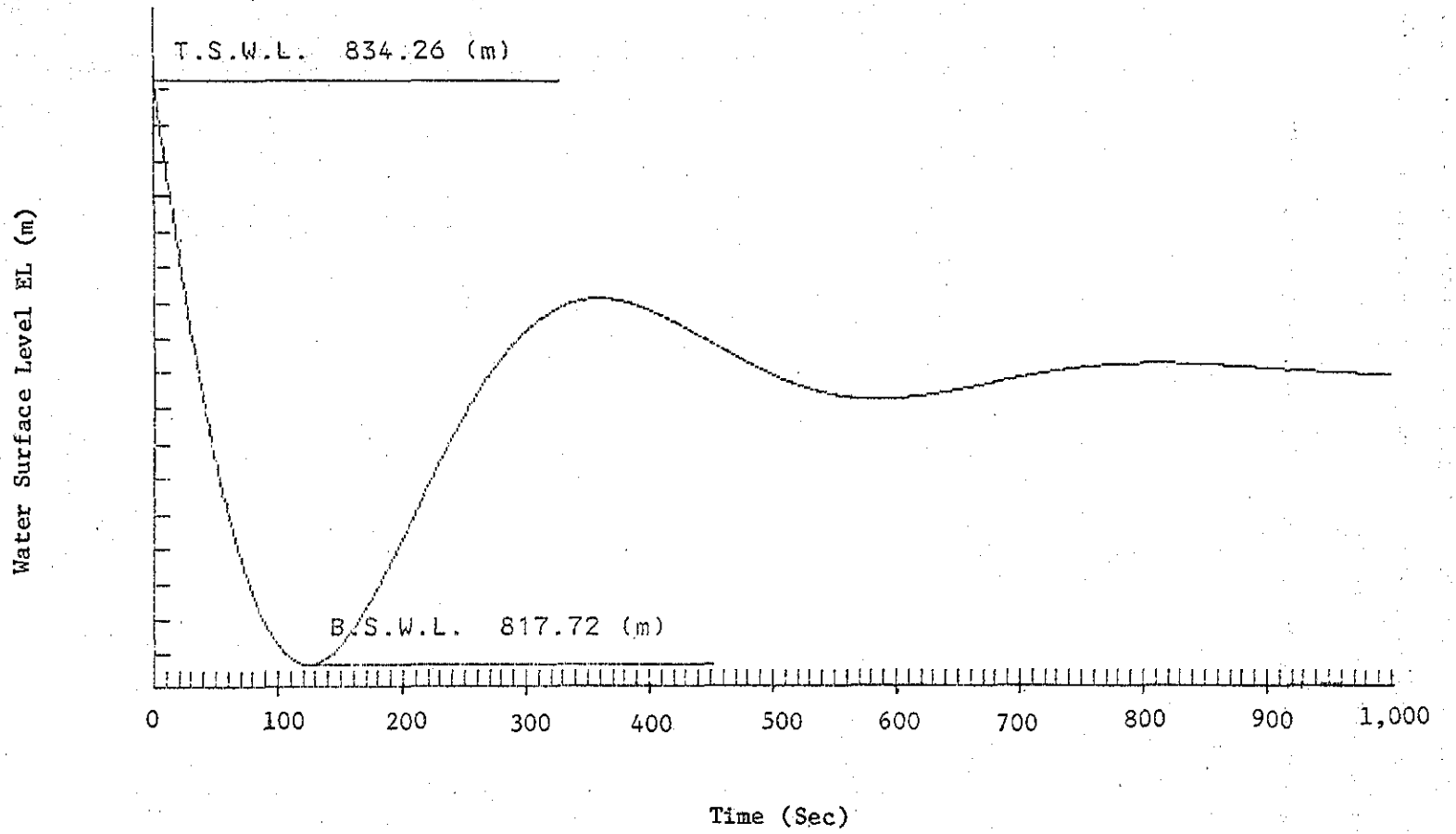


Fig. D-14 CASE D-3 Port Diameter 2.40 m



D.6 Water Hammer at Penstock

General features of a net work of waterway is shown in Fig. D-15. The net work consists of elements of waterway (pipe), pondages, a surge tank and turbines.

Results computed are shown in Fig. D-16 - Fig. D-19.

Fig. D-15 Waterway System

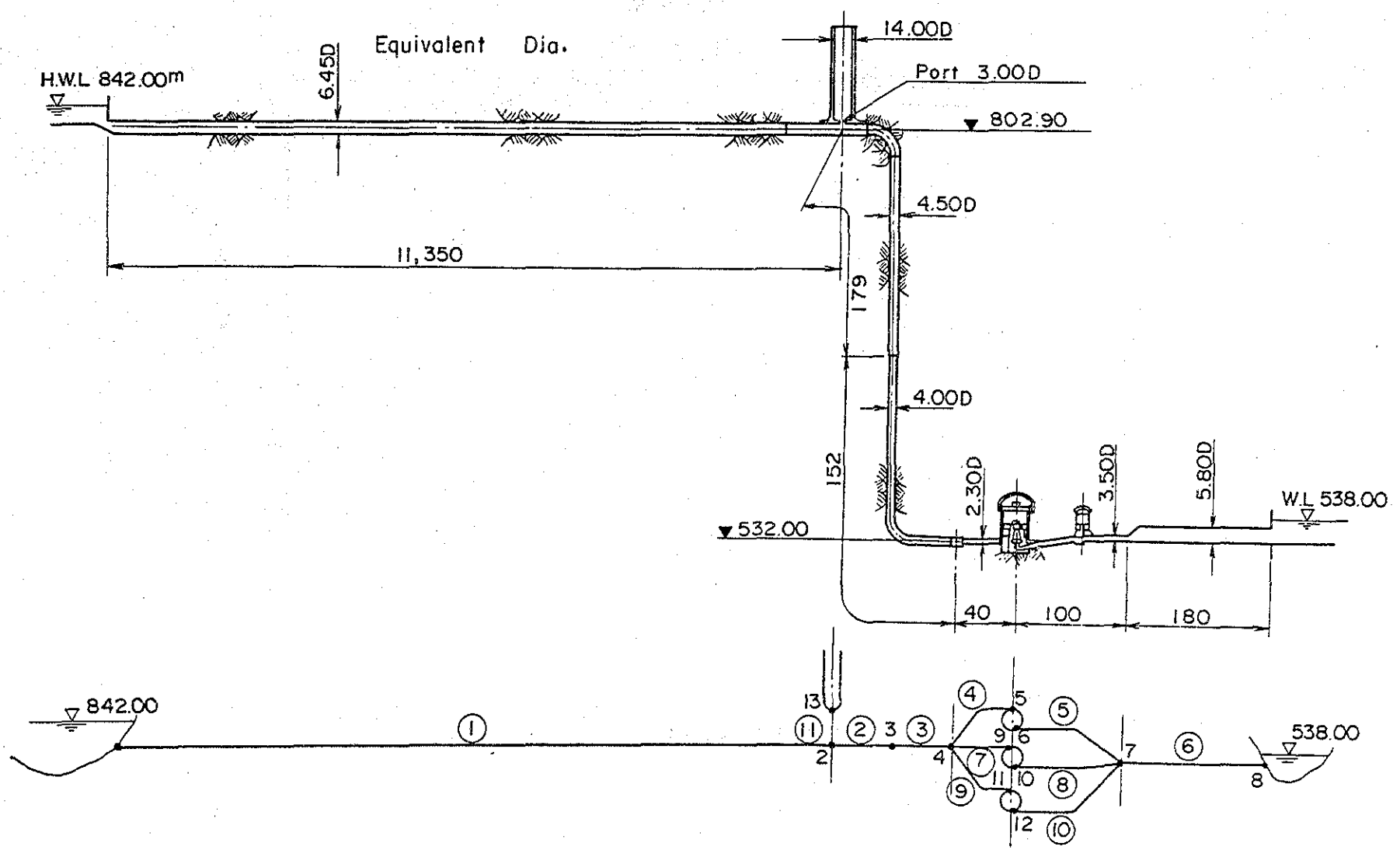


Fig. D-16 Pipe No. 5 (Upstream)

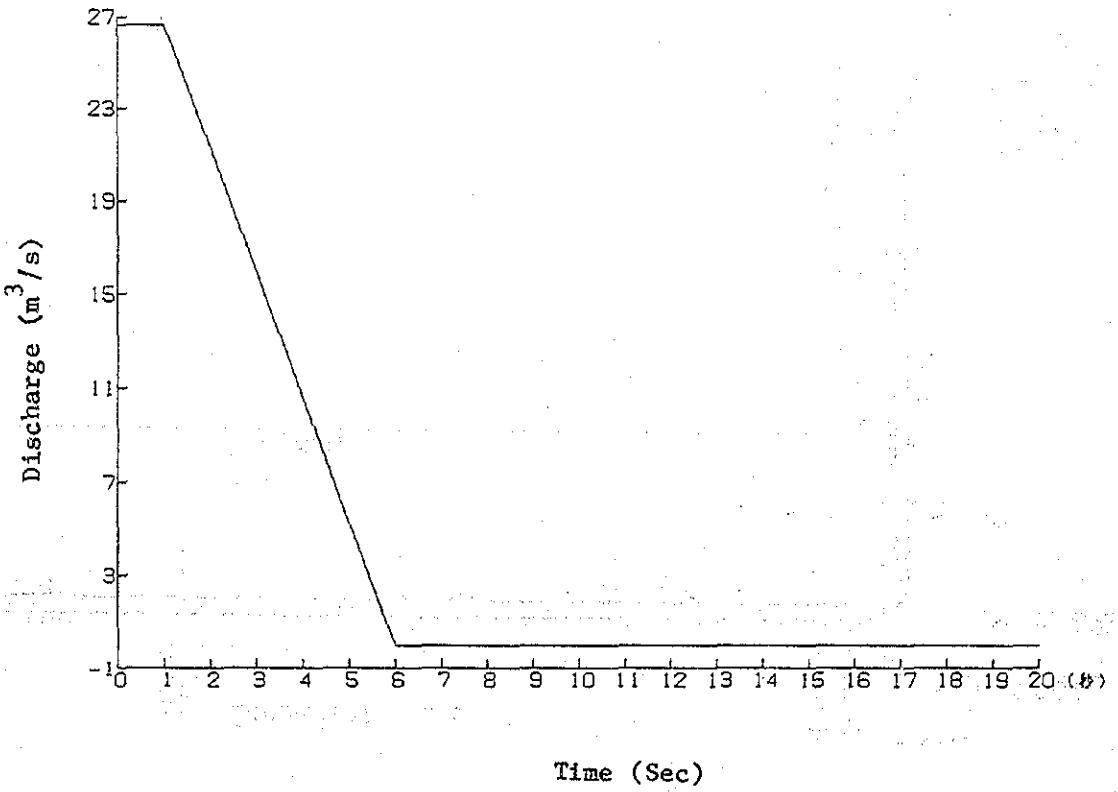


Fig. D-17 Point No. 3

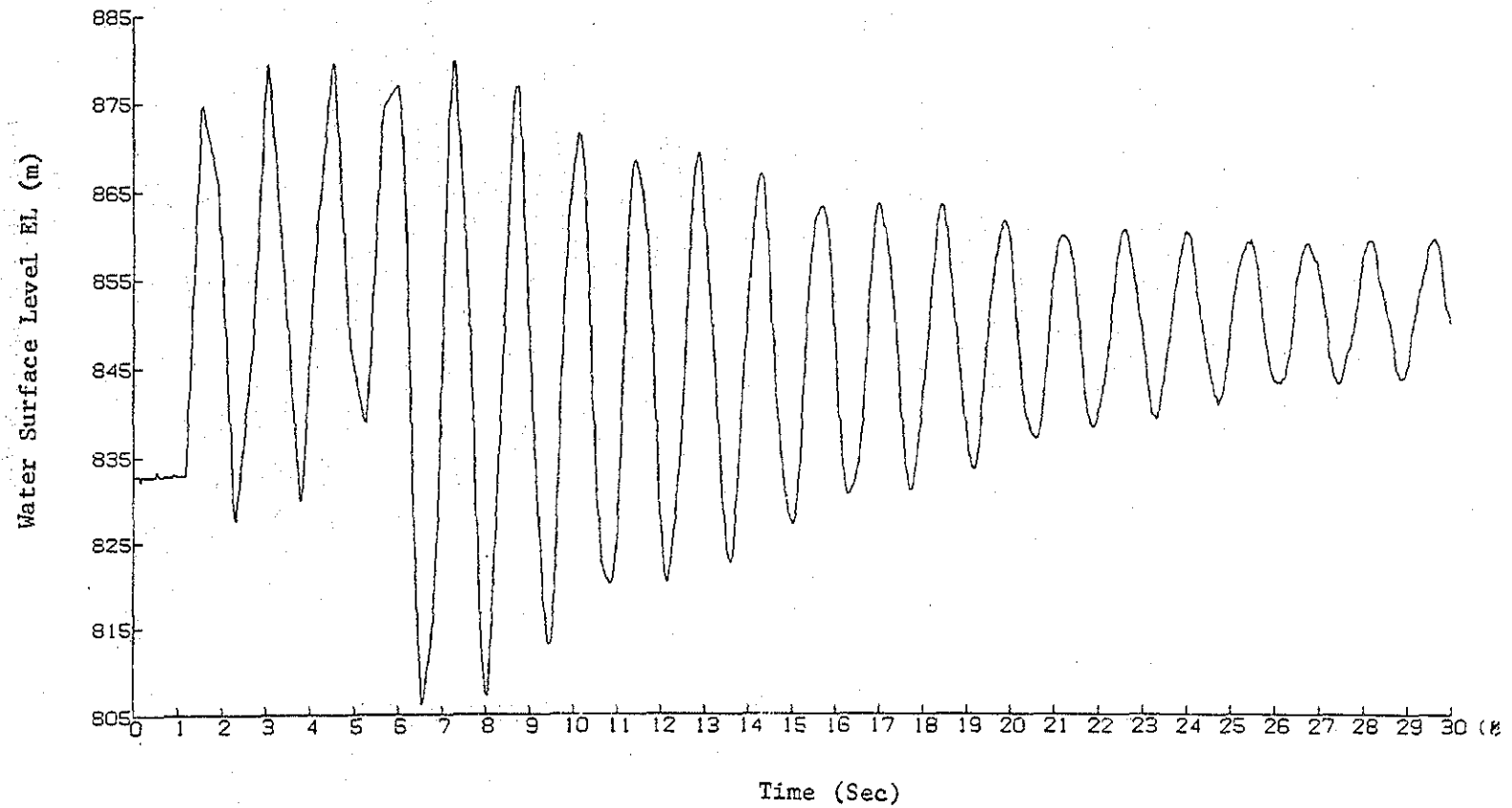


Fig. D-18 Point No. 4

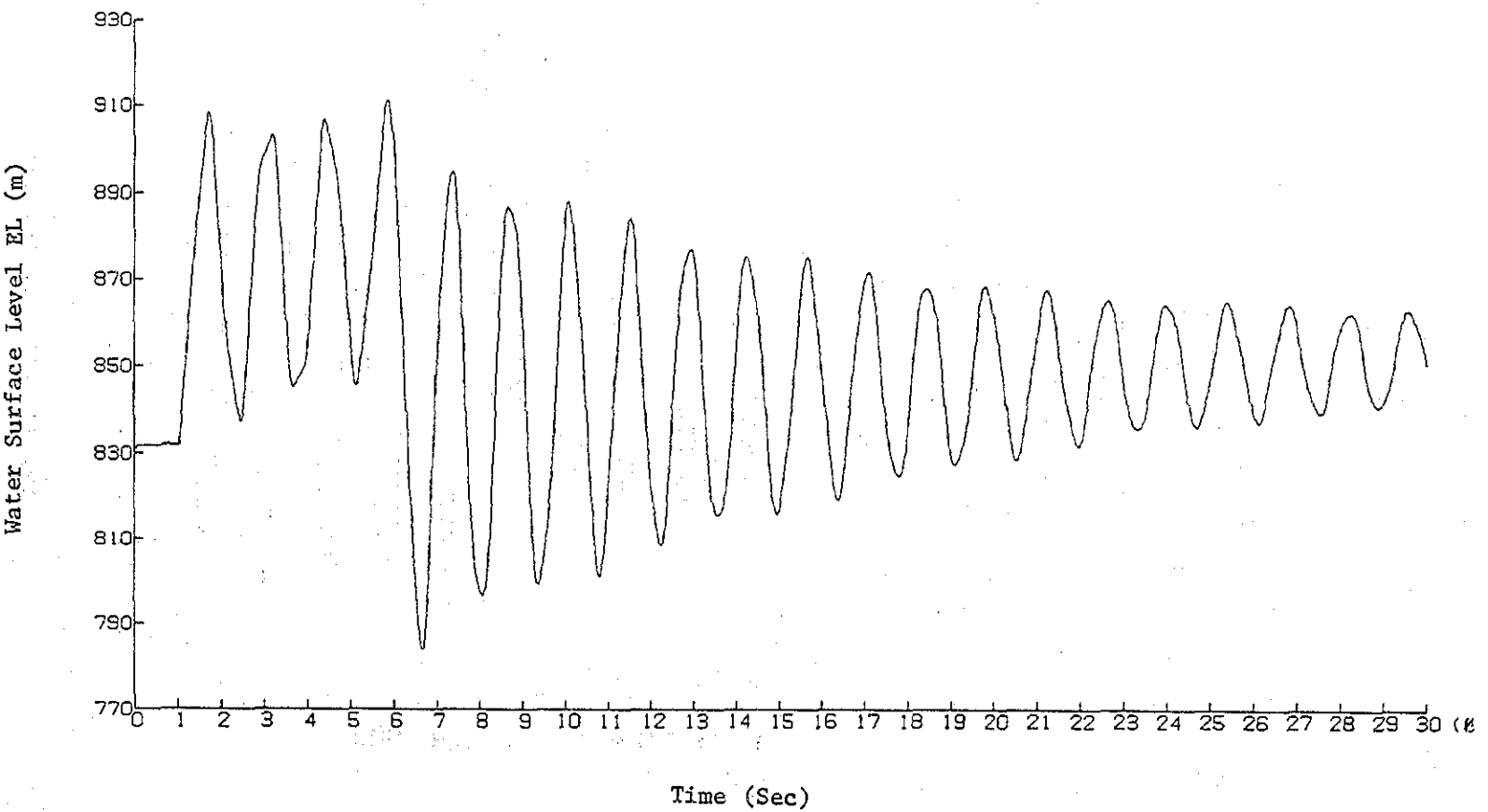
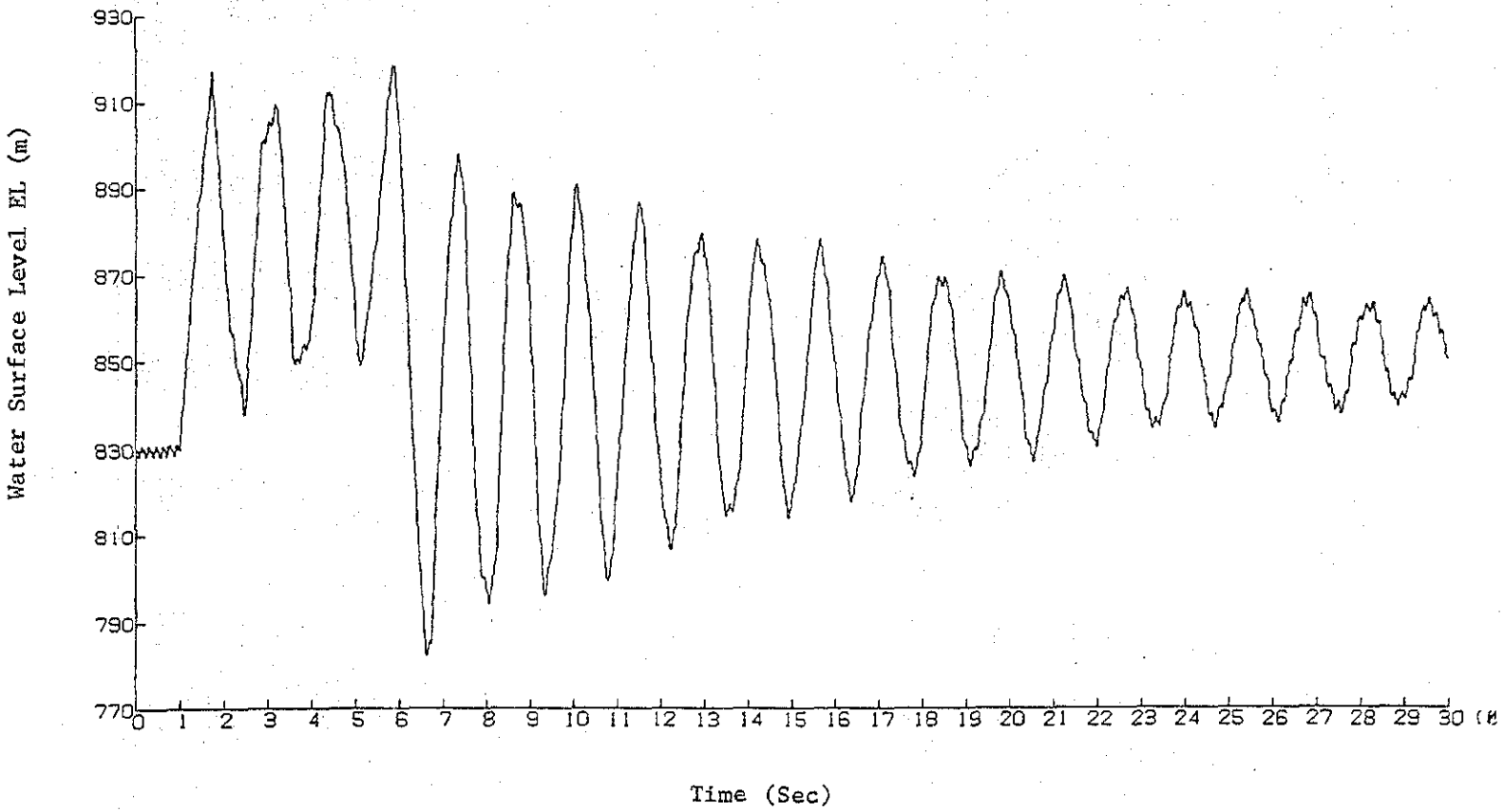


Fig. D-19 Point No. 5



D. 7 Rating Curve at Tailrace Outlet

** n=0.035 **

SH= 535 RH= 555
DH= 2 n= .035
(1 / I) I = 60

1 X= 9 Y= 558
2 X= 13.5 Y= 539
3 X= 20 Y= 537
4 X= 20 Y= 535
5 X= 50 Y= 535
6 X= 50 Y= 537
7 X= 58.5 Y= 539
8 X= 64 Y= 541
9 X= 66 Y= 543
10 X= 75.5 Y= 551
11 X= 86.5 Y= 560

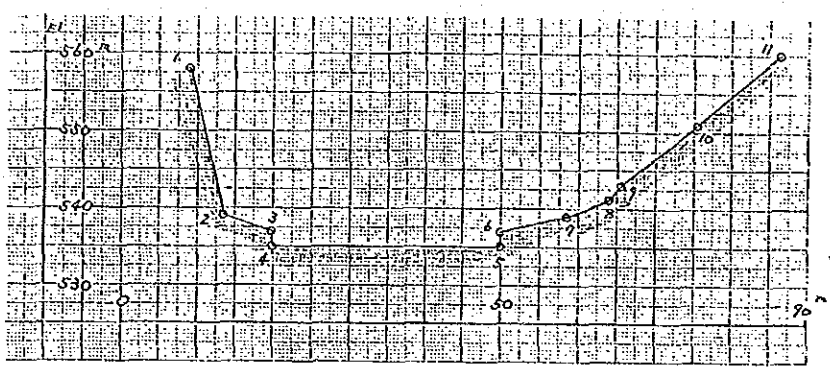


Table D-7

1 / 60

EL. (m)	D (m)	A (m^2)	P (m)	R (m)	n	V (m/s)	F	SQ (m^3/s)	Q (m^3/s)
535.000	0.000	0.00	0.000	0.000	0.035	0.000	0.000	0.00	0.00
537.000	2.000	60.00	34.000	1.765	0.035	5.386	1.276	323.19	323.19
539.000	3.000	135.00	49.533	2.725	0.035	7.197	1.392	971.59	971.59
541.000	4.531	230.97	57.441	4.021	0.035	9.327	1.468	2154.34	2154.34
543.000	6.275	335.40	62.324	5.381	0.035	11.327	1.515	3799.08	3799.08
545.000	7.907	445.14	67.485	6.596	0.035	12.973	1.546	5774.90	5774.90
547.000	9.478	560.58	72.645	7.717	0.035	14.404	1.568	8074.48	8074.48
549.000	10.997	681.72	77.805	8.762	0.035	15.677	1.584	10687.10	10687.10
551.000	12.470	808.55	82.965	9.746	0.035	16.829	1.597	13607.30	13607.30
553.000	13.890	941.16	88.179	10.673	0.035	17.881	1.608	16828.60	16828.60
555.000	15.275	1079.59	93.393	11.560	0.035	18.858	1.617	20358.60	20358.60

** n=0.045 **

SH= 535 RH= 555
DH= 2 n= .045
(1 / I) I = 60

1 X= 9 Y= 558
2 X= 13.5 Y= 539
3 X= 20 Y= 537
4 X= 20 Y= 535
5 X= 50 Y= 535
6 X= 50 Y= 537
7 X= 58.5 Y= 539
8 X= 64 Y= 541
9 X= 66 Y= 543
10 X= 75.5 Y= 551
11 X= 86.5 Y= 560

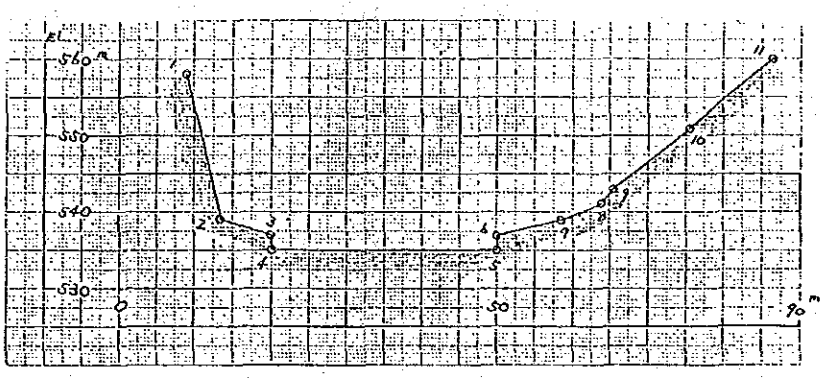
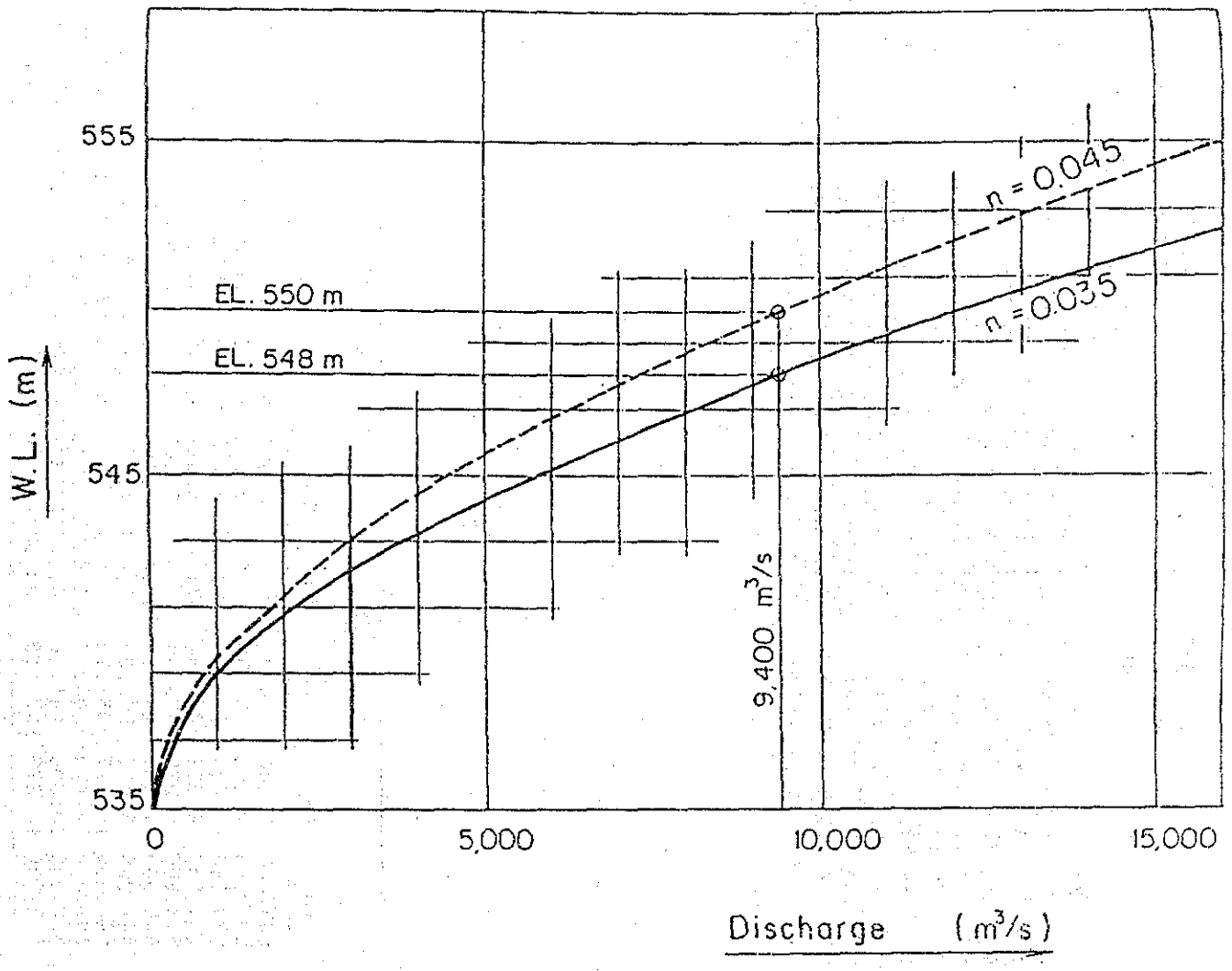


Table D-8

1 / 60

EL. (m)	D (m)	A (m^2)	P (m)	R (m)	n	V (m/s)	F	SQ (m^3/s)	Q (m^3/s)
535.000	0.000	0.00	0.000	0.000	0.045	0.000	0.000	0.00	0.00
537.000	2.000	60.00	34.000	1.765	0.045	4.189	0.993	251.37	251.37
539.000	3.000	135.00	49.533	2.725	0.045	5.598	1.083	755.68	755.68
541.000	4.531	230.97	57.441	4.021	0.045	7.255	1.142	1675.60	1675.60
543.000	6.275	335.40	62.324	5.381	0.045	8.810	1.178	2954.84	2954.84
545.000	7.907	445.14	67.485	6.596	0.045	10.090	1.202	4491.59	4491.59
547.000	9.478	560.58	72.645	7.717	0.045	11.203	1.219	6280.15	6280.15
549.000	10.997	681.72	77.805	8.762	0.045	12.193	1.232	8312.15	8312.15
551.000	12.470	808.55	82.965	9.746	0.045	13.089	1.242	10583.50	10583.50
553.000	13.890	941.16	88.179	10.673	0.045	13.907	1.250	13088.90	13088.90
555.000	15.275	1079.59	93.393	11.560	0.045	14.667	1.257	15834.50	15834.50

Fig. D-20 Rating Curve at Tailrace Outlet



D.8 Calculation of Head Loss

1. General

Dimensions of waterway, such as diameter, length, etc. are shown in Fig. D-21, 22 and 23.

Coefficients of roughness are as shown below:

Unlined, (TBM)	0.020
Shotcrete (TBM)	0.018
Shotcrete (CBM)	0.020
Concrete lined	0.013
Steel lined	0.012

2. Results

The summary table (Table D-9) shows calculation results.

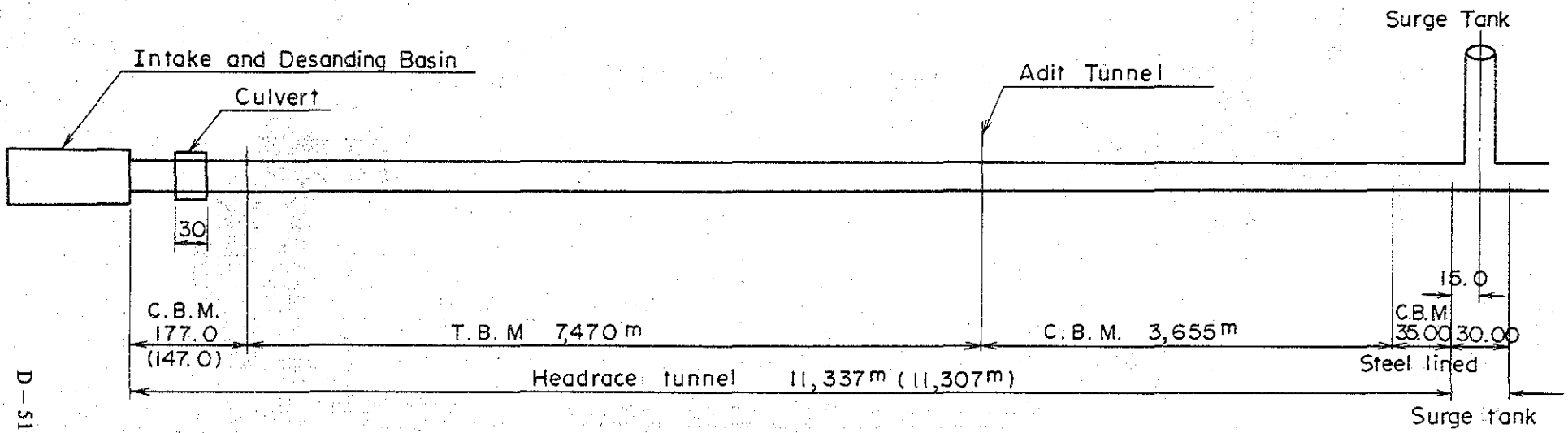
Table D-9 Summary Tabel of Head Losses

$Q=80m^3/s$

Unit		Loss of Head (m)
1	Intake	$3.1250 \times 10^{-5} \times Q^2 = 0.20$
	Tunnel	142.8658 " = 9.14
	Penstock	55.5827 " = 3.55
	Tailrace	12.9728 " = 0.83
	Outlet	
	Total	13.72
2	Intake	$3.1250 \times 10^{-5} \times Q^2 = 0.20$
	Tunnel	142.8658 " = 9.14
	Penstock	51.7560 " = 3.31
	Tailrace	12.4848 " = 0.80
	Outlet	
	Total	13.45
3	Intake	$3.1250 \times 10^{-5} \times Q^2 = 0.20$
	Tunnel	142.8658 " = 9.14
	Penstock	55.5843 " = 3.56
	Tailrace	10.5949 " = 0.68
	Outlet	
	Total	13.58

A design head loss of 14.00 m is applied for the optimum studies and the planning, taking some miscellaneous losses into consideration.

Fig. D-21 Headrace Tunnel Profile



T. B. M		C. B. M		Note
Unliend	2,000 m	Shotcrete	1,300	
Shotcrete	3,370	Concret (I), with Shotcrete	400	
Concrete (I), with Shotcrete	600	Concrete (II)	2,102	Including 147
Concrete (II)	1,500	Stell lined	35	
Total	7,470	Total	3,837	

Fig. D-22 Penstock

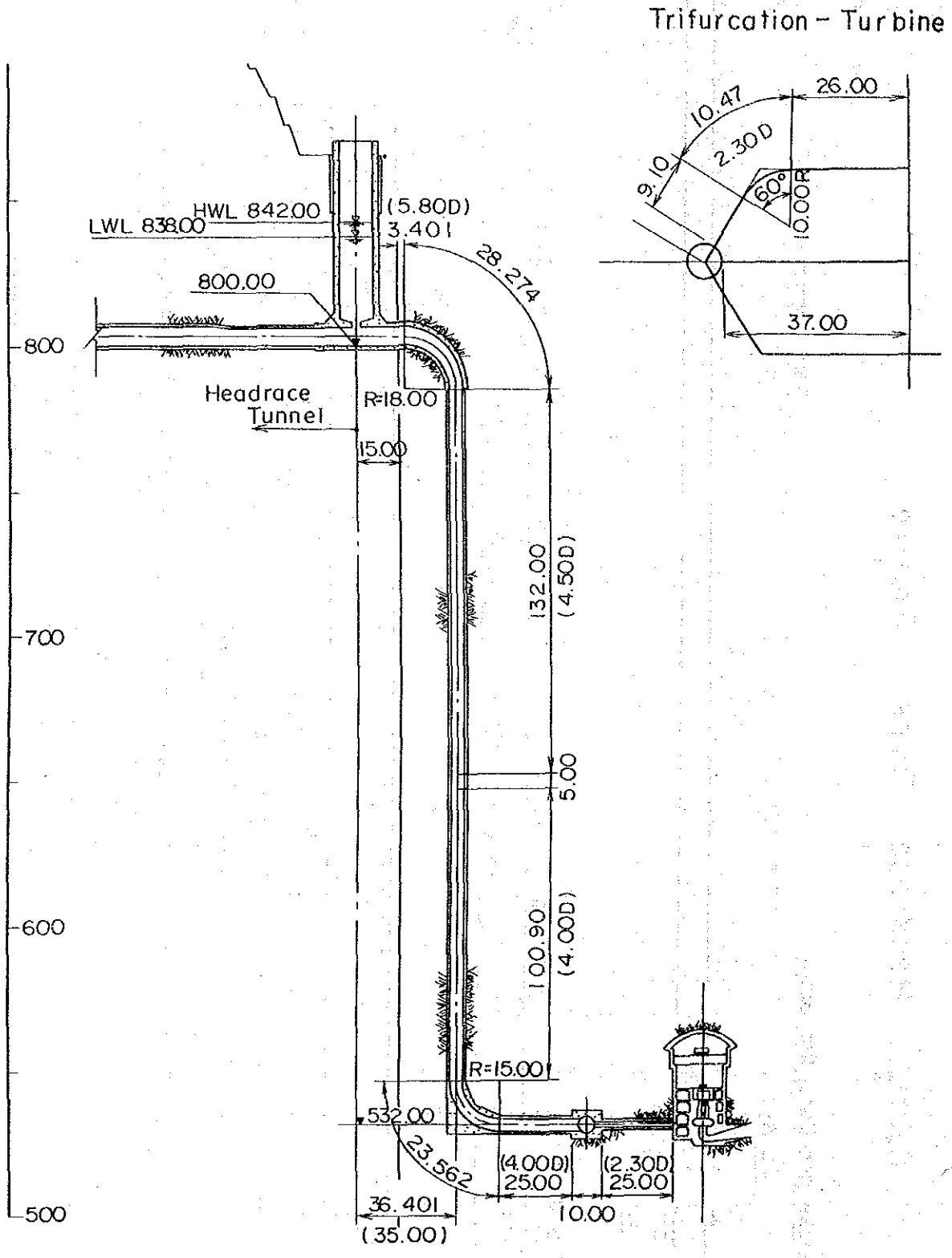
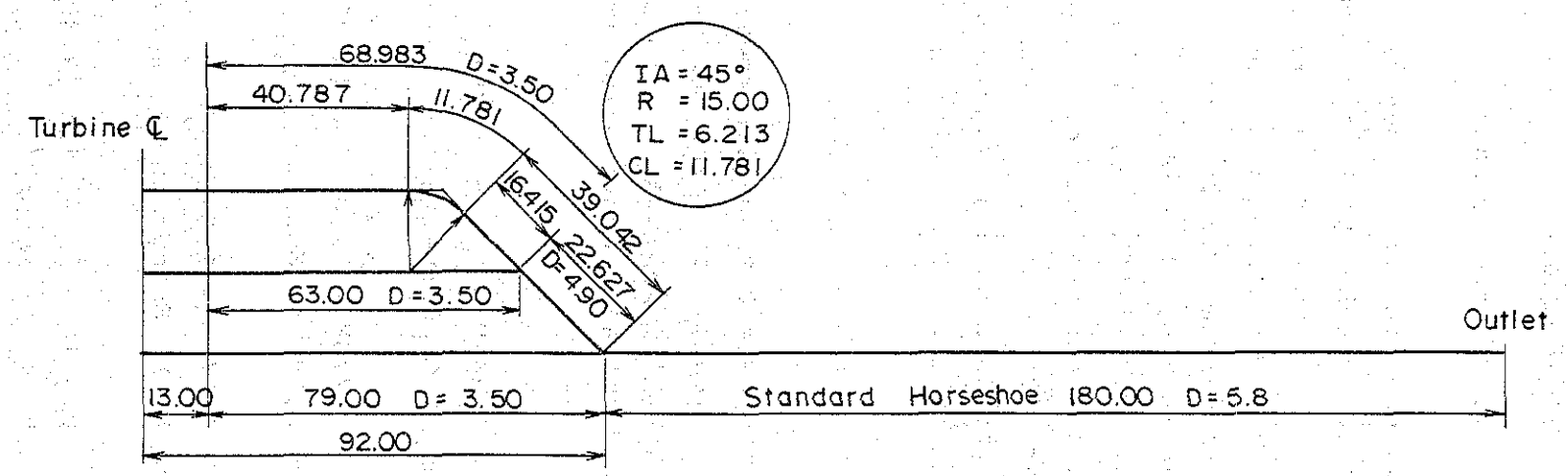


Fig. D-23 Tailrace Tunnel



D.9 Probability Analysis on Seismic Hazard at the ARUN-3 PROJECT site

1. Seismicity Data

Seimicity data used in this study are based on those retrieved from 'The Earthquake Data File' compiled by NOAA (National Oceanic and Atmospheric Administration Environmental Data Service). Total number of the data amounts to 964 , covering a period from 1963 to 1985 . Location of all the data is plotted in Fig. 1 in which the ARUN-3 project site (27°33'40"N, 87°18'25"E) is shown by a cross. Numbers of the data in each year during the period are shown in Table 1, together with accumulative numbers from 1963 . General aspects of the data such as magnitude and epicentral distance can be seen in Table 2 and also in Figs. 2-12 .

2. Attenuation Models

Of previously proposed attenuation models which express peak acceleration, A (gal), in terms of earthquake magnitude, M, and hypocentral distance, R (km), or epicentral distance, D (km), five models shown below are used in this study.

$$\log A = 3.090 + 0.347M - 2 \log (R+25) \quad (1)$$

proposed by C. Oliveira[1].

$$\log A = 2.674 + 0.278M - 1.301 \log (R+25) \quad (2)$$

proposed by R. K. McGuire[2].

$$\log A = 2.041 + 1.842M - 1.6 \log D \quad (3)$$

proposed by L. Esteva and E. Rosenblueth[3].

$$\log A = 2.308 + 0.411M - 1.637 \log (R+30) \quad (4)$$

proposed by T. Katayama[4].

$$\log (A/640) = (D+40)(-7.6+1.724M-0.1036M^2)/100 \quad (5)$$

proposed by S. Okamoto[5].

For all the data described earlier, peak accelerations were calucuted by using the above attenuation models , and maximum accelerations in each year -long interval were found to be as shown in Table 3.

3. Statistical Analysis of Maximum Accelerations

The seismicity data are available for successive 23 years from 1963 to 1985 . Hence, a probalistic model based on the "Theory of Extreme Values" can be established by setting an equal time interval to one year.

Although a probability function of the maximum acceleration expected at the project site is not known, it is reasonable to suppose that the function should be associated with the third type asymptotic distribution defined by

$$P(x) = \exp[-[(w-x)/(w-u)]^k] \tag{6}$$

where w is an upper limit of a variable, k is a shape parameter, u is a characteristic value, and x is a random variable taken as logarithm of the maximum acceleration during a year-long interval, expressed as

$$x = \log A_{max} \tag{7}$$

The previously mentioned maximum acceleration values are plotted in Figs. 13-17. Plotting position of each maximum value was calculated by

$$p(m) = (N-m+1)/(N+1) \tag{8}$$

where N (=23) is the total number of the time interval and m is the order of the value from the largest one. In these figures, regression curves estimated for the third asymptotic distribution function are also shown by solid lines, from which the maximum acceleration for any return period can be evaluated. Table 4 shows the maximum acclerations expected at the site for five different return periods of 50, 100 , 200 , 500 and 1000 years.

4. References

1) Oliveira, C.; Seismic Risk Analysis, EERC 74-1, Earthquake Engineering Research Center, University of California, Berkeley (1974), 1-102.

2) McGuire, R. K.; Seismic Structural Response Risk Analysis incorporating Peak Response Regressions on Earthquake Magnitude and Distance, Mass. Inst. Tech. Dep. Civ. Eng., R74-51 (1974).

3) Esteva, L. and Rosenblueth, E.; Espectos de Temblores a Distancias Moderadas y Grandes, Proc. Chilean Conference on Seismology and Earthquake Engineering, vol. 1, University of Chile (1963).

4) Katayama, T.; Fundamentals of Probabilistic Evaluation of Seismic Activity and Seismic Risk (in Japanese), SEISAN-KENKYU (Monthly Journal of Institute of Industrial Science, University of Tokyo), 27-5 (1975), 1-11.

5) Okamoto, S.; Introduction to Earthquake Engineering 2nd ed., University of Tokyo Press (1984), 152-154.

Table-1

Number of Earthquakes in a year during the period from 1906 to 1985

Year	N	Sum of N	Year	N	Sum of N
1906	1		1946	4	
1907	0		1947	3	
1908	1		1948	0	
1909	0		1949	1	
1910	0		1950	101	
1911	1		1951	44	
1912	0		1952	29	
1913	3		1953	15	
1914	0		1954	13	
1915	1		1955	26	
1916	1		1956	17	
1917	0		1957	17	
1918	3		1958	21	
1919	1		1959	30	
1920	3		1960	22	
1921	2		1961	27	
1922	0		1962	21	
1923	4		1963	22	22
1924	11		1964	32	54
1925	4		1965	37	91
1926	14		1966	45	136
1927	13		1967	32	168
1928	5		1968	35	203
1929	3		1969	23	226
1930	14		1970	22	248
1931	13		1971	30	278
1932	18		1972	26	304
1933	4		1973	32	336
1934	18		1974	32	368
1935	16		1975	67	435
1936	14		1976	36	471
1937	13		1977	53	524
1938	15		1978	56	580
1939	5		1979	55	635
1940	11		1980	83	718
1941	12		1981	56	774
1942	3		1982	70	844
1943	1		1983	38	882
1944	5		1984	68	950
1945	1		1985	14	964

Note : Magnitude is not described in the Files before 1962.

Table 2

Distribution of Magnitude and Epicentral Distance of the Seismicity Data

Δ : Epicentral Distance [km]
M : Magnitude

	0≦Δ<50	<100	<200	<300	<400	<500	<600	<700	<800	<900	≦1000	Total
3.5≦M<4.0	0	0	0	0	1	1	0	2	3	2	3	12
<4.5	1	0	4	4	5	10	10	17	21	30	33	135
<5.0	0	5	11	10	22	26	49	49	90	122	112	496
<5.5	2	8	4	6	7	16	22	33	30	64	58	250
<6.0	0	0	1	1	3	4	6	10	9	12	7	53
<6.5	0	1	1	1	0	0	0	4	2	3	3	15
<7.0	0	0	0	0	0	0	0	0	0	3	0	3
Total	3	14	21	22	38	57	87	115	155	236	216	964

Table 3

Maximum Accelerations during a year from 1963 to 1985

unit : gal

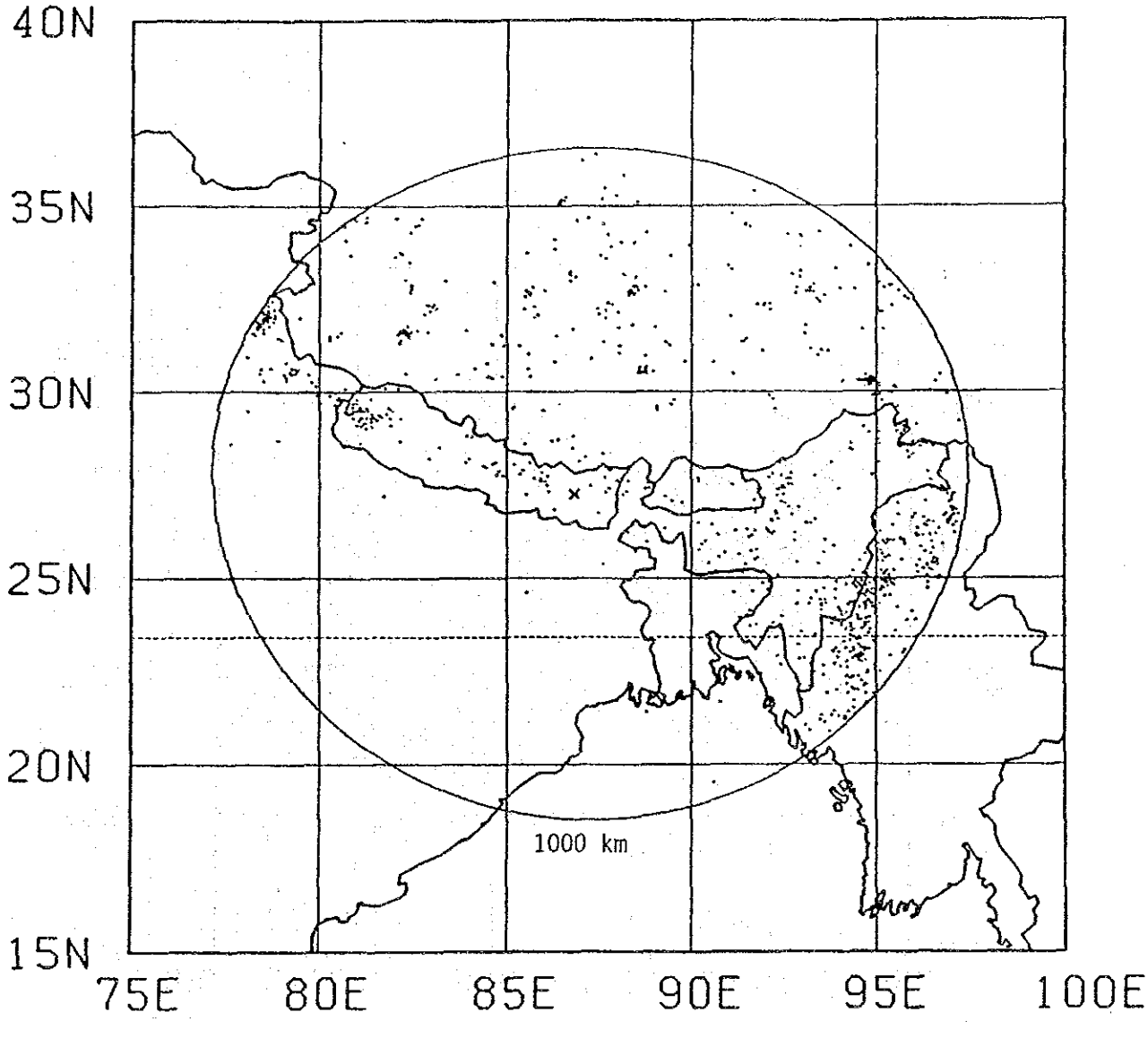
year	C.Oliveira Eq.(1)	R.K.McGuire Eq.(2)	L.Esteva & E.Rosenblueth Eq.(3)	T.Katayama Eq.(4)	S.Okamoto Eq.(5)
1963	7.1	27.3	7.0	9.1	10.3
1964	7.6	30.8	7.0	11.7	17.0
1965	17.3	61.2	15.5	33.8	61.8
1966	1.6	10.8	1.4	3.1	0.2
1967	1.8	12.3	1.7	3.9	0.4
1968	2.5	15.1	2.3	5.0	1.2
1969	0.7	6.6	0.7	1.8	0.0
1970	2.9	17.1	2.6	6.2	1.8
1971	6.8	29.3	6.1	11.5	13.3
1972	5.9	27.1	5.3	10.6	10.4
1973	7.4	31.6	6.6	13.0	16.2
1974	5.3	27.1	4.7	11.8	9.8
1975	22.3	64.8	24.4	30.4	122.2
1976	1.8	12.6	1.7	4.2	0.6
1977	1.3	9.9	1.2	3.0	0.1
1978	2.9	17.2	2.6	6.2	1.9
1979	5.0	24.1	4.4	9.2	6.4
1980	5.2	27.6	4.6	12.6	9.8
1981	1.0	8.3	0.9	2.5	0.0
1982	2.2	14.0	2.0	4.8	0.7
1983	0.5	5.1	0.5	1.2	0.0
1984	2.1	13.2	1.9	4.1	0.6
1985	0.4	5.4	0.5	1.6	0.0

Table 4

Maximum Accelerations for Five Return Periods

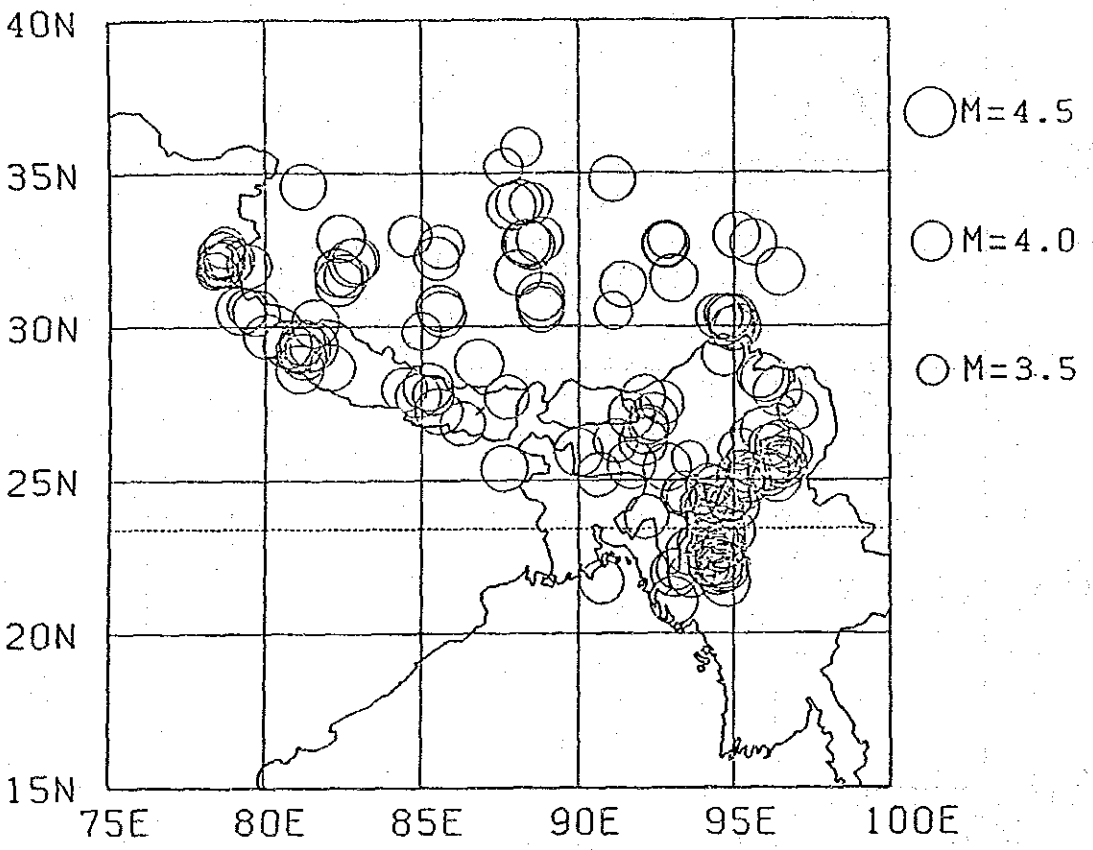
unit : gal

Model (Eq.No.)	Proposer(s)	Return Period , Tr (year)				
		50	100	200	500	1000
(1)	C.Oliveira	26	34	42	55	65
(2)	R.K.McGuire	71	84	97	113	125
(3)	L.Esteva & E.Rosenblueth	28	41	57	85	113
(4)	T.Katayama	38	48	59	75	87
(5)	S.Okamoto	164	231	298	381	436



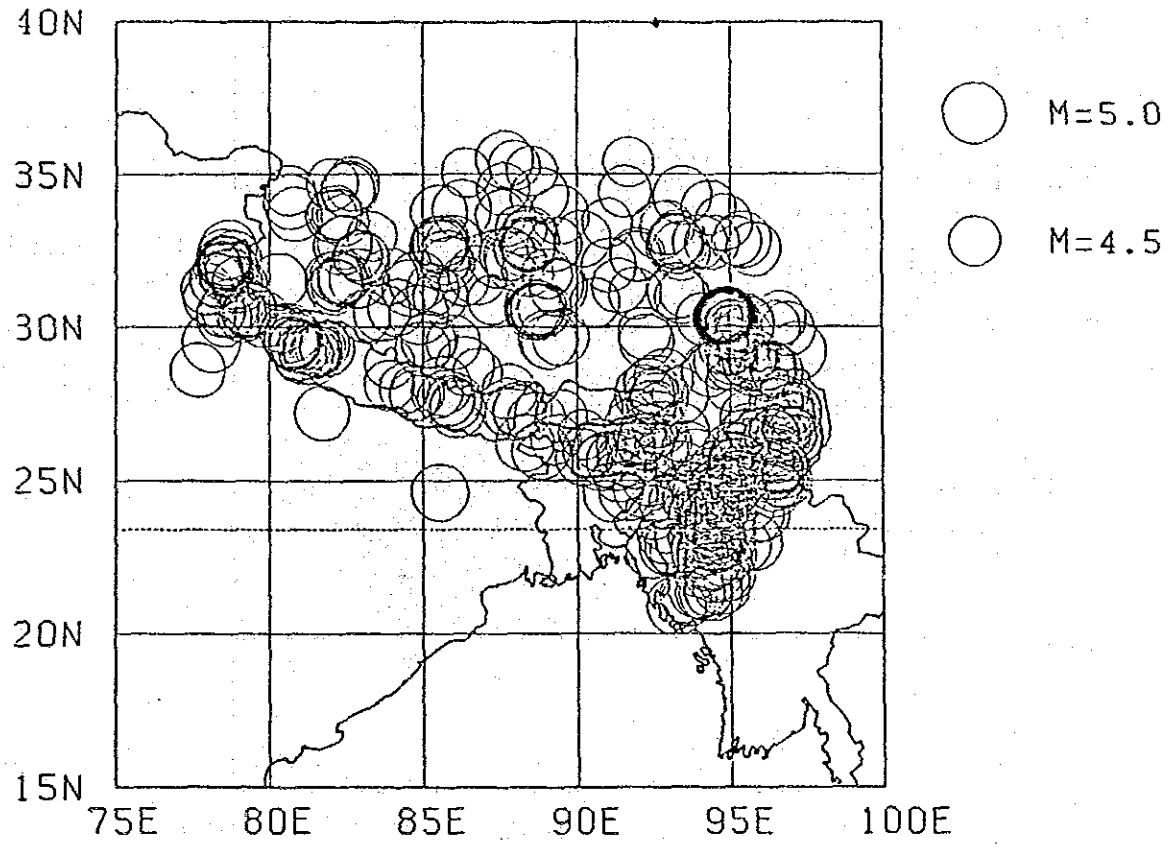
Seismicity of all data in 1963-1985,
Total Number of Plots inthe area of $\Delta \leqq 1000.0$ (km) is 964.

Fig. 1



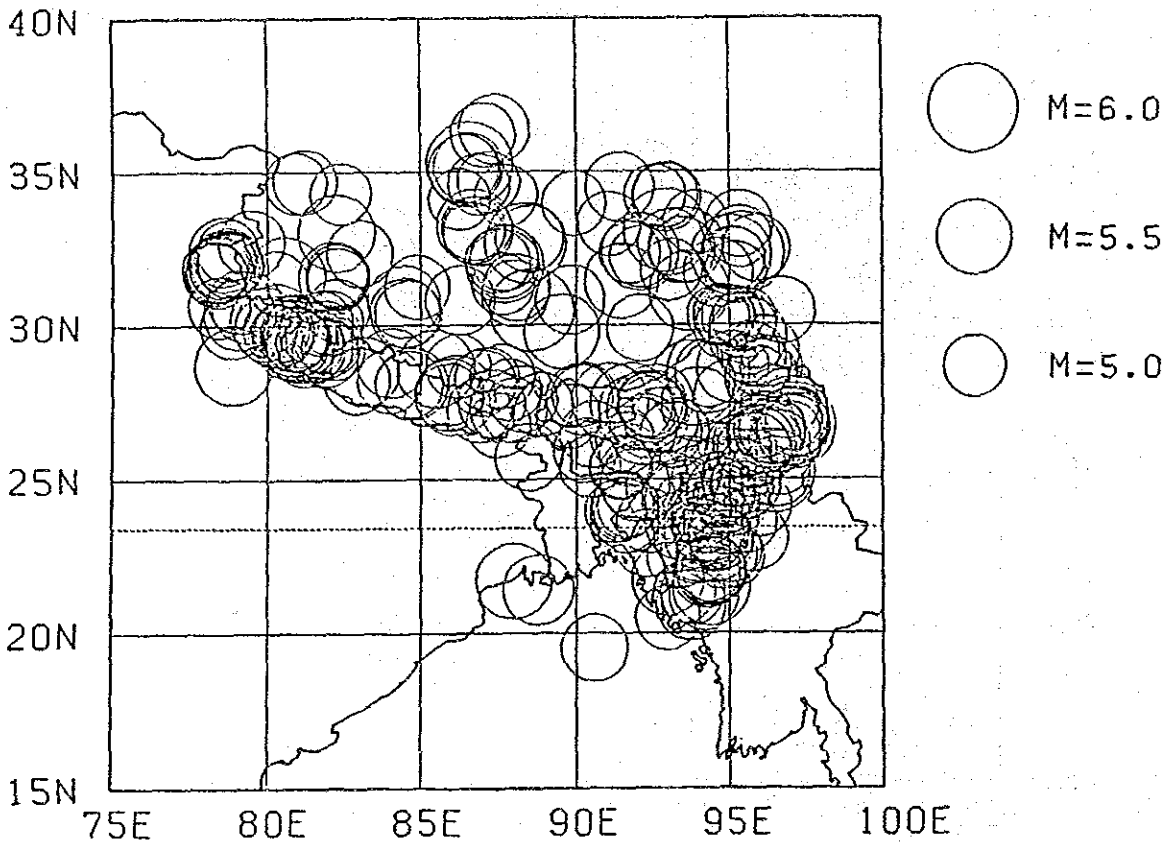
Seismicity of Magnitude 3.5≦M<4.5 in 1963-1985,
Total Number of Plots is 147.

Fig. 2



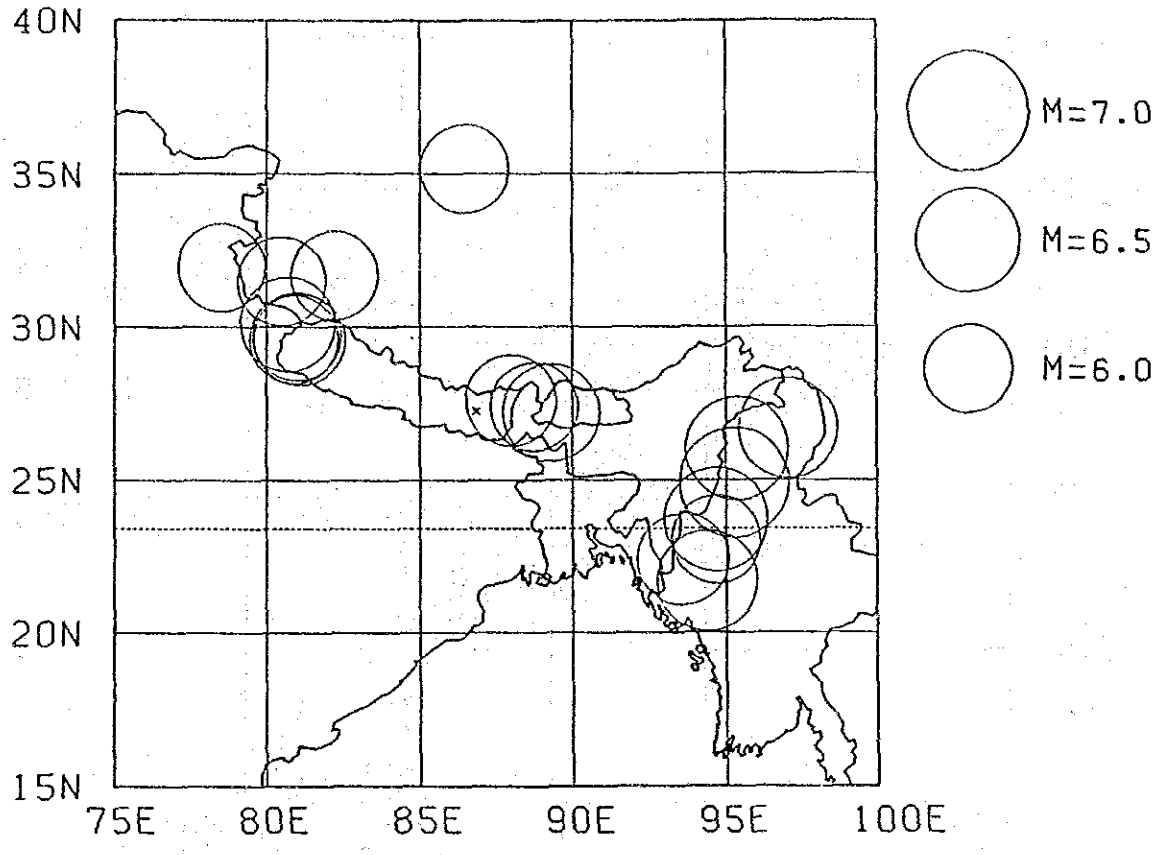
Seismicity of Magnitude 4.5≦M<5.0 in 1963-1985,
Total Number of Plots is 496.

Fig. 3



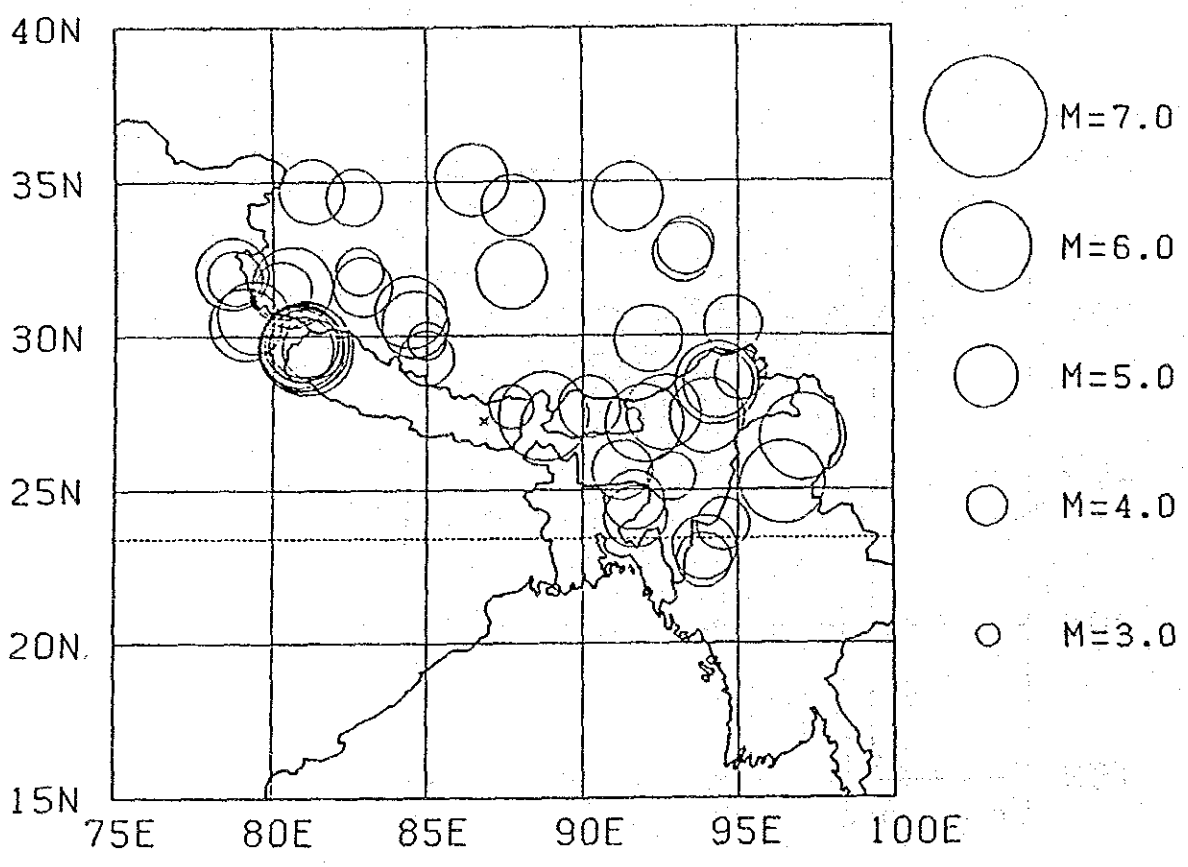
Seismicity of Magnitude 5.0≦M<6.0 in 1963-1985,
Total Number of Plots is 303.

Fig. 4



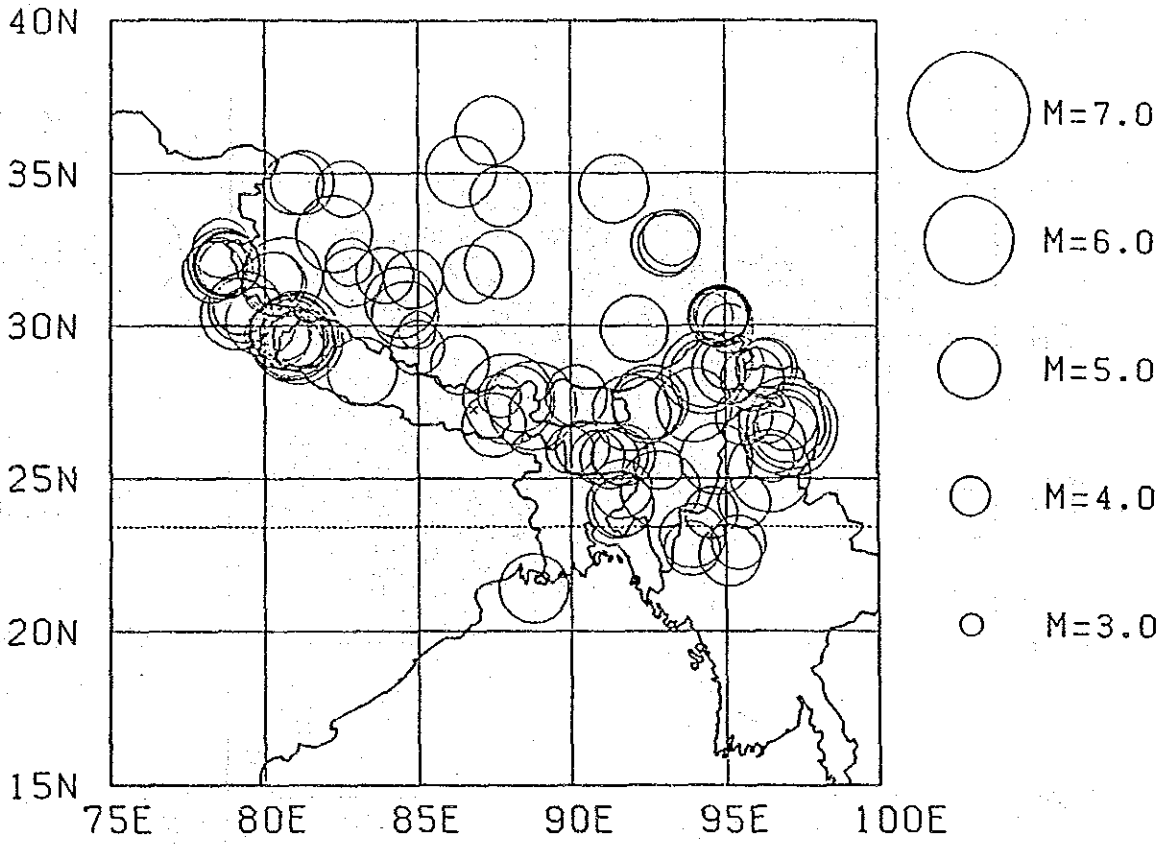
Seismicity of Magnitude 6.0≦M<7.0 in 1963-1985,
Total Number of Plots is 18.

Fig. 5



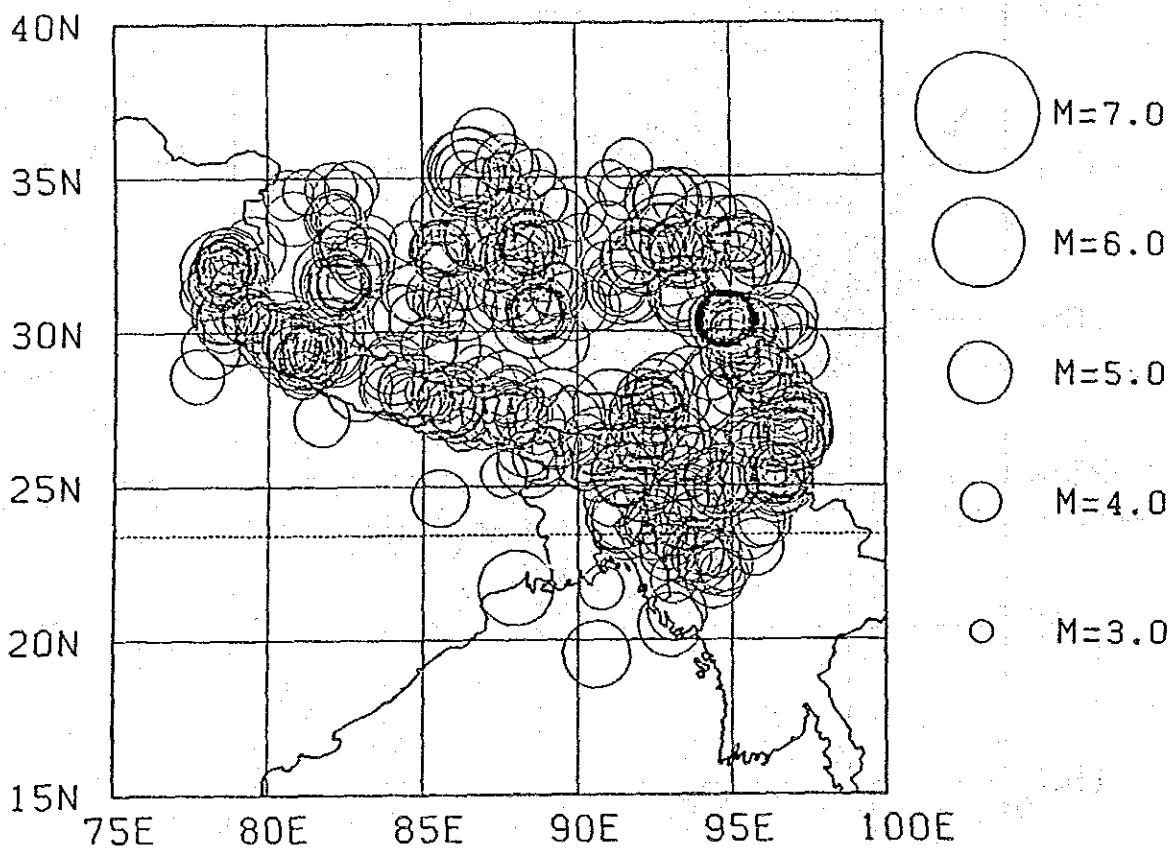
Distribution of Focal Depth $0 \leqq D < 20$ km in 1963-1985,
Total Number of Plots is 48.

Fig. 6



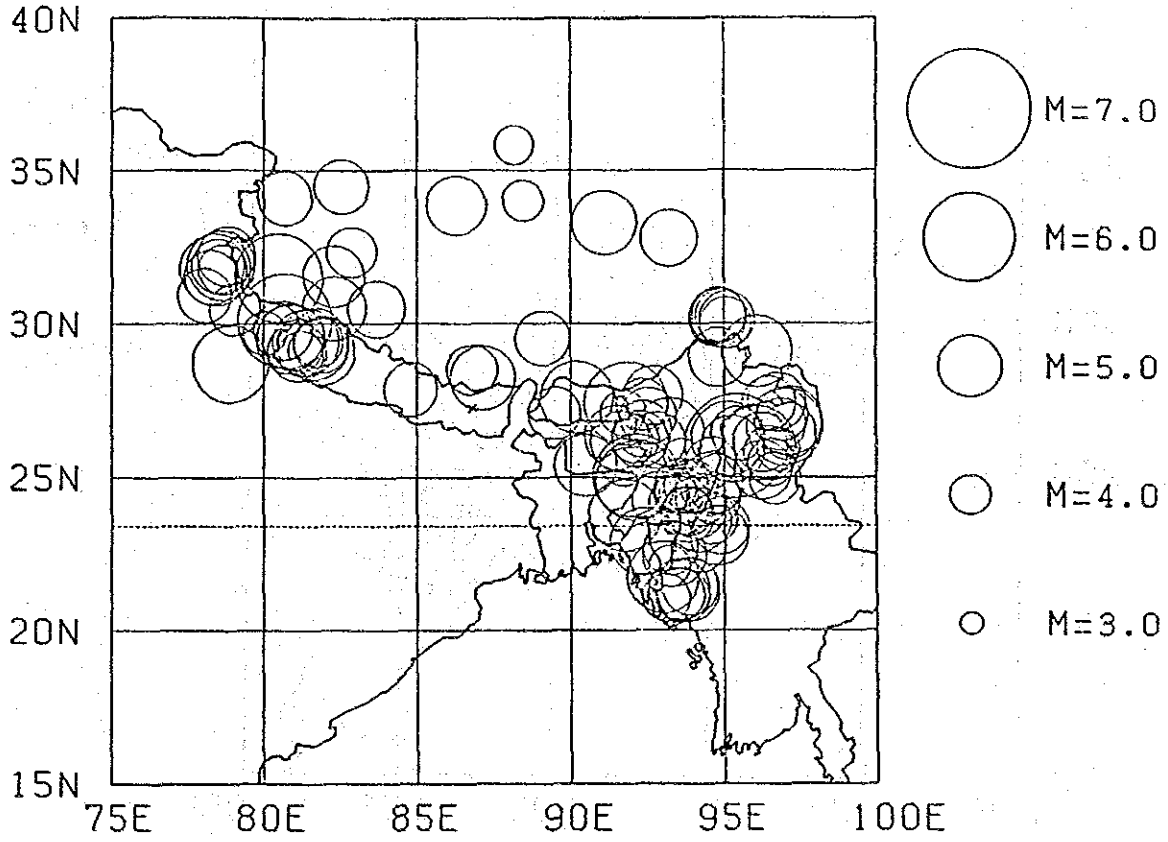
Distribution of Focal Depth 0≦D<30 km in 1963-1985,
Total Number of Plots is 105.

Fig. 7



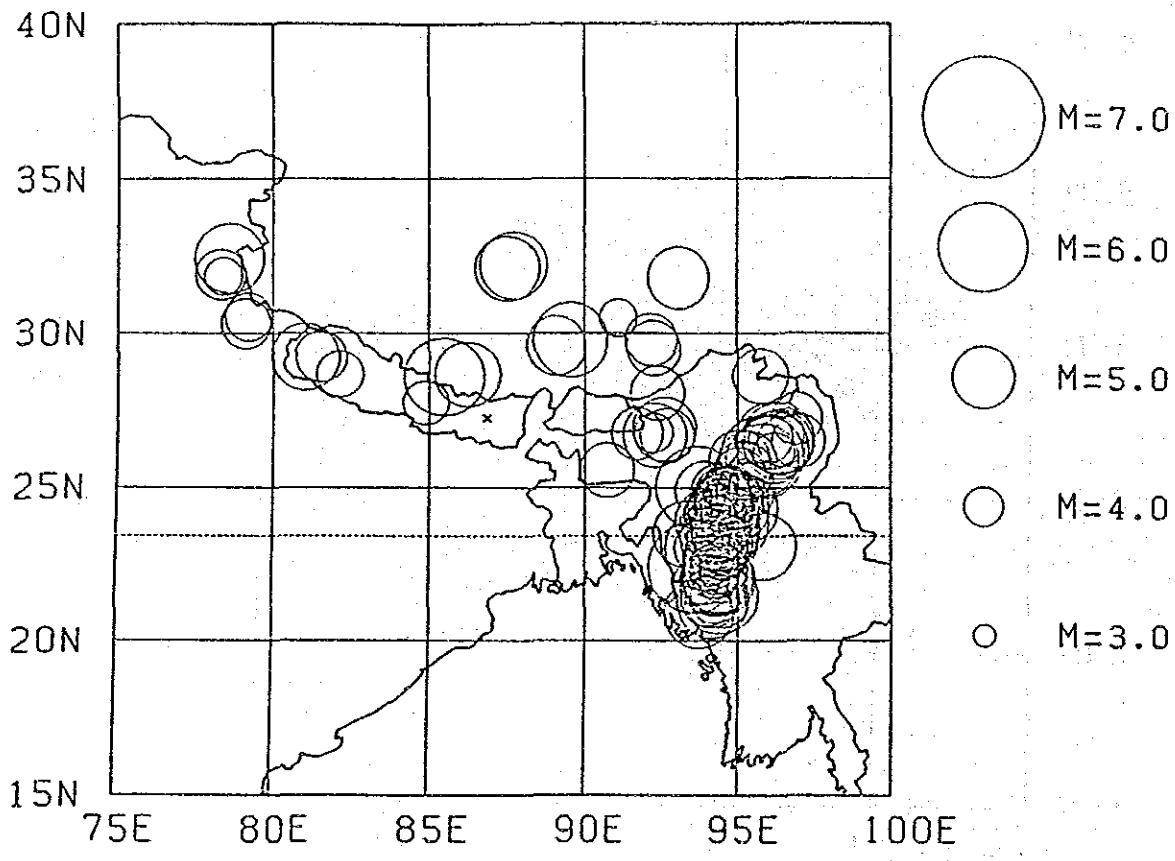
Distribution of Focal Depth 30≦D<40 km in 1963-1985,
Total Number of Plots is 534.

Fig. 8



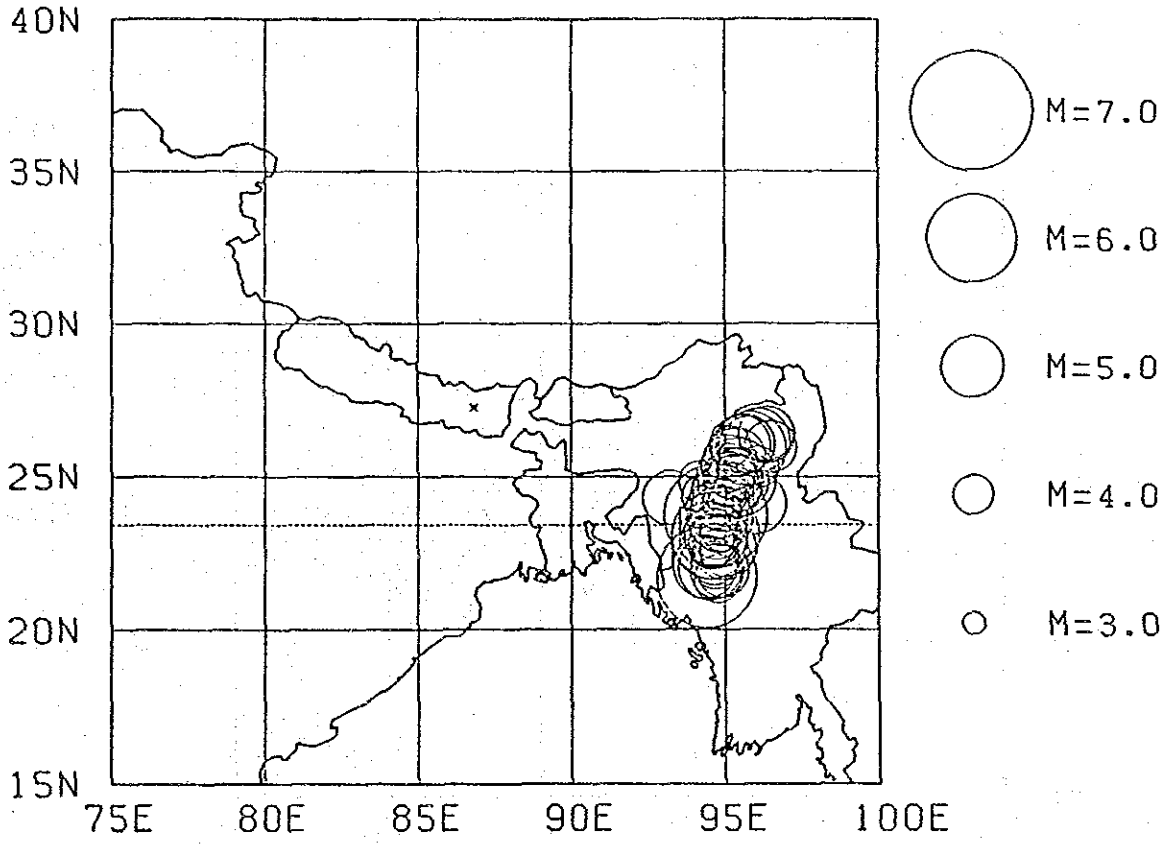
Distribution of Focal Depth 40≦D<60 km in 1963-1985,
Total Number of Plots is 118.

Fig. 9



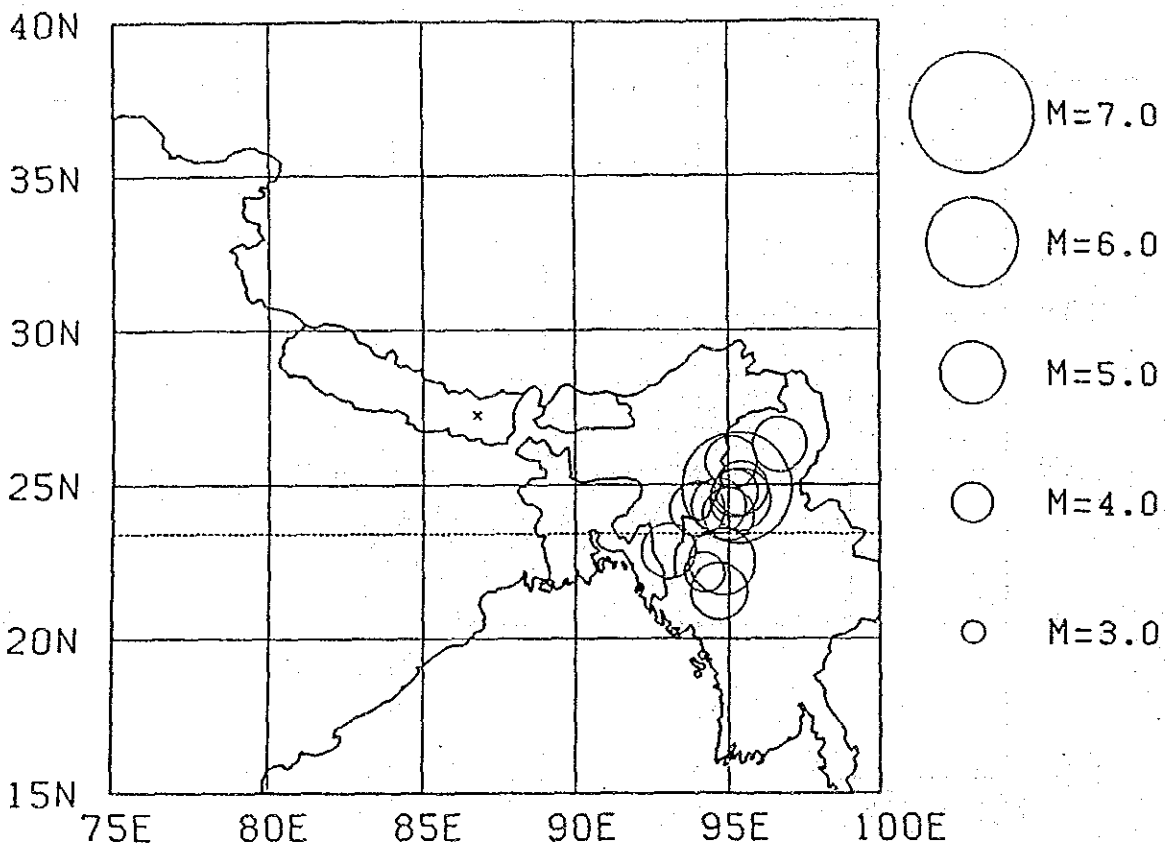
Distribution of Focal Depth 60≦D<100 km in 1963-1985,
Total Number of Plots is 129.

Fig. 10



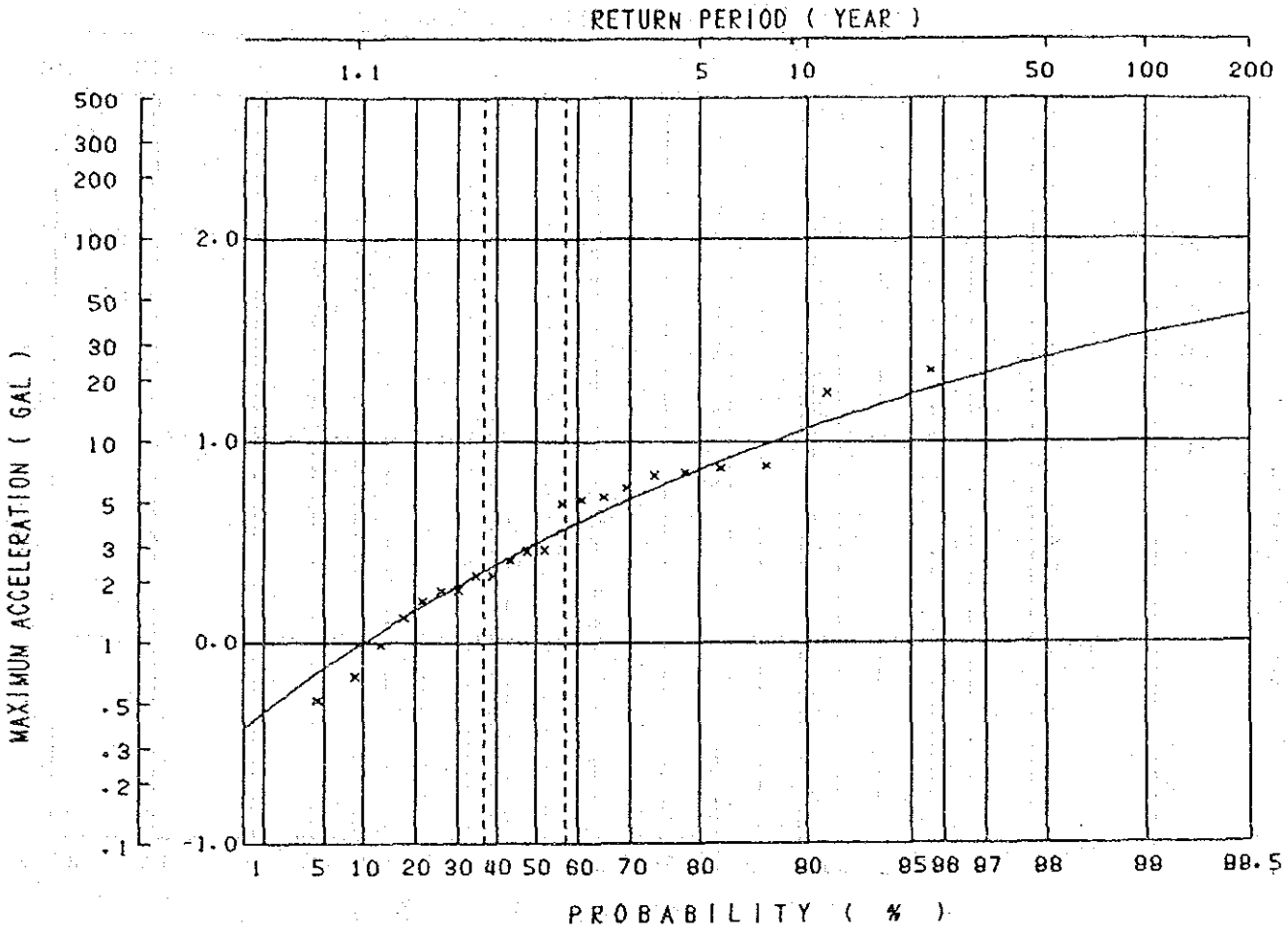
Distribution of Focal Depth 100≦D<150 km in 1963-1985,
Total Number of Plots is 65.

Fig. 11



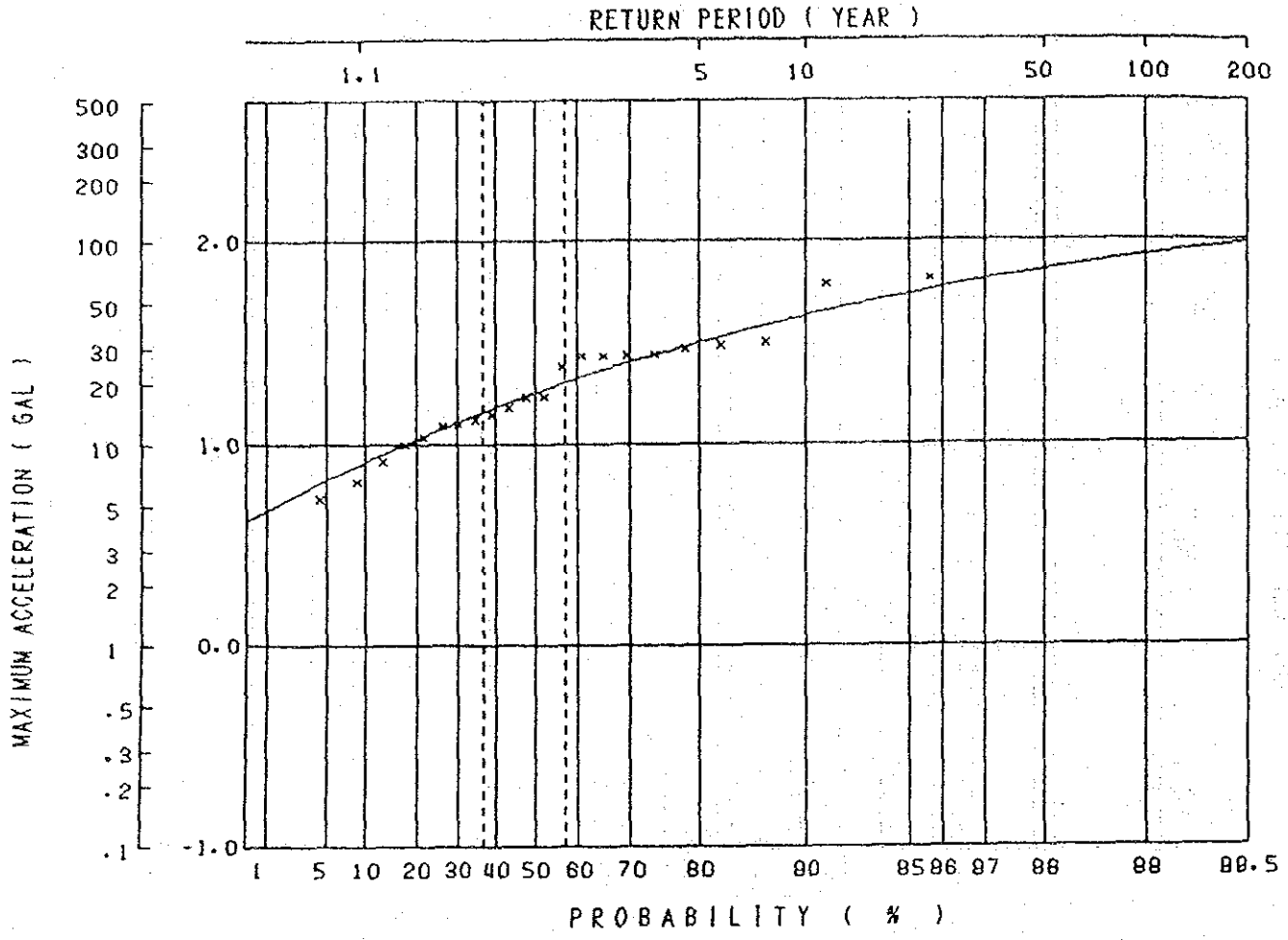
Distribution of Focal Depth 150≦D<200 km in 1963-1985,
Total Number of Plots is 13.

Fig. 12



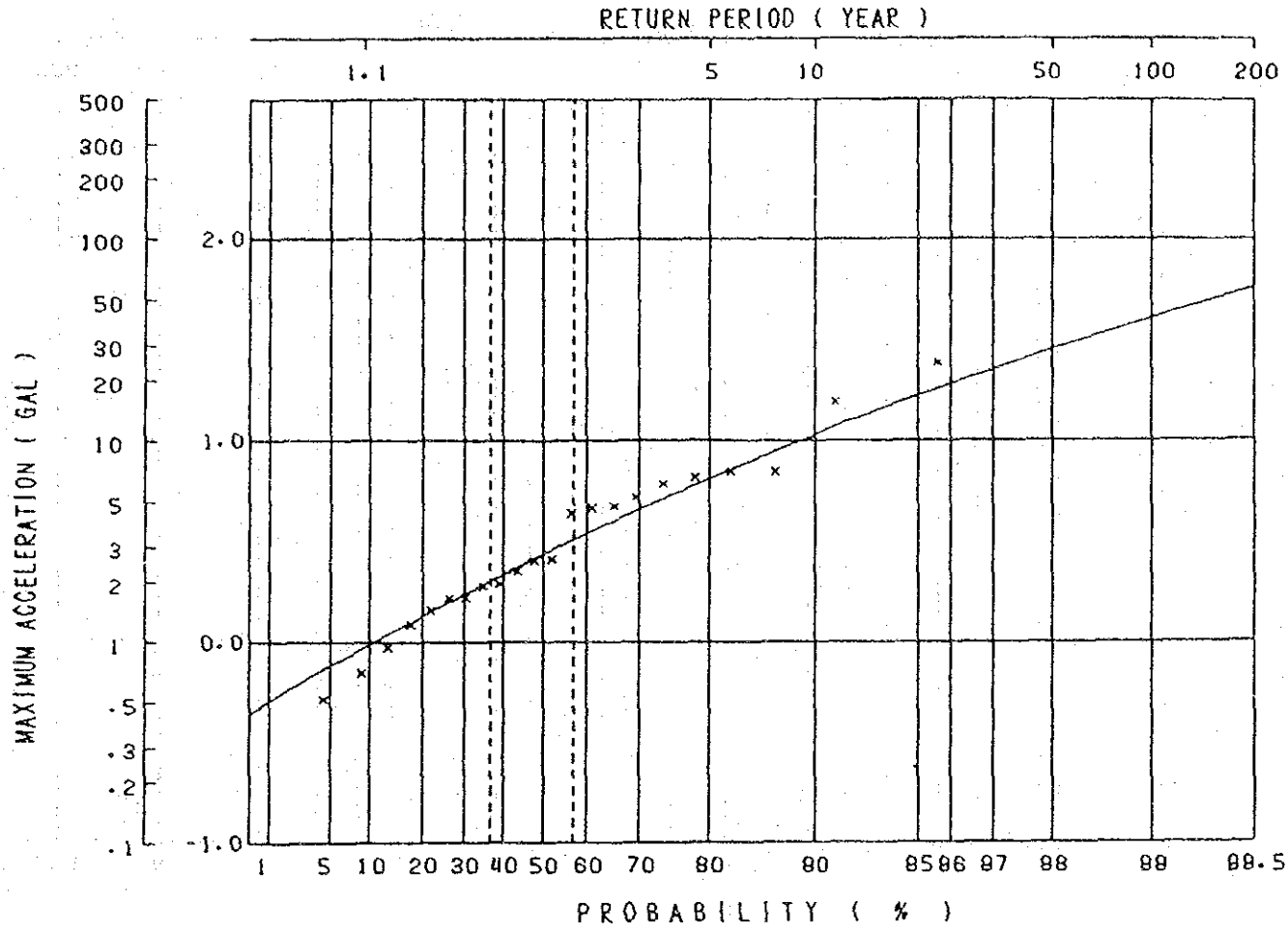
Return Period for Maximum Accelerations calculated by Eq.(1)

Fig. 13



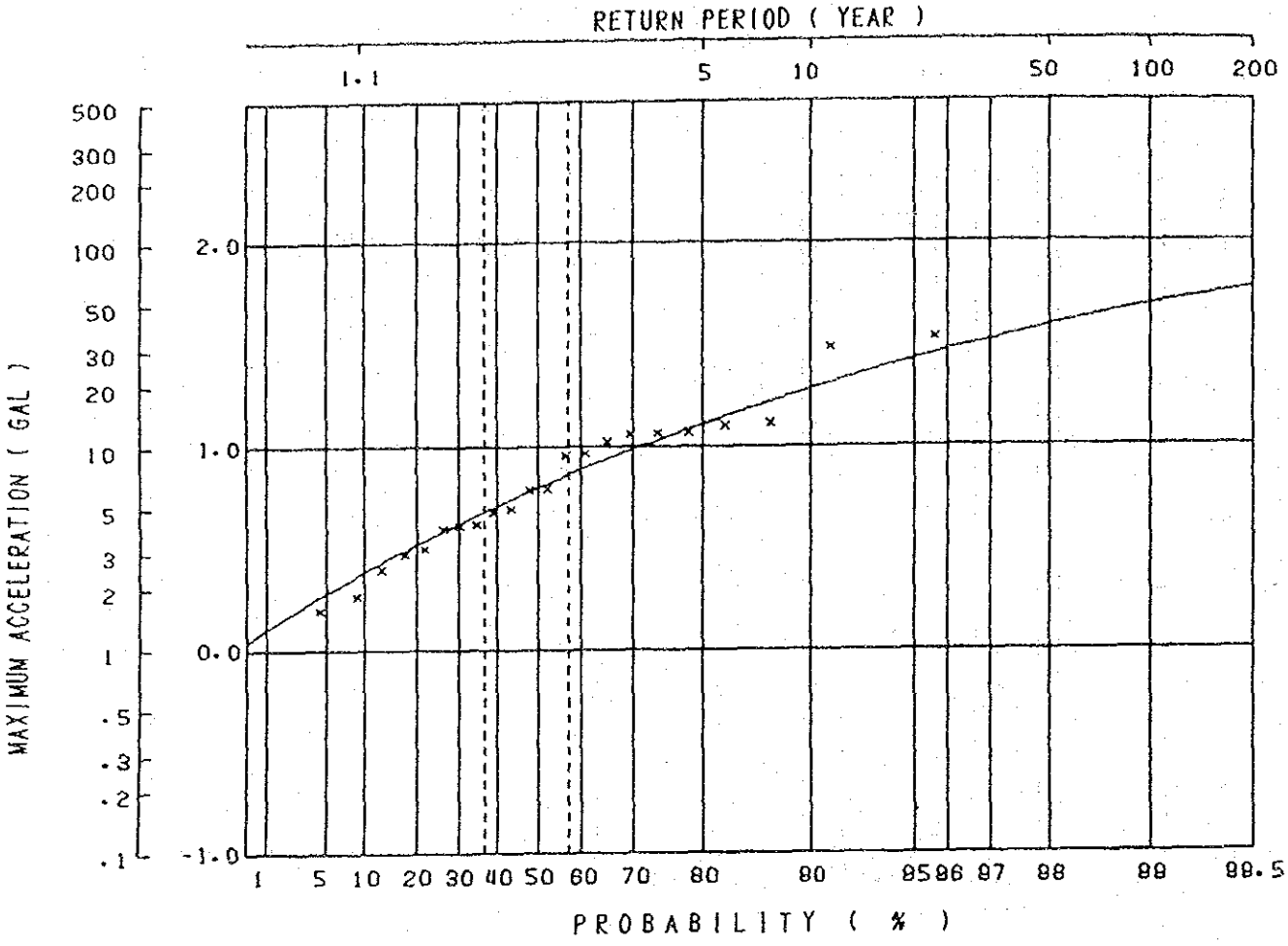
Return Period for Maximum Accelerations calculated by Eq.(2)

Fig. 14



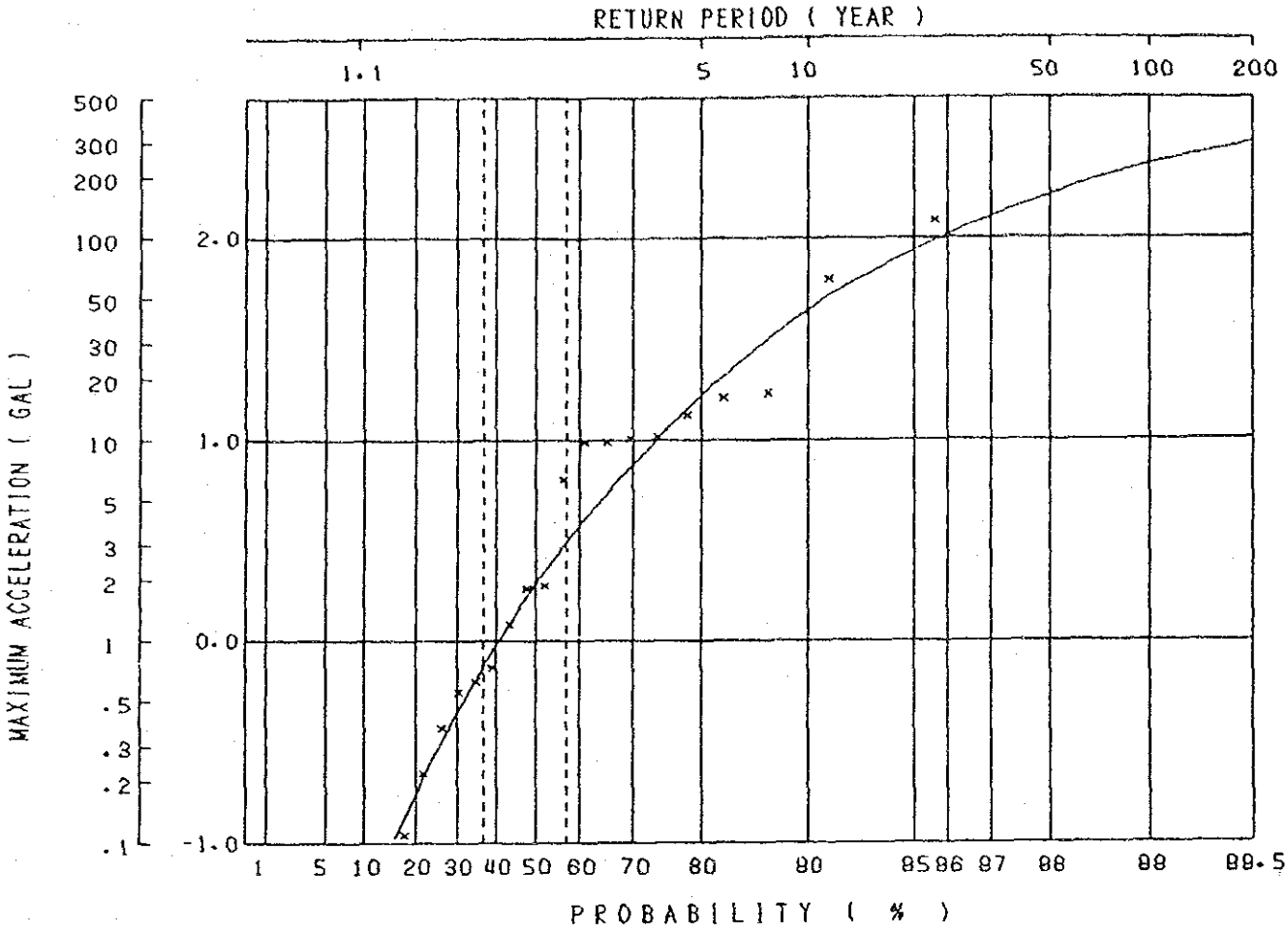
Return Period for Maximum Accelerations calculated by Eq.(3)

Fig. 15



Return Period for Maximum Accelerations calculated by Eq.(4)

Fig. 16



Return Period for Maximum Accelerations calculated by Eq.(5)

Fig. 17

JICA