TECHNICAL DATA

Table DT-1 Hydraulic Calculations for Transmission Pipelines, Alternative (1) to Iquique Water Supply

Transmission Pipeline
From Pampa - North (La Tirana) to Alto Hospicio (Route No.1)

Distance between La Tirana and Alto Hospicio: L= 64,600 m
Total pipe length: L= 64,600 m x 2 lines = 129,200 m

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Point (Accumulated Distance) (m)	Altitude above Sea Level (+m)	Distance between Two Points (m)	Flow Q (l/s)	Pipe Dia. (mm)	V (m/s)	I (x10*-3)	H (m)	Dynamic Water Level (+m)
0	+1,025	0						+1,025.00
(Pump Station: GL=+1,025, LWL=+1,025, HWL=+1,030)								+1,150.00
40,400	+1,100	40,400	701	700x2	0.91	1.07	43.23	+1,106.77
(Tank: GL=+1,100, LWL=+1,100, HWL=+1,105)								+1,100.00
42,100	+1,050	1,700	701	400x2	2.78	16.33	27.76	+1,072.24
(Tank: GL=+1,050, LWL=+1,050, HWL=+1,055)								+1,050.00
53,750	+975	11,650	701	500x2	1.79	5.51	64.19	+985.81
(Tank: GL=+975, LWL=+975, HWL=+980)								+975.00
57,150	+760	3,400	701	400x2	2.78	16.33	55.52	+919.48
(Tank: GL=+750, LWL=+750, HWL=+755)								+760.00
64,600	+545	7,450	701	400x2	2.78	16.33	121.66	+638.34
(Tank at Alto Hospicio: GL=+545, LWL=+545, HWL=+550)								

Length of Pipes
from Pampa-North (La Tirana)
to Alto Hospicio (Route No.1)

Diameter	Pipe Length
700 mm	40,400 m x 2 lines = 80,800 m
500 mm	11,650 m x 2 " = 23,300 m
400 mm	12,550 m x 2 " = 25,100 m
Total =	64,600 m x 2 lines = 129,200 m

Transmission Pump for Alternative (1)

Actual head = (+1,105)-(+1,025) = 80 m
Loss of head in pipe = 43.23
Total head = 80 + 43.23 + 1.50 = 124.73 m -->125 m
Total discharge = 701 l/sec
Number of pump : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 125 / 0.78 = 274.3 kw
Motor power = P x (1+g) = 274.3 x (1+0.15)
= 315.4 --> 320 kw (x 5 units = 1,600 kw for installation)

Maximum actual power consumption = 320 x 4 units = 1,280 kw
Average " " " = 1,280 / 1.30 = 985 kw

Table DT-2 Hydraulic Calculations for Transmission Pipelines, Alternative (2) to Iquique Water Supply

Transmission Pipeline
from Pampa - North (La Tirana) to Alto Hospicio (Route No.2)

Distance between La Tirana and Alto Hospicio: L= 63,500 m
Total pipe length: L= 63,500 m x 2 lines = 127,000 m

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Point (Accumulated Distance) (m)	Altitude above Sea Level (+m)	Distance between Two Points (m)	Flow Q (l/s)	Pipe Dia. (mm)	V (m/s)	I (x10*-3)	H (m)	Dynamic Water Level (+m)
0	+1,015	0						+1,015.00
(Transmission Pump Station: LWL=+1,015, HWL=+1,020)								+1,127.00
21,400	+1,099	21,400	701	700x2	0.91	1.07	22.90	+1,104.10
(Booster Pump Station: GL=+1,099, LWL=+1,099, HWL=+1,104)								+1,211.00
22,200	+1,205	800	701	700x2	0.91	1.07	0.86	+1,210.14
(Tank: GL=+1,205, LWL=+1,205, HWL=+1,210)								+1,205.00
36,900	+1,150	14,700	701	600x2	1.24	2.27	33.37	+1,171.63
(Tank: Gl+1,150, LWL=+1,150, HWL=+1,155)								+1,150.00
42,100	+1,100	5,200	701	500x2	1.79	5.51	28.65	+1,121.35
(Tank: GL=+1,100, LWL=+1,100, HWL=+1,105)								+1,100.00
44,000	+1,000	1,900	701	400x2	2.78	16.33	31.03	+1,068.97
(Tank: GL=+1,000, LWL=+1,000, HWL=+1,005)								+1,000.00
54,400	+ 930	10,400	701	500x2	1.79	5.51	57.30	+942.70
(Tank: GL=+930, LWL=+930, HWL=+935)								+930.00
56,750	+ 735	2,350	701	400x2	2.78	16.33	38.38	+891.62
(Tank: GL=+735, LWL=+735, HWL=+740)								+735.00
63,500	+545	6,750	701	400x2	2.78	16.33	110.23	+624.77
(Alto Hospicio Tank: GL=+545, LWL=+545, HWL=+550)								+545.00

Length of Pipes from Pampa-North (La Tirana)
to Alto Hospicio (Route No.2)

Diameter	Pipe Length
700 mm	22,200 m x 2 lines = 44,400 m
600 mm	14,700 m x 2 " = 29,400 m
500 mm	15,600 m x 2 " = 31,200 m
400 mm	11,000 m x 2 " = 22,000 m
Total =	63,500 m x 2 lines = 127,000 m

Transmission/Booster Pumps for Alternative (2)

Transmission Pump at Collection Tank (Well-Field)
Actual head = (+1,104)-(+1,015) = 89 m
Loss of head in pipe = 22.90 m
Total head: H = 89 + 22.90 + 1.50 = 113.4 --> 114 m
Total discharge = 701 l/sec
Number of pumps : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 114 / 0.78 = 250.1 kw
Motor power = P x (1+g) = 250.1 x (1+0.15)
= 287.6 --> 290 kw (x 5 units = 1,450 kw for installation)
Maximum actual power consumption = 290 x 4 units = 1,160 kw

Booster Pump at,L= 21,400 m
Actual head = (+1,210)-(1,099) = 111 m
Loss of head in pipe = 0.86 m
Total head = 111 + 0.86 + 1.50 = 113.36 --> 114 m
Total discharge = 701 l/sec
Number of pumps : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 114 / 0.78 = 250.1 kw
Motor power = P x (1+g) = 250.1 x (1+0.15)
= 287.6 --> 290 kw (x 5 units = 1,450 kw for installation)
Maximum actual power consumption = 290 x 4 units = 1,160 kw

Total maximum actual power consumption = 1,160 + 1,160 = 2,320 kw

Total average actual power consumption = 2,320 / 1.30 = 1,785 kw

Table DT-3 Hydraulic Calculations for Transmission Pipelines, Alternative (3) to Iquique Water Supply

Transmission Pipeline
from Pampa-South (Pintados) to Alto Hospicio (Route No.1)

Distance between Pintados and Alto Hospicio: L= 84,400 m
Total Pipe Length: L= 84,400 m x 2 lines = 168,800 m

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Point (Accumulated Distance) (m)	Altitude above Sea Level (+m)	Distance between Two Points (m)	Flow Q (l/s)	Pipe Dia. (mm)	V (m/s)	I (x10*-3)	H (m)	Dynamic Water Level (+m)
0	+995	0						+995.00
(Transmission Pump Station: LWL=+995, HWL=+1,000)								+1,088.00
41,700	+1,038	41,700	701	700x2	0.91	1.07	44.62	+1,043.38
(Booster Pump Station: LWL=+1,038, HWL=+1,043)								+1,163.00
44,150	+1,155	2,450	701	700x2	0.91	1.07	2.62	+1,160.38
(Tank at Rinconada: LWL=+1,155, HWL=+1,160)								+1,155.00
70,900	+978	26,750	701	500x2	1.79	5.51	147.39	+1,007.61
(Tank at Carpas: GL=+978, LWL=+978, HWL=+983)								+978.00
76,900	+682	6,000	701	400x2	2.78	16.33	97.98	+880.02
(Tank at Santa Rosa: GL=+682, LWL=+682, HWL=+687)								+682.00
84,400	+545	7,500	701	400x2	2.78	16.33	122.48	+559.53
(Tank at Alto Hospicio: GL=+545, LWL=+545, HWL=+550)								

Length of Pipes
from Pampa-South (Pintados)
to Alto Hospicio (Route No.1)

Diameter	Pipe Length
700 mm	44,150 m x 2 lines = 88,300 m
500 mm	26,750 m x 2 " = 53,500 m
400 mm	13,500 m x 2 " = 27,000 m
Total =	84,400 m x 2 lines = 168,800 m

Transmission/Booster Pumps for Alternative (3)

Transmission Pump at Collection Tank (Well-Field)
Actual head = (+1,043)-(+995) = 48 m
Loss of head in pipe = 44.62 m
Total head = 48 + 44.62 + 1.50 = 94.12 --> 95 m
Total discharge = 701 l/sec
Number of pumps : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 95 / 0.78 = 208.5 kw
Motor power = P x (1+g) = 208.5 x (1+0.15)
= 239.8 --> 240 kw (x 5 units = 1,200 kw for installation)
Maximum actual power consumption = 240 x 4 units = 960 kw

Booster Pump at Diana (L= 41,700 m)
Actual head =(+1,160)-(+1,038)= 122 m
Loss of head in pipe = 2.62 m
Total head = 122 + 2.62 + 1.50 = 126.12 --> 127 m
Total discharge = 701 l/sec
Number of pumps : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 127 / 0.78 = 278.7 kw
Motor power = P x (1+g) = 278.7 x (1+0.15)
= 320.5 --> 325 kw (x 5 units = 1,625 kw for installation)
Maximum actual power consumption = 325 x 4 units = 1,300 kw

Total maximum actual power consumption = 960 + 1,300 = 2,260 kw
(Transmission pumps and booster pumps)

Total average actual power consumption = 2,260 / 1.30 = 1,739 kw

Table DT-4 Hydraulic Calculations for Transmission Pipelines, Alternative (4) to Iquique Water Supply

Transmission Pipeline
from Pampa-South (Pintados) to Alto Hospicio (Route No.2)

Distance between Pintados and Alto Hospicio: L= 81,300 m
Total Pipe Length: L= 81,300 m x 2 lines = 162,600 m

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Point (Accumulated Distance) (m)	Altitude above Sea Level (+m)	Distance between Two Points (m)	Flow Q (l/s)	Pipe Dia. (mm)	V (m/s)	I (x10*-3)	H (m)	Dynamic Water Level (+m)
0	+995	0						+995.00
(Transmission Pump Station: LWL=+995, HWL=+1,000)								+1,096.00
37,550	+1,050	37,550	701	700x2	0.91	1.07	40.18	+1,055.82
(Booster Pump Station: LWL=+1,050, HWL=+1,055)								+1,074.00
54,900	+1,050	17,350	701	700x2	0.91	1.07	18.56	+1,055.44
(Tank: LWL=+1,050, HWL=+1,055)								+1,050.00
67,700	+1,000	12,800	701	600x2	1.24	2.27	29.06	+1,020.94
(Tank: LWL=+1,000, HWL=+1,005)								+1,000.00
70,300	+ 800	2,600	701	400x2	2.78	16.33	42.46	+957.54
(Tank: LWL=+800, HWL=+805)								+800.00
73,550	+ 700	3,250	701	400x2	2.78	16.33	53.07	+746.93
(Tank: LWL=+700, HWL=+705)								+700.00
81,300	+ 545	7,750	701	400x2	2.78	16.33	126.56	+573.44
(Tank at Alto Hospicio: LWL=+545, HWL=+550)								+545.00

Length of Pipes
from Pampa-South (Pintados)
to Alto Hospicio (Route No.2)

Diameter	Pipe Length
700 mm	54,900 m x 2 lines = 109,800 m
600 mm	12,800 m x 2 " = 25,600 m
400 mm	13,600 m x 2 " = 27,200 m
Total =	81,300 m x 2 lines = 162,600 m

Transmission/Booster Pumps for Alternative (4)

Transmission Pump at Collection Tank (Well-Field)
Actual head = (+1,055)-(+995) = 60 m
Loss of head in pipe = 40.18 m
Total head = 60 + 40.18 + 1.50 = 101.68 --> 102 m
Total discharge = 701 l/sec
Number of pumps : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 102 / 0.78 = 223.8 kw
Motor power = P x (1+g) = 223.8 x (1+0.15)
= 257.4 --> 260 kw (x 5 units = 1,300 kw for installation)
Maximum actual power consumption = 260 x 4 units = 1,040 kw

Booster Pump at L= 37,550 m
Actual head = (+1,055)-(+1,050) = 5 m
Loss of head in pipe = 18.50 m
Total head = 5 + 18.56 + 1.50 = 25.06 --> 26 m
Total discharge = 701 l/sec
Number of pumps : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 26 / 0.78 = 57.1 kw
Motor power = P x (1+g) = 57.1 x (1+0.15)
= 65.7 --> 70 kw (x 5 units = 350 kw for installation)
Maximum actual power consumption = 70 x 4 units = 280 kw

Total maximum actual power consumption = 1,040 + 280 = 1,320 kw
(Transmission pumps and booster pumps)

Total average actual power consumption = 1,320 / 1.30 = 1,015 kw

Table DT-5 Hydraulic Calculations for Transmission Pipelines, Alternative (5) to Iquique Water Supply

Transmission Pipeline from Salar del Huasco to Alto Hospicio

Distance between Salar del Huasco and Alto Hpspicio: L= 157,700 m
Total Pipe Length: L= 157,700 m x 2 lines = 315,400 m

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Point (Accumulated Distance) (m)	Altitude above Sea Level (+m)	Distance between Two Points (m)	Flow Q (l/s)	Pipe Dia. (mm)	V (m/s)	I (x10*-3)	H (m)	Dynamic Water Level (+m)
0(Plant)	+3,800	0						+3,800.00
(Pump Station No.1: LWL=+3,800, HWL=+3,805)								+3,963.00
12,800	+3,944	12,800	701	700x2	0.91	1.07	13.70	+3,949.30
(Pump Station No.2: LWL=+3,944, HWL=+3,949)								+4,108.00
15,000	+4,100	2,200	701	700x2	0.91	1.07	2.35	+4,105.65
(Pump Station No.3: LWL=+4,100, HWL=+4,105)								+4,214.00
22,900	+4,200	7,900	701	700x2	0.91	1.07	8.45	+4,205.55
(Tank: LWL=+4,200, HWL=+4,205)								+4,200.00
27,800	+4,000	4,900	701	400x2	2.78	16.33	80.02	+4,119.98
(Tank: LWL=+4,000)								+4,000.00
32,900	+3,800	5,100	"	"	"	"	83.28	+3,916.72
(Tank: LWL=+3,800)								+3,800.00
34,950	+3,600	2,050	"	"	"	"	33.48	+3,766.52
(Tank: LWL=+3,600)								+3,600.00
36,650	+3,400	1,700	"	"	"	"	27.76	+3,572.24
(Tank: LWL=+3,400)								+3,400.00
38,600	+3,200	1,950	"	"	"	"	31.84	+3,368.16
(Tank: LWL=+3,200)								+3,200.00
40,100	+3,000	1,500	"	"	"	"	24.50	+3,175.50
(Tank: LWL=+3,000)								+3,000.00
44,050	+2,800	3,950	"	"	"	"	64.50	+2,935.50
(Tank: LWL=+2,800)								+2,800.00
47,790	+2,600	3,740	"	"	"	"	61.07	+2,738.93
(Tank: LWL=+2,600)								+2,600.00
50,580	+2,400	2,790	"	"	"	"	45.56	+2,554.44
(Tank: LWL=+2,400)								+2,400.00

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Point (Accumulated Distance) (m)	Altitude above Sea Level (+m)	Distance between Two Points (m)	Flow Q (l/s)	Pipe Dia. (mm)	V (m/s)	I (x10*-3)	H (m)	Dynamic Water Level (+m)
52,850 (Tank: LWL=+2,200)	+2,200	2,270	701	400x2	2.78	16.33	37.07	+2,362.93 +2,200.00
55,400 (Tank: LWL=+2,000)	+2,000	2,550	"	"	"	"	41.64	+2,158.36 +2,000.00
58,900 (Tank: LWL=+1,800)	+1,800	3,500	"	"	"	"	57.16	+1,942.84 +1,800.00
61,500 (Tank: LWL=+1,600)	+1,600	2,600	"	"	"	"	42.46	+1,757.54 +1,600.00
63,900 (Tank: LWL=+1,400)	+1,400	2,400	"	"	"	"	39.19	+1,560.81 +1,400.00
69,200 (Tank: LWL=+1,220)	+1,220	5,300	"	"	"	"	86.55	+1,313.45 +1,220.00
117,450 (Tank at Rinconada: LWL=+1,155, HWL=+1,160)	+1,155	48,250	"	700x2	0.91	1.07	51.63	+1,168.37 +1,155.00
144,200 (Tank at Carpas: LWL=+978, HWL=+983)	+978	26,750	"	500x2	1.79	5.51	147.39	+1,007.61 +978.00
150,200 (Tank at Santa Rosa: LWL=+682, HWL=+687)	+682	6,000	"	400x2	2.78	16.33	97.98	+880.02 +682.00
157,700 (Tank at Alto Hospicio: LWL=+545, HWL=+550)	+545	7,500	"	400x2	2.78	16.33	122.48	+559.52 +545.00

Length of Pipes
from Salar del Huasco
to Alto Hospicio

Diameter	Pipe Length
700 mm	71,150 m x 2 lines = 142,300 m
500 mm	26,750 m x 2 " = 53,500 m
400 mm	59,800 m x 2 " = 119,600 m
Total =	157,700 m x 2 lines = 315,400 m

Transmission/Booster Pumps for Alternative (5)

Transmission Pump No.1 (at Treatment Plant)
Actual head = (+3,949)-(+3,800) = 149 m
Loss of head in pipe = 13.70
Total head = 149 + 13.70 + 1.50 = 164.20 m --> 165 m
Total discharge = 701 l/sec
Number of pumps : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 165 / 0.78 = 362.0 kw
Motor power = P x (1+g) = 362.0 x (1+0.15)
= 416.3 --> 420 kw (x 5 units = 2,100 kw for installation)
Maximum actual power consumption = 420 x 4 units = 1,680 kw
(at Pump Station No.1)

Transmission Pump No.2 (at L=12,800 m) for Booster
Actual head = (+4,105)-(+3,944) = 161 m
Loss of head in pipe = 2.35 m
Total head = 161 + 2.35 + 1.50 = 164.85 m --> 165 m
Total discharge = 701 l/sec
Number of pumps : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 165 / 0.78 = 362.0 kw
Motor power = P x (1+g) = 362.0 x (1+0.15)
= 416.3 --> 420 kw (x 5 units = 2,100 kw for installation)
Maximum actual power consumption = 420 x 4 units = 1,680 kw
(at Pump Station No.2)

Transmission Pump No.3 (at L=15,000 m) for Booster
Actual head = (+4,205)-(+4,100) = 105 m
Loss of head in pipe = 8.45 m
Total head = 105 + 8.45 + 1.50 = 114.95 m --> 115 m
Total discharge = 701 l/sec
Number of pumps : (4 operation) + (1 standby) = 5 units
Pump discharge = 701/4 = 175.25 l/sec = 10.5 m3/min /unit
Pump type : Double suction multi-stage volute pump
Pump diameter = 146 x (10.5/2.0)(*0.5) = 334 --> 350 mm
Pump power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Efficiency of the pump) = 0.78)
= 0.163 x 10.5 x 115 / 0.78 = 252.3 kw
Motor power = P x (1+g) = 252.3 x (1+0.15)
= 290.1 --> 295 kw (x 5 units = 1,475 kw for installation)
Maximum actual power consumption = 295 x 4 units = 1,180 kw
(at Pump Station No.3)

Total maximum actual power consumption = 1,680 + 1,680 + 1,180 = 4,540 kw

Total average actual power consumption = 4,540 / 1.30 = 3,492 kw

Table DT-6 Hydraulic Calculations for Transmission Pipelines Common for All Alternatives (1)-(5) to Iquique Water Supply

Transmission Pipeline from Alto Hospicio to Cavancha

Distance between Alto Hospicio and Cavancha: L= 3,000 m
Total Pipe Length: L= 3,000 m x 2 lines = 6,000 m

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Point (Accumulated Distance) (m)	Altitude above Sea Level (+m)	Distance between Two Points (m)	Flow Q (l/s)	Pipe Dia. (mm)	V (m/s)	I (x10*-3)	H (m)	Dynamic Water Level (+m)
0	+545	0						+550.00
(Tank at Alto Hospicio: GL=+545, LWL=+545, HWL=+550)								+545.00
460	+400	460	701	400x2	2.78	16.33	7.51	+537.49
(Pressure-reducing valve)								+410.00
1,190	+250	730	701	400x2	2.78	16.33	11.92	+398.08
(Pressure-reducing valve)								+260.00
3,000	+114	1,810	701	400x2	2.78	16.33	29.56	+230.44
(Tank at Cavancha: GL=+114, LWL=+114, HWL=+119)								+119.00

Pipe Length
from Alto Hospicio to Cavancha

Diameter	Pipe Length
400 mm	3,000 m x 2 lines = 6,000 m
Total =	3,000 m x 2 lines = 6,000 m

Table DT-7 Hydraulic Calculations for Intake Facilities at La Tirana (Pampa del Tamarugal - North)

Well-Field in Pampa del Tamarugal - North (La Tirana)

Well No.	Yield (l/sec)	Altitude above Mean Sea Level: Ground Level	Static Water Level	Dynamic Water Level
A1	55	+1,015 m	+ 990 m	+ 960 m
B1	55	+1,020	+ 995	+ 965
C1	55	+1,025	+ 995	+ 965
D1	55	+1,025	+ 995	+ 965
A2	55	+1,015	+ 990	+ 960
B2	55	+1,020	+ 990	+ 960
C2	55	+1,025	+ 995	+ 965
D2	55	+1,025	+ 995	+ 965
A3	55	+1,015	+ 990	+ 960
B3	55	+1,020	+ 990	+ 960
C3	55	+1,025	+ 990	+ 960
D3	55	+1,025	+ 995	+ 965
A4	55	+1,015	+ 990	+ 960
B4	55	+1,020	+ 990	+ 960
C4	55	+1,025	+ 990	+ 960
D4	55	+1,025	+ 990	+ 960

(Total number of deep wells = 16 wells)

Hydraulic Calculations for Intake Pipelines - La Tirana

Pipeline	L (m)	Q (l/s)	D (mm)	V (m/s)	I (x10*-3)	Loss H=LxI (m)	Accumulated Loss (m)	Water Level (+m)
P	-	-	-	-	-	-	-	+1,030.00
P - 13	750	738	800	1.47	2.21	1.66	1.66	+1,031.66
13 - 12	500	440	600	1.56	3.45	1.73	3.39	+1,033.39
12 - 11	500	220	450	1.38	3.89	1.94	5.33	+1,035.33
11 - 10	250	110	350	1.14	3.67	0.92	6.25	+1,036.25
10 - D1	250	55	250	1.12	5.24	1.31	7.56	+1,037.56

List of Intake Pipes

Diameter	Length
800 mm	750 m x 1 line = 750 m
600 mm	500 m x 2 lines = 1,000 m
450 mm	500 m x 4 " = 2,000 m
350 mm	250 m x 8 " = 2,000 m
250 mm	250 m x 16 " = 4,000 m
	Total = 9,750 m

Intake Pump Power Calculations
for La Tirana (Pampa del Tamarugal) Source

	(A)		(B)	(C)=(A)-(B)	(D)=(C)+2.00
Well No.	Ground Altitude (+m)	Water Level to be Pumped (+m)	Dynamic Water Level in the Well (+m)	Pump Head (m)	Total Pump Head including loss around the pump (m)
A1	+1,015	+1,037.56	+960	77.56	80.56 --> 81
B1	+1,020	"	+965	72.56	75.56 --> 76
C1	+1,025	"	+965	"	" 76
D1	+1,025	"	+965	"	" 76
A2	+1,015	"	+960	77.56	80.56 --> 81
B2	+1,020	"	+960	"	" 81
C2	+1,025	"	+965	72.56	75.56 --> 76
D2	+1,025	"	+965	"	" 76
A3	+1,015	"	+960	77.56	80.56 --> 81
B3	+1,020	"	+960	"	" 81
C3	+1,025	"	+960	"	" 81
D3	+1,025	"	+965	72.56	75.56 --> 76
A4	+1,015	"	+960	77.56	80.56 --> 81
B4	+1,020	"	+960	"	" 81
C4	+1,025	"	+960	"	" 81
D4	+1,025	"	+960	"	" 81

(Note):
Type of Pump : Submersible Motor Pump
Pump Discharge = 55 l/sec = 3.30 m3/min
Pump Diameter = 146 x (3.30/2.2)(*0.5) = 178.8 --> 200 mm

Pump Power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Pump efficiency = 0.7)

H = 81 m --> P = 0.163 x 3.30 x 81.0 / 0.7 = 62.2 kw
Motor Power: R = P x (1+g)
(g: Allowance = 0.15)
= 62.2 x 1.15 = 71.5 kw --> 75 kw

H = 76 m --> P = 0.163 x 3.30 x 76.0 / 0.7 = 58.4 kw
Motor Power: R = 58.4 x 1.15 = 67.2 kw --> 70 kw

Total Motor Power = (75 x 10) + (70 x 6) = 1,170 kw

Total maximum actual power consumption = 1,170 x (738)/(55x16) = 981 kw

Total average actual power consumption = 981 / 1.30 = 755 kw

Table DT-8 Hydraulic Calculations for Intake Facilities at Pintados (Pampa del Tamarugal - South)

Well-Field in Pampa del Tamarugal - South (Pintados)

Well No.	Yield (l/sec)	Altitude above Mean Sea Level: Ground Level	Static Water Level	Dynamic Water Level
A1	55	+ 995 m	+ 980 m	+ 950 m
B1	55	+ 995	+ 980	+ 950
C1	55	+ 995	+ 980	+ 950
D1	55	+ 995	+ 980	+ 950
A2	55	+ 995	+ 980	+ 950
B2	55	+ 995	+ 980	+ 950
C2	55	+1,000	+ 980	+ 950
D2	55	+1,000	+ 980	+ 950
A3	55	+1,000	+ 980	+ 950
B3	55	+1,000	+ 980	+ 950
C3	55	+1,000	+ 980	+ 950
D3	55	+1,000	+ 980	+ 950
A4	55	+1,000	+ 980	+ 950
B4	55	+1,000	+ 980	+ 950
C4	55	+1,000	+ 980	+ 950
D4	55	+1,005	+ 980	+ 950

(Total number of deep wells = 16 wells)

Hydraulic Calculation for Intake Pipelines - Pintados

Pipeline	L (m)	Q (l/s)	D (mm)	V (m/s)	I (x10*-3)	Loss H=LxI (m)	Accumulated Loss (m)	Water Level (+m)
P	-	-	-	-	-	-	-	+1,000.00
P - 13	750	738	800	1.47	2.21	1.66	1.66	+1,001.66
13 - 12	500	440	600	1.56	3.45	1.73	3.39	+1,003.39
12 - 11	500	220	450	1.38	3.89	1.94	5.33	+1,005.33
11 - 10	250	110	350	1.14	3.67	0.92	6.25	+1,006.25
10 - D1	250	55	250	1.12	5.24	1.31	7.56	+1,007.56

List of Intake Pipes

Diameter	Length	
800 mm	750 m x 1 line	= 750 m
600 mm	500 m x 2 lines	= 1,000 m
450 mm	500 m x 4 "	= 2,000 m
350 mm	250 m x 8 "	= 2,000 m
250 mm	250 m x 16 "	= 4,000 m
	Total	= 9,750 m

Intake Pump Power Calculation for Pampa del Tamarugal - South (Pintados) Source

	(A)	(B)	(C)=(A)-(B)	(D)=(C)+2.00
Well No.	Ground Altitude (+m)	Water Level to be Pumped (+m)	Dynamic Water Level in the Well (+m)	Pump Head (m)	Total Pump Head including loss around the pump (m)
A1	+995	+1,007.56	+950	57.56	60.56 --> 61
B1	+995	"	+950	"	" 61
C1	+995	"	+950	"	" 61
D1	+995	"	+950	"	" 61
A2	+995	+1,006.56	+950	"	" 61
B2	+995	"	+950	"	" 61
C2	+1,000	"	+950	"	" 61
D2	+1,000	"	+950	"	" 61
A3	+1,000	"	+950	"	" 61
B3	+1,000	"	+950	"	" 61
C3	+1,000	"	+950	"	" 61
D3	+1,000	"	+950	"	" 61
A4	+1,000	+1,006.56	+950	"	" 61
B4	+1,000	"	+950	"	" 61
C4	+1,000	"	+950	"	" 61
D4	+1,005	"	+950	"	" 61

(Note):
Type of Pump : Submersible Motor Pump
Pump Discharge = 55 l/sec = 3.30 m3/min
Pump Diameter = 146 x (3.30/2.2)(*0.5) = 178.8 --> 200 mm

Pump Power: P = 0.163 x Q(m3/min) x H(m) / f
(f: Pump efficiency = 0.7)
= 0.163 x 3.30 x 61.0 / 0.7 = 46.9 kw

Motor Power: R = P x (1+g)
(g: Allowance = 0.15)
= 46.9 x 1.15 = 53.9 --> 55 kw

Total Motor Power = 55 x 16 = 880 kw

Total maximum actual power consumption = 880 x (738)/(55x16) = 738 kw

Total average actual power consumption = 738 / 1.30 = 568 kw

Table DT-9 Hydraulic Calculations for Intake Facilities at Salar del Huasco

Hydraulic Calculation for Intake Pipelines
Salar del Huasco Well-Field (1)

Point No.	Ground Altitude (+m)	Construction of Junction Tank	Water Level of the Tank (+m)	Water Level at the Point (+m)
C7	+3,905	Yes	+3,906	+3,906.00
15	+3,870	Yes	+3,871	+3,871.00
14	+3,860	Yes	+3,861	+3,861.00
13	+3,835	Yes	+3,836	+3,836.00
12	+3,825	Yes	+3,826	+3,826.00
11	+3,815	Yes	+3,816	+3,816.00
10	+3,810	Yes	+3,811	+3,811.00
A2	+3,805	No	-	+3,809.30
A1	+3,795	No	-	+3,806.98
P	+3,800	Yes	+3,805	+3,805.00

Pipeline	L (m)	Q (l/sec)	D (mm)	V (m/s)	I (x10*-3)	H=Lxl (m)	Water Level Calculated (Altitude: +m)
C7 - 15	1,100	40	200	1.27	8.61	9.50	+3,906.00 - +3,896.50
15 - 14	550	80	250	1.62	10.5	5.76	+3,871.00 - +3,865.24
14 - 13	800	160	300	2.26	15.5	12.43	+3,861.00 - +3,848.57
13 - 12	1,000	240	400	1.91	8.10	8.10	+3,836.00 - +3,827.90
12 - 11	1,150	400	500	2.04	7.03	8.09	+3,826.00 - +3,817.91
11 - 10	1,000	520	600	1.84	4.70	4.70	+3,816.00 - +3,811.30
10 - A2	1,000	640	800	1.27	1.70	1.70	+3,811.00 - +3,809.30
A2 - A1	1,050	738	800	1.47	2.21	2.32	+3,809.30 - +3,806.98
A1 - P	300	738	800	1.47	2.21	0.66	+3,806.98 - +3,806.32

List of Pipelines and Length

Diameter	Distance (m)	Total
800 mm :	300 + 1,050 + 1,000	= 2,350 m
600 mm :	1,000	= 1,000 m
500 mm :	1,150	= 1,150 m
400 mm :	1,000	= 1,000 m
350 mm :	200	= 200 m
300 mm :	(1,000x6) + 250 + 300 + 300 + 800	= 7,650 m
250 mm :	550 + 650 + 1,000 + 300	= 2,500 m
200 mm :	(1,000x6) + 1,100	= 7,100 m
150 mm :	(30 m) x 22 wells	= 660 m
	Total Length	= 23,610 m

Hydraulic Calculation for Intake Pipelines
Salar del Huasco Well-Field (2)

Point No.	Ground Altitude (+m)	Construction of Junction Tank	Water Level of the Tank (+m)	Water Level at the Point (+m)
B7	+3,875	Yes	+3,876	+3,876.00
B6	+3,860	No	-	+3,867.39
A8	+3,845	Yes	+3,846	+3,846.00
A7	+3,840	Yes	+3,841	+3,841.00
A6	+3,830	No	-	+3,836.69
A5	+3,825	No	-	+3,832.57
C6	+3,875	Yes	+3,876	+3,876.00
C5	+3,845	Yes	+3,846	+3,846.00
B5	+3,835	No	-	+3,837.39
C4	+3,840	Yes	+3,841	+3,841.00
B4	+3,825	Yes	+3,826	+3,826.00
A4	+3,820	Yes	+3,821	+3,821.00
C3	+3,840	Yes	+3,841	+3,841.00
B3	+3,820	Yes	+3,821	+3,821.00
A3	+3,810	No	-	+3,816.69
C2	+3,840	Yes	+3,841	+3,841.00
B2	+3,815	Yes	+3,816	+3,816.00
C1	+3,835	Yes	+3,836	+3,836.00
B1	+3,810	Yes	+3,811	+3,811.00

Pipeline	L (m)	Q (l/sec)	D (mm)	V (m/s)	I (x10*-3)	H=LxI (m)	Water Level Calculated (Altitude: +m)
B7 - B6	1,000	40	200	1.27	8.61	8.61	+3,876.00 - +3,867.39
B6 - 14	300	80	250	1.63	10.5	3.14	+3,867.39 - +3,864.25
A8 - A7	1,000	40	250	0.82	2.90	2.90	+3,846.00 - +3,843.10
A7 - A6	1,000	80	300	1.13	4.31	4.31	+3,841.00 - +3,836.69
A6 - A5	1,000	120	300	1.70	9.12	9.12	+3,836.69 - +3,327.57
A5 - 12	200	160	350	1.66	7.33	1.47	+3,832.57 - +3,826.10
C6 - 15	650	40	250	0.82	2.90	1.89	+3,876.00 - +3,874.11
C5 - B5	1,000	40	200	1.27	8.61	8.61	+3,846.00 - +3,837.39
B5 - 13	300	80	300	1.13	4.31	1.29	+3,837.39 - +3,836.10
C4 - B4	1,000	40	200	1.27	8.61	8.61	+3,841.00 - +3,832.39
B4 - A4	1,000	80	300	1.13	4.31	4.31	+3,826.00 - +3,821.69
A4 - 11	300	120	300	1.68	9.12	9.12	+3,821.00 - +3,818.26
C3 - B3	1,000	40	200	1.27	8.61	8.61	+3,841.00 - +3,832.39
B3 - A3	1,000	80	300	1.13	4.31	4.31	+3,821.00 - +3,816.69
A3 - 10	250	120	300	1.70	9.12	2.28	+3,816.69 - +3,814.41
C2 - B2	1,000	40	200	1.27	8.61	8.61	+3,841.00 - +3,832.39
B2 - A2	1,000	80	300	1.13	4.31	4.31	+3,816.00 - +3,811.69
C1 - B1	1,000	40	200	1.27	8.61	8.61	+3,835.00 - +3,826.39
B1 - A1	1,000	80	300	1.13	4.31	4.31	+3,811.00 - +3,806.69

Pump Power Calculation for Intake Pumps at Salar del Huasco Well-Field (1)

		(A)		(B)	(C)=(A)-(B)	(D)=(C)+2.00
Well No.	Ground Altitude (+m)	Water Level in Junction Tank (+m)	Dynamic Water Level in Pipeline (+m)	Dynamic Water Level in the Well (+m)	Pump Head (m)	Total Pump Head including loss around the pump (m)
A8	+3,845	+3,846	-	+3,805	41.00	43.00 --> 43
C7	+3,905	+3,906	-	+3,830	76.00	78.00 --> 78
B7	+3,875	+3,876	-	+3,810	66.00	68.00 --> 68
A7	+3,840	+3,841	-	+3,800	41.00	43.00 --> 43
C6	+3,875	+3,876	-	+3,800	76.00	78.00 --> 78
B6	+3,860	-	+3,867.39	+3,795	72.39	74.39 --> 75
A6	+3,830	-	+3,832.60	+3,790	42.60	44.60 --> 45
C5	+3,845	+3,846	-	+3,790	56.00	58.00 --> 58
B5	+3,835	-	+3,837.39	+3,785	52.39	54.39 --> 55
A5	+3,825	-	+3.826.83	+3,785	41.83	43.83 --> 44
C4	+3,840	+3,841	-	+3,785	56.00	58.00 --> 58
B4	+3,825	+3,826	-	+3,780	46.00	48.00 --> 48
A4	+3,820	+3,821	-	+3,780	41.00	43.00 --> 43
C3	+3,840	+3,841	-	+3,780	61.00	63.00 --> 63
B3	+3,820	+3,821	-	+3,775	46.00	48.00 --> 48
A3	+3,810	-	+3,813.00	+3,770	43.00	45.00 --> 45
C2	+3,840	+3,841	-	+3,775	66.00	68.00 --> 68
B2	+3,815	+3,816	-	+3,770	46.00	48.00 --> 48
A2	+3,805	-	+3,807.71	+3,765	42.71	44.71 --> 45
C1	+3,835	+3,836	-	+3,765	71.00	73.00 --> 73
B1	+3,810	+3,811	-	+3,760	51.00	53.00 --> 53
A1	+3,795	-	+3,805.60	+3,755	50.60	52.60 --> 53

Pump Power Calculation for Intake Pumps at Salar del Huasco Well-Field (2)

	(Q)	(H)	(P)	(R)
Pump No.	Discharge	Total Head (m)	Pump Power (kw)	Motor Power (kw)
A8	40 l/sec = 2.40 m3/min	43	24.0	27.6 --> 30 kw
C7	" "	78	43.6	50.1 --> 55 kw
B7	" "	68	38.0	43.7 --> 45 kw
A7	" "	43	24.0	27.6 --> 30 kw
C6	" "	78	43.6	50.1 --> 55 kw
B6	" "	75	41.9	48.2 --> 50 kw
A6	" "	45	25.2	28.9 --> 30 kw
C5	" "	58	32.4	37.3 --> 40 kw
B5	" "	55	30.7	35.4 --> 40 kw
A5	" "	44	24.6	28.3 --> 30 kw
C4	" "	58	32.4	37.3 --> 40 kw
B4	" "	48	26.8	30.8 --> 35 kw
A4	" "	43	24.0	27.6 --> 30 kw
C3	" "	63	35.2	40.5 --> 45 kw
B3	" "	48	26.8	30.8 --> 35 kw
A3	" "	45	25.2	28.9 --> 30 kw
C2	" "	68	38.0	43.7 --> 45 kw
B2	" "	48	26.8	30.8 --> 35 kw
A2	" "	45	25.2	28.9 --> 30 kw
C1	" "	73	40.8	46.9 --> 50 kw
B1	" "	53	29.6	34.1 --> 35 kw
A1	" "	53	29.6	34.1 --> 35 kw
			Total (22 pumps) =	850 kw

(Note):
Type of Pump : Submersible Motor Pump
Pump Discharge = 40 l/sec = 2.40 m3/min
Pump Diameter = 146 x (2.40/2.3)(*0.5) = 149.1 --> 150 mm

Pump power: P = 0.163 x Q(m3/min) x H(m) / f = 0.559 x H
f = Efficiency of the pump = 0.70

Motor power: R = P x (1+g)
g = Allowance = 0.15

Total motor power = 850 kw

Total maximum actual power consumption = 850 x (738)/(40x22) = 713 kw

Total average actual power consumption = 713 / 1.30 = 548 kw

Junction Tanks at Salar del Huasco Well-Field

Type of Junction Tank	Dimensions Width x Length x Depth	Volume (m3)	Number of Tanks	Construction Site
Type-A	3.0 m x 3.0 m x 3.0 m	27.0 m3	17 sites	Nos. C7, B7, A7, C6, 15, 14, C5, C4, B4, A4, C3, B3, C2, B2, C1, B1 and A8
Type-B	3.0 m x 5.0 m x 3.5 m	52.5 m3	2 sites	Nos. 13 & 12
Type-C	4.0 m x 6.0 m x 3.5 m	84.0 m3	2 sites	Nos. 11 & 10

COST ESTIMATION DATA

Table DC-1 Construction Cost for Alternative (1)
- Iquique Water Supply Scheme
Pampa-North (La Tirana) Water Source - Route No.1

Summary

Item	Amount (Peso:$)
(A) Well-Field (at Pampa-North (La Tirana))	$ 4,335,846,000
(B) Transmission Pumps (at Well-Field)	$ 2,031,190,000
(C) Transmission Pipeline (from La Tirana to Cavancha/Iquique)	$ 29,081,203,000
(D) Tanks (Transmission/ Break-pressure / Distribution Tanks)	$ 1,373,250,000
Total (A+B+C+D) (Alternative (1) for Iquique Water Supply)	$ 36,821,489,000

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
US$1.00 = Chile Peso: $435.00
US$1.00 = Japanese Yen: ¥110.00
Japanese Yen 1.00 = Chile Peso: $3.955

Table DC-1' Cost Estimation for Alternative (1)
- Iquique Water Supply Scheme
Pampa-North (La Tirana) Water Source - Route No.1

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
US$1.00 = Chile Peso: $435.00
US$1.00 = Japanese Yen: ¥110.00
Japanese Yen 1.00 = Chile Peso: $3.955

Item	Q'ty	Unit Price ($)	Amount ($)
(A) Well-Field (at La Tirana)			
1. Deep wells			
1.1 Construction of deep well (12" x 200 m depth, screen: 80 m)	16 wells	70,629,000	1,130,064,000
1.2 Pump house 5.5 m x 4.0 m	16 Nos.	2,200,000	35,200,000
		Sub Total = $	1,165,264,000
2. Pump (Submersible pump with motor, column pipe, electric cables, base plate, water level indicator, check valve, gate valves, flow meter, station pipes) Q= 55 l/sec = 3.30 m3/min, Dia= 150 mm			
2.1 Pump (79 m, 75 kw)	10 Nos.	79,100,000	791,000,000
2.2 Pump (74 m, 70 kw)	6 "	77,518,000	465,108,000
2.3 Electrical facilities for the above (Including pump control panel, transformer, telemeter transfer panel, uninterrupted power supply)	16 units	37,572,500	601,160,000
		Sub Total = $	1,857,268,000
3. Power transmission line, including power cable, control cable for telemeter, wooden pole, insulator, etc.	1 lot		367,815,000
		Sub Total = $	367,815,000
4. Pipelines (ACP) within the well-field (Materials and Installation cost)			
4.1 800 mm ACP	750 m	113,689	85,267,000
4.2 600 mm ACP	1,000 m	70,208	70,208,000
4.3 450 mm ACP	2,000 m	53,491	106,982,000
4.4 350 mm ACP	2,000 m	36,545	73,090,000
4.5 250 mm ACP	4,000 m	19,749	78,996,000

Item	Q'ty	Unit Price ($)	Amount ($)
		Sub Total =	$ 414,543,000
5. Valves in Well-Field			
5.1 Valve 800 mm (Butterfly)	1 No.	18,382,000	18,382,000
5.2 Valve 600 mm (")	2 Nos.	12,859,000	25,718,000
5.3 Valve 350 mm (Sluice)	8 Nos.	2,968,000	23,744,000
		Sub Total =	$ 67,844,000
6. Roads and others			
6.1 Access road (w= 4.0 m) to the well-field	5,800 m	4,942	28,664,000
6.2 Maintenance road (w= 4.0 m) within the well-field	10,500 m	4,942	51,891,000
6.3 Asphalt pavement work for the above (550 m x 4.0 m)	2,200 m2	1,271	2,796,000
6.4 Boundary fence (h= 2.0 m)	6,400 m	18,589	118,970,000
6.5 Entrance gate	1 No.		791,000
		Sub Total =	$ 203,112,000
7. Miscellaneous Works	1 lot		260,000,000
Total of (A)			$ 4,335,846,000
(B) Transmission Pumps			
1. Transmission Pumps (350 mm x 10.5 m3/min x 125 m x 420 kw x 5 units)			
1.1 Mechanical equipment including transmission pump with motor, suction valve, delivery valve, check valve	5 units	114,695,000	573,475,000
1.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
1.3 Sub station (11 kv / 3,000 kvA) including incoming panel, receiving panel, transformer	1 lot		375,725,000
1.4 Electrical equipment including transmission pump control panel, intake pump feeder panel, low voltage panel, cables	1 lot		355,950,000

Item	Q'ty	Unit Price ($)	Amount ($)
1.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000
2. High voltage (23 kv) electric power line from Pozo Almonte Substation/ ELIQSA	20 km	7,900,000	158,000,000
Total of (B)			$ 2,031,190,000
(C) Transmission Pipeline (from La Tirana to Cavancha/Iquique)			
1. Pipeline (DIP) from La Tirana to Alto Hospicio (Materials and Installation cost)			
1.1 700 mm DIP (40,400 m x 2)	80,800 m	266,537	21,536,190,000
1.2 500 mm " (11,650 m x 2)	23,300 m	157,154	3,661,688,000
1.3 400 mm " (12,550 m x 2)	25,100 m	113,741	2,854,899,000
1.4 Pressure-reducing valve (2x2) 400 mm (with a strainer)	4 Nos.	27,404,000	109,616,000
1.5 Highway crossing work (3 sites x 2 times)	6 sites	5,000,000	30,000,000
1.6 Asphalt pavement restoration	18,796 m2	1,271	23,890,000
		Sub Total =	$ 28,216,283,000
2. Pipeline (DIP) from Alto Hospicio to Cavancha (Materials and Installation cost)			
2.1 400 mm DIP (3,000 m x 2)	6,000 m	113,741	682,446,000
2.2 Pressure-reducing valve 400 mm (3 sites x 2 times)	6 Nos.	27,404,000	164,424,000
2.3 Highway crossing work (1 x 2)	2 sites	5,000,000	10,000,000
2.4 Railway crossing work (1 x 2)	2 sites	2,000,000	4,000,000
2.5 Concrete-blocks work (30 x 2)	60 Nos.	67,500	4,050,000
		Sub Total =	$ 864,920,000
Total of (C)			$ 29,081,203,000
(D) Tanks (Collection / Transmission/ Break-pressure / Distribution Tanks) (RC: Reinforced Concrete)			
1. Tanks (Between La Tirana and Alto Hospicio)			
1.1 1,250 m3 tank (3 sites x 2)	6 Nos.	54,800,000	328,800,000
1.2 250 m3 " (3 sites x 2)	6 Nos.	14,575,000	87,450,000
		Sub Total =	$ 416,250,000
2. Distribution Tanks (at Cavancha)			
2.1 7,500 m3 tank	4 Nos.	239,250,000	957,000,000

Item	Q'ty	Unit Price ($)	Amount ($)
Total of (D)			$ 1,373,250,000
Grand Total (A+B+C+D) (Alternative (1) for Iquique Water Supply)			$ 36,821,489,000

Table DC-2 Construction Cost for Alternative (2)
- Iquique Water Supply Scheme
Pampa-North (La Tirana) Water Source - Route No.2

Summary

Item	Amount (Peso:$)
(A) Well-Field (at Pampa-North (La Tirana))	$ 4,335,846,000
(B) Transmission Pumps and Booster Pumps	$ 3,619,620,000
(C) Transmission Pipeline (from La Tirana to Cavancha/Iquique)	$ 27,534,142,000
(D) Tanks (Transmission/ Break-pressure / Distribution Tanks)	$ 1,534,750,000
Total (A+B+C+D) (Alternative (2) for Iquique Water Supply)	$ 37,024,358,000

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
US$1.00 = Chile Peso: $435.00
US$1.00 = Japanese Yen: ¥110.00
Japanese Yen 1.00 = Chile Peso: $3.955

Table DC-2' Cost Estimation for Alternative (2)
- Iquique Water Supply Scheme
Pampa-North (La Tirana) Water Source - Route No.2

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
US$1.00 = Chile Peso: $435.00
US$1.00 = Japanese Yen: ¥110.00
Japanese Yen 1.00 = Chile Peso: $3.955

Item	Q'ty	Unit Price ($)	Amount ($)
(A) Well-Field (at La Tirana)			
1. Deep wells			
1.1 Construction of deep well (12" x 200 m depth, screen: 80 m)	16 wells	70,629,000	1,130,064,000
1.2 Pump house 5.5 m x 4.0 m	16 Nos.	2,200,000	35,200,000
		Sub Total = $	1,165,264,000
2. Pump (Submersible pump with motor, column pipe, electric cables, base plate, water level indicator, check valve, gate valves, flow meter, station pipes) Q= 55 l/sec = 3.30 m3/min, Dia= 150 mm			
2.1 Pump (79 m, 75 kw)	10 Nos.	79,100,000	791,000,000
2.2 Pump (74 m, 70 kw)	6 "	77,518,000	465,108,000
2.3 Electrical facilities for the above (Including pump control panel, transformer, telemeter transfer panel, uninterrupted power supply)	16 units	37,572,500	601,160,000
		Sub Total = $	1,857,268,000
3. Power transmission line, including power cable, control cable for telemeter, wooden pole, insulator, etc.	1 lot		367,815,000
		Sub Total = $	367,815,000
4. Pipelines (ACP) within the well-field (Materials and Installation cost)			
4.1 800 mm ACP	750 m	113,689	85,267,000
4.2 600 mm ACP	1,000 m	70,208	70,208,000
4.3 450 mm ACP	2,000 m	53,491	106,982,000
4.4 350 mm ACP	2,000 m	36,545	73,090,000
4.5 250 mm ACP	4,000 m	19,749	78,996,000

Item	Q'ty	Unit Price ($)	Amount ($)
		Sub Total =	$ 414,543,000
5. Valves within the well-field			
5.1 Valve 800 mm (Butterfly)	1 No.	18,382,000	18,382,000
5.2 Valve 600 mm (")	2 Nos.	12,859,000	25,718,000
5.3 Valve 350 mm (Sluice)	8 Nos.	2,968,000	23,744,000
		Sub Total =	$ 67,844,000
6. Road and others			
6.1 Access road (w= 4.0 m) to the well-field	5,800 m	4,942	28,664,000
6.2 Maintenance road (w= 4.0 m) within the well-field	10,500 m	4,942	51,891,000
6.3 Asphalt pavement work for the above (550 m x 4.0 m)	2,200 m2	1,271	2,796,000
6.4 Boundary fence (h= 2.0 m)	6,400 m	18,589	118,970,000
6.5 Entrance gate	1 No.		791,000
		Sub Total =	$ 203,112,000
7. Miscellaneous Works	1 lot		260,000,000
Total of (A)			$ 4,335,846,000
(B) Transmission Pumps and Booster Pumps			
1. Transmission Pumps (350 mm x 10.5 m3/min x 114 m x 300 kw x 5 units)			
1.1 Mechanical equipment including transmission pump with motor, suction valve, delivery valve, check valve	5 units	95,711,000	478,555,000
1.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
1.3 Sub station (11 kv / 2,500 kvA) including incoming panel, receiving panel, transformer	1 lot		340,130,000

Item	Q'ty	Unit Price ($)	Amount ($)
1.4 Electrical equipment including transmission pump control panel, intake pump feeder panel, low voltage panel, cables	1 lot		344,085,000
1.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000
2. Booster Pumping Station (350 mm x 10.5 m3/min x 114 m x 300 kw x 5 units)			
2.1 Mechanical equipment including booster pump with motor, suction valve, delivery valve, check valve	5 units	95,711,000	478,555,000
2.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
2.3 Sub station (11 kv / 2,500 kvA) including incoming panel, receiving panel, transformer	1 lot		340;130,000
2.4 Electrical equipment including booster pump control panel, low voltage panel, cables	1 lot		344,085,000
2.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000
3. High voltage (23 kV) electric power line from Pozo Almonte Substation/ ELIQSA	20 km	7,900,000	158,000,000
Total of (B)			$ 3,619,620,000

(C) Transmission Pipeline (from La Tirana to Cavancha/Iquique)

1. Pipeline (DIP) from La Tirana to Alto Hospicio (Materials and Installation cost)			
1.1 700 mm DIP (22,200 m x 2)	44,400 m	266,537	11,834,242,000
1.2 600 mm " (14,700 m x 2)	29,400 m	218,546	6,425,252,000
1.3 500 mm " (15,600 m x 2)	31,200 m	167,677	5,231,522,000
1.4 400 mm " (11,000 m x 2)	22,000 m	122,701	2,699,422,000
1.5 Pressure-reducing valve: 600	2 Nos.	64,902,000	129,804,000
1.6 " " " : 500	4 "	43,639,000	174,556,000

Item	Q'ty	Unit Price ($)	Amount ($)
1.7 " " " : 400	6 "	27,404,000	164,424,000
1.8 Highway crossing work	2 sites	5,000,000	10,000,000
		Sub Total =	$ 26,669,222,000
2. Pipeline (DIP) from Alto Hospicio to Cavancha (Materials and Installation cost)			
2.1 400 mm DIP (3,000 m x 2)	6,000 m	113,741	682,446,000
2.2 Pressure-reducing valve 400 mm (3 sites x 2 times)	6 Nos.	27,404,000	164,424,000
2.3 Highway crossing work (1 x 2)	2 sites	5,000,000	10,000,000
2.4 Railway crossing work (1 x 2)	2 sites	2,000,000	4,000,000
2.5 Concrete-blocks work (30 x 2)	60 Nos.	67,500	4,050,000
		Sub Total =	$ 864,920,000
Total of (C)			$ 27,534,142,000
(D) Tanks (Collection / Transmission/ Break-pressure / Distribution Tanks) (RC: Reinforced Concrete)			
1. Tank (Between La Tirana and Alto Hospicio)			
1.1 1,250 m3 tank	8 Nos.	54,000,000	432,000,000
1.2 250 m3 "	10 Nos.	14,575,000	145,750,000
		Sub Total =	$ 577,750,000
2. Distribution Tanks (at Cavancha)			
2.1 7,500 m3 tank	4 Nos.	239,250,000	957,000,000
Total of (D)			$ 1,534,750,000
Grand Total (A+B+C+D)			$ 37,024,358,000
(Alternative (2) for Iquique Water Supply)			

Table DC-3 Construction Cost for Alternative (3)
- Iquique Water Supply Scheme
Pampa-South (Pintados) Water Source - Route No.1

Summary

Item	Amount (Peso:$)
(A) Well-Field (at Pampa-North (La Tirana))	$ 4,141,961,000
(B) Transmission Pumps	$ 3,620,640,000
(C) Transmission Pipeline (from Pintados to Cavancha/Iquique)	$ 36,890,678,000
(D) Tanks (Transmission/ Break-pressure / Distribution Tanks)	$ 1,447,300,000
Total (A+B+C+D) (Alternative (3) for Iquique Water Supply)	$ 46,100,579,000

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
US$1.00 = Chile Peso: $435.00
US$1.00 = Japanese Yen: ¥110.00
Japanese Yen 1.00 = Chile Peso: $3.955

Table DC-3' Cost Estimation for Alternative (3)
- Iquique Water Supply Scheme
Pampa-South (Pintados) Water Source - Route No.1

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
US$1.00 = Chile Peso: $435.00
US$1.00 = Japanese Yen: ¥110.00
Japanese Yen 1.00 = Chile Peso: $3.955

Item	Q'ty	Unit Price ($)	Amount ($)
(A) Well-Field (at Pintados)			
1. Deep wells			
1.1 Construction of deep well (12" x 200 m depth, screen: 80 m)	16 wells	70,629,000	1,130,064,000
1.2 Pump house 5.5 m x 4.0 m	16 Nos.	2,200,000	35,200,000
		Sub Total = $	1,165,264,000
2. Pump (Submersible pump with motor, column pipe, electric cables, base plate, water level indicator, check valve, gate valves, flow meter, station pipes) Q= 55 l/sec = 3.30 m3/min, Dia= 150 mm			
2.1 Pump (55 kw)	16 Nos.	71,190,000	1,139,040,000
2.2 Electrical facilities for the above (Including pump control panel, transformer, telemeter transfer panel, uninterrupted power supply)	16 units	34,408,500	550,536,000
		Sub Total = $	1,689,576,000
3. Power transmission line, including power cable, control cable for telemeter, wooden pole, insulator, etc.	1 lot		367,815,000
		Sub Total = $	367,815,000
4. Pipelines (ACP) within the well-field (Materials and Installation cost)			
4.1 800 mm ACP	750 m	113,689	85,267,000
4.2 600 mm ACP	1,000 m	70,208	70,208,000
4.3 450 mm ACP	2,000 m	53,491	106,982,000
4.4 350 mm ACP	2,000 m	36,545	73,090,000
4.5 250 mm ACP	4,000 m	19,749	78,996,000

Item	Q'ty	Unit Price ($)	Amount ($)
		Sub Total =	$ 414,543,000
5. Valves within the well-field			
5.1 Valve 800 mm (Butterfly)	1 No.	18,382,000	18,382,000
5.2 Valve 600 mm (")	2 Nos.	12,859,000	25,718,000
5.3 Valve 350 mm (Sluice)	8 Nos.	2,968,000	23,744,000
		Sub Total =	$ 67,844,000
6. Road and others			
6.1 Access road	500 m	4,942	2,471,000
6.2 Maintenance road	10,500 m	4,942	51,891,000
6.3 Asphalt pavement	2,200 m2	1,271	2,796,000
6.4 Boundary fence	6,400 m	18,589	118,970,000
6.5 Entrance gate	1 lot		791,000
		Sub Total =	$ 176,919,000
7. Miscellaneous Works	1 lot		260,000,000
Total of (A)			$ 4,141,961,000
(B) Transmission Pumps and Booster Pumps			
1. Transmission Pumps (350 mm x 10.5 m3/min x 95 m x 300 kw x 5 units)			
1.1 Mechanical equipment including transmission pump with motor, suction valve, delivery valve, check valve	5 units	92,942,000	467,710,000
1.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
1.3 Sub station (11 kv / 2,500 kvA) including incoming panel, receiving panel, transformer	1 lot		340,130,000
1.4 Electrical equipment including transmission pump control panel, intake pump feeder panel, low voltage panel, cables	1 lot		344,085,000
1.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000

Item	Q'ty	Unit Price ($)	Amount ($)
2. Booster Pumping Station (350 mm x 10.5 m3/min x 127 m x 350 kw x 5 units)			
2.1 Mechanical equipment including booster pump with motor, suction valve, delivery valve, check valve	5 units	106,785,000	533,925,000
2.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
2.3 Sub station (11 kv / 2,500 kvA) including incoming panel, receiving panel, transformer	1 lot		340,130,000
2.4 Electrical equipment including booster pump control panel, low voltage panel, cables	1 lot		300,580,000
2.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000
3. High voltage (23 kV) electric power line from Tamarugal Substation/ ELIQSA	20 km	7,900,000	158,000,000
Total of (B)			$ 3,620,640,000
(C) Transmission Pipeline (from Pintados to Cavancha/Iquique)			
1. Pipeline (DIP) from Pintados to Alto Hospicio (Materials and Installation cost)			
1.1 700 mm DIP (44,150 m x 2)	88,300 m	266,537	23,535,217,000
1.2 500 mm " (26,750 m x 2)	53,500 m	167,677	8,970,719,500
1.3 400 mm " (13,500 m x 2)	27,000 m	122,701	3,312,927,000
1.4 Pressure reducing valve: 500	2 Nos.	43,639,000	87,278,000
1.5 " " " : 400	4 Nos.	27,404,000	109,616,000
1.6 Highway crossing work	2 sites	5,000,000	10,000,000
		Sub Total =	$ 36,025,758,000
2. Pipeline (DIP) from Alto Hospicio to Cavancha (Materials and Installation cost)	(Same as Alternative (1) =		$ 864,920,000
Total of (C)			$ 36,890,678,000

Item	Q'ty	Unit Price ($)	Amount ($)
(D) Tanks			
(Collection / Transmission/ Break-pressure / Distribution Tanks)			
(RC: Reinforced Concrete)			
1. Tanks (Between Pintados and Alto Hospicio)			
1.1 1,250 m3 tank	8 Nos.	54,000,000	432,000,000
1.2 250 m3 "	4 Nos.	14,575,000	58,300,000
		Sub Total = $	490,300,000
2. Distribution Tanks (at Cavancha)			
2.1 7,500 m3 tank	4 Nos.	239,250,000	957,000,000
Total of (D)			$ 1,447,300,000
Grand Total (A+B+C+D)			$ 46,100,579,000
(Alternative (3) for Iquique Water Supply)			

Table DC-4 Construction Cost for Alternative (4)
- Iquique Water Supply Scheme
Pampa-South (Pintados) Water Source - Route No.2

Item	Amount (Peso:$)
(A) Well-Field (at Pampa-North (La Tirana))	$ 4,141,961,000
(B) Transmission Pumps	$ 3,092,265,000
(C) Transmission Pipeline (from Pintados to Cavancha/Iquique)	$ 39,367,155,000
(D) Tanks (Transmission/ Break-pressure / Distribution Tanks)	$ 1,476,450,000
Total (A+B+C+D) (Alternative (4) for Iquique Water Supply)	$ 48,068,831,000

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
US$1.00 = Chile Peso: $435.00
US$1.00 = Japanese Yen: ¥110.00
Japanese Yen 1.00 = Chile Peso: $3.955

Table DC-4' Cost Estimation for Alternative (4)
- Iquique Water Supply Scheme
Pampa-South (Pintados) Water Source - Route No.2

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
US$1.00 = Chile Peso: $435.00
US$1.00 = Japanese Yen: ¥110.00
Japanese Yen 1.00 = Chile Peso: $3.955

Item	Q'ty	Unit Price ($)	Amount ($)
(A) Well-Field (at Pintados)			
1. Deep Wells			
1.1 Construction of deep well (12" x 200 m depth, screen: 80 m)	16 wells	70,629,000	1,130,064,000
1.2 Pump house 5.5 m x 4.0 m	16 Nos.	2,200,000	35,200,000
		Sub Total = $	1,165,264,000
2. Pump (Submersible pump with motor, column pipe, electric cables, base plate, water level indicator, check valve, gate valves, flow meter, station pipes) Q= 55 l/sec = 3.30 m3/min, Dia= 150 mm			
2.1 Pump (55 kw)	16 Nos.	71,190,000	1,139,040,000
2.2 Electrical facilities for the above (Including pump control panel, transformer, telemeter transfer panel, uninterrupted power supply)	16 units	34,408,500	550,536,000
		Sub Total = $	1,689,576,000
3. Power transmission line, including power cable, control cable for telemeter, wooden pole, insulator, etc.	1 lot		367,815,000
		Sub Total = $	367,815,000
4. Pipelines (ACP) within the well-field (Materials and Installation cost)			
4.1 800 mm ACP	750 m	113,689	85,267,000
4.2 600 mm ACP	1,000 m	70,208	70,208,000
4.3 450 mm ACP	2,000 m	53,491	106,982,000
4.4 350 mm ACP	2,000 m	36,545	73,090,000
4.5 250 mm ACP	4,000 m	19,749	78,996,000

Item	Q'ty	Unit Price ($)	Amount ($)
		Sub Total =	$ 414,543,000
5. Valves within the well-field			
5.1 Valve 800 mm (Butterfly)	1 No.	18,382,000	18,382,000
5.2 Valve 600 mm (")	2 Nos.	12,859,000	25,718,000
5.3 Valve 350 mm (Sluice)	8 Nos.	2,968,000	23,744,000
		Sub Total =	$ 67,844,000
6. Road and others			
6.1 Access road	500 m	4,942	2,471,000
6.2 Maintenance road	10,500 m	4,942	51,891,000
6.3 Asphalt pavement	2,200 m2	1,271	2,796,000
6.4 Boundary fence	6,400 m	18,589	118,970,000
6.5 Entrance gate	1 lot		791,000
		Sub Total =	$ 176,919,000
7. Miscellaneous Works	1 lot		260,000,000
Total of (A)			$ 4,141,961,000
(B) Transmission Pumps and Booster Pumps			
1. Transmission Pumps (350 mm x 10.5 m3/min x 102 m x 320 kw x 5 units)			
1.1 Mechanical equipment including transmission pump with motor, suction valve, delivery valve, check valve	5 units	96,897,000	484,485,000
1.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
1.3 Sub station (11 kv / 3,000 kvA) including incoming panel, receiving panel, transformer	1 lot		340,130,000
1.4 Electrical equipment including transmission pump control panel, intake pump feeder panel, low voltage panel, cables	1 lot		344,085,000

Item	Q'ty	Unit Price ($)	Amount ($)
1.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000
2. Booster Pumping Station (350 mm x 10.5 m3/min x 26 m x 75 kw x 5 units)			
2.1 Mechanical equipment including booster pump with motor, suction valve, delivery valve, check valve	5 units	56,161,000	280,805,500
2.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
2.3 Sub station (11 kv / 500 kvA) including incoming panel, receiving panel, transformer	1 lot		158,840,000
2.4 Electrical equipment including booster pump control panel, low voltage panel, cables	1 lot		189,840,000
2.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000
3. High voltage (23 kV) electric power line from Tamarugal Substation/ ELIQSA	20 km	7,900,000	158,000,000
Total of (B)			$ 3,092,265,000
(C) Transmission Pipeline (from Pintados to Cavancha/Iquique)			
1. Pipeline (DIP) from Pintados to Alto Hospicio (Materials and Installation cost)			
1.1 700 mm DIP (54,900 m x 2)	109,800 m	266,537	29,265,762,000
1.2 600 mm " (12,800 m x 2)	25,600 m	218,546	5,594,778,000
1.3 400 mm " (13,600 m x 2)	27,200 m	122,701	3,337,467,000
1.4 Pressure-reducing valve: 600	2 No.	64,902,000	129,804,000
1.5 " " " : 400	6 Nos.	27,404,000	164,424,000
1.6 Highway crossing work	2 sites	5,000,000	10,000,000
		Sub Total =	$ 38,502,235,000
2. Pipeline (DIP) from Alto Hospicio to Cavancha (Materials and Installation cost)		(Same as Alternative (1)) =	$ 864,920,000

Item	Q'ty	Unit Price ($)	Amount ($)
Total of (C)			$ 39,367,155,000
(D) Tanks (Collection / Transmission/ Break-pressure / Distribution Tanks) (RC: Reinforced Concrete)			
1. Tanks (Between Pintados and Alto Hospicio)			
1.1 1,250 m3 tank	8 Nos.	54,000,000	432,000,000
1.2 250 m3 "	6 Nos.	14,575,000	87,450,000
		Sub Total =	$ 519,450,000
2. Distribution Tanks (at Cavancha)			
2.1 7,500 m3 tank	4 Nos.	239,250,000	957,000,000
Total of (D)			$ 1,467,450,000
Grand Total (A+B+C+D)			$ 48,068,831,000
(Alternative (4) for Iquique Water Supply)			

Table DC-5 Construction Cost for Alternative (5)
- Iquique Water Supply Scheme
Salar del Huasco Water Source

Summary

Item	Amount (Peso:$)
(A) Well-Field (at Salar del Huasco)	$ 5,547,606,000
(B) Treatment Plant (at Salar del Huasco) Q=701 l/sec, Iron/manganese removal	$ 12,359,583,000
(C) Transmission Pumps (3 stations)	$ 6,429,595,000
(D) Transmission Pipeline (from Salar del Huasco to Cavancha/Iquique)	$ 63,467,908,000
(E) Tanks (Transmission/ Break-pressure / Distribution Tanks)	$ 2,179,400,000
Total (A+B+C+D+E) (Alternative (5) for Iquique Water Supply)	$ 89,984,092,000

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
US$1.00 = Chile Peso: $435.00
US$1.00 = Japanese Yen: ¥110.00
Japanese Yen 1.00 = Chile Peso: $3.955

Table DC-5' Cost Estimation for Alternative (5), Iquique Water Supply (Water Source: Salar del Huasco)

(Note): - Cost : as of March 1994
- Cost without Value Added Tax (IVA)
- Foreign exchange rate (as of March 1994):
  US$1.00 = Chile Peso: $435.00
  US$1.00 = Japanese Yen: ¥110.00
  Japanese Yen 1.00 = Chile Peso: $3.955

Item	Q'ty	Unit Price ($)	Amount ($)
(A) Well-Field (at Salar del Huasco)			
1. Deep Wells			
1.1 Construction of deep well (12" x 150 m depth, screen: 60 m)	8 wells	57,378,000	459,024,000
1.2 Construction of deep well (12" x 200 m depth, screen: 60 m)	14 wells	68,078,000	953,092,000
1.3 Pump house 5.5 m x 4.0 m	22 Nos.	2,200,000	48,400,000
		Sub Total =	$ 1,460,516,000
2. Pumps (Submersible pump with motor, column pipe, electric cables, base plate, water level indicator, check valve, gate valves, flow meter, station pipes) Q= 40 l/sec = 2.40 m3/min, Dia= 150 mm			
2.1 Pump (55 kw)	7 Nos.	59,325,000	415,275,000
2.2 Pump (45 kw)	2 "	55,370,000	110,740,000
2.3 Pump (37 kw)	13 "	51,415,000	668,395,000
		Sub Total =	$ 1,194,410,000
3. Electrical facilities for the above (Including pump control panel, transformer, telemeter transfer panel, uninterrupted power supply)			
3.1 For 55 kw pumps	7 units	34,408,500	240,859,500
3.2 For 45 kw pumps	2 "	31,640,000	63,280,000
3.3 For 37 kw pumps	13 "	31,640,000	411,320,000
		Sub Total =	$ 715,460,000
4. Power transmission line, including power cable, control cable for telemeter, wooden pole, insulator, etc.	1 lot		1,040,165,000

Item	Q'ty	Unit Price ($)	Amount ($)
		Sub Total =	$ 1,040,165,000
5. Junction tank within the well-field			
5.1 V=27.0 m3 (RC)	17 Nos.	3,399,879	57,798,000
5.2 V=52.5 m3 (RC)	2 Nos.	4,627,613	9,255,000
5.3 V=84.0 m3 (RC)	2 Nos.	5,702,140	11,404,000
		Sub Total =	$ 78,457,000
6. Pipelines (ACP) within the well-field (Materials and Installation cost)			
6.1 800 mm ACP	2,350 m	113,689	267,169,000
6.2 600 mm ACP	1,000 m	70,208	70,208,000
6.3 500 mm ACP	1,150 m	59,053	67,911,000
6.4 400 mm ACP	1,000 m	45,393	45,393,000
6.5 350 mm ACP	200 m	36,545	7,309,000
6.6 300 mm ACP	7,650 m	29,514	225,782,000
6.7 250 mm ACP	2,500 m	19,749	49,373,000
6.8 200 mm ACP	7,100 m	14,672	104,171,000
6.9 150 mm ACP	660 m	10,758	7,100,000
		Sub Total =	$ 844,416,000
7. Valves within the well-field (Stop valves around Junction Tank)			
7.1 Valve 800 mm (Butterfly)	2 Nos.	18,382,000	36,764,000
7.2 Valve 600 mm (")	2 Nos.	12,859,000	25,718,000
7.3 Valve 500 mm (Sluice)	2 Nos.	9,396,000	18,792,000
7.4 Valve 400 mm (")	2 Nos.	4,115,000	8,230,000
7.5 Valve 350 mm (")	1 No.	2,968,000	2,968,000
7.6 Valve 300 mm (")	12 Nos.	2,271,000	27,252,000
7.7 Valve 250 mm (")	5 Nos.	1,601,000	8,005,000
7.8 Valve 200 mm (")	5 Nos.	982,000	4,910,000
		Sub Total =	$ 132,639,000
8. Maintenance road	16,500 m	4,942	81,543,000
Total of (A)			$ 5,547,606,000
(B) Treatment Plant (at Salar del Huasco) For iron/manganese removal (Capacity: Q= 701 l/sec = 60,570 m3/day)			
1. Civil works	1 lot		3,151,694,000
2. Building works	1 lot		1,915,735,000
3. Mechanical equipment	1 lot		4,511,248,000
4. Electric equipment	1 lot		2,780,906,000

Item	Q'ty	Unit Price ($)	Amount ($)
Total of (B)			$ 12,359,583,000
(C) Transmission Pumps and Booster Pumps			
1. Transmission Pumps (No.1 Station) (350 mm x 10.5 m3/min x 165 m x 550 kw x 5 units)			
1.1 Mechanical equipment including transmission pump with motor, suction valve, delivery valve, check valve	5 units	142,380,000	711,900,000
1.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
1.3 Sub station (11 kv / 3,500 kvA) including incoming panel, receiving panel, transformer	1 lot		395,500,000
1.4 Electrical equipment including transmission pump control panel, intake pump feeder panel, low voltage panel, cables	1 lot		387,590,000
1.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000
		Sub Total =	$ 2,063,030,000
2. Transmission Pumps (No.2 Station) (350 mm x 10.5 m3/min x 165 m x 550 kw x 5 units)			
2.1 Mechanical equipment including booster pump with motor, suction valve, delivery valve, check valve	5 units	142,380,000	711,900,000
2.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
2.3 Sub station (11 kv / 3,500 kvA) including incoming panel, receiving panel, transformer	1 lot		395,500,000

Item	Q'ty	Unit Price ($)	Amount ($)
2.4 Electrical equipment including booster pump control panel, low voltage panel, cables	1 lot		387,590,000
2.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000
		Sub Total =	$ 2,063,030,000
3. Transmission Pumps (No.3 Station) (350 mm x 10.5 m3/min x 115 m x 330 kw x 5 units)			
3.1 Mechanical equipment including booster pump with motor, suction valve, delivery valve, check valve	5 units	100,457,000	502,285,000
3.2 Accessories for the above including header pipe valve, flow meter, station pipes, overhead electrical crane, etc.	1 lot		348,040,000
3.3 Sub station (11 kv / 2,500 kvA) including incoming panel, receiving panel, transformer	1 lot		340,130,000
3.4 Electrical equipment including booster pump control panel, low voltage panel, cables	1 lot		300,580,000
3.5 Pump house construction 44 m x 10 m x 10 m (h)	1 lot		220,000,000
		Sub Total =	$ 1,711,035,000
4. High voltage (23 kV) electric power line from Pica Substation/ ELIQSA	75 km	7,900,000	592,500,000
Total of (C)			$ 6,429,595,000
(D) Transmission Pipeline (from Salar del Huasco to Cavancha/Iquique)			
1. Pipeline (DIP) from Salar del Huasco to Alto Hospicio (Materials and Installation cost)			
1.1 700 mm DIP (22,900+48,250)x2	142,300 m	266,537	37,928,215,000
1.2 500 mm " (26,750 m x 2)	53,500 m	167,677	8,970,720,000
1.3 400 mm " (46,300+13,500)x2	119,600 m	122,701	14,675,039,000

Item	Q'ty	Unit Price ($)	Amount ($)
1.4 Pressure-reducing valve: 500 (with a strainer)	2 Nos.	43,639,000	87,278,000
1.5 " " " : 400	34 Nos.	27,404,000	931,736,000
1.6 Highway crossing work	2 sites	5,000,000	10,000,000
		Sub Total =	$ 62,602,988,000
2. Pipeline (DIP) from Alto Hospicio to Cavancha (Materials and Installation cost)		(Same as Alternative (1)) =	$ 864,920,000
Total of (D)			$ 63,467,908,000

(E) Tanks
(Collection / Transmission/ Break-pressure / Distribution Tanks)
(RC: Reinforced Concrete)

1. Tanks (Between Salar del Huasco and Alto Hospicio)			
1.1 1,250 m3 tank	14 Nos.	54,000,000	756,000,000
1.2 250 m3 "	32 Nos.	14,575,000	466,400,000
		Sub Total =	$ 1,222,400,000
2. Distribution Tanks (at Cavancha)			
2.1 7,500 m3 tank	4 Nos.	239,250,000	957,000,000
Total of (E)			$ 2,179,400,000

Grand Total (A+B+C+D+E) ..... $ 89,984,092,000
(Alternative (5) for Iquique Water Supply)

Table DC-6 Construction Cost of Deep Wells

(1) Scheme: Lower Lluta Scheme for Arica Water Supply
Water Source : Lower Lluta Basin

Number and Depth of Deep Wells:
(a) 150 m deep (screen 45 m + casing 105 m) x 8 wells = 1,200 m
(b) 120 m deep (screen 36 m + casing 84 m) x 18 wells = 2,160 m
Total 26 wells --> 3,360 m

Construction Cost

Item	Q'ty	Unit Price (US$)	Amount (US$)
1. Mobilization to the site	1 lot		36,500
2. Installation	26 sites	3,000	78,000
3. Drilling work	3,360 m	350	1,176,000
4. Well logging	1 lot		163,100
5. Casing and screen			
5.1 Casing pipe	1,008 m	70	70,560
5.2 Screen	2,352 m	330	776,160
5.3 Installation of screen and casing pipes	3,360 m	30	100,800
5.4 Gravel packing	390 m3	550	214,500
6. Well development (15 hours)	26 wells	4,500	117,000
7. Pumping test	26 wells	20,000	520,000
8. Transfer between the sites	25 sites	2,230	55,750
9. Construction of well head	26 wells	1,000	26,000
10. Demobilization from the site	1 lot		36,500
		Total =	US$ 3,370,870

Breakdown:
(a) (150 m depth well) x (8 wells) --> US$ 1,150,260 / 8 wells
= US$ 143,783 /well

(b) (120 m depth well) x (18 wells) --> US$ 2,220,610 / 18 wells
= US$ 123,367 /well

(2) Scheme: Alternative (1) or (2) for Iquique Water Supply Scheme
Water Source : La Tirana (Pampa del Tamarugal - North)
or,
Scheme: Alternative (3) or (4) for Iquique Water Supply Scheme
Water Source : Pintados (Pampa del Tamarugal - South)

Number and Depth of Deep Wells for Each Scheme:
200 m deep (screen 80 m + casing 120 m) x 16 wells = 3,200 m

Total 16 wells --> 3,200 m

Construction Cost

Item	Q'ty	Unit Price (US$)	Amount (US$)
1. Mobilization to the site	1 lot		36,500
2. Installation	16 sites	3,000	48,000
3. Drilling work	3,200 m	350	1,120,000
4. Well logging	1 lot		130,600
5. Casing and screen			
5.1 Casing pipe	1,920 m	70	134,400
5.2 Screen	1,280 m	330	422,400
5.3 Installation of screen and casing pipes	3,200 m	30	96,000
5.4 Gravel packing	240 m3	550	132,000
6. Well development (15 hours)	16 wells	4,500	72,000
7. Pumping test	16 wells	20,000	320,000
8. Transfer between the sites	15 sites	2,230	33,450
9. Construction of well head	16 wells	1,000	16,000
10. Demobilization from the site	1 lot		36,500
		Total =	US$ 2,597,850

Breakdown:
US$ 2,597,850 / 16 wells = US$ 162,365 /well

(3) Scheme: Alternative (5) for Iquique Water Supply Scheme
Water Source : Salar del Huasco

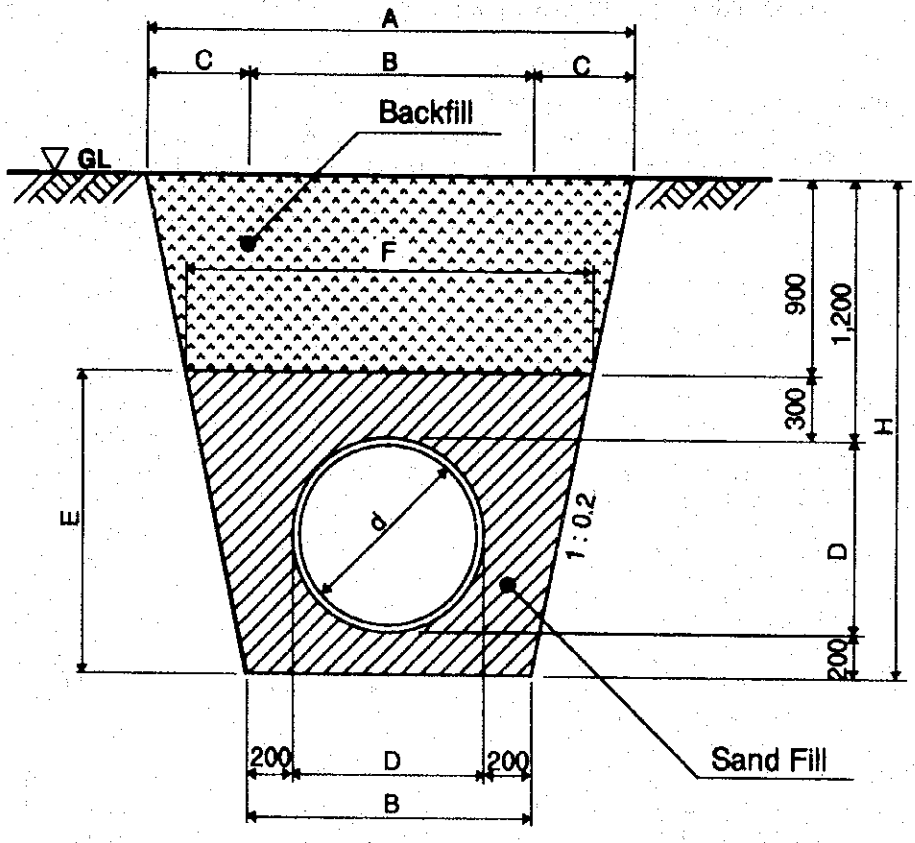
Number and Depth of Deep Wells:
(a) 150 m deep (screen 60 m + casing 90 m) x 8 wells = 1,200 m
(b) 200 m deep (screen 60 m + casing 140 m) x 14 wells = 2,800 m
Total 22 wells --> 4,000 m

Construction Cost

Item	Q'ty	Unit Price (US$)	Amount (US$)
1. Mobilization to the site	1 lot		40,000
2. Installation	22 sites	3,000	66,000
3. Drilling work	4,000 m	350	1,400,000
4. Well logging	1 lot		167,700
5. Casing and screen			
5.1 Casing pipe	2,680 m	70	187,600
5.2 Screen	1,320 m	330	435,600
5.3 Installation of screen and casing pipes	4,000 m	30	120,000
5.4 Gravel packing	330 m3	550	181,500
6. Well development (15 hours)	22 wells	4,500	99,000
7. Pumping test	22 wells	20,000	440,000
8. Transfer between the sites	21 sites	2,230	46,830
9. Construction of well head	22 wells	1,000	22,000
10. Demobilization from the site	1 lot		40,000
		Total =	US$ 3,246,230

Breakdown:
(a) (150 m depth well) x (8 wells) --> US$ 1,055,230 / 8 wells
= US$ 131,904 /well

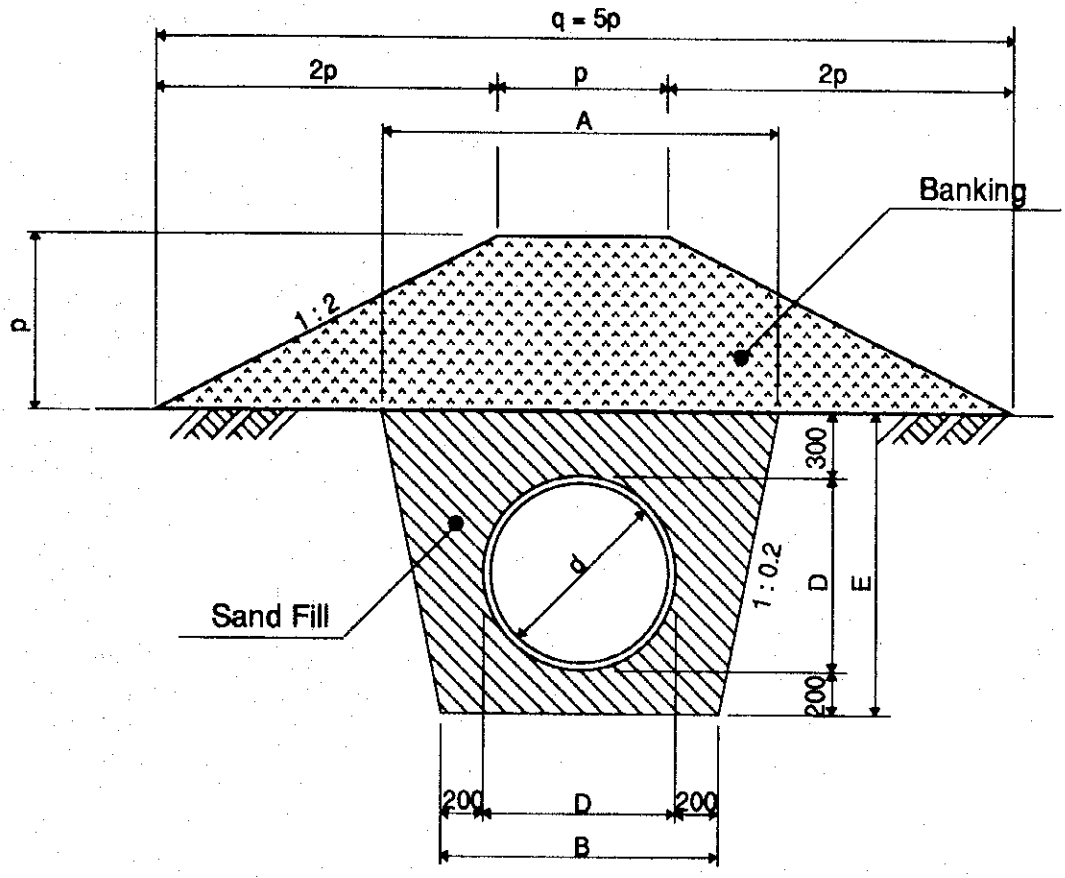
(b) (200 m depth well) x (14 wells) --> US$ 2,191,000 / 14 wells
= US$ 156,500 /well



Dimensions

d	D	B	H	C	A	E	F
Nominal Diameter	Outside Diameter	Width of Bed	Depth		Width of Top	Depth of Sand	Width of Sand
150 mm	0.169 m	0.569 m	1.569 m	0.314 m	1.197 m	0.669 m	0.837 m
200 mm	0.220 m	0.620 m	1.620 m	0.324 m	1.268 m	0.720 m	0.908 m
250 mm	0.272 m	0.672 m	1.672 m	0.334 m	1.340 m	0.772 m	0.981 m
300 mm	0.326 m	0.726 m	1.726 m	0.345 m	1.416 m	0.826 m	1.056 m
350 mm	0.378 m	0.778 m	1.778 m	0.356 m	1.490 m	0.878 m	1.129 m
400 mm	0.429 m	0.829 m	1.829 m	0.366 m	1.561 m	0.929 m	1.201 m
450 mm	0.480 m	0.880 m	1.880 m	0.376 m	1.632 m	0.980 m	1.272 m
500 mm	0.532 m	0.932 m	1.932 m	0.386 m	1.704 m	1.032 m	1.345 m
600 mm	0.635 m	1.035 m	2.035 m	0.407 m	1.849 m	1.135 m	1.489 m
700 mm	0.738 m	1.138 m	2.138 m	0.428 m	1.994 m	1.238 m	1.633 m
800 mm	0.842 m	1.242 m	2.242 m	0.448 m	2.138 m	1.342 m	1.779 m
900 mm	0.945 m	1.345 m	2.345 m	0.469 m	2.283 m	1.445 m	1.923 m
1,000 mm	1.048 m	1.448 m	2.448 m	0.490 m	2.428 m	1.548 m	2.067 m

Fig. DC - 1 Pipe Laying Work Standard for DIP - Trench Type



Dimensions

d	D	B	E	A	p	q
Nominal Diameter	Outside Diameter	Width of Bed	Depth of Trench	Width of Top	Height of Bank	Width of Bank Bed
150 mm	0.169 m	0.569 m	0.669 m	0.837 m	0.395 m	1.975 m
200 mm	0.220 m	0.620 m	0.720 m	0.908 m	0.428 m	2.140 m
250 mm	0.272 m	0.672 m	0.772 m	0.981 m	0.461 m	2.305 m
300 mm	0.326 m	0.726 m	0.826 m	1.056 m	0.495 m	2.475 m
350 mm	0.378 m	0.778 m	0.878 m	1.129 m	0.525 m	2.625 m
400 mm	0.429 m	0.829 m	0.929 m	1.201 m	0.560 m	2.800 m
450 mm	0.480 m	0.880 m	0.980 m	1.272 m	0.590 m	2.950 m
500 mm	0.532 m	0.932 m	1.032 m	1.345 m	0.625 m	3.125 m
600 mm	0.635 m	1.035 m	1.135 m	1.489 m	0.690 m	3.450 m
700 mm	0.738 m	1.138 m	1.238 m	1.633 m	0.755 m	3.775 m
800 mm	0.842 m	1.242 m	1.342 m	1.779 m	0.820 m	4.100 m
900 mm	0.945 m	1.345 m	1.445 m	1.923 m	0.885 m	4.425 m
1,000 mm	1.048 m	1.448 m	1.548 m	2.067 m	0.950 m	4.750 m

Fig. DC - 2 Pipe Laying Work Standard for DIP - Banking Type

Table DC-7 Estimation of Unit Cost for Pipe Laying Work

Summary of Unit Cost for Pipe Laying Work

Nominal Diameter	Ductile Cast Iron Pipe (DIP)		Asbestos Cement Pipe (ACP)	
	(1)	(2)	(3)	(4)
	Trench Type ($/m)	Banking Type ($/m)	Trench Type ($/m)	Banking Type ($/m)
150 mm	37,093	34,620	13,231	10,758
200 mm	49,022	46,286	17,408	14,672
250 mm	62,928	60,086	22,591	19,749
300 mm	78,933	75,693	32,754	29,514
350 mm	98,862	95,366	40,041	36,545
400 mm	117,517	113,741	49,169	45,393
450 mm	138,923	134,856	57,558	53,491
500 mm	161,525	157,154	63,424	59,053
600 mm	211,386	206,377	75,217	70,208
700 mm	272,224	266,537	94,356	88,669
800 mm	337,075	330,666	120,098	113,689
900 mm	386,534	379,366	139,547	132,379
1,000 mm	465,525	457,542	168,470	160,487

(Note):
- Above costs consist of pipe materials and installation cost.
- Costs do not include the Value Added Tax (IVA).
- $: Chilean Peso
- Foreign Currency Exchange Rate (as of March 1994)
  US $1.00 = Peso $435.00
  US $1.00 = Japanese Yen ¥110.00
  ¥ 1.00 = $3.955

Trench Type (Full Earth Covering Type) Work

Dimensions

d	D	a	B=D+0.4	H=D+1.4	C=Hx0.2	A=B+2C	E=D+0.5
Nominal Diameter	Outside Diameter	Area for D	Width of Bed	Depth		Width of Top	Depth of Sand
150 mm	0.169 m	0.0224 m2	0.569 m	1.569 m	0.314 m	1.197 m	0.669 m
200 mm	0.220	0.0380	0.620	1.620	0.324	1.268	0.720
250 mm	0.272	0.0581	0.672	1.672	0.334	1.340	0.772
300 mm	0.326	0.0834	0.726	1.726	0.345	1.416	0.826
350 mm	0.378	0.112	0.778	1.778	0.356	1.490	0.878
400 mm	0.429	0.144	0.829	1.829	0.366	1.561	0.929
450 mm	0.480	0.181	0.880	1.880	0.376	1.632	0.980
500 mm	0.532	0.222	0.932	1.932	0.386	1.704	1.032
600 mm	0.635	0.317	1.035	2.035	0.407	1.849	1.135
700 mm	0.738	0.428	1.138	2.138	0.428	1.994	1.238
800 mm	0.842	0.557	1.242	2.242	0.448	2.138	1.342
900 mm	0.945	0.701	1.345	2.345	0.469	2.283	1.445
1,000 mm	1.048	0.862	1.448	2.448	0.490	2.428	1.548

d	K =(1/2)x(A+B)xH	F=B+2Ex0.2	S=(1/2)x (B+F)E	V=(S-a)	L= (K-S)
Nominal Diameter	Excavation	Width of Sand	Soil Disposal	Sand Volume	Backfill Volume
150 mm	1.385 m3/m	0.837 m	0.470 m3/m	0.448 m3/m	0.915 m3/m
200 mm	1.529	0.908	0.550	0.512	0.979
250 mm	1.682	0.981	0.638	0.580	1.044
300 mm	1.849	1.056	0.736	0.653	1.113
350 mm	2.016	1.129	0.837	0.725	1.179
400 mm	2.186	1.201	0.943	0.799	1.243
450 mm	2.361	1.272	1.054	0.873	1.307
500 mm	2.546	1.345	1.175	0.953	1.371
600 mm	2.934	1.489	1.432	1.115	1.502
700 mm	3.348	1.633	1.715	1.289	1.633
800 mm	3.789	1.779	2.027	1.470	1.762
900 mm	4.254	1.923	2.361	1.660	1.893
1,000 mm	4.744	2.067	2.721	1.859	2.023

Excavation

Nominal Diameter	Total Excavation Volume	Manual Excavation (1)			Machine Excavation (2)			(1)+(2)
		Volume (10%)	Unit Price	Amount	Volume (90%)	Unit Price	Amount	Total amount
	m3	m3	$/m3	$	m3	$/m3	$	$
150 mm	1.385	0.139	2,476	344	1.246	1,238	1,543	1,887
200 mm	1.529	0.153	"	378	1.376	"	1,703	2,081
250 mm	1.682	0.168	"	416	1.514	"	1,874	2,290
300 mm	1.849	0.185	"	485	1.664	"	2,060	2,545
350 mm	2.016	0.202	"	500	1.814	"	2,246	2,746
400 mm	2.186	0.219	"	542	1.967	"	2,435	2,977
450 mm	2.361	0.236	"	584	2.125	"	2,631	3,215
500 mm	2.546	0.255	"	631	2.291	"	2,836	3,467
600 mm	2.934	0.293	"	725	2.641	"	3,270	3,995
700 mm	3.348	0.335	"	829	3.013	"	3,730	4,559
800 mm	3.789	0.379	"	938	3.410	"	4,222	5,160
900 mm	4.254	0.425	"	1,052	3.829	"	4,740	5,792
1,000 mm	4.744	0.474	"	1,174	4.270	"	5,286	6,460

Soil Disposal and Sand Filling

Nominal Diameter	Soil Disposal by Dumptruck			Sand Filling Work		
	Volume of Soil Disposal	Unit Price	Amount	Sand Volume	Unit Price	Amount
	m3	$/m3	$	m3	$/m3	$
150 mm	0.470	1,800	846	0.448	(5,370+499)	2,629
200 mm	0.550	"	990	0.512	"	3,005
250 mm	0.638	"	1,148	0.580	"	3,404
300 mm	0.736	"	1,325	0.653	"	3,832
350 mm	0.837	"	1,507	0.725	"	4,255
400 mm	0.943	"	1,697	0.799	"	4,689
450 mm	1.054	"	1,897	0.873	"	5,124
500 mm	1.175	"	2,115	0.953	"	5,593
600 mm	1.432	"	2,578	1.115	"	6,544
700 mm	1.715	"	3,087	1.289	"	7,565
800 mm	2.027	"	3,649	1.470	"	8,627
900 mm	2.361	"	4,250	1.660	"	9,743
1,000 mm	2.721	"	4,898	1.859	"	10,910

Pipe Laying Work (including joint work)
per 10 m length

(per 10 meters)

Nominal Diameter	Piping Worker (1)			Helper (2)			(1) + (2)
	Worker	Wage	Amount	Helper	Wage	Amount	Sub total
	Days	$/day	$	Days	$/day	$	$
150 mm	0.12	5,635	676	0.16	3,798	608	1,284
200	0.14	"	789	0.18	"	684	1,473
250	0.14	"	789	0.24	"	912	1,701
300	0.18	"	1,014	0.34	"	1,291	2,305
350	0.24	"	1,352	0.40	"	1,519	2,871
400	0.30	"	1,691	0.46	"	1,747	3,438
450	0.36	"	2,029	0.52	"	1,975	4,004
500	0.40	"	2,254	0.58	"	2,203	4,457
600	0.48	"	2,705	0.72	"	2,735	5,440
700	0.58	"	3,268	0.86	"	3,266	6,534
800	0.68	"	3,832	1.04	"	3,950	7,782
900	0.80	"	4,508	1.22	"	4,634	9,142
1,000	0.96	"	5,410	1.46	"	5,545	10,955

Nominal Diameter	Machine (Crane) (3)			Total = (1)+(2)+(3)	
	Duration	Unit price	Amount	per 10 m	per meter
	Hours	$/hour	$	$/10 m	$/m
150 mm	1.34	16,000	21,440	22,724	2,272
200	1.41	"	22,560	24,033	2,403
250	1.47	"	23,520	25,221	2,522
300	1.54	"	24,640	26,945	2,695
350	1.61	"	25,760	28,631	2,863
400	1.68	"	26,880	30,318	3,031
450	1.74	"	27,840	31,844	3,184
500	1.81	"	28,960	33,417	3,342
600	1.94	"	31,040	36,480	3,648
700	2.08	"	33,280	39,814	3,981
800	2.21	"	35,360	43,142	4,314
900	2.35	"	37,600	46,742	4,674
1,000	2.55	"	40,800	51,755	5,176

Backfilling

Nominal Diameter	Backfill Volume	Manpower (1)			Machine (2)			(1)+(2)
		Volume (10%)	Unit cost	Amount	Volume (90%)	Unit cost	Amount	Total amount
		m3	$/m3	$	m3	$/m3	$	$
150 mm	0.915	0.092	499	46	0.823	250	206	252
200	0.979	0.098	"	49	0.881	"	220	269
250	1.044	0.104	"	52	0.940	"	235	287
300	1.113	0.111	"	55	1.002	"	251	306
350	1.179	0.118	"	59	1.061	"	265	324
400	1.243	0.124	"	62	1.119	"	280	342
450	1.307	0.131	"	65	1.176	"	294	359
500	1.371	0.137	"	68	1.234	"	309	377
600	1.502	0.150	"	75	1.352	"	338	413
700	1.633	0.163	"	81	1.470	"	368	449
800	1.762	0.176	"	88	1.586	"	397	485
900	1.893	0.189	"	94	1.704	"	426	520
1,000	2.023	0.202	"	101	1.821	"	455	556

Summary of Pipe Trench Work - Unit Price per Meter

	(1)	(2)	(3)	(4)	(5)	Total
Nominal Diameter	Pipe laying	Excavation	Sand filling	Backfill	Soil Disposal	
	$/m	$/m	$/m	$/m	$/m	$/m
150 mm	2,272	1,887	2,629	252	846	7,886
200	2,403	2,081	3,005	269	990	8,748
250	2,522	2,290	3,404	287	1,148	9,651
300	2,695	2,545	3,822	306	1,325	10,693
350	2,863	2,746	4,255	324	1,507	11,695
400	3,031	2,977	4,689	342	1,697	12,736
450	3,184	3,215	5,124	359	1,897	13,779
500	3,342	3,467	5,593	377	2,115	14,894
600	3,648	3,995	6,544	413	2,578	17,178
700	3,981	4,559	7,565	449	3,087	19,641
800	4,314	5,160	8,627	485	3,649	22,235
900	4,674	5,792	9,743	520	4,250	24,979
1,000	5,176	6,460	10,910	556	4,898	28,000

Pipe Material Cost (DIP)

Nominal Diameter	CIF Chile Price of Pipes				Inland Cost for Pipes		
	Pipes + Poly sleeve = Total				Volume weight	Unit cost	Amount
	Japanese Yen			Chile Peso			
	(¥/m)	+ (¥/m)	= (¥/m)	($/m)	(ton/m)	($/ton)	($/m)
150 mm	6,292	+ 340	= 6,632	26,230	0.041	7,200	295
200	8,731	+ 398	= 9,139	36.145	0.065	"	468
250	11,641	+ 451	= 12,092	47,824	0.096	"	691
300	14,946	+ 501	= 15,447	61,093	0.131	"	943
350	19,182	+ 530	= 19,712	77,961	0.178	"	1,282
400	23,125	+ 550	= 23,675	93,635	0.225	"	1,620
450	27,637	+ 626	= 28,263	111,780	0.276	"	1,987
500	32,360	+ 731	= 33,091	130,875	0.337	"	2,426
600	42,946	+ 837	= 43,783	173,162	0.471	"	3,391
700	55,968	+ 958	= 56,926	225,142	0.636	"	4,479
800	69,702	+ 1,105	= 70,807	280,041	0.818	"	5,890
900	80,019	+ 1,227	= 81,246	321,328	1.022	"	7,358
1,000	96,872	+ 1,405	= 98,277	388,685	1.259	"	9,065

Exchange Rate as of February 1994
US$ 1.00 = Japanese Yen: ¥ 110.0/US$
US$ 1.00 = Chilean Peso: $ 435.0/US$
Yen 1.00 = Chilean Peso $ 3.955/Yen

Nominal Diameter	Pipe Cost			Fittings Cost (10%)	Total cost of pipes and fittings
	($/m)	+ ($/m)	= ($/m)	($/m)	($/m)
150 mm	26,230	+ 295	= 26,525	2,653	29,178
200	36,145	+ 468	= 36,613	3,661	40,274
250	47,824	+ 691	= 48,515	4,852	53,367
300	61,093	+ 943	= 62,036	6,204	68,240
350	77,961	+ 1,282	= 79,243	7,924	87,167
400	93,635	+ 1,620	= 95,255	9,526	104,781
450	111,780	+ 1,987	= 113,767	11,377	125,144
500	130,875	+ 2,426	= 133,301	13,330	146,631
600	173,162	+ 3,391	= 176,553	17,655	194,208
700	225,142	+ 4,479	= 229,621	22,962	252,583
800	280,041	+ 5,890	= 286,218	28,622	314,840
900	321,328	+ 7,358	= 328,686	32,869	361,555
1,000	388,685	+ 9,065	= 397,750	39,775	437,525

Summary of Pipe (DIP) - Trench Type Installation Cost

Nominal Diameter	(1) Material Cost ($/m)	(2) Installation Cost ($/m)	(3)=(1)+(2) Total ($/m)
150 mm	29,178	7,915	37,093
200	40,274	8,748	49,022
250	53,367	9,561	62,928
300	68,240	10,693	78,933
350	87,167	11,695	98,862
400	104,781	12,736	117,517
450	125,144	13,779	138,923
500	146,631	14,894	161,525
600	194,208	17,178	211,386
700	252,583	19,641	272,224
800	314,840	22,235	337,075
900	361,555	24,979	386,534
1,000	437,525	28,000	465,525

Banking Type Work

Dimensions

d	D	a	B=D+0.4	E=D+0.5	A=B+2Ex0.2
Nominal Diameter	Outside Diameter	Area for D	Width of Bed	Depth of Trench	Width of Top
150 mm	0.169 m	0.0224 m2	0.569 m	0.669 m	0.837 m
200 mm	0.220	0.0380	0.620	0.720	0.908
250 mm	0.272	0.0581	0.672	0.772	0.981
300 mm	0.326	0.0834	0.726	0.826	1.056
350 mm	0.378	0.112	0.778	0.878	1.129
400 mm	0.429	0.144	0.829	0.929	1.201
450 mm	0.480	0.181	0.880	0.980	1.272
500 mm	0.532	0.222	0.932	1.032	1.345
600 mm	0.635	0.317	1.035	1.135	1.489
700 mm	0.738	0.428	1.138	1.238	1.633
800 mm	0.842	0.557	1.242	1.342	1.779
900 mm	0.945	0.701	1.345	1.445	1.923
1,000 mm	1.048	0.862	1.448	1.548	2.067

d	K	S=K-a	p	q=5xp	V	
Nominal Diameter	Excavation (1/2)x(A+B)E	Sand Volume	Height of Bank	Width of Bank Bed	Bank Volume	Soil Disposal
150 mm	0.470 m3/m	0.448 m3/m	0.395 m	1.975 m	0.468 m3/m	-
200 mm	0.550	0.512	0.428	2.140	0.550	-
250 mm	0.638	0.580	0.461	2.305	0.638	-
300 mm	0.736	0.653	0.495	2.475	0.735	-
350 mm	0.837	0.725	0.525	2.625	0.827	-
400 mm	0.943	0.798	0.560	2.800	0.941	-
450 mm	1.054	0.873	0.590	2.950	1.044	-
500 mm	1.175	0.953	0.625	3.125	1.172	-
600 mm	1.432	1.115	0.690	3.450	1.428	-
700 mm	1.715	1.289	0.755	3.755	1.710	-
800 mm	2.027	1.470	0.820	4.100	2.017	-
900 mm	2.361	1.660	0.885	4.425	2.350	-
1,000 mm	2.721	1.859	0.950	4.750	2.708	-

Excavation

Nominal Diameter	Total Excavation Volume	Manual Excavation (1) Volume (10%)	Unit Price	Amount	Machine Excavation (2) Volume (90%)	Unit Price	Amount	(1)+(2) Total amount
	m3	m3	$/m3	$	m3	$/m3	$	$
150 mm	0.470	0.047	2,476	116	0.423	1,238	524	640
200 mm	0.550	0.055	"	136	0.495	"	557	693
250 mm	0.638	0.064	"	158	0.574	"	711	869
300 mm	0.736	0.074	"	183	0.662	"	820	1,003
350 mm	0.837	0.084	"	208	0.753	"	932	1,140
400 mm	0.943	0.094	"	233	0.849	"	1,051	1,284
450 mm	1.054	0.105	"	260	0.949	"	1,175	1,435
500 mm	1.175	0.118	"	292	1.057	"	1,308	1,600
600 mm	1.432	0.143	"	354	1.289	"	1,596	1,950
700 mm	1.715	0.172	"	426	1.543	"	1,910	2,336
800 mm	2.027	0.203	"	503	1.824	"	2,258	2,761
900 mm	2.361	0.236	"	584	2.125	"	2,631	3,215
1,000 mm	2.721	0.272	"	673	2.449	"	3,032	3,705

Banking Work

Nominal Diameter	Banking Volume	Manpower (1) Volume (10%)	Unit cost	Amount	Machine (2) Volume (90%)	Unit cost	Amount	(1)+(2) Total amount
	m3	m3	$/m3	$	m3	$/m3	$	$
150 mm	0.468	0.047	499	23	0.421	250	105	128
200 mm	0.550	0.055	"	27	0.495	"	124	151
250 mm	0.638	0.064	"	32	0.574	"	144	176
300 mm	0.735	0.074	"	37	0.661	"	165	202
350 mm	0.827	0.083	"	41	0.744	"	186	227
400 mm	0.941	0.094	"	47	0.847	"	212	259
450 mm	1.044	0.104	"	52	0.940	"	235	287
500 mm	1.172	0.117	"	58	1.055	"	264	322
600 mm	1.428	0.143	"	71	1.285	"	321	392
700 mm	1.710	0.171	"	85	1.539	"	385	470
800 mm	2.017	0.202	"	101	1.815	"	454	555
900 mm	2.350	0.235	"	117	2.115	"	529	646
1,000 mm	2.708	0.271	"	135	2.437	"	609	744

Summary of Pipe (DIP) - Banking Type Installation Cost

Nominal Diameter	(1) Pipe laying	(2) Excavation	(3) Sand filling	(4) Banking	(5) Sub Total	(6) Material Cost	(7)=(5)+(6) Total
	$/m	$/m	$/m	$/m	$/m	$/m	$/m
150 mm	2,045	640	2,629	128	5,442	29,178	34,620
200	2,163	693	3,005	151	6,012	40,274	46,286
250	2,270	869	3,404	176	6,719	53,367	60,086
300	2,426	1,003	3,822	202	7,453	68,240	75,693
350	2,577	1,140	4,255	227	8,199	87,167	95,366
400	2,728	1,284	4,689	259	8,960	104,781	113,741
450	2,866	1,435	5,124	287	9,712	125,144	134,856
500	3,008	1,600	5,593	322	10,523	146,631	157,154
600	3,283	1,950	6,544	392	12,169	194,208	206,377
700	3,583	2,336	7,565	470	13,954	252,583	266,537
800	3,883	2,761	8,627	555	15,826	314,840	330,666
900	4,207	3,215	9,743	646	17,811	361,555	379,366
1,000	4,658	3,705	10,910	744	20,017	437,525	457,542

(Note): (1) = 90% of Trench Work Type
(3) = Same as that of Trench Work Type

Summary of Pipe (DIP) - Banking Type Installation Cost for Mountainous Area

Nominal Diameter	(1) Pipe laying	(2) Excavation	(3) Sand filling	(4) Banking	(5) Sub Total	(6) Material Cost	(7)=(5)+(6) Total
	$/m	$/m	$/m	$/m	$/m	$/m	$/m
150 mm	4,090	1,280	5,258	256	10,884	29,178	40,162
200	4,326	1,368	6,010	302	12,024	40,274	52,298
250	4,540	1,738	6,808	352	13,438	53,367	66,805
300	4,852	2,006	7,664	404	14,906	68,240	83,146
350	5,154	2,280	8,510	454	16,398	87,167	103,565
400	5,456	2,568	9,358	518	17,920	104,781	122,701
450	5,732	2,870	10,248	574	19,424	125,144	144,568
500	6,016	3,200	11,186	644	21,046	146,631	167,677
600	6,566	3,900	13,088	784	24,338	194,208	218,546
700	7,166	4,672	15,130	940	27,908	252,583	280,491
800	7,766	5,522	17,254	1,110	31,652	314,840	346,492
900	8,414	6,430	19,486	1,292	35,622	361,555	397,177
1,000	9,316	7,410	21,820	1,488	40,034	437,525	477,559

Asbestos Cement Pipe (ACP) Installation Cost

Pipe Material Cost (ACP: Asbestos Cement Pipe)

Nominal Diameter	(1) Santiago Price of ACP(AW-20)	(2) Trans-portation Cost	(3) Pipe Cost (1)+(2)	(4) Fittings Cost (3)x25%	(5) Total (3)+(4)
	$/m	$/m	$/m	$/m	$/m
150 mm	3,958	295	4,253	1,063	5,316
200	6,466	468	6,934	1,734	8,668
250	9,733	691	10,424	2,606	13,030
300	16,706	943	17,649	4,412	22,061
350	21,395	1,282	22,677	5,669	28,346
400	27,526	1,620	29,146	7,287	36,433
450	33,036	1,987	35,023	8,756	43,779
500	36,398	2,426	38,824	9,706	48,530
600	43,040	3,391	46,431	11,608	58,039
700	55,293	4,479	59,772	14,943	74,715
800	72,408	5,890	78,290	19,573	97,863
900	84,296	7,358	91,654	22,914	114,568
1,000	103,311	9,065	112,376	28,094	140,470

ACP Pipe Laying Cost (Material and Installation)

Nominal Diameter	Installation Cost (6) Trench Type ($/m)	Installation Cost (7) Banking Type ($/m)	Total Cost (ACP) (5)+(6) Trench Type ($/m)	Total Cost (ACP) (5)+(7) Banking Type ($/m)
150 mm	7,915	5,442	13,231	10,758
200	8,748	6,012	17,408	14,672
250	9,561	6,719	22,591	19,749
300	10,693	7,453	32,754	29,514
350	11,695	8,199	40,041	36,545
400	12,736	8,960	49,169	45,393
450	13,779	9,712	57,558	53,491
500	14,894	10,523	63,424	59,053
600	17,178	12,169	75,217	70,208
700	19,641	13,954	94,356	88,669
800	22,235	15,826	120,098	113,689
900	24,979	17,811	139,547	132,379
1,000	28,000	20,017	168,470	160,487

List of Valve Cost

US$ 1.00 = ¥ 110.00
US$ 1.00 = Chilean Peso: $435.00
Japanese Yen (¥) 1.00 = Chilean Peso: $3.955

Sluice/Butterfly Valve

Diameter	(1) CIF (Yen) Sluice Valve	(2) CIF (Yen) Butterfly	(3) =(1)x3.955 CIF (Peso)	(4) =(2)x3.955 CIF (Peso)
1,000 mm	-	¥ 8,241,300		$32,594,000
900	-	¥ 5,991,744		$23,697,000
800	-	¥ 4,647,751		$18,382,000
700	-	¥ 3,582,833		$14,170,000
600	-	¥ 3,251,428		$12,859,000
500	¥2,375,696	-	$9,396,000	
450	¥1,314,123	-	$5,197,000	
400	¥1,040,409	-	$4,115,000	
350	¥ 750,406	-	$2,968,000	
300	¥ 574,183	-	$2,271,000	
250	¥ 404,679	-	$1,601,000	
200	¥ 248,356	-	$ 982,000	
150	¥ 157,429	-	$ 623,000	
100	¥ 93,752	-	$ 371,000	
75	¥ 64,281	-	$ 254,000	

Pressure-Reducing Valve

Dia. (mm)	(1) FOB Pressure-Reducing Valve	(2) FOB Strainer	(3)=(1)+(2) FOB	(4)=(3)x120% CIF	(5) =(4)x 3.955 CIF (Peso)
1,000	¥18,554,000 (900 mm x 120%)	¥14,505,000	¥33,059,000	¥39,671,000	$156,899,000
900	¥15,462,000 (800 mm x 123%)	¥12,088,000	¥27,550,000	¥33,060,000	$130,752,000
800	¥12,571,000 (700 mm x 126%)	¥ 9,828,000	¥22,399,000	¥26,879,000	$106,306,000
700	¥ 9,977,000 (600 mm x 130%)	¥ 7,800,000	¥17,777,000	¥21,332,000	$ 84,368,000
600	¥ 7,675,000	¥ 6,000,000	¥13,675,000	¥16,410,000	$ 64,902,000
500	¥ 5,335,000	¥ 3,860,000	¥ 9,195,000	¥11,034,000	$ 43,639,000
450	¥ 4,217,000	¥ 3,000,000	¥ 7,217,000	¥ 8,660,000	$ 34,250,000
400	¥ 3,374,000	¥ 2,400,000	¥ 5,774,000	¥ 6,929,000	$ 27,404,000
350	¥ 2,808,000	¥ 1,773,000	¥ 4,581,000	¥ 5,497,000	$ 21,741,000
300	¥ 2,330,000	¥ 931,000	¥ 3,261,000	¥ 3,913,000	$ 15,476,000
250	¥ 1,673,000	¥ 698,000	¥ 2,371,000	¥ 2,845,000	$ 11,252,000
200	¥ 1,508,000	¥ 467,000	¥ 1,975,000	¥ 2,370,000	$ 9,373,000
150	¥ 1,052,000	¥ 351,000	¥ 1,403,000	¥ 1,684,000	$ 6,660,000
100	¥ 740,000	¥ 260,000	¥ 1,000,000	¥ 1,200,000	$ 4,746,000
75	¥ 637,000	¥ 208,000	¥ 845,000	¥ 1,014,000	$ 4,010,000
50	¥ 576,000	¥ 117,000	¥ 693,000	¥ 832,000	$ 3,291,000

Table DC-8 Concrete Tank - Design Criteria and Cost

Capacity of Tanks (Criteria)

Category	Capacity
- Collection tank	1 hour's capacity
- Transmission tank	1 hour's capacity
- Break-pressure tank	10 minutes' capacity
- Suction well for transmision pump	1 hour's capacity
- Junction tank	10 minutes' capacity
- Distribution tank	12 hours' capacity for Iquique
" "	8 hours' capacity for Arica
- Junction tank for Upper Lluta	1 hour's capacity

Construction Cost of Concrete Tanks

Tank Capacity (m3)	Unit Cost ($/m3)	Construction Cost ($)
25 m3	125,921	3,148,000
50 m3	88,145	4,407,000
100 m3	65,654	6,565,000
200 m3	60,696	12,139,000
250 m3	58,300	14,575,000
300 m3	56,099	16,830,000
400 m3	51,837	20,735,000
500 m3	47,885	23,943,000
1,000 m3	43,709	43,709,000
1,250 m3	43,200	54,000,000
1,500 m3	42,692	64,038,000
2,000 m3	39,242	78,484,000
2,500 m3	36,720	91,800,000
3,000 m3	34,257	102,771,000
4,000 m3	33,347	133,388,000
5,000 m3	32,705	163,525,000
6,000 m3	32,300	193,800,000
7,500 m3	31,900	239,250,000
10,000 m3	31,074	310,740,000

Tank Capacity for Iquique Water Supply Alternatives

Capacity of Tank (Criteria)

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Transmission tank = 1 hour's capacity
                  = 701 l/sec x 1 hour
                  = 2,524 m3 --> 2,500 m3
                    (1,250 m3 x 2 tanks)
Break-pressure tank = 10 minute's capacity
                  = 701 l/sec x 10 min
                  = 421 m3 --> 500 m3
                    (250 m3 x 2 tanks)
Suction well for pump = 1 hour's capacity
                      = 2,500 m3
                        (1,250 m3 x 2 tanks)
-----------------------------------------
```

Tank Capacity for Alternative (1) to Iquique Water Supply From Pampa-North (La Tirana) to Alto Hospicio (Route No.1)

```
-------------------------------------------------------------------
0) Collection Tank at Well-Field (GL=+1,025)
   = Suction well for transmission pump --> 2,500 m3 (1,250 m3 x 2)
1) Tank at L=40,400 (GL=+1,100)
   : Transmission tank  --> 2,500 m3 (1,250 m3 x 2)
2) Tank at L=42,100 (GL=+1,050): La Isla Tank
   : Break-pressure tank -->  500 m3 (250 m3 x 2)
3) Tank at L=53,750 (GL=+975): El Toro-1 Tank
   : Break-pressure tank -->  500 m3 (250 m3 x 2)
4) Tank at L=55,850 (GL=+760): El Toro-2 Tank
   : Break-pressure tank -->  500 m3 (250 m3 x 2)
4) Tank at L=64,600 (GL=+545): Alto Hospicio Tank
   : Transmission tank --> 2,500 m3 (1,250 m3 x 2)

Cost of Tanks:
1,250 m3 tank: 6 Nos. x $54,000,000 = $ 324,000,000
  250 m3 tank: 6 Nos. x $14,575,000 = $  87,450,000
                                      ---------------
                                Total = $ 411,450,000
-------------------------------------------------------------------
```

Tank Capacity for Alternative (2) to Iquique Water Supply From Pampa-North (La Tirana) to Alto Hospicio (Route No.2)

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0) Collection Tank at Well-Field (GL=+1,015)
   : Suction well for transmission pump --> 2,500 m3 (1,250 m3 x 2)
1) Tank at Booster Pump Station
   : Suction well for booster pump --> 2,500 m3 (1,250 m3 x 2)
2) Tank at L=22,200 (GL=+1,205)
   : Transmission tank --> 2,500 m3 (1,250 m3 x 2)
3) Tank at L=36,900 (GL=+1,150)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
4) Tank at L=42,100 (GL=+1,100)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
5) Tank at L=44,000 (GL=+1,000)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
6) Tank at L=54,500 (GL=+930)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
7) Tank at L=56,750 (GL=+735)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
8) Tank at L=63,500 (GL=+545)
   : Transmission tankk --> 2,500 m3 (1,250 m3 x 2)

Cost of Tanks:
1,250 m3 tank: 8 Nos. x $ 54,000,000 = $ 432,000,000
250 m3 tank: 10 Nos. x $ 14,575,000 = $ 145,750,000
Total = $ 577,750,000

Tank Capacity for Alternative (3) to Iquique Water Supply From Pampa-South (Pintados) to Alto Hospicio (Route No.1)

---

0) Collection Tank at Well-Field (GL=+995)
   : Suction well for transmission pump --> 2,500 m3 (1,250 m3 x 2)
1) Tank at Booster (L=41,750)(GL=+1,038) at Diana
   : Suction well for booster pump --> 2,500 m3 (1,250 m3 x 2)
2) Tank at Rinconada (L=44,150)(GL=+1,155)
   : Transmission tank --> 2,500 m3 (1,250 m3 x 2)
3) Tank at Carpas (L=70,900)(GL=+978)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
4) Tank at Santa Rosa (L=76,900)(GL=+682)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
5) Tank at Alto Hospicio (L=84,400)(GL=+545)
   : Transmission tank --> 2,500 m3 (1,250 m3 x 2)

Cost of Tank:
1,250 m3 tank: 8 Nos. x $ 54,000,000 = $ 432,000,000
250 m3 tank: 4 Nos. x $ 14,175,000 = $ 56,700,000
Total = $ 488,700,000

Tank Capacity for Alternative (4) to Iquique Water Supply
From Pampa-North (La Tirana) to Alto Hospicio (Route No.2)

---

0) Collection Tank at Well-Field (GL=+995)
   : Suction well for transmission pump --> 2,500 m3 (1,250 m3 x 2)
1) Tank at L=37,550 (GL=+1,050)
   : Suction well for booster pump --> 2,500 m3 (1,250 m3 x 2)
2) Tank at L=54,900 (GL=+1,050)
   : Transmission tank --> 2,500 m3 (1,250 m3 x 2)
3) Tank at L=67,700 (GL=+1,000)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
4) Tank at L=70,300 (GL= +800)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
5) Tank at L=74,450 (GL= +650)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
6) Tank at Alto Hospicio (L=81,300)(GL=+545)
   : Transmission tank --> 2,500 m3 (1,250 m3 x 2)

Cost of Tank:

1,250 m3 tank:	8 Nos. x	$ 54,000,000 =	$ 432,000,000
250 m3 tank:	6 Nos. x	$ 14,575,000 =	$ 87,450,000
		Total =	$ 519,450,000

Tank Capacity for Alternative (5) to Iquique Water Supply
From Salar del Huasco to Alto Hospicio

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0) Tank at Pump Station No.1 (L= 0)
   : Suction well for transmission pump --> 2,500 m3 (1,250 m3 x 2)
1) Tank at Pump Station No.2 (L=12,600)
   : Suction well for transmission pump --> 2,500 m3 (1,250 m3 x 2)
2) Tank at Pump Station No.3 (L=15,000)
   : Suction well for transmission pump --> 2,500 m3 (1,250 m3 x 2)
3) Tank at L=22,900 (GL=+4,200)
   : Transmission tank --> 2,500 m3 (1,250 m3 x 2)
4) Tank at L=27,800 (GL=+4,000)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
5) Tank at L=32,900 (GL=+3,800)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
6) Tank at L=34,950 (GL=+3,600)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
7) Tank at L=36,650 (GL=+3,400)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
8) Tank at L=38,600 (GL=+3,200)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
9) Tank at L=40,100 (GL=+3,000)
   : Break-pressure tank --> 500 m3 (250 m3 x 2)
10) Tank at L=44,050 (GL=+2,800)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
11) Tank at L=47,790 (GL=+2,600)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
12) Tank at L=50,580 (GL=+2,400)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
13) Tank at L=52,850 (GL=+2,200)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
14) Tank at L=55,400 (GL=+2,000)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
15) Tank at L=58,900 (GL=+1,800)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
16) Tank at L=61,500 (GL=+1,600)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
17) Tank at L=63,900 (GL=+1,400)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
18) Tank at L=69,200 (GL=+1,220)
    : Transmission tank --> 2,500 m3 (1,250 m3 x 2)
19) Tank at Rinconada L=117,450 (GL=+1,155)
    : Transmission tank --> 2,500 m3 (1,250 m3 x 2)
20) Tank at Carpas L=144,200 (GL= +978)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
21) Tank at Santa Rosa L=152,200 (GL= +682)
    : Break-pressure tank --> 500 m3 (250 m3 x 2)
22) Tank at Alto Hospicio L=157,700 (GL=+545)
    : Transmission tank --> 2,500 m3 (1,250 m3 x 2)

Cost of Tanks:

1,250 m3 tank:	14 Nos. x $ 54,000,000	= $ 756,000,000
250 m3 tank:	32 Nos. x $ 14,575,000	= $ 466,400,000
	Total	= $ 1,222,400,000

Capacity of Distribution Tank for Storage at Cavancha in the City for all the Alternatives (From Alto Hospicio to Cavancha)

Distribution Tank = 12 hours' capacity =
= 701 l/sec x 12hours =
= 30,280 m3 --> 7,500 m3 x 4 Nos.

Cost of Tank:
7,500 m3 tank: 4 Nos. x $ 239,250,000 = $ 957,000,000

Total = $ 957,000,000

Summary of Tank Cost for Alternatives (1)-(5) to Iquique Water Supply

Alternative	Tanks on the Pipeline	Distribution Tank	Total
Alternative (1)	$ 411,450,000	$ 957,000,000	$ 1,368,450,000
" (2)	$ 577,750,000	$ 957,000,000	$ 1,534,750,000
" (3)	$ 488,700,000	$ 957,000,000	$ 1,445,700,000
" (4)	$ 519,450,000	$ 957,000,000	$ 1,476,450,000
" (5)	$ 1,222,400,000	$ 957,000,000	$ 2,179,400,000

Table DC-9 Unit Cost of Road Construction

<Specification>
Road surface : Gravel pavement (t= 100 mm)
Width of the road : w= 4.0 m
Usage : Access road to the station/plant
and for well-field maintenance

1. Road construction (per meter)
   - Foundation (Soil banking): 0.92 m3/m x $ 2,000/m3 = $ 1,840 /m
   - Gravel pavement : 0.43 m3/m x $ 7,000/m3 = $ 3,010 /m
   Total = $ 4,850 /m

2. Turn-out construction
   - Foundation (Soil banking): 8.60 m3/m x $ 2,000/m3 = $ 17,200 /place
   - Gravel pavement : 4.15 m3/m x $ 7,000/m3 = $ 29,050 /place
   Total = $ 46,250 /place

3. Road and Turn-out (per meter)
   $ 4,850 + $ 46,250/ 500 m = $ 4,850 + $ 92 = $ 4,942 /m