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Kanagawa

4th Extension Works of Yokohama Water Works

I. History

Yokohama W.W. was constructed in September 1887 by the modern advanced system for the first time in Japan. Since then, extension works were done three times, following to the prosperity of the city. But by enlargement of the city area according to incorperation of neighbouring towns and villages, and promotion of various industries, consumption of water having increased year by year, and at last, at the summer season of 1939, greatest distributing quantity amounted up to 227,000 cu m per day which was the max. limit of capacity of the conveyance pipe lines at that time, and execution of the new extension works was of urgent necessity.

Hereupon, the 4th extension works were schemed to meet the striking increase of water demands, receiving the source water of 5.5 cu m / sec (200 cu ft / sec) from the Utilization works of Sagami-river (U.W.S.R.) managed by Kanagawa Prefecture G. whichjust started at that time,

Outline of the works projected

(1) Water conveyance ways

a. Tunnel A
from the Tsukui division basin of U.W.S.R. to Shimokuzawa division well,
length 4,220 m, convrete lining,
horse shoe shape, ht. & width 3.5 m each,
max. discharge capacity 600 cu ft per sec.

b. Shimokuzawa Division Well
reinf. conc. construction
dia. 52 m at major 32 m at minor,
depth 3.70 m.
(Water for Kawasaki is divided here, and this well and tunnel A are cooperated with Kawasaki-shi.)

c. Tunnel B
from the Shimokuzawa D.W. to the Asamizo reservoir,
length 5,705 m, concrete lining,
horse shoe shape, ht. & width 2.6 m each,
max. discharge capacity 300 cu ft per sec.

d. Conveyance Conduits A
from the Asamizo reducing tank to the Kawai measuring basin,
length 11,000 m,
inner dia. 1,500 m m Hume pipes and steel pipes,

e. Conveyance Conduit B
from the Kawai plants to the Tsurugamine Junction Well,
length 4,580 m.
inner dia. 1,350 m m Hume pipes and steel pipes.

f. Conveyance Conduit C
from the Tsurugamine J.W. to the Nishiya purification plants,
length 1,950 m.
inner dia. 1,500 m m Hume pipes and steel pipes.

(2) Asamizo sedimentation Basins

2 sedimentation basins and accessaries.

(3) Purification Equipments at the Nishiya P.P.

16 rapid filter beds and accessaries.

(4) Distribution Equipments

a. Newly-laying of distribution pipes at some parts of Isogo and Tsurumi wards.

b. Improvement and newly-laying of distribution main at Isogo, the upland district of Tsurumi, and Tozuka.

c. Clear Water Reservoirs
one at Isogo, Kanagawa, and Tozuka each.

The work started in April 1940, but after the outbreak of the War, as want of materials became severe more and more, continueing of work fell into a difficulty. Moreover, by the air raid on 29 May 1945, main parts of the city destroyed and most parts of distribution and service pipes was damaged. Then, as abig crisis for the water supply of this city came following to these worst circumstances and calamity, the personnels concerned made every efforts to supply water by urgent repair of the destroyed equipments.

However, after the closure of the War, following to Allied Forces Occupation in this city, water demand suddenly increased and head of water had fallen day by day, and supply amounts were extremely extremely restricted, and at some district decrease and suspension of water supply happened.

Judging from the a/m conditions, Allied Forces adviced to Yokohama-shi that the most urgent parts among the 4th extension works which have been suspended at that time and works for increase of distribution capacity should be carried out quickly. Then, these urgent works were carried out day and night without rest, and this critical junction was taken away temporarily. But, owing to that the a/m works were such emergency measures as boost pumps provided for the conveyance and

distruibution mains, stopping of boosting activity and decrease and suspension of water due to it, may occur as a matter of cource, at the case of no juice or trouble of machines.

As a counter-device against these weak points, it was considered that by urging the carrying out of 4th Ext. Works, conveyance and distribution capacity should be kept surely by means of natural flow, and following to it purification capacity should be enlarged.

However, judging from the economical situation at that time enforcement of the whole original plans was hopeless. Therefore, the second alteration plans were decided which are the only minimum quantities of works for the expected demand. The main points of alteration are as follows. Date of decision Feb. 1947
Total alteration budget- 206,000,000 yen

1. The expected max. distribution amount in 1952 will be 366,000 m^3 per day.

2. One sedimentation basin (2 basins in original plan.)

3. The conveyance conduits between Kawai and Nishiya which was designed to be laid apart the existing pipe lines providing against the air raid, will be laid along that lines, using welding steel pipes in the whole.

4. 8 rapid filter beds. (16 beds in the original plan).

5. Clear water reservoirs at Isogo, Kanagawa, and Tozuka are given up.

6. Among the distribution pipe lines, main lines at the upland districts and Tozuka area are given up, and in place of that the boost pumps are installed for the emergency measures.

But since the starting of the a/m works, restriction of funds and materials became violent extremely, and enforcement of works fell into a difficulty due to it. On the other hand, water consumption had been increasing day by day, following to the increase of the dependent houses of Allied Forces and revival of dwellings, shops, offices and etc. At last, in July 1948, even the distribution amount of 322,000 m^3 per day which was max. capacity of Y.W.W. at that time, could not meet the expanded demand, in spite of the forcible execution of leakage prevention works and the liming supply at night. Besides, as 50% of this distribution capacity has relied upon the urgent boosting, water suspension in the whole city might be unavoidable in consequence of the unstable situation of electric power. This was the greatest crisis, indeed. Then, the 3rd alteration plans were decided, in which the expected supply amount of water has been taken so much as possible, turning out the former temporizing measures, and which was planned to be able to increase the supply capacity at any time, following to the work progression.

Date of decision Sept. 1948
Total alteration budget 912,000,000 yen.

The fundamental principles of the alteration.

a. The expected max. distribution capacity is 468,000 m^3 per day in 1958.

b. Principally, the conveyance capacity which is the most weak point of Y.W.W. will be enlarged and secured, in place of that the works for the distribution in the city will be reduced in large breadth, for fear lest the enormous budget should be necessary, and enforcement of works should be hard, due to prices and wages which revised following to the sudden rise of inflation.

The main alteration parts.

a. Works of the sedimentation plants: It was planned to construct one sedimentation basin only in the original plan, but it is not enough to let display the efficiency of sedimentation, judging from the turbidity of the source Sagami-Lake and increase of expected max. distribution amount. So, thinking over the expansion in future, it will be altered to construct an earth dam type large sediment. Reservoir.

b. Works of the conveyance equipments: The low pressure junction well will be newly installed near to the Kawai measuring basin, and the main conveyance pipe line (dia 1,500 m m) from Asamizo will connect to this well. Cancelling the welding steel pipes from Kawai to Nishiya and selecting the new route along the edges of the plateau north of the original route, and the concrete open channel from the Kawai J.W. to the Tsurugamine J.W. and the Hume pipes dia 1,650 m m (1,500 m m, in the original plan) from the Tsurugamine J.W. to Nishiya, will be constructed and laid. These alterations are effective not only to save steel that it might be hard to come to hand under the present circumstances but also to increase the conveyance capacity.

c. Works of the purification equipments: 16 rapid filter beds will installed. (8 beds, in the original plan)

d. Works of the distribution equipments: The phase of water distribution in the city had changed entirely comparing to the one before the War, therefore the adjustment of the works of distribution equipments is the important matter. Especially, the residents in the Tozuka area had never got favours of Y.W.W. up to the present. In order to meet the population increment of this area after the War, the new construction of the Tozuka main will be fulfilled with utmost efforts, and the distribution equipments for the Isogo and Tsurumi

areas will be limited to the minimum quantities and will be supplemented by the boost pumps.

After that, the rise of inflation had not stopped yet, the required construction cost had expanded unexpectedly due to the twice revisions of prices and wages, and it was unavoidable to increase the a/m budget. Consequently, in July. 49 the 4th alteration plan was decided, increasing the total budget up to 1,550,000,000 yen, but not altering the work included.

II. Details of Equipments

Subjects	Works	Work included	Locality
Tunnels	Large Tunnel	Horse shoe shape, conc. lining, ht. & width, both 3.5 m. length 4,220 m. max. discharge 600 cu.ft /sec.	Tsukui Devision Basin---Shimokuzawa Dev. Well
	Shimokuzawa Devision Well	Reinf. conc. structure, major dia. 52 m. minor dia. 33 m. depth 3.7 m.	Shikuzawa
	Small Tunnel	Horse shoe shape, conc. lining, ht. & width, both 2.6 m. length 5,705 m. max. discharge 300 cu.ft /sec.	Shimokuzawa--- --Asamizo
Sedimentation Plants	Arrival Well	Circular shape, reinf. conc. structure inner dia. 10.0 m. depth 6.5 m.	Asamizo
	Coagulation Basin	Chemical pouring equipment: 8 chem. dissolving & mingling chambers, reinf. conc. structure, machines for pouring, Coagulation channel: reinf. conc. structure, width 3.0 m. depth 2.0 m. length 32.0 m. meandering flow system, (also used to let flow from the arrival basin to the sedim. reserv.)	" "
	Intake Tower	Cylindrical shape, reinf. conc. structure inner dia. 4.0 m. total ht. 17.0 m. max. intake cap. 300 cuft /sec.	"
	Sedimentation Reservoir	Earth dam type reservoir, Main dam: with clay core, average bottom width 80.0 m. top width 5.0 m. length 224 m. side slopes 1:3 at inside 1:2.5 at outside Secondary dams: without core, average bottom width 30.0 m. top width 3.0---5.0 m. average ht. 10.0 m. total length 802 m. side slopes, 1:2.5 at inside 1:2 at outside Water surface area of stagnant about 120,000 sq. m. (29.7 acr) max. capacity 800,000 cu. m.	"

Subjects	Works	Work included	Locality
		Overflow awy, scouring sluice, and other accessaries,	
	Conduits	Inner dia. 1,500 mm. Hume pipes, length 850 m.----2 lines Inner dia. 2,000 mm. steel pipes, length 300 m.----1 line Inner dia. 1,500 mm. Hume pipes, length 400 m.----1 line	the end of the small tunnel---the arrival well.
Conveyance Ways	OPen Channel	Rectangular type, reinf. conc. str. ht. 2.4 m. width 2.2 m. length 5,700 m. max. discharge 230 cu.ft /sec.	Kawai---Tsurugamine
	Aqueduct	Steel frame and reinf. conc. str. 6 spans, max. span length 40.0 m. clearance below of the bottom of beam 25.0 m. total length 1,400 m.	on the way of above channel
	Junction Well	One at Kawai,---elliptical shape, major dia. 30.0 m. minor dia. 20.0 m. depth 2.5 m. One at Ysurugamine,----circular shape, inner dia. 20.0 m. depth 2.5 m. Both reinf. conc. structure,	
	Removal of Old Pipes	Inner dia. 22 in. & 18 in. cast iron pipes, length 8,830 m. Inner dia. 20 in. C.I.P. length 4,300 m.	
	Conveyance Pipe Line	Inner dia. 1,500 mm. C.I.P. length 11,000 m.	Asamizo---Kawai
	Booster Pumping Stations	Locality / H.P of Pumps / Set Aoyama / 250 / 1 Tana / 700 / 1 " / 500 / 1 Kami-Kawai / 700 / 1 " / 600 / 1 Oshima / 600 / 1 " / 380 / 1 Imajuku / 800 / 1 " / 600 / 1	
	Pressure Reducing tank	Reinf. conc. cylindrical structure, inner dia. 15 m. total ht. 15.5 m. depth of water 10 m.	Asamizo

Subjects	Works	work included	Locality
	Weir Basin	Reinf. conc. structure, rectangular type, 30 m. x 30 m. depth of water 4.5 m.	Kawai Purif. Plants.
Purification Equipments	Rapid Filter Beds	16 beds, Wheeler system, gravity type, rectangular shape, reinf. conc. str. 11.5 m. x 4.35 m. depth 2.85 m. standard filtration vel. 140 m. /day, total atandard filtration capacity 240,000 cu. m. /day,	Nishiya Purif. Plants
	Mixing and settling Basins	2 basins, rectangular type reinf. conc. structure, 45 m. x 28 m. depth 4.5 m. capacity 5,500 cu. m. /basin, time of settling 1.5 hrs,	"
	ArrivalBasin and Coagulation Basin	Two- storied rectangular type, reinf. conc. structure, Upper storey is an arrival basin, 19 m. x 16.5 m. depth 3.5 m. Lower storey is a coagulation basin, 19 m. x 10 m. depth 3.5 m.	"
	Conduit Pipe Lines	Inner dia. 2,000 mm. steel pipes, length 516 m. Inner dia. 1,650 mm. steel & Hume pipes length 2,200 m.	Tsurugamine---Nishiya
Works of Distribution Lines	Tozuka Service Reservoir	Tunnel system of horse shoe type, reinf. conc. structure, ht. 2.0 m. width 2.0 m. legth 640 m. effective capacity 2,000 cu. m. (which is emptied in 5 hours at the max. distribution rate.)	Tozuka
	Isogo distribution Main	Inner dia. 560 mm. & 460 mm. C.I.P. length 2,120 m.	Isogo
	Tozuka "	Inner dia. 460 mm. C.I.P. length 10,100 m.	TOzuka
	Tsurumi "	Inner dia. 900 mm. C.I.P. length 11,800 m. Inner dia. 800 mm. C.I.P. length 2,500 m.	Tsurumi
	Booster Pumping Station	One booster pump 800 H.P.	Mineoka

III. Supplying Effects following to the Work Progressions

1. The work of conveyance pipes (dia. 1,500 mm. length 11,000 m.) from Asamizo to Kawai, completed just after the War. By this, the distribution amount was kept up surely, (though it is minimum) opposing to leakage due to the air raid and disorder after the War.

2. By the work completion of conveyance booster stations---250 H.P. at Aoyama, 700 & 500 H.P. at Tana, 700 & 600 H.P. at Kami-Kawai---distribution capacity increased 10 cu. ft per sec. in mean.

3. By the completion of tunnel works, the charge of electric power for the operation of the existing pumps had been saved, and if the turbidity of the Tsukui devision basin should be neglected, the distribution amount of 100 cu. ft per sec. in maximum can be warranted.

4. By connecting the newly installed pipes of dia. 1,650 mm. between Tsurugamine and Nishiya to the old pipe line,(dia. 1,100 mm.) two-stage boost could be operated. By it, distribution amount increased 9cu. ft per sec. in maximum.

5. Intake amount of the raw water

	Before extension works		At the present time		After completion of Ext. works
	Ordinary	Max.	ordinary	max.	max.
Aoyama	73	82	73	82	82
Oshima	47	53	47	53	0
Sagami-Lake	0	0	100	100	200 (conv. cap. 300)
Total	120	135	220	235	282 (conv. cap.

Unit: cu. ft per sec.

Inspected by
I. Nukazawa

LIST OF BIDDING RESULTS OF 4th EXT. WORKS AFTER THE WAR

YOKOHAMA WATER WORKS

1. Construction works of the Asamizo reservoir.

Date of bidding	October 1948
Reasonable cost expected	114,000,000 yen

Results of bidding

Bidder	Bidding cost
Nishimatsu kensetsu (successful)	79,580,000 yen
Obayashi-gumi	82,730,000
Kumagai-gumi	84,000,000
Kajima kensetsu	86,930,000
Hazama-gumi	90,130,000

Work included

Earth dam type sedimentation reservoir	
Excavation and heaping up	257,200 m^3
Treading down	10,210,200 m^2
Clay core work	13,856 m^3
Sodding and slope tamping	14,870 m^2

2. Constr. works of conveyance open channel, Kawai---Tsurugamine (1st section).

Date of bidding	February 1950
Reasonable cost expected	46,000,000 yen

Results of bidding

Bidder	Bidding cost
Taisei kensetsu (successful)	39,500,000 yen
Kajima "	42,600,000
Nishimatsu "	42,880,000
Sanken kogyo	42,950,000
Hazama-gumi	43,000,000
Obayashi-gumi	43,000,000
Kodama kogyo	43,000,000
Takenaka komuten	disclaimed
Kumagai-gumi	"

Work included

Reinf. conc. rectangular shape, ht. 2.4 m width 2.2 m
Length 2,550 m

3. Construction works of conveyance open channel, Kawai---Tsurugamine (2nd section).

Date of bidding

Reasonable cost expected 42,800,000 yen

Results of bidding

Bidder	Bidding cost
Sanken kogyo	37,000,000 yen
Kumagai-gumi	40,530,000
Kajima kensetsu	40,580,000
Obayashi-gumi	40,700,000
Takenaka komuten	40,900,000
Hazama-gumi	41,000,000
Taisei kensetsu	41,000,000
Kodama kogyo	41,000,000

Work included

Reinf. conc. rectangular shape, ht. 2.4 m width 2.2 m
Length 2,350 m (from the edn of 1st section)

4. Construction works of conveyance open channel, Kawai---Tsurugamine, (3rd section).

Date of bidding February 1950

Reasonable cost expected 35,200,000 yen

Results of bidding

Bidder	Bidding cost
Obayashi-gumi (successful)	30,500,000 yen
Kumagai-gumi	31,050,000
Taisei kensetsu	32,950,000
Kajima "	32,960,000
Nishimatsu "	32,980,000
Kodama kogyo	33,000,000
Takenaka komuten	33,100,000
Sanken kogyo	33,200,000
Hazama-gumi	33,300,000

Work included

Reinf. conc. rectangular shape, ht. 2.4 m width 2.2 m
Length 2,300 m (from the end of 2nd section to the end of the channel.)

5. Laying works of dia 2,000 m m conveyance conduits (at Tsurugamine)

Date of bidding — February 1950

Reasonable cost expected — 8,500,000 yen

Results of bidding

Bidder		Bidding cost
Kobai-gumi	(successful)	7,895,000 yen
Hodogaya deken		8,360,000
Kato-gumi		8,430,000
Matsuo-gumi		8,524,734
Kuwajima doken		8,625,000

Work included

Laying of inner dia 2,000 m m steel pipes,
Length 516 m

Opinion

Seeing above bidding costs of each work, I can not but doubt that bidders talked up previously about their bidding costs. But I suppose that these previous talks might have be done to avoid their nonsensical competition and yet to bid with the lowest cost as possible, (taking it in good faith) considering that all bidding costs are lower than the reasonable cost expected by Y.W.W.B. remarkably.

By I. NUKAZAWA,
Sanitary Engineer

THE EQUIPMENTS CONSTRUCTED BEFORE THE 4TH EXTENSION WORKS

(1) Intake Equipments

a. Abiko Intake

Source water : surface water of Doshi-Ri.(br. of Sagami-Ri.)
size of intake gate : 3.05 m. x 2.15 m.
intake amount : 73 cu. ft / sec.

b. Oshima Intake

Source water : river bed water of Sagami-Ri. collected by infiltration galleries,
lifting pumps : 250 H.P.--7 sets, 175 H.P.--5 sets,
intake amount : 47 cu. ft / sec.

(2) Aoyama Sedimentation Plants

1--Grit chamber :
12 m. x 20.5m. depth of water 2.8 m. reinf. conc. structure,
1--Sedimentation basins :
53 m. x 69 m. depth of water 5.42 m. reinf. conc. structure,
4--Sedim. basins :
each, 52.9 m. x 69.m. depth of water 4.4 m. reinf. conc. str.
8--Chemical dissolving and mingling chambers :

(3) Kawai Purification Plants

1--Measuring basin :
30 m. x 30 m. depth of water 3.0 m. reinf. conc. structure,
2--Slow sand filter beds :
both, 21.4 m. x 17.1 m. depth 3.0 m.
standard filtration vel. 4.85 m. per day
" " cap. 3,500 cu. m. per day (in total)
1--Clear water reservoir :
21.82 m. x 15.76 m. effective depth of water 5.76 m.
reinf. conc. structure, capacity 1,800 cu. m.

(4) Nishiya Purification Plants

1--Arrival basin :
reinf. conc. structure, 19 m. x 16 m. depth of water 3.0 m.
2--Coagulation basins :
meandering flow system, width 4.5 m. depth of water 3.5 m.
reinf. conc. structure, length 13.5 m.
1--Chemical settling reservoir :
36 m. x 11.7 m. depth of water 3.4 m. capacity 5,680 cu. m.
time of settling 1.5 hours,

8--Slow sand filter beds :
each, 64.25 m. x 45.75 m. depth of water 2.73 m.
reinf. conc. structure,
standard filtration velocity 4.85 cu. m. per day,
" " 11,000 " (in all)

7--Rapidfilter beds :
gravitation type Wheeler system, 9.6 m. x 7.3 m.
depth of water 2.55 m. reinf. conc. structure ,
standard filtration velocity 120 cu. m. per day,
" " capacity 58,800 cu. m. per day,(in all)

5--Rapid filter beds :
gravitation type Duel system, 9.4 m. x 7.3 m.
depth of water 2.50 m. reinf. conc. structure,
standard filtration velocity 120 cu. m. per day,
" " capacity 41,000 " (in all)

1--Elevated tank : for washimg of rapid filter beds,
inner dia. 10 m. effective depth of water 4.0 m.
max. head above the water level of filter beds, 14.75 m.
capacity of tank 314 cu. m.

Clear water reservoirs :
No.1 C.W.R. (2 reservoirs)
both, 72.7 m. x 47.3 m. effective depth of water 5.5 m.
reinf. conc. str. effective capacity 35,780 cu. m.
No.2 C.W.R. & No.3 C.W.R.
both, 46.8 m. x 36 m. effective depth of water 4.25 m.
reinf. conc. str. total effective capacity

(5) Conveyance Conduits

a. Abiko intake.--- Aoyama-sedimentation plants
ht. & width, both 2.12 m. length 143 m.
horse shoe shape tunnel constructed of concrete,

b. Aoyama sedim. plants --- Nakasawa junction well
inner dia. 1,050 mm. C.I.P. & inner dia. 800 mm. Hume pipes,
length 5,660 m.

c. Nakasawa J.W. --- Kami-Oshima J.W.
ht. & width, both 1.90 m. length 3,300 m.
horse shoe shape tunnel construted of concrete,

d. Kami-Oshima J.W. --- Kawai Purification Plants
inner dia. 1,100 mm. C.I.P. length 18,580 m.

e. Oshima J.W. --- Kawai Purif. Plants
inner dia. 36, 22, & 18 in. C.I.P. length 18,600 m.

f. Kawai Purif. Plants --- Nishiya Purif. Plants
inner dia. 1,100 mm. 38 & 20 in. C.I.P. length 8,420 m.

g. Total length 54,703 m.

(6) Clear Water Reservoirs in the city

a. Nogeyama C.W.R. 2--reservoirs,
both, circular shape, reinf. conc. structure,
inner dia. 41.24 m. depth of water 4.64 m.
total effective capacity 11,900 m.

b. Tsurumi C.W.R.
circular shape, inner dia. 60.0 m. depth of water 4.30 m.
reinf. conc. structure, effective capacity 12,200 cu. m.

c. Tsurumi Elevated Tank
inner dia. 8.5 m. depth of water 5.50 m. reinf. conc. str.
effective capacity 680 cu. m.
max. head above the sea level 62.75 m.

(7) Distribution Main

Lines	Inner dia. of Pipes	Districts
Tsurumi Main	900 mm	Tsurumi lowland & upland
Honmoku-Kanagawa Main	910 mm	Honmoku, Kanagawa & Kannai
Upland District Main	610 mm & 600 mm	Yamate & Negishi
Maita	610 mm	Isogo, Kanazawa & HOdogaya
Nogeyama Main	18 & 26 in	Kangai & Central area of the city
Kawai-Atsugi A.F.B.	10 in	

By I. Nukazawa

Kanagawa

9 August 1950

SUBJECT: Counter Devices Against Decrease and Suspension of Water Supply at Tokyo and Yokohama

DATE OF INSPECTION: Tokyo - 2 August 1950
Yokohama - 3 August 1950

1. Causes of decrease and suspension of water supply at Tokyo and Yokohama.

The following 5 causes are considered. (These are common for both cities.)

a. Increase of water demand; increase of population, and increase of water demand per head per day.

It means that the increase of demand is more than the increase of supply.

b. Change of phases of water demands before and after the war.

Before the war, population was dense at the central area of the city, but today, revival of the most par s of there have delayed, on the other hand, the outskirts developed remarkably as residence zones of citizens.

c. Complexity of topography.

Many booster pumping stations have been installed for the upland districts, but for partial unevenness, it seems that it is difficult to adjust the water pressure.

d. Insufficiency of diameter of pipes.

Mostly, the cases of supply decrease and suspension have occurred at the districts which have this defect especially at the adjacent places of pipe ends.

e. Leakage.

It is estimated that leakage amount is 30-50% of distribution amount.

2. Case of Tokyo-To Water Works.

On and after 16 July 1950, total distribution amount increased up to 1,450,000 m^3/day by beginning of use of the newly constructed No. 1

chemical setting basin at Kanamachi Filter Plants.

Remarks: Maximum distribution amount on August was 1,338,000 m^3/day.

a. Bad Supply Districts:

Lowland Districts.

(1) The whole area of Adachi-Ku
(2) Nippori, Arakawa-Ku
(3) Oku, Arakawa-Ku
(4) Sunamachi, Koto-Ku
(5) Near the Rokugo-Br., Kamata, Ota-Ku

Upland Districts.

(1) The whole area of Suginami System
(2) Shimura area, Itabashi-Ku
(3) Tozuka-Machi, Yodobashi-Ku
(4) Wakamatsu-Cho, Yodobashi-Ku
(5) Osaki, Shinagawa-Ku
(6) Gotanda, Shinagawa-Ku

Remarks: Area C was improved by newly laid pipes. (Diameter - 300 mm, length 1600 m.) Area B' and b" will be expected good supply by completion of Shin-Arakawa and Ayase inverted siphons. (Expected date of beginning of water passing, 5 this month) Area D is caused from the low pressure of Kawasaki Water Works.

Improvement Works:

See Attached Sheets - Works for the Exclusion of the Bad Supply, Tokyo-To Water Works.

3. Case of Yokohama Water Works

a. Bad Supply Districts

(1) Some parts of Isogo-Ku
(2) Some parts of Gumyoji Area
(3) Some parts of Kanazawa-Ku, (Yokosuka Side)
(4) Osato, Hommoku, (near Sankeien-Garden)
(5) Some parts of Tsurumi-Ku (Kawasaki Side)
(6) Some parts of upland areas in the whole city.

Remarks: Supply for Occupation Forces, very good.

Distribution and Arrival Amounts at Nishiya Purification Plants from 14 July 50 to 2 Aug 50

Date	Distrib. Amt (m^3/day)	Arrival Amt. (m^3/day)	Remarks
July 14	318,800	329,700	
15	328,000	332,700	
16	327,400	335,600	
17	341,600	332,700	
18	336,100	334,700	
19	341,500	335,600	
20	334,200	331,500	
21	343,600	332,900	
22	349,000	335,600	Maximum Demand
23	334,300	335,600	
24	336,100		
25	335,500		
26	340,700		
27	329,300	333,800	
28	326,900	333,900	
29	327,600	335,600	
30	332,700	318,200	
31	343,300	329,300	
Aug. 1	325,800	321,200	
2	319,100	327,900	

4. Improvement Works

a. Pipe laying works for the purpose of water supply improvement in the Isogo, Gumyoji and Kanazawa Area.

Locality:	Koboshi - Gumyoji
Dia. of pipes:	560 mm. (22 in.)
Length:	3,446 m.
Budget:	11,800,000 yen
Exp. period of works:	20 August - 30 November (this year)

(Mr. Kunitomo, Chief of Y.W.W.B. said, "This plan will be decided by the municipal assembly within 2 or 3 days.")

b. Partial Improvement Works in 50 J.F.Y.

(1) Completed Works up to 31 July:

Locality	Kind of Work	Dia of Pipe (m)	Length (m)	Fire Plug
Kita-Saiwai-cho, Nishi-Ku	Newly Laying	100	398	4
Central Market, Kanagawa-Ku	"	150	68	
Tozuka-Machi, Tozuka-Ku	"	100	156	1

Locality	Kind of Work	Dia. of Pipe (m)	Length (m)	Fire Plug
Idogaya-Nakamachi, Minami-Ku	Newly Laying	100	303	
Iwama-Machi, Nishi-Ku	"	200	945	4
Yamuko-Machi, Tsurumi-Ku	"	100	204	3
Hiyoshi-Machi, Kohoku-Ku	"	75	189	2
Nakasato-Machi, Minami-Ku	"	100	216	2
Hommoku-Mitsusaka, Naka-Ku	"	100	119	1
Yamamoto-Cho, Naka-Ku	"	100	315	4
Hama-Cho, Isogo-Ku	"	100	370	2
Yatsusaka, Kanazawa-Ku	"	100	48	
Yatsusaka, Kanazawa-Ku	"	65	58	
Yatsusaka, Kanazawa-Ku	"	125	15	
Daimonbashi-Dori, Hodogaya-Ku	"	100	128	1
Toyooka-Dori, Tsurumi-Ku	"	100	235	2
Ichiba-Machi, Tsurumi-Ku	"	75	327	3
TOTAL			4,094	29

(2) Works Under Construction

Locality	Kind of Work	Dia. of Pipe (m)	Length (m)	Fire Plug
Shinohara-Machi, Kohoku-Ku	Newly Laying	150	800	3
Mutsura-Machi, Kanazawa-Ku	"	75	172	1
Hommoku-Osato, Naka-Ku	"	75	72	1
TOTAL			1,044	5

(3) Works Not Yet Started:

Locality	Kind of Work	Dia. of Pipe (m)	Length (m)	Fire Plug
Hommoku-Motomachi, Naka-Ku	Newly Laying	150	522	
Namamugi-Chugakko-Dori, Tsurumi-Ku	"	100	540	1
Kanazawa-Machi, Kanazawa-Ku	"	75	72	
Kanazawa-Machi, Kanazawa-Ku	"	100	141	3
Tsurumi-Machi, Tsurumi-Ku	"	100	390	3
Shimosuiyoshi-Cho, Tsurumi-Ku	"	100	267	3
TOTAL			7,070	44

Remarks: Mr. Kunitomi said, "Even the others than the a/m works, they will be carried out as long as the budget lasts."

By I. Nukazawa
Sanitary Engineer

9 August 1950

Works for the Exclusion of the Bad Supply, Tokyo Water Works

1. Urgent extension works:

By the progression of the urgent extension works - such as No. 1 chemical settling basin, at the Kanamachi Filter Plants, inverted siphons and many distribution mains - Some areas were improved possibly. Consequently, it seems that, the bad supply at these areas were excluded remarkably.

The following works induded in the urgent extension works, are the improvement works of bad supply chiefly.

Locality	Kind of Work	Dia. of Pipe (m)	Length (m)
Work Completed			
a. River bank of Nakagawa, front of Azuma-cho 7-8 chome, Sumida-Ku.	Newly Laying	150	113
b. Saginomiya, 2-chome, Nakano-Ku	"	250	3,200
Toyotama-Kita-Machi, 6-chome, Nerima-Ku	Withdrawal	200	2,430
	"	150	870
Under Construction			
c. Minami-Suna-Machi, 3-chome —2-chome, Joto-Ku	Newly Laying	200	1,870
	Withdrawal	150	1,570
	"	100	300
Work Not Yet Started			
d. Umeta-Cho — Magome-Nishi — 2-chome, Ota-Ku	Newly Laying	100	250
e. Kami-Ikegami-Cho — Magome-Nishi, 2-chome, Otaku	"	100	250
f. Itabashi 7-10 chome, Itabashi-Ku.	"	300	1,020
g. Shimura-Hasunuma — Shimura-Maino-Machi, Itabashi-Ku	"	200	1,200
h. Omiyama — Shimmei-Cho, Suginami-Ku	"	250	900
	Withdrawal	100	900

Locality	Kind of Work	Dia. of Pipe(m)	Length (m)
Work Not Yet Started (cont'd)			
i. Amamuma, 1-chome, Suginami-Ku	Newly Laying	200	420
	Withdrawal	150	420
j. Hirazuka, 4 chome — Nishi-Osaki, 1-chome, Shinagawa-Ku	Newly Laying	300	1,080
k. Kami-Jujo, 4-chome — 1 Natsuki-Nishi, 5-chome, Kita-Ku	"	200	600
	"	100	600
l. Toshima-cho, 1-chome — Higashi-Jujo, 4-chome, Kita-Ku	"	300	1,920
	Withdrawal	150	200
	"	100	1,720
m. Higashi-Jujo, 5-chome — Akabane, 1-chome, Kita-Ku	Newly Laying	200	1,400
	Withdrawal	100	780
	"	65	430
n. Higashi-Nakano-Machi, Nakano-Ku — Zoman-cho, 4-chome, Suginami-Ku	Newly Laying	300	1,960
	Withdrawal	150	380
		100	220
o. Yoyogi — Nishihara Service Res. Shibuya-Ku	Newly Laying	350	1,000
p. Senju-Kawara-Machi—Senju-Okawa-Machi, Adachi-Ku	"	350	1,000
Total (urgent works)	Newly Laying		19,611
	Withdrawal		10,220

2. The following work is an individual improvement one which does not belong to the urgent works.

Higashi-Komatsu-cho, 3-chome-Ukitabashi, Higashi-Fumabori-cho, Edogawa-Ku	Newly Laying	350	2,200

3. Partial Improvement Works in 50 J.F.Y.

Newly Laying

Locality	Dia. of. Pipe(m)	Length (m)
Yukigaya-Machi, Ota-Ku	100	300
Hongo-cho, Meguro-Ku	"	600
Omori, 2-chome, Ota-Ku	"	470
Senzoku-cho, Meguro-Ku	"	500
Iriarai, 3-chome, Ota-Ku	"	300
Oi-Kanoizuka-Machi, Shinagawa-Ku	"	580
Komazawa-Machi, Meguro-Ku	200	160
Seijo-Machi, Sedagaya-Ku	150	500
Azukizawa, 3-chome, Itabashi	100	570
Umeta-Higashi-Machi, Adachi-Ku	100	180
TOTAL		4,160

Relaying

Locality	Laying dia(mm)	Laying Length(m)	Withdrawal dia(mm)	Withdrawal Length(m)
Koyamadai 2-chome, Shinagawa-Ku	100	150	Auxiliary Pipe	150
Oi-Motoshiba-cho	"	250	"	250
Denen-Chofu, 2-chome, Sedagaya-Ku	"	490	"	490
Iriarai, 6-chome, Ota-Ku	"	510	"	510
Senju-Sakae-Machi and Umeda-Machi, Adachi-Ku	"	350	"	350
Tateishi-Machi, Katsushika-Ku	"	320	"	320
Oi-Kitahamakawa-cho, Shinagawa-Ku	"	320	"	320
Nishi-Togoshi 1-2 chome, Shinagawa-Ku	"	450	"	450
Nishi-Ichinoe, 1-chome, Edogawa-Ku	"	550	"	550
Yasukata-Machi, Ota-Ku	"	260	"	260
TOTAL		3,650		3,650

4. In addition to the a/m works, the extension works of the Suginami Filter Plants are carrying out now. This is the enlargement of pump opacity chiefly.

By I. Nukazawa
Sanitary Engineer

9 August 1950

Distribution Amounts, Tokyo-To Water Works
(From 16 July to 6 August 1949 and 1950)

Date	1950 Amt. (m^3/day)	Weather	1949 Amt. (m^3/day)
July 16	1,409,100	Cloudy & Fair	1,249,800
17	1,435,800	Fair	1,304,900
18	1,415,400	"	1,278,500
19	1,437,900	"	1,300,600
20	1,427,200	"	1,317,800
21	1,434,700	"	1,300,800
22	1,464,500	"	1,312,700
23	1,467,500	"	1,299,500
24	1,441,600	"	1,316,300
25	1,444,200	"	1,299,500
26	1,453,400	"	1,303,000
27	1,445,700	"	1,321,300
28	1,420,900	"	1,320,500
29	1,400,900	Rainy	1,330,100
30	1,414,700	Cloudy	1,298,100
31	1,451,300	Cloudy & Rainy	1,322,300
Aug. 1	1,450,000	"	1,343,200
2	1,463,600	"	1,329,700
3	1,430,400	Cloudy & Rainy	1,337,700
4	1,422,200	"	1,315,600
5	1,433,400	"	1,340,700
6	1,448,600	Cloudy & Fair	1,327,000
Average	1,437,000		1,312,000

ao

9 August 1950

Subjects: Counter Devices Against Decrease and Suspension of Water Supply at Tokyo and Yokohama

Date of Inspection: Tokyo 2 August 1950
Yokohama 3 August 1950

1. Causes of decrease and suspension of water supply at Tokyo and Yokohama. The following 5 causes are considered. (These are common for both cities).

a. Increase of water demand; increase of population, and increase of water demand per head per day. It means that the increase of demand is more than the increase of supply.

b. Change of phases of water demands before and after the War. Before the War, population was dense at the central area of the city, but to-day, revival of the most parts of there have delayed, on the other hand, the outskirts developed remarkably as recidence zones of citizens.

c. Complexity of topography - Many booster pumping stations have been installed for the upland districts, but for partial unevenness, it seems that it is difficult to adjust the water pressure.

d. Insufficiency of dia. of pipes - Mostly, the cases of supply decrease and suspension have occurred at the districts which have this defect, especially at the adjacent places of pipe ends.

e. Leakage - It is estimated that leakage amt. is 30 - 35% of distribution amt.

2. Case of Tokyo-to Water Works - On and after 16 July 50, total distribution amt. increased up to 1,450,000 m^3/day by beginning of use of the newly constructed No. 1 chemical setting basin at Kanamachi filter plants.

Remarks: On Aug ma. distrib. amt. was 1,338,000 m^3/day

Bad supply districts:

Lowland districts

a. The whole area of Adachi-ku

b'. Nippori, Arakawa-ku

b''. Oku, Arakawa-ku

Upland districts

e. The whole area of Suginami System

f. Shimura area, Itabashi-ku

g'. Tozuka-machi, Yodobashi-ku

g". Wakamatsu-cho, Yodobashi-ku

h'. Osaki, Shinagawa-ku

h". Gotanda, Shinagawa-ku

Remarks: Area C was improved by newly laid pipes (dia. 300 mm. length 1600m.) Area b' and b" will be expected good supply by completion of Shin-arakawa and Ayase inverted siphons. (Expected date of beginning of water passing, 5 this month.) Area d is caused from the low pressure of Kawasaki water works.

Improvement works: See attached sheets - works for the exclusion of the Bad Supply, Tokyo-to water works.

3. Case of Yokohama Water Works.

Bad supply districts

a. Some parts of Isogo-ku

b. " " " Gumyoji area

c. " " " Kanazawa-ku (Yokosuka side

d. Osato, Hommoku, (near Sankeien-garden)

e. Some parts of Tsurumi-ku (Kawasaki side)

f. " " " upland areas in the whole city

Remarks: Supply for Occupation Forces, very good.

Distribution and arrival amounts at Nishiya Purif. Plants. from 14 July 1950 to 2 Aug 1950.

Date	Distrib. Amt. (m^3/day)	Arrival Amt. (m /day)	Remarks
Jul 14	318,800	329,700	
15	328,000	332,700	
16	327,400	335,600	
17	341,600	332,700	
18	336,100	334,700	
19	341,500	335,600	
20	334,200	331,500	
21	343,600	332,900	
22	349,000	335,600	max. demand
23	334,300	335,600	
24	336,100		
25	335,500		
26	340,700		

Date	Distrib. Amt. (m^3/day)	Arrival Amt. (m^3/day)	Remarks
Jul 27	329,300	333,800	
28	326,900	333,900	
29	327,600	335,600	
30	332,700	318,200	
31	343,300	329,300	
Aug 1	325,800	321,200	
2	319,100	327,900	

Improvement works

a. Pipe laying works for the purpose of water supply improvement in Isogo, Gumyoji and Kanazawa.

Area.

Locality: Kubosho - Gumyoji
Dia. of pipes: 560 mm. (22 in)
Length: 3446 m.
Budget: 11,800,000 yen
Exp. period of works 20 Aug - 30 Nov (this year)
(Mr. Kumitomo, Chief of Y.W.W.B. said, "this plan will be decided by the municipal assembly within 2 or 3 days")

b. Partial improvement works in 50 J.F.Y.

(1) Completed works up to 31 July

Locality	Kind of Work	Dia. of Pipe (mm.)	Length (m)	Five Plugs
Kita-saiwai-cho, Nishi-ku	newly laying	100	398	4
Central market, Kanagawa-ku	"	150	68	
Tozuka-machi, Tosuka-ku	"	100	156	1
Idogaya-nakamachi, Minami-ku	"	100	303	
Iwama-machi, Nishi-ku	"	200	945	4
Yamuko-machi, Tsurumi-ku	"	100	204	3
Hiyoshi-machi, Kohoku-ku	"	75	189	2
Nakasato-machi, Minami-ku	"	100	216	2
Hommoku-mitsusaka, Naka-ku	"	100	119	1
Yamamoto-cho, Naka-ku	"	100	315	4
Hama-cho, Isogo-ku 2	"	100	370	2
Yatsusaka, Kanazawa-ku	"	100	48	
" "	"	65	58	
" "	"	127	15	
Daimonbashi-dori, Hodogaya-ku	"	100	128	1
Toyooka-dori, Tsurumi-ku	"	100	235	2
Ichiba-machi "	"	75	327	3
Total			4,094	29

(2) Works under construction

Locality	Kind of Work	Dia.of Pipe (mm)	Length (m)	Five Plugs
Shinohara-machi, Kohoku-ku	Newly laying	150	800	3
Mutsura-machi, Kanazawa-ku	"	75	172	1
Hommoku-Osato, Naka-ku	"	75	72	1
Total			1,044	5

(3) Works not yet started

Locality	Kind of Work	Dia.of Pipe (mm.)	Length (m)	Five Plugs
Hommoku-Motomachi, Naka-ku	Newly laying	150	522	
Namamugi-chugakko-dori, Tsurumi-ku	"	100	540	1
Kanazawa-machi, Kanazawa-ku	"	75	72	
" "	"	100	141	3
Tsurumi-machi, Tsurumi-ku	"	100	390	3
Shimosuiyosui-cho, Tsurumi-ku	"	100	267	3
Total			1,932	10
Gross total			7,070	44

Remarks: Mr. Kunitomi said, "Even the others than the a/m works, they will be carried out as long as the budget lasts".

by I. Nukazawa
Sanitary Engineer

Kanagawa

11 May 1950

The remarkable Points on Kawasaki W.W.

1. Particularity of Kawasaki-City

a) Besides the ordinary purified water supply system, Kawasaki-City has a raw water supply system for industrial use.

b) Consumption of factory (large amount consumer) use, the increase of which has not serious relation to population increase directly, is large comparing to general use. That is, in 1949
general use : factory use = 31 : 69

c) Yet now, leakage amount is large comparing with other cities.

d) Area of Kawasaki-City is limited, being held between Tokyo and Yokohama, and there is no land of enlargement excepting the reclamation of the sea. Therefore, population increase of Kawasaki-City in future will be limited and its maximum population can not possibly amount to more than 500,000 persons.

e) Consequently, on estimation of expected demand amount of water in future, the a/m special conditions must be taken up as most important functions.

2. 4th Extension Works

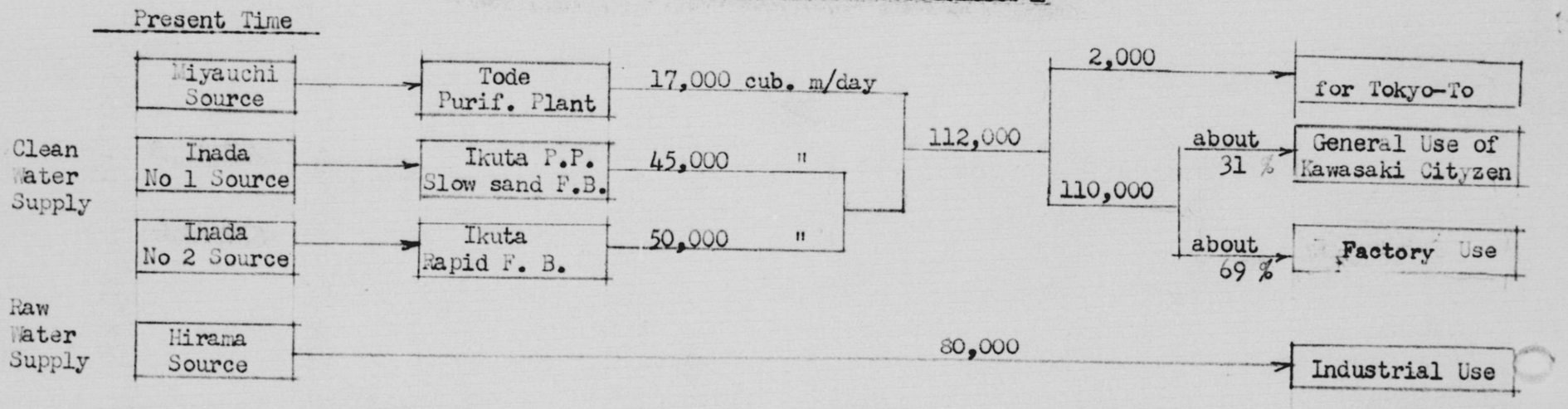
At the present time, it does not seem that the construction works of 4th extension projects have delayed, but as there are many works which must be completed hereafter, and also the funds accompanied with them are great amounts, it is anxiety whether or not the floatation of municipal loan will be authorized by Japanese Finance Department just as the plan of Kawasaki City. Therefore in order to push the works hereafter, great efforts of the officials concerned should be required, not only on the side of the execution of works but also on the side of the municipal finance.

3. Problem of Supply to Tokyo-To

~~Supply of 230,000 cub m per day of raw water to Tokyo-To which has suffered from want of water, in truth. So, promotion works of Kawasaki W.W. should be one of the most important matters for Tokyo-To also.~~

Supply of 230,000 cub m per day of raw water to Tokyo-To is good condition for Tokyo-To which has suffered from want of water, in truth. So promotion of Kawasaki W.W. should be one of the most important matters for Tokyo-To also.

Supply Capacity of Kawasaki Water Works

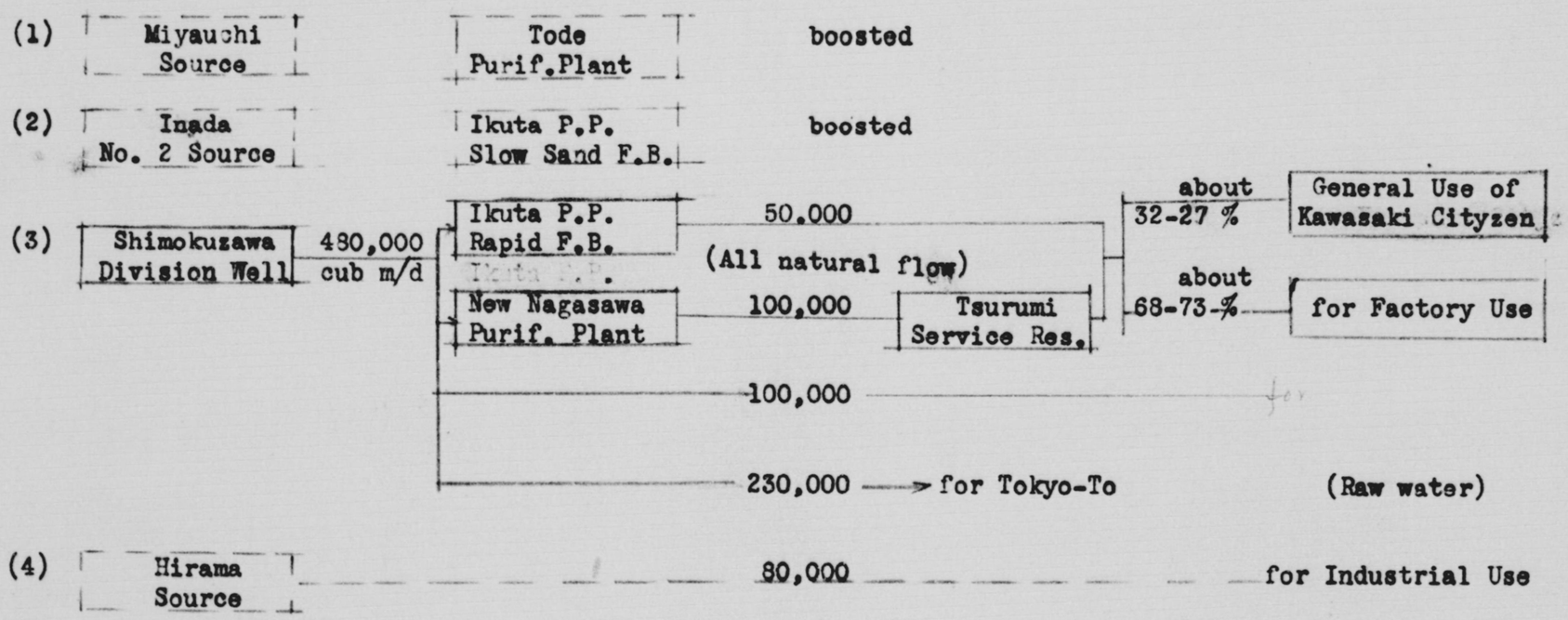


From August this year to final completion of the 4th Extension Projects

1. Against the demand increase, the clean water supply main will be boosted to be to supply 140,000 cub m per day, and in order to produce this amount of clean water, theexisting filter beds will be urged temporarily by means of increase of filtration velocity.

2. When conveyance tunnels have completed, 50,000 cub.m per day water will be ~~let flow~~ go to the Ikuta rapid filter beds, from this new source, and old Inada No.1 source will be discontinued.

After Completion of the 4th Ext. Projects



(1) (2) & (4) are retained as spare. If these spare installations operate also, total maximum supply capacity is as follows.

from spare source	62,000	212,000 cub m / day	
" new "	150,000		
" spare "	80,000	180,000 "	
" new "	100,000		

Actual Amounts of Clean Water Supply of Kawasaki W.W. from 1946 to 1949 Sheet /

	Items	1946 Amounts	%	1947 Amounts	%	1948 Amounts	%	1949 Amounts	%
A	General Use (measured by meter)	3,366,736	8.1	4,522,422	10.8	6,269,056	15.8	7,110,590	17.7
B	Factory Use (")	8,562,638	20.5	14,213,510	33.9	14,122,290	35.5	15,503,499	38.6
C	Supply to Tokyo-To (")	161,640	0.4	271,661	0.7	332,452	0.8	378,829	0.9
D	Supply to Yokohama (")	2,515,644	6.0	2,059,483	4.9	864,934	2.2	526,319	1.3
E	Leakage and Free Rent	27,109,790	65.0	20,804,011	49.7	18,143,131	45.7	16,674,994	41.5
F	Total (total distrib. amt.)	41,716,448	100.0	41,871,087	100.0	39,731,863	100,0	40,194,231	100.0

Remarks: A includes use of public baths
B includes use of railway yards and station, and supply for ships.
Units ofwater amout: cub m.

Expected Demand Amount of Clean Water at Kawasaki-City in Future

Sheet 2

Year	Total Popu-lation	Rate of Pervasion	Water Supply Popul.	Mean Net Demand for General Use Ltr/head /day	Mean Net Demand for General Use cub m /day	Mean Net Demand for Factories cub m/day	(A) Total Mean Net Demand cub m/day	% of Leakage against (A)	(B) Leakage Amt cub m/day	(A)+(B) Total Req. cub m/day	(A)+(B) Mean Amt cub m/day	{(A)+(B)}x1.12 Max Req. Amount cub m/day
1949	317,300	65.6	208,100	95.2	19,800	44,100	63,900	71.0	45,370	109,270		122,980
1950	333,000	68.0	226,440	100.0	22,640	46,300	68,940	65.0	44,810	113,750		127,400
1951	346,000	69.5	240,470	105.0	25,250	48,510	73,760	60.0	44,260	118,020		132,180
1952	358,000	70.5	252,390	110.0	27,760	51,160	78,920	55.0	43,410	122,330		137,010
1953	368,000	71.3	261,280	115.0	30,050	53,580	83,630	50.0	41,820	125,450		140,500
1954	376,000	72.1	271,100	120.0	32,530	56,230	88,760	46.0	40,830	129,590		145,140
1955	384,000	73.0	280,320	125.0	35,040	59,090	95,030	43.0	40,860	135,890		152,200
1956	391.000	73.6	287,780	130.0	37,410	62,180	99,590	42.0	41,830	141,420		158,390
1957	398,000	74.2	295,320	135.0	39,870	65,270	105,140	41.0	43,110	148,250		166,040
1958	404,000	74.6	301,380	140.0	42,190	68,360	110,550	41.0	45,330	155,880		174,590
1959	409,000	75.2	307,570	145.0	44,600	71,880	116,470	40.0	46,590	163,060		182,630
1960	414,000	75.7	313,400	150.0	47,010	75,410	122,420	40.0	48,970	171,390		191,960

Remarks: Figures of 1949 are actual results.

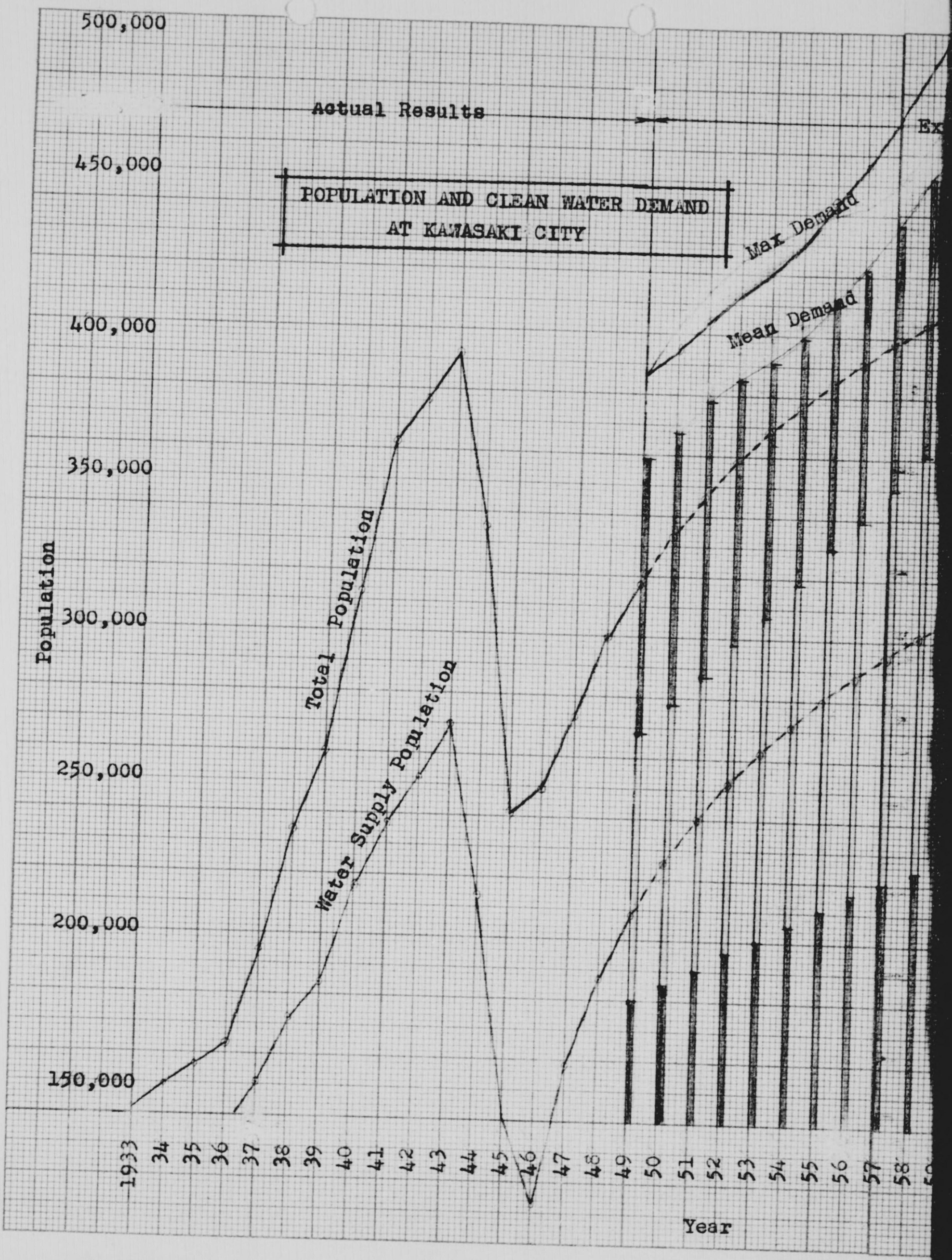
(Investigated by I. Nukazawa.)

Clean Water Supply Capacity & Demand of Kawasaki City

Actual Results from 1933 to 1949

Sheet 3

Year	Total Popoulation	Rate of Pervasion %	Water supply Population	For General Use: Max Demand Ltr / head / day	For General Use: Max Demand cub m / day	For Use of Factories Max Demand cub m/ day	Total Max Demand cub m / day	Percentage of: General Use	Percentage of: Factory Use
1933	141,850	66.54	94,387	97.9	9,240	9,249	18,489	50.0	50.0
1934	150,375	87.98	102,345	93.0	9,513	11,026	20,539	46.4	53.6
1935	156,522	72.71	113,807	101.9	11,594	12,179	23,773	47.5	52.5
1936	162,800	83.24	135,515	105.2	14,261	16,075	30,336	47.1	52.9
1937	194,762	77.92	151,759	106.6	16,185	21,415	37,600	43.0	57.0
1938	234,542	73.55	172,506	100.8	17,403	31,587	48,990	35.6	64.4
1939	260,104	70.79	184,128	134.3	24,728	46,573	71,300	34.6	65.4
1940	313,025	69.29	216,902	157.1	34,070	48,657	82,727	41.2	58.8
1941	362,399	65.28	237,179	147.3	34,948	49,914	84,862	41.1	58.9
1942	376,601	67.04	252,472	143.8	36,293	51,834	88,127	41.2	58.8
1943	392,000	68.88	270,000	156.8	42,336	60,464	102,800	41.2	58.8
1944	335,471	63.78	214,034	99.5	21,303	67,897	89,200	23.8	76.2
1945	241,449	59.04	142,280	94.6	13,459	50,114	63,573	21.2	78.8
1946	249,596	45.50	113,240	310.0	35,100	without statistics			
1947	272,943	58.20	158,691	220.0	34,900				
1948	298,914	62.50	187,338	185.0	34,660				
1949	317,300	65.60	208,100	183.3	38,150	84,830	122,980	31.0	69.0


POPULATION AND CLEAN WATER DEMAND
AT KAWASAKI CITY
Actual Results
Max Demand
Mean Demand
Total Population
Water Supply Population
Population
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
1933
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35
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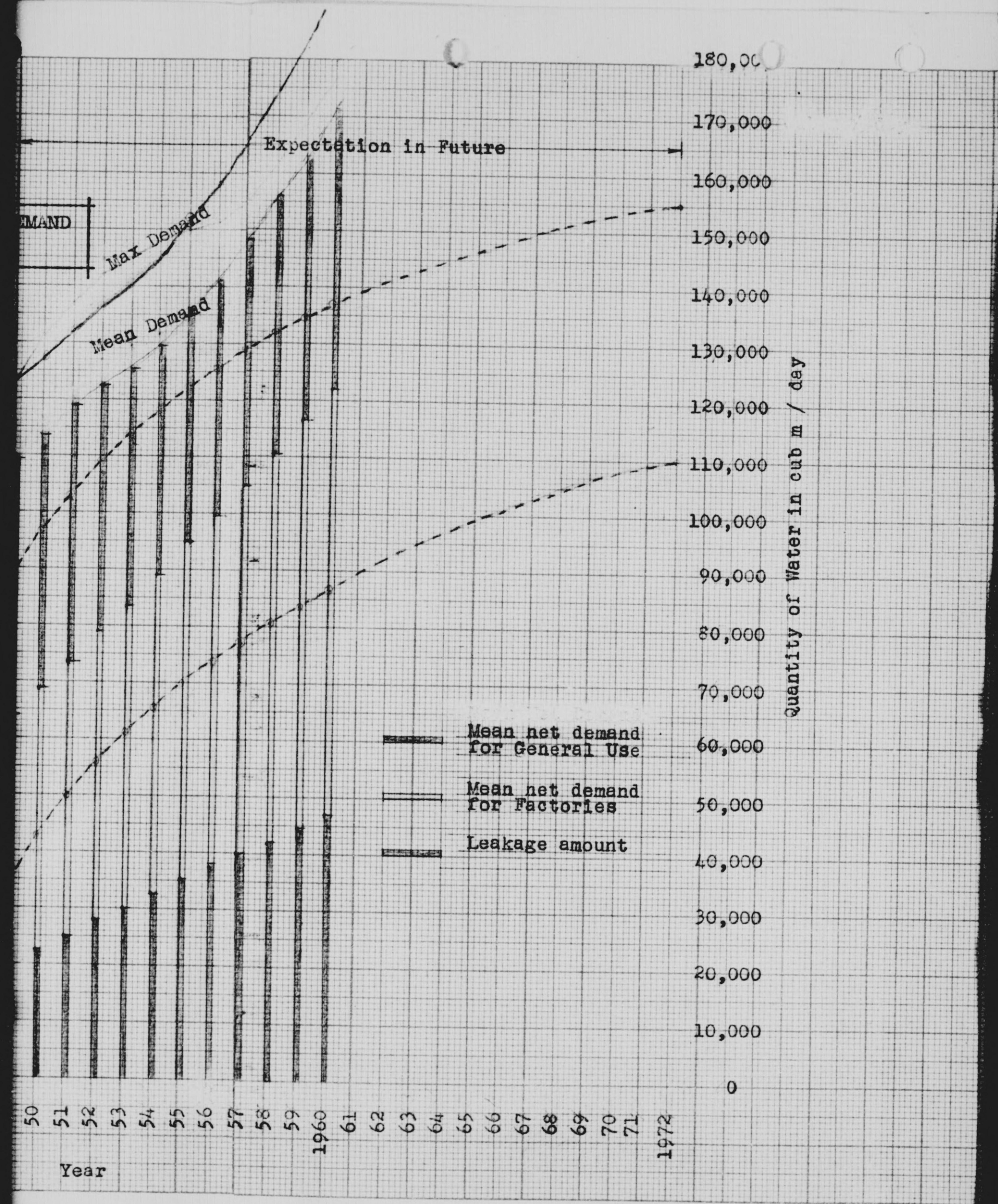
Year


Expectation in Future
Max Demand
Mean Demand
Mean net demand for General Use
Mean net demand for Factories
Leakage amount
Quantity of Water in cub m / day
180,000
170,000
160,000
150,000
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Year
50
51
52
53
54
55
56
57
58
59
1960
61
62
63
64
65
66
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70
71
1972

Kanazawa

Existing Equipments of Kawasaki W. W.

The existing equipments of sources and filter plants are classified in the following 3 systems.

a. Miyauchi - Tode system
b. No. 1 Ikuta system
c. No. 2 Ikuta system

A. Miyauchi - Tode system

1. Source of water

The intake plant is located at Miyauchi about 5.6 miles N. W. of Kawasaki city center. The raw water is "river bed water" which is collected by infiltration galleries installed in the bed of the River Tama. Max. intake capacity is 18,000 cub m per day. The collected raw water is pumped to Tode filter plants. The intake pump station is located near the inside of the bank of the River Tama, and one set of 300 m m bore turbine pump and two sets of 250 m m bore turbine pumps are installed in it.

2. Conveyance of Raw Water

From Miyauchi intake plant to Tode filter plant Length 7,180 m (4.46 miles) 2 lines each inner dia. 350 m m cast iron pipes.

3. Tode Filter Plant

Tode F. P. is located at the place about 1.25 miles N. W. of Kawasaki city center, and consisted of the following equipments.

Equipment	No. of Units
Arrival Wells	2
Sand slow filter beds	6

	Length (m)	Width (m)	Eff. Area (sq m)	Filt. speed (m/d)
No. 1 Bed	23.5	31.1	730	40
No. 2 Bed	23.5	31.1	730	40
No. 3 Bed	23.5	31.1	730	40
No. 4 Bed	29.3	31.1	910	40
No. 5 Bed	22.5	31.1	700	40
No. 6 Bed	22.5	31.1	700	40
Total			4,500	

Total max filtration capacity 18,000 cub m/day.

Service reservoirs 4

	Length (m)	Width (m)	Eff. Depth (m)	Capacity (cub m)
No. 1 Resv	20.4	15.94	2.4	770
No. 2 Resv	20.4	15.94	2.4	770
No. 3 Resv	20.4	24.61	2.7	1,330
No. 4 Resv	20.4	24.61	2.7	1,330
		Total		4,200

Distribution pumps 5

Each, 75 H. P. Bore 250 m m Turbine pump

B. No.1 Ikuta System

1. Source of water

The raw water is "river bed water" which is collected by infiltration galleries installed at the foreland of Inada bank of the River Tama, about 6 miles N.W.W. of the Miyauchi intake, and about 11 miles N.W. of the Kawasaki city center. Max intake capacity is 60,000 cub m per day. The collected raw water is pumped up, to the No. 1 Ikuta filter plant on the hill (El. 78.0 m) about 1.1 miles S of the intake site.

The pump station is located near the inside of the Inada bank, and 8 sets of 250 m m bore turbine pumps are installed in it.

2. Conveyance of raw water

From Inada intake pump station to No. 1 Ikuta filter plant.

Length 2,014 m (1.25 miles) 1 line,
Inner dia 700 m m electric welding steel pipes.

3. No. 1 Ikuta F. P.

No. 1 Ikuta F.P. is located on the hill (El. 78.0 m) about 1.1 miles south of the Inada intake pump station, and it is consisted of the following equipments.

Equipment	No. of Units
Rapid filter beds	10
For each bed	
Length	8 m
Width	5 m
Area	40 sq m
Filt. speed	125 m/day
Max filt. capacity	50,000 cub m/day (in all)

Service reservoirs	2	
for each reservoir		
Length	55.7	m
Width	27.6	m
Eff. depth	3.0	m
Capacity	4,289	cub m
Total ca.	8,578	cub m
Water quality examination apparatus	1	
Chlorination apparatus	1	

C. No. 2 Ikuta System

1. Source of Water

"The river bed water" is collected by 5 shallow wells which are installed at the protected lowland of the Inada bank of the River Tama, neighbouring to the intake pump station of the No. 1 Ikuta System. The wells are arranged at intervals of about 300 m and connected in series each other. They are constructed of reinforced concrete by well sinking method. Inner dia, depth, and max intake capacity of each well are 6 m, about 15 m and about 10,000 cub m per day respectively.

On the top slab of each well, two pumps (one is spare) are installed.

Total intake capacity is 50,000 cub m/day

2. Conveyance of Raw Water

No. 1 well	——	No. 2 well	inner dia	400 m m	Hume pipe
No. 2 well	——	No. 3 well	inner dia	500 m m	Hume pipe
No. 3 well	——	No. 4 well	inner dia	600 m m	Hume pipe
No. 4 well	——	No. 5 well	inner dia	700 m m	Hume pipe
No. 5 well	——	Filter Plant	inner dia	700 m m	Hume pipe
Total length		2,540 m	(1.57 miles)		

3. No.2 Ikuta F. P

The No. Ikuta F.P. is located at the adjacent northern lower place of No. 1 Ikuta F.P. and it is consisted of following equipment

Equipment			No. of Units
Slow sand filter beds			6 (2 are spares)
for each bed			
length	58.3	m	
width	39.0	m	
eff. area	2,249	sq m	
filt. speed	5.0	m 1 day	
filt. capacity	45,000	cub m 1 day (in all)	

Clean Water reservoir	1
length	56.8 m
width	47.2 m
eff. depth	3.0 m
capacity	7,310 cub m
Pump house	1
Lift pumps	4 (1 is spare)

4. Service Reservoir

The service R. is installed ~~standing~~ side by side with the service Res. of No.1 Ikuta System.

length	59.4 m
width	55.4 m
eff. depth	3.0 m
capacity	9,375 cub m

Clean water is pumped up, flowing through the inner dia 700 m m cast iron pipe line whose length is 444.5 m, from clean water R. to this service R.

The clean water pumped up, is chlorinated just before flowing into the service R.
(The old chlorination apparatus belonging to the clean water R. was removed near the service R. on Oct. 49, by the reason of that chlorine gives bad influence to the pump. It should be investigated more strictly.)

List of Pumps of Existing K."W. W.

Items	Unit	Miyauchi-Tode System		
		Intake	Pumps	Distribution Ps
No. of sets	set	1	2	5
Type		one-stage horiz. type Turbine P.	one-stage horiz. type T. P.	2-stage horiz type T. P.
Bore	m m	300	250	250
Lifting head	m	56.7	33.0	51.8
Lifting capacity	cub m/min	8.5	6.2	4.34
Req. H. P.	H. P.	200	75	75

		No.1 Ikuta System	No.2 Ikuta System	
		Intake Pumps	Intake Pumps	Lifting Pumps
No. of sets	set	8	10	4
Type		2-stage veritcal type Turbine P.	Vertical type Evolution P.	2-stage horiz. type Turbine P.
Bore	m m	250	250	350
Lifting head	m	85.0	18.0	64.0
Lifting Capacity	cub m/min	7.1	7.0	11.7
Req. H. P.	H. P.	190	55	260

D. Distribution Pipe Lines

1. Distribution Mains:

   a. From S. R. on the Hill Ikuta to the front of Tode F.P.
   inner dia 1,000 m m electric welding steel pipes.
   length 17,423.3 m

   b. From Tode F.P to the city center.
   inner dia 450 m m steel pipes.

2. Branch Lines:

   3-300 m m pipe lines and 1-250 m m pipe line, branching off on the a/m main a.

3. Distr. Lines in the city Area: (Measured on 1 Oct. '49)

Kind of Pipe	Inner Dia (m m)	Length (m)
Steel pipe	900	2,666.00
Steel pipe	700	1,141.00
Steel pipe	600	4,158.00
Cast iron pipe	500	2,756.20
Cast iron pipe	450	2,783.50
Cast iron pipe	400	3,783.00
C.I and steel	350	6,814.00
C.I and Steel	300	7,073.41
C.I and steel	250	4,862.11
C.I and steel	200	22,536.05
C.I and steel	150	40,615.61
Cast iron pipe	125	274.47
C.I. and steel	100	98,155.81
Etanit pipe	100	21,527.47
C.I. and steel	75	95,525.07
Etanit pipe	75	2,025.69
Hume pipe	100	1,060.00
Total		317,767.39 (197.45 miles)

Remarks: There are no settling reservoirs at every system, besides washing of rapid filter bed has been operated once a week only, source water being so much clean.

Kanagawa

Outline of the 4th Extention Projects of Kawasaki W.W.

I. General

Beginning of work	July 1941
Work Suspension	June 1945
New Start after the end of the War	April 1948
Expected period of work completion	March 1953
Total alternation budget	2,330,000,000 (yen)

II. Alternation (4th) Plan

A. Source Utilization works of Sagami-Ri by Kanagawa Prefecture

B. Quantity of Raw Water 480,000 cub.m /day

for general use	150,000	"
for industrial use	100,000	"
for Tokyo-To	230,000	"

Remarks:- Total quality of raw water included utilization of existing sources which are 62,000 cub.m /day for the general use and 80,000 cub.m /day for the industrial use, is 622,000 cub.m /day.

C. expected full demand period 1960

D. Kinds of Works

1) Water Conveyance Tunnels

a) Cooperative works by Kawasaki and Yokohama from Tsukui Division Well to Shimokuzawa Division Well, (executed by Yokohama-City)

Tunnel	4,129	meter
Intake work	28	"
Division Well (shimokuzawa)	52	"
Culvert	60	"
Total length	4,269	"

b) From the end of Shimokuzawa D.W. to Nagasawa Purif. Plant

Tunnel		length	20,630	meter
Inverted Siphons	4	"	810	"
Culverts	3	"	135	"
Division well	1	"	13	"
Arrival well	1	"	12	"
Rapid fall pipeline	1	"	158	"
Aqueduct	1	"	30	"
		total length	21,788	"

2) Nagasawa Purification Plant

a) Arrival well 1
b) Open channel, from the end of tunnel to the arrival well, and Over flow 1
(Water for Tokoy-To is divided from here)
c) Coagulation basin 1
d) Division well 1
(Water for existing Ikuta purification Plant, and for industrial use are divided from here)
e) Culvert, from the coagulation basin to the division well)
f) Settling reservoirs 4
inner dia. 47.0 m circular shape
g) Rapid filter beds 14 beds
Wheeler system
total filtration capacity 108,000 cub.m /day
filt. vel. 120 m /day
h) Pump Well 1
i) Pumps & other miscell. machins for rapid F.B.
j) Apparatus of chlorination and water quality test
k) Clean water reservoir 1
capacity, 18,000 cub. m
square shape with a bulkhead at middle center
l) Water tank for sand washing 1
m) Miscellaneous Conduits and Drain pipes
n) Land levelling, Roads and Miscell. Works

3) Supply Main

a) Cast iron pipe line
inner dia, 1,100 m.m. length, 11,500 m.
from Nagasawa purification plant to the crossing point of Toyoko-line at Hiyoshi, Kohoku-ku, Yokohama.
b) Steel pipe line
inner dia, 1,100 m.m. length, 5,110 m.
from Hiyoshi to Tsurumi Service Reservoir.

4) Distribution Main

a) Tsurumi Service Reservoirs 3
total capacity 27,000 cub. m
reinf. conc. construction
b) Distribution Main & Branch line
inner dia. 1,100 700 600 500 350 & 300 m.m
cast iron pipes
total length 8,240 m.
from Tsurumi Serv R. to Kawasaki city center and in the city area

5) Water Conveyance Conduits
inner dia 1,200 m.m cast iron pipes
length 2,460 m
from Division well at Nagasawa purification plant to existing Ikuta Rapid filter beds

6) Over flow

a) Reservoir capacity 22,000 cub m
b) Intake tower
c) Conduit pipe
inner dia 1,500 m.m Hume pipe
length 97.2 m
from Open channel at Nagasawa purif. plant to the reservoir
a)
d) Drain Tunnel
1.5m x 1.5 m horse shoe shape
concrete lining, length 852 m

7) Buildings

8) Compensation for land

9) Machins and Instruments for construction works

III. Budget, Actual Expenditure and Work Progression

Items	Budget (yen)	Actual Expenditure by the end of March 50 (yen)	Work Progression (actual) at the end of March 50 %	Work Progression (expected) at the end of march 51 %	Expected period of completion
Construction Works					
1) Water conveyance Tunnels	987,880,000		46.7	100	March 51
a) Cooperative Works	80,000,000				
b) Main Convey.Tunnel	793,780,000				
c) Rapid fall Pipes	9,735,000				
d) Inverted Siphons	88,455,000				
e) Aqueduct	12,160,000				
f) Culverts	3,750,000				
2) Nagasawa Purification Plant	359,640,000		7.0	40.5	March 53
a) Arrival Well (including Open Channel)	9,210,000				
b) Coagulation Bacin	16,460,000				
c) Settling Reservoir	102,450,000				
d) Rapid Filter Beds (including Pumps, other Machines & Apparatus)	103,670,000				
e) Pump Well	1,833,000				
f) Clean water Reservoir	36,485,000				
g) Water Tank for Sand Washing	5,100,000				
h) Conduits & Pipes	45,220,000				
i) Miscell. for Ground	39,212,000				
3) Supply Main	375,940,000		0	66.0	March 53
a) Cast iron Pipe Line	218,780,000				
b) Steel Pipe Line	157,160,000				
4) Distribution Main	286,630,000		4.1 ~~41.0~~	41.0	March 53
a) Tsurumi Service Reservoirs	146,460,000				
b) Distribution Pipes	140,170,000				

(continue)

Items	Budget (yen)	Actual Expenditure by the end of March 50 (yen)	Work Progression (actual) at the end of March 50 %	Work Progression (expected) at the end of March 51 %	Expected period of completion
5) Water Conveyance Conduits	82,526,000		0		March 51
6) Over flow	31,630,000		0		March 52
a) Intake Tower	2,574,000				
b) Reservoir	9,610,000				
c) Conduit pipe & DrainTunnel	19,446,000				
7) Buildings	32,813,000		27.0		March 53
8) Compensation for Land	25,014,000				"
9) Machines & Instuments	23,256,000				"
10) Miscellaneous	13,751,000				"
Total Sum of Construction Works	2,219,080,000	381,901,000	about 33.0	about 37.0	"
Office Expense	87,920,000	21,561,000			
~~Reserve~~ Emergency use Funds	23,000,000	0			
Gross Total	2,330,000,000	403,462,000			

Kanagawa

17 August 1950

SUBJECT: Some Items of 4th Extension Projects of Kawasaki Water Works

FROM: I. Nukazawa

TO: Mr. C. W. Allen

This is the supplementary volume of the original report which was already submitted to your inspection.

1. Main contract works of extension projects after the closure of the war.

Mark	Name of Work
A	1st Construction Work of No. 1 Section of Conveyance Tunnel.
B	2nd " " " 2 " " "
C	1st " " " " " "
D	2nd " " " " " "
E	3rd " " " " " "
F	Construction works of an aqueduct.
G	" " of No. 1, 2, 3, 4, inverted siphons.
H	" " of No. 5 inverted siphon.
I	Manufacturing and setting at site of steel pipes for No. 1, 2, 3, 4, inverted siphons.
J	Manufacturing and setting at site of electric welding steel pipes for No. 5 inverted siphon.
K	Construction works of Nagasawa Purification Plants.

Mark	Locality (from--to)	Work Included	Period (from--to)	Contract Cost (yen)	Contractor
A	Shimokuzawa D.W. -- Koyama, Sagamibara-machi, Kanagawa Prefecture	Conveyance tunnel, horseshoe shape, conc. lining, ht & width each 2.6 m Length 2,697.8 m	2 Oct 48 - -30 Sept 50	82,856,700	Kodama Kogyo Co. Ltd. Tokyo
B	"	" Length 1,435.5 m	12 July 49 -- 31 Mar 51	55,787,000	"
C	Takaishi-- Nagasawa, Kawasaki-Shi	" Length 1,340.15 m	7 Apr 48-- 30 Oct 49	32,983,330	Hazama-Gumi Co. Ltd. Tokyo

Mark	Locality (from--to)	Work Included	Period (from--to)	Contract Cost (yen)	Contractor
D	Shimokoyama Tatau-Mura Tokyo-To--Ikuto, Kawasaki-Shi	Conveyance tunnel Length 6,106.76 m 1-Devision well	28 Sept 48 --31 Mar 51	229,025,950	Hazama-Gumi Co., Ltd. Tokyo
E	Koyama, Sagami-Hara-Machi, Kanagawa Pref. --Takaishi, Kawasaki-Shi.	Conveyance tunnel, horseshoe shape, cone. lining, ht and width each 2.6 m. Length 8,851.48 m 1-junction well.	20 May 49-- 31 Mar 51	283,500,000	"
F	Ikuta, Kawasaki-Shi	Box rahmen type, reinf. conc. bridge loading of reinf. conc. conduit. full length 30 m.	28 Apr 49 --31 Mar 50	10,168,700	"
G	Ikuta, Kawasaki-Shi	Conc. cover of 2-steel pipe lines, dia. 1700 mm. (pipe setting works, not be included) length of one line 801.38 m 8-reinf conc. junction wells.	8 Aug 49-- 7 Aug 50	55,000,000	Hazama-Gumi
H	Ikuta, Kawasaki-Shi	Conc. cover of steel pipe line, dia. 2400 mm. (pipe setting works, not be included) Length 106. m 2-reinf. conc. J. W.	15 Jul 49-- 31 Mar 50	5,799,331	"

Each of the a/m works is the residue of which was suspended with payment of accounts settled. After the closure of the war, at the time of restarting of works; it was decided to let the former contractor carry out each residual work by free contract, for fear of delaying of work following to confusion or trouble between the former and the new contractor, according to existence of old relations.

I think that it is unavailable measure, but it is very difficult to make sure whether cost estimation of each new contract is fair and reasonable or not, because of complexity of work conditions.

The following 3 were tendered by bidders picked up by Kawasaki Municipality.

Mark	Locality (from--to)	Work Included	Period (from--to)	Contract Cost (yen)	Contractor
I	Ikuta, Kawasaki-Shi	Manufacture and setting of dia. 1,700 mm. steel pipes. Total length 1433.35 mm.	18 May 48 --30 June 50	25,907,641	Fukushima IRon Works Co. Ltd. Kawasaki
J	"	Manufacture and setting of site of dia. 2,400 mm. elect. welding steel pipes. Length 92.15 m.	15 Feb 49 --31 Mar 50	2,600,451	"
K	Nagasawa, Ikuta, Kawasaki-Shi	1-arrival basin 1-open channel 1-coagulation basin 1-devision well 1-culvert 4-settling reservoirs 14-rapid filter beds 1-pump well 1-clean water reservoir 1-water tank for back washing Miscellaneous conduits and drain pipes land leveling, road and other miscellaneous works.	1 Apr 50--31 Mar 50	200,380,000	Hazama-Gumi

Bidding Results

Mark of Work	Method of Bidding	Date of Bidding	Bidder	Bidding Cost	Reasonable Expected Cost	Remarks
J	Bidding by selected members	11 Feb 49	Fukushima Iron Works	2,380,000	2,550,000	Successful
			Nihon Kokan Yokohama	2,500,000		
			Shipyard, (Mitsubishi	2,620,000		
			Joko) Sakai Iron Works	3,500,000		
I	"	18 May 49	Fukushima Iron Works	15,734,000	19,650,000	Successful
			Sakai Iron Works	15,850,000		
			Yokohama Shipyard	15,885,000		
			Nihon Kokan	17,900,000		
K	"	10 Feb 50	Hazama-Gumi	200,380,000	201,400,000	Successful
			Taisei Kensetsu	238,000,000		
			Nishimatsu "	243,000,000		
			Kumagai-Gumi	250,000,000		
			Obayashi-Gumi	256,000,000		

2. Materials Required.

Material	Unit	Required Amounts	Items of Req. Amt. for Tunnel Works	for the Others
Cement	Kil.T.	25,712	17,495	8,217
Steel	"	1,797	1,080	717
Cast Iron Pipe	"	13,511	2	13,509
Cast iron	"	73	0	73
Lead	"	450	50	400
Steel pipe	"	2,166	766	1,400
Yarn	"	17.3	0.1	17.2
Coke	"	25.3	0	25.3
Charcoal	"	63	0	63
Clean Sand	m^3	52,433	37,800	14,633
Gravel (not clean)	"	2,478	833	1,645
Round Stone	"	7,252	1,840	5,612
Clean Gravel	"	85,685	69,000	16,685
Gasoline	Gal.	152,650	95,000	57,650
Timber	Koku	59,927	16,289	43,638

Remarks: "Koku" is Japanese measuring unit for a large amount of timber only, (different from "koku" which is used for liquid and grain). 1 koku = 10 cu. ft. (nearly)

3. Unit Cost of Works in Budget

a. Tunnel Work

Kind of Work	Description	Unit	Unit Cost: After the re-start (yen)	Unit Cost: Before the re-start (yen)
Excavation of tunnel	Horseshoe shape 2.6 m x 2.6 m (inner measure)	M	21,008.20	782.41
Conc. lining of tunnel	1:3:6 mix	M^3	4,881.00	112.04
Forms for conc.		M^2	1,453.00	64.05
Rubble Concrete	Ground conc. 1:4:8 mix	M^3	3,790.00	--

b. Other Works

Kind of Work	Description	Unit	Unit Cost: After the re-start (yen)	Unit Cost: Before the re-start (yen)
EARTH WORK				
Excavation	Ht.< 3.0 m.	M^3	315.00	3.60 3.80
"	Ht.> 3.0 m.	"	420.00	4.60
Refilling and heaping up		"	131.00	1.80
Sodding		"	,122.00	--
CONSTRUCTIONAL WORK				
Concrete A	1:2:4 min	M^3	4,770.00	--
" B	1:3:6: "	"	4,190.00	--
" C	1:4:8 "	"	3,830.00	--
Reinforcement		Kil.T	27,800.00	--
Forms for conc.		M^2	420.00	--

Kind of Work	Description	Unit	Unit Cost: After the re-start (yen)	Unit Cost: Before the re-start (yen)
Rubble Foundation		M^3	1,930.00	--
Asphalt coating	Thickness 13 mm	M^2	380.00	--
Special mortar Coating for water tight	Thickness 20 mm) 1:2 mix)-	M^2	720.00	--
Mortar coating for water tight	Thickness 12 mm) 1:3 mix)	(for use of wall)	597.00	--
		(for use of bottom slab)	470.00	--
Expansion Joint (for reservoir)		M	1,525.00	--

Pipe Laying Works

Articles	Innerdia (mm)	Length (m)	Material Cost	Pipe Setting Works (not include earth & conc. works)
Steel Pipes	Various		55,000 yen/T	
"	2,400			4,100 yen/m
"	1,700			2,900 "
"	1,100	6		8,500 yen/piece
"	900	"		5,750 "
"	300	"		1,434 "
C.I.P (straight)	Various		20,040 yen/T	
"	1,100	4) for conveyance		7,410 yen/piece
"	900	")-pipe line		5,750 "
"	300	") Nagasawa F.P.-- Tsurumi Reserv.		1,434 "
"	1,200	") for conveyance		8,046 "
"	1,000	")-pipe line		6,592 "
"	700	") Nagawawa F.P.--		3,830 "
"	300	") Ikuta F.P.		1,382 "
"	1,100	) for distribution		4,690 yen/m
"	700	) pipe line		2,706 "
"	600	)-Tsurumi F.P.--		2,258 "
"	500	) the city of Kawasaki		1,839 "
C.I.P (irregular)	Various		40,960 yen/T	

On the Corrosion of Metal
by Chlorinated Supply Water

It seems that copper, steel, zinc, bronze, brass, gun metal, etc are attacked by chlorinated supply water.

For example, runners of turbine pump (made of special steel) and ~~cleaning~~ cooling pipes (made of copper) at the Ikuta filter plant, Kawasaki W.W. was attacked considerably and at the each attacked surface, pock-marks have appeared all over, and at the Nihon Kokan factory, it is said that rate of corrosion of runners of steam turbin (made of Monel metal) by chlorinated water use of 6 months was more excessive than that by non-chlorinated water use of 3 years.

(cf. Chlorine contents were 0.7 - 1.0 ppm at the supply end of this factory during from Jan 1948 to Jun 1949.)

KAWASAKI STEEL MFG FACTORY OF NIHON KOKAN CO LTD

1. Approx. actual figures at April 50.

Consumption of clear water supplied by K.W.W.	7,250	ton/day
for production, supposed about 70%	5,075	"
for welfare, " " 30%	2,175	"

Worked persons including clerk & business men about 12,500

Then, for welfare 2,175 ÷ 12,500= 174 ltr /head/day

Used amount of raw water

raw water supplied by K.W.W.	514,680	ton/month
raw water by self supply	14,810	"
total supplied amount of raw water	529,490	"
amount of repeating use	967,220	"
gross total amount	1,496,710	"

The greater part of the supplied raw water has been used being filtered by the self installations.

2. Production, laborers, & clear water consumption.

Year (fiscal)	Production Amounts	Production Index No.	Laborers Persons	Laborers Index No.	Clean Water Consumption Amounts	Clean Water Consumption Index Number
	T				Cub m	
1946						
1st half-yr	64,051		757,000			
2nd "	71,051		898,000			
Total	135,102	100	1,655,000	100	1,098,800	100
1947						
1st half-yr	105,806		1,067,000			
2nd "	116,727		1,180,000			
Total	221,533	164	2,247,000	135	1,151,000	105
1948						
1st half-yr	307,340		1,449,000			
2nd "	467,899		1,758,000			
Total	775,239	571	3,207,000	194	1,972,300	179
1949						
1st half-yr	659,081		2,113,000			
2nd "	919,555		2,137,000			
Total	1,578,636	1165	4,250,000	257	2,639,500	240

Remarks: Clerks and business men are not included in "laborers".

Above figures indicate that the more water consumption increase the more production goes up, but their increments are not directly proportional, and moreover, water amounts are not made distinctions

according to the uses for production and welfare. Then I suppose approximately basing upon talk of the officials concerned of this factory as follows.

A. Yearly production.
B. Water demand per ton of production.
C. A x B, yearly water demand for production.
D. Yearly total worked laborers.
E. Water demand per head per day for welfare.
F. D x E, yearly water demand for welfare.
G. C + F, total demand.
H. Total consumption indicated on meters.
I. Corresponding amount as leakage.
J. I ÷ H, percentage of leakage.

Year (fiscal)	A	B	C	D	E	F
	T	Cub.m.	Cub.m.		Cub.m.	Cub.m.
1946	135,100	1.50	202,650	1,655,000	0.15	248,250
1947	221,530	1.45	321,220	2,247,000	0.14	314,580
1948	775,240	1.20	930,290	3,207,000	0.14	448,980
1949	1,578,640	.90	1,420,780	4,250,000	0.14	595,000

Year (fiscal)	G	H	I	J
1946	450,900	1,098,800	647,900	59.0
1947	635,800	1,151,000	515,200	44.8
1948	1,379,270	1,972,300	593,030	30.1
1949	2,015,780	2,639,500	623,720	23.6

Remarks: I suppose that the remarkable decrease of B (water demand per ton of production) in 1948 and 1949 may perhaps depend on the increase of repeating use of clean water filtered by self installation and decrease of leakage in the factory compound.

Half-yearly Products, from 1946 to 1949

Reported by Kawasaki Steel MFG Factory of Nihon Kokan.

Year (fiscal)	Pig-iron	Sintered Ore	Coke	Chemicals (by-products)	Steel Production	Rolled Steel	Steel Pipes	Refractories (Brick, Cement)	Total	Index No.
	T	T	T	T	T	T	T	T	T	
1946										
1st half-yr			20,321	1,313	22,367	7,804	10,326	1,920	64,051	
2nd "			18,135	654	28,298	8,899	12,582	2,483	71,051	
Total			38,456	1,967	50,665	16,703	22,908	4,403	135,102	100
1947										
1st half-yr			23,037	1,774	41,875	17,796	16,794	4,530	105,806	
2nd "			29,866	2,063	45,973	20,411	13,204	4,210	116,727	
Total			52,903	3,837	87,848	38,207	29,998	8,740	221,533	164
1948										
1st half-yr	67,162	12,558	95,669	5,076	57,823	39,479	22,553	7,020	307,340	
2nd "	111,118	36,566	112,141	7,407	102,928	55,179	31,483	11,077	467,899	
Total	178,280	49,124	207,810	12,483	160,751	94,658	54,036	18,097	775,239	571
1949										
1st half-yr	159,846	60,615	149,232	12,246	146,331	79,370	36,599	14,842	659,081	
2nd "	222,166	74,481	185,808	28,899	225,502	130,010	38,152	14,537	919,555	
Total	382,012	135,096	335,040	41,145	371,833	209,380	74,751	29,379	1,578,636	1,165

KAWASAKI FACTORY OF SHOWA DENKO CO LTD

1. Approx, actual figures at April 1950.

Consumption of clear water supplied by K.W.W.		3,600	Cub.m/day
for production, supposed about	86%	3,100	"
for welfare, " "	14%	500	"

worked persons including clerk and business men about 2,700

Then, for welfare, 500 ÷ 2,700= 187 ltr/head/day

Consumption of raw water supplied by K.W.W. 25,000 cub.m./day
All being used without filtration.

Self supply plant
There are 10 wells, each has 150 cub.m/hour capacity, but only 3 of them are used, and the other 7 ones are in ruin now.

2. Production, laborers, & clear water consumption.

Year	Production of Ammonium Sulphate Ton		Laborers, not including business-men		Clear water Consumption Cub.m.	
1946	69,052,450	(100)	620,000	(100)	898,090	(100)
1947	62,210,120	(90)	887,000	(143)	870,500	(97)
1948	105,238,860	(152)	964,000	(155)	1,034,370	(115)
1949	118,370,260	(171)	971,000	(157)	1,271,530	(151)

Remarks:
( ) indicates index number.

Investigation on relation among production, worked persons and clear water consumption.

Assumed figures: Percentage of water leakage.
Net demand for welfare per head per day.

Notations:

A Total yearly consumption of clear water supplied by KWW
B Percentage of leakage in the compound.
C Yearly leakage amount in the compound.
D Total yearly net demand of clear water.
E Net demand of C.W. for welfare per head per day.
F Yearly worked persons.
G Yearly net demand of C.W. for welfare.
H " " " " " for production
I " production.
J Net demand of C.W. per 1,000 ton of production.

Year	A	B	C	D	E	F	G	H	I	J
			(A x B)	(A - C)			(E x F)	(D-G)		(H + I)
	cub.m.	%	cub.m.	cub.m.	cub.m.		cub.m.	cub.m.	T	cub.m.
1946	898,090	35	314,330	583,760	0.145	620,000	89,900	493,860	69,052,450	7.14
1947	870,500	35	304,675	565,825	0.145	887,000	128,615	437,210	62,210,120	7.02
1948	1,034,370	20	206,870	827,500	0.145	964,000	139,780	687,720	105,238,860	6.53
1949	1,271,530	20	254,310	1,017,220	0.145	971,000	140,800	876,420	118,370,260	7.41

SANRAKU SHIZO (BREWING) CO LTD

1. Approximate actural figures at April 1950.

Consumption of clear water supplied by K.W.W. 1635 cub m/day
for production, supposed about 97.4% 1592.5 "
for welfare, " " 2.6% 42.5 "

laborers (not including business men) about 285
then, for welfare, 42.5 ÷ 285 = 149 ltr/head/day

Utilization of raw water supply of K.W.W.
None, but the company desires this earnestly.

Self supply plant
None.

Utilization of sea water
None, and it seems that it is needless.

2. Production, leakage, and clear water consumption

a. Figures reported by the company and K.W.W.B.

Production (yearly)		1946		1947		1948	
Alcohol	koku	2,909.1	(100)	5,542.6	(140)	9,412.4	(325)
	cub m	524.8		999.9		1,698.0	
	gal	138,636.0		264,144.0		448,561.0	
Composited sake	koku	11,543.9	(100)	12,039.8	(104)	12,906.5	(112)
	cub m	2,082.5		2,172.0		2,328.3	
	gal	550,134.0		573,777.0		615,067.0	
Distilled spirits	koku	1,455.8	(100)	141.0	(10)	---	
	cub m	262.6		25.4		---	
	gal	69,371.0		6,710.0		---	
Whisky	koku	122.3	(100)	181.5	(148)	120.0	(98)
	cub m	22.1		32.7		21.6	
	gal	5,838.0		8,638.0		5,706.0	
Total	koku	16,031.1	(100)	17,904.9	(112)	22,438.9	(140)
	cub m	2,892.0		3,230.0		4,047.9	
	gal	763,979.0		853,269.0		1,069,334.0	

Production (yearly) 1949

Alcohol	koku	19,467.0	(669)
	cub m	3,511.8	
	gal	927,712.0	
Composited sake	koku	26,696.0	(231)
	cub m	4,816.0	
	gal	1,272,243.0	
Distilled spirits	koku	10,591.0	(728)
	cub m	1,910.6	
	gal	504,723.0	
Whisky	koku	30.0	(25)
	cub m	5.4	
	gal	1,427.0	
Total	koku	56,784.0	(354)
	cub m	10,243.8	
	gal	2,706,105.0	

Clear water consumption (yearly)

	1946	1947	1948	1949
cub m	847,018	382,657	443,501	580,100

Laborers (yearly)

1946	1947	1948	1949
100,980	98,850	102,540	99,420

Remarks: 1 koku = 0.1804 cub m
1 cub m - 264.17 gal. U.S. liquid.
( ) indicates index number.

b. Investigation:

Assumed figures: Percentage of water leakage.
Net demand for welfare per had per day.

Notation:-

A Clear water consumption per day (mean value).
B Percentage of leakage in the compound.
C Leakage amount in the compound per day.
D Total net demand of clear water per day.
E Net demand of clear water for welfare per head per day.
F Daily worked persons (mean value).
G Net demand of C.W. for welfare.
H " " " " " production.
I Mean quantity of production per day.
J Net demand of C.W. per cub m of production.

Year	A	B	C (a x b)	D (a - c)	E	F
	cub m	%	cub m	cub m	cub m	
1946	2,320.6	30.0	696.2	1,624.4	0.14	281
1947	1,048.4	10.0	104.8	943.6	0.14	275
1948	1,215.1	10.0	121.5	1,093.6	0.14	285
1949	1,589.2	5.0	79.5	1,509.7	0.14	276

Year	G(e x f)	H (d - g)	I	J (h ÷ i)
	cub m	cub m	cub m	cub m
1946	39.3	1,585.1	7.9	200.6
1947	38.5	905.1	8.9	101.7
1948	39.9	1,053.7	11.1	94.9
1949	38.6	1,471.1	28.1	52.4

Among the above results, fluctuations of values of J, (net demand of clear water per cub m of production) are too large. It may probably be caused from the following conditions.

1. mistake of some of reported figures.
2. uncertainty of water measure.
3. unsuitableness of my own assuption.
4. improvement of brewing technique.

In either case (excepting cause 2), it is desirable fact that the values of J have been decreasing.

April 50

試験法　説明（概要）

試験は（毎分）

No.1 Reservoir には毎日源水浄水配水池水に就て之を行う。

No.2 Reservoir には配水池水は毎日　浄水及源水は隔日之を行う。

No.3 Reservoir には源水浄水及配水池水共週二回之を行う。

The city にありては週二回市内各地点より採取し之を行う。

又報告書中週二回或は1回の試験に止めるものもあります

例は

硫酸（Sulphates）　硝酸（Nitrates）　アンモニヤ（Ammonia）
亜硝酸（Nitrogen）　硬度（Hardness）　殊遺（Residue）　等

尚 24 April の分ニテ Colon Bacteria は目今 Test 中デ御ザイマス

Short Explanation on Chemucal Analysis of Supply Water

Kawasaki W. W.

Kinds of Water	No. 1 Res. (at Ikuta)	No. 2 Res. (at Ikuta)	No. 3 Res. (at Tode)
Raw Water	daily	every other day	twice aweek
Filted Water	"	"	"
Chlorinated Water (in the Reservoir)	"	daily	"

Tests at service ends in the city are twice a week.

By way of exception, tests of sulphate, nitrogen, nitrate, ammonia, hardness and residue etc are done once or twice a week.

Tests of colon and bacteria on 24 April are under examination.

KAWASAKI WATER WORKS NO. Repeat

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 1 RESERVOIR.

DATE 18 April HOUR 8.-

NAME S. Higama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	16.-	16.-	15.-	
	WATER	13.2	13.-	13.-	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PS~~. VALUE P.H.		6.8	6.8	6.5	
CHLORINE IN CHLORIDES (ppm)		7.810	7.455	8.165	
SULPHATES		Not Examined			
NITRATES		Not Examined			
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED(ppm)		1.580	1.264	0.948	
TOTAL HARDNESS		Not. Examined			
TOTAL RESIDUE (ppm)		Not. Examined			
FREE CHLORINE (ppm)		None	None	1.5	
COLONIES PER c. c (370)		20	12	5	
GLOW GAS 10 c c.		Not. Examined			
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. / RESERVOIR.

DATE 19 April HOUR 8.40

NAME S. Iizama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	16.-	16.-	15.-	
	WATER	13.-	13.-	13.2	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		none	none	none	
~~PH~~. VALUE p. H.		6.8	6.8	6.5	
CHLORINE IN CHLORIDES (ppm)		7.810	7.100	8.165	
SULPHATES		4.115	3.292	4.938	
NITRATES		0.107	0.102	0.097	
AMMONIA NITROGEN		none	none	none	
PERMANGANATE CONSUMED(ppm)		1.251	0.938	0.938	
TOTAL HARDNESS		1.775	1.725	1.725	
TOTAL RESIDUE (ppm)		88.-	62.-	58.-	
FREE CHLORINE (ppm)		none	none	1.5	
COLONIES PER c. c (370)		16	16	2	
GLOW GAS 10 c c.		0%0.0	0%0.0	0%0.0	
COLON BACTERIA PER 10 c. c.		(—)	(—)	(—)	
COLON BACTERIA		not Examined			
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. / RESERVOIR.

DATE 20 April HOUR 8.-

NAME S. Hiyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	17.-	17.-	15.-	
	WATER	13.2	13.-	13.2	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PS.~~ VALUE p.H.		6.8	6.8	6.5	
CHLORINE IN CHLORIDES (ppm)		7.810	7.810	8.165	
SULPHATES		Not Examined			
NITRATES		Not Examined			
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED(ppm)		1.580	1.580	0.948	
TOTAL HARDNESS		Not Examined			
TOTAL RESIDUE (ppm)		Not Examined			
FREE CHLORINE (ppm)		None	None	1.5	
COLONIES PER c. c (370)		16	9	7	
GLOW GAS 10 c c.		Not Examined			
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. / RESERVOIR.

DATE 21 April HOUR 830

NAME S. Iriyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	18.-	18.-	17.-	
	WATER	13.-	13.2	13.2	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		none	none	none	
~~PS~~. VALUE p.H.		6.7	6.7	6.5	
CHLORINE IN CHLORIDES (ppm)		7.455	7.455	8.520	
SULPHATES		Not Examined			
NITRATES		not Examined			
AMMONIA NITROGEN		none	none	none	
PERMANGANATE CONSUMED(ppm)		1.564	1.251	0.625	
TOTAL HARDNESS		Not Examined			
TOTAL RESIDUE (ppm)		Not Examined			
FREE CHLORINE (ppm)		none	none	1.5	
COLONIES PER c. c (370)		40	8	5	
GLOW GAS 10 c c.		Not Examined			
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 1 RESERVOIR.

DATE 22 April HOUR 8.30

NAME S. Tujama

ITEMS / SAMPLE		RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	18.-	18.-	17.-	
	WATER	13.-	13.2	13.2	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PS.~~ VALUE P.H.		6.8	6.7	6.4	
CHLORINE IN CHLORIDES (ppm)		7.455	8.165	8.520	
SULPHATES		Trace	Trace	Trace	
NITRATES		Trace	Trace	Trace	
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED(ppm)		0.948	0.948	0.632	
TOTAL HARDNESS		Not Examined			
TOTAL RESIDUE (ppm)		Not Examined			
FREE CHLORINE (ppm)		None	None	1.5	
COLONIES PER c. c (370)		14	15	7	
GLOW GAS 10 c c.		Not Examined			
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. / RESERVOIR.

DATE 23 April HOUR 8. 10

NAME S. Sugama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	17.-	16.-	14.-	
	WATER	13.-	13.-	12.-	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PS.~~ VALUE P. H.		6.8	6.7	6.4	
CHLORINE IN CHLORIDES (ppm)		7.100	7.455	8.520	
SULPHATES		Not Examined			
NITRATES		Not Examined			
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED(ppm)		0.948	0.948	0.632	
TOTAL HARDNESS		Not Examined			
TOTAL RESIDUE (ppm)		Not Examined			
FREE CHLORINE (ppm)		None	None	1.5	
COLONIES PER c. c (370)		20	16	5	
GLOW GAS 10 c c.		Not Examined			
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. / RESERVOIR.

DATE 24 April HOUR 8.-

NAME S. Hiyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	17.-	16.-	14.-	
	WATER	13.-	13.-	12.-	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PS.~~ VALUE P.H.		6.7	6.7	6.5	
CHLORINE IN CHLORIDES (ppm)		7.810	7.810	8.520	
SULPHATES		Not Examined			
NITRATES		Not Examined			
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED(ppm)		1.264	1.264	0.632	
TOTAL HARDNESS		1.750	1.700	1.725	
TOTAL RESIDUE (ppm)		78.-	42.-	38.-	
FREE CHLORINE (ppm)		None	None	1.5	
COLONIES PER c. c (370)		28	9	5	
GLOW GAS 10 c c.		10.0	10.0	10.0	
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION					

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 2 RESERVOIR.

DATE 18 April HOUR 8.-

NAME S. Iriyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC			16.-	
	WATER			13.6	
TUABIDITY				0	
COIOR				0	
ODOR AND TASTE				None	
~~PH~~. VALUE P.H.				6.4	
CHLORINE IN CHLORIDES (ppm)				7.810	
SULPHATES				Not Examined	
NITRATES				Not Examined	
AMMONIA NITROGEN				None	
PERMANGANATE CONSUMED(ppm)				0.968	
TOTAL HARDNESS				Not Examined	
TOTAL RESIDUE (ppm)				Not Examined	
FREE CHLORINE (ppm)				1.4	
COLONIES PER c. c (370)				4	
GLOW GAS 10 c c.				Not Examined	
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 2 RESERVOIR.

DATE 19 April HOUR 9.40

NAME S. Iwyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	18.-	18.5	18.-	
	WATER	13.4	12.8	13.5	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PS.~~ VALUE p.H.		6.8	6.8	6.4	
CHLORINE IN CHLORIDES (ppm)		6.390	6.390	7.810	
SULPHATES		4.526	4.115	3.292	
NITRATES		0.107	0.097	0.087	
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED(ppm)		1.564	1.877	0.625	
TOTAL HARDNESS		1.800	1.750	1.725	
TOTAL RESIDUE (ppm)		92.-	72.-	54.-	
FREE CHLORINE (ppm)		None	None	1.4	
COLONIES PER c. c (370)		16	4	4	
GLOW GAS 10 c c.		0%	0%	0%	
COLON BACTERIA PER 10 c. c.		(—)	(—)	(—)	
COLON BACTERIA		Not Examined			
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 2 RESERVOIR.

DATE 20 April HOUR 8.-

NAME S. Iriyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC			16.-	
	WATER			13.5	
TUABIDITY				0	
COIOR				0	
ODOR AND TASTE				none	
~~PS~~. VALUE P.H.				6.4	
CHLORINE IN CHLORIDES (ppm)				7.810	
SULPHATES				Not Examined	
NITRATES				not Examined	
AMMONIA NITROGEN				none	
PERMANGANATE CONSUMED(ppm)				0.938	
TOTAL HARDNESS				Not Examined	
TOTAL RESIDUE (ppm)				not Examined	
FREE CHLORINE (ppm)				1.4	
COLONIES PER c. c (370)				0	
GLOW GAS 10 c c.				Not Examined	
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 2 RESERVOIR.

DATE 21 April HOUR 9.30

NAME S. Iriyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	17.5	17.5	18.-	
	WATER	13.5	13.-	13.4	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PS.~~ VALUE P.H.		6.8	6.8	6.5	
CHLORINE IN CHLORIDES (ppm)		7.100	6.745	7.810	
SULPHATES		Not Examined			
NITRATES		Not Examined			
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED(ppm)		1.251	0.938	0.625	
TOTAL HARDNESS		Not Examined			
TOTAL RESIDUE (ppm)		Not Examined			
FREE CHLORINE (ppm)		None	None	1.5	
COLONIES PER c. c (370)		20	10	5	
GLOW GAS 10 c c.		Not Examined			
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 2 RESERVOIR.

DATE 22 April HOUR 8.30

NAME S. Iriyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC			18.-	
	WATER			13.2	
TUABIDITY				0	
COIOR				0	
ODOR AND TASTE				None	
~~PS.~~ VALUE P.H.				6.4	
CHLORINE IN CHLORIDES (ppm)				7.810	
SULPHATES				not Exami	
NITRATES				not Exami	
AMMONIA NITROGEN				None	
PERMANGANATE CONSUMED(ppm)				0.632	
TOTAL HARDNESS				not Exami	
TOTAL RESIDUE (ppm)				not Exami	
FREE CHLORINE (ppm)				1.4	
COLONIES PER c. c (370)				4	
GLOW GAS 10 c c.				Not Exami	
COLON BACTEBIA PER 10 c. c.					
COLON BACTEBIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 2 RESERVOIR.

DATE 23 April HOUR 8.10

NAME S. Iriyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC			17.-	
	WATER			13.5	
TUABIDITY				0	
COIOR				0	
ODOR AND TASTE				None	
~~PS~~. VALUE p.H.				6.4	
CHLORINE IN CHLORIDES (ppm)				7.810	
SULPHATES				Not Exami	
NITRATES				Not Exami	
AMMONIA NITROGEN				None	
PERMANGANATE CONSUMED(ppm)				0.632	
TOTAL HARDNESS				Not Exami	
TOTAL RESIDUE (ppm)				Not Exami	
FREE CHLORINE (ppm)				None	
COLONIES PER c. c (370)				5	
GLOW GAS 10 c c.				Not. Exami	
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 2 RESERVOIR.

DATE 24 April HOUR 9.30

NAME S. Iiyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	18.-	15.-	16.-	
	WATER	13.-	12.-	13.-	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		none	none	none	
PS. VALUE		6.8	6.7	6.4	
CHLORINE IN CHLORIDES (ppm)		7.455	6.745	7.810	
SULPHATES		Not Examined			
NITRATES		Not Examined			
AMMONIA NITROGEN		none	none	none	
PERMANGANATE CONSUMED(ppm)		1.264	0.948	0.632	
TOTAL HARDNESS		1.750	1.725	1.725	
TOTAL RESIDUE (ppm)		86.-	56.-	62.-	
FREE CHLORINE (ppm)		none	none	1.5	
COLONIES PER c. c (370)		32	10	5	
GLOW GAS 10 c c.		10.0	10.0	10.0	
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION					

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 3 RESERVOIR.

DATE 17 April HOUR 8.-

NAME S. Iizama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	12.-	12.5	13.-	
	WATER	13.2	13.-	13.-	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PH~~. VALUE P.H.		6.7	6.7	6.5	
CHLORINE IN CHLORIDES (ppm)		10.650	11.005	11.360	
SULPHATES		not Examined			
NITRATES		not Examined			
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED(ppm)		1.595	0.957	0.638	
TOTAL HARDNESS		1.800	1.750	1.725	
TOTAL RESIDUE (ppm)		120.-	100.-	76.-	
FREE CHLORINE (ppm)		None	None	1.4	
COLONIES PER c. c (370)		36	15	8	
GLOW GAS 10 c c.		0%	0%	0%	
COLON BACTERIA PER 10 c. c.		(—)	(—)	(—)	
COLON BACTERIA		Not Examined			
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 3 RESERVOIR.

DATE 19 April HOUR 8.-

NAME S. Higama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	17.-	17.-	16.-	
	WATER	16.-	16.-	15.5	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PH~~. VALUE P.H.		6.7	6.7	6.4	
CHLORINE IN CHLORIDES (ppm)		10.650	11.715	11.360	
SULPHATES		5.349	4.526	4.526	
NITRATES		0.097	0.097	0.087	
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED (ppm)		1.896	1.264	1.264	
TOTAL HARDNESS		1.800	1.750	1.750	
TOTAL RESIDUE (ppm)		104.-	78.-	62.-	
FREE CHLORINE (ppm)		None	None	1.4	
COLONIES PER c. c (370)		30	12	8	
GLOW GAS 10 c c.		0%	0%	0%	
COLON BACTERIA PER 10 c. c.		(-)	(-)	(-)	
COLON BACTERIA		Not Examined			
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. 3 RESERVOIR.

DATE 24 April HOUR 8.10

NAME S. Shigoma

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC	15.-	15.-	14.-	
	WATER	13.-	13.2	13.-	
TUABIDITY		0	0	0	
COIOR		0	0	0	
ODOR AND TASTE		None	None	None	
~~PS.~~ VALUE P. H.		10.-	9.-	8.-	
CHLORINE IN CHLORIDES (ppm)		11.360	12.070	12.070	
SULPHATES		not Examined			
NITRATES		not Examined			
AMMONIA NITROGEN		None	None	None	
PERMANGANATE CONSUMED(ppm)		1.264	0.948	0.948	
TOTAL HARDNESS		1.775	1.750	1.725	
TOTAL RESIDUE (ppm)		96.-	68.-	46.-	
FREE CHLORINE (ppm)		None	None	1.5	
COLONIES PER c. c (370)		30	9	7	
GLOW GAS 10 c c.		10°	10°	10°	
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION					

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. ~~RESER~~ The city RESERVOIR.

DATE 17 April HOUR 9.50

NAME S. Hiyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC			13.-	
	WATER			11.8	
TUABIDITY				0	
COIOR				0	
ODOR AND TASTE				None	
~~PS~~. VALUE P.H.				6.5	
CHLORINE IN CHLORIDES (ppm)				8.520	
SULPHATES				not Examined	
NITRATES				not Examined	
AMMONIA NITROGEN				None	
PERMANGANATE CONSUMED(ppm)				0.957	
TOTAL HARDNESS				1.750	
TOTAL RESIDUE (ppm)				62.-	
FREE CHLORINE (ppm)				0.8	
COLONIES PER c. c (370)				5	
GLOW GAS 10 c c.				0.0/0.0	
COLON BACTERIA PER 10 c. c.				(-)	
COLON BACTERIA				Not Examined	
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. The city RESERVOIR.

DATE 19 April HOUR 10.20

NAME S. Iriyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC			17.-	
	WATER			15.-	
TUABIDITY				0	
COIOR				0	
ODOR AND TASTE				None	
~~PS.~~ VALUE P.H.				6.5	
CHLORINE IN CHLORIDES (ppm)				8.520	
SULPHATES				2.469	
NITRATES				0.092	
AMMONIA NITROGEN				None	
PERMANGANATE CONSUMED(ppm)				0.938	
TOTAL HARDNESS				1.725	
TOTAL RESIDUE (ppm)				50.-	
FREE CHLORINE (ppm)				0.5	
COLONIES PER c. c (370)				4	
GLOW GAS 10 c c.				0.0/0.0	
COLON BACTERIA PER 10 c. c.				(-)	
COLON BACTERIA				not Examined	
OPINION				Satisfactory	

KAWASAKI WATER WORKS NO.

ANALYTICAL RESULTS ON WATER SUPPLY OF NO. The city RESERVOIR.

DATE 24 April HOUR 9.50

NAME S. Liyama

ITEMS	SAMPLE	RAW	WATER NOT CHIORINATED	PURIFIED	REMARKS
TEMP C°	ATMOSPHEA LIC			13.5	
	WATER			12.-	
TUABIDITY				0	
COIOR				0	
ODOR AND TASTE				None	
PS. VALUE				6.4	
CHLORINE IN CHLORIDES (ppm)				8.520	
SULPHATES				Trece	
NITRATES				Trece	
AMMONIA NITROGEN				None	
PERMANGANATE CONSUMED(ppm)				0.625	
TOTAL HARDNESS				1.725	
TOTAL RESIDUE (ppm)				42.-	
FREE CHLORINE (ppm)				0.5	
COLONIES PER c. c (370)				8	
GLOW GAS 10 c c.				10.0	
COLON BACTERIA PER 10 c. c.					
COLON BACTERIA					
OPINION					