2.2.4 Awareness of Citizens on Water Supply Service

(1) Satisfaction on the Existing Water Supply Condition

A questionnaire survey targeting 300 households was conducted from July to September in 2001 to gasp awareness on water supply service. The degree of satisfaction on existing water supply system by Township is as follows:

Table 2.2.5 Degree of Satisfaction on the Existing Water Supply System

Name of Township	Degree of Satisfaction	Remarks
Aung Myay Thar Zan	60 %	
Chan Aye Thar Zan	70 %	
Ma Ha Aung Myay	80 %	
Chan Myar Thar Zi	80 %	
Pyi Gyi Ta Gun	--	No Answer

Totally speaking, the degree of satisfaction is not low. The households in Pyi Gyi Ta Gun would not reply because surveyed households have not been using piped water system with meter.

(2) Household Income and Willingness to Pay

In the Study Areas, four social classes were considered based on monthly household income to estimate monthly affordability and willingness to pay per household per month. Monthly household income of existing users in Mandalay City is as follows.

Table 2.2.6 Classified Monthly Household Income

Social Class	% in existing users (2002 Survey)	Monthly Household Income	Affordability (Ks/HH/month)
Upper Class	5	More than 1,000,000 Ks	30,000
Middle Class	35	Average 300,000 Ks	9,000
Lower Class	40	Average 150,000 Ks	4,500
Bottom Class	20	Average 70,000 Ks	2,100

Estimated willingness to pay for Mandalay City is shown below.

Table 2.2.7 Estimation of Classified Willingness to Pay

Social class	For the Existing Service (Ks/HH/month)	For the Better Service (Ks/HH/month)
Upper Class	380	15,500
Middle Class	210	5,050
Lower Class	150	2,700
Bottom Class	120	700
Non (Future) users	---	4,586

The above tables show that the majority of the households in Mandalay fall under lower class category. It means that 40 percent of the household in Mandalay City earns Ks 150,000 per month and only twenty percent of the households were in bottom class category and their monthly income is about Ks 70,000. In Mandalay City the affordability to pay for water ranges from Ks 30,000 to 2100 per household per month.

The affordability to pay for water per household per month is calculated as three per cent of household income. i.e.: affordability = 3 % x income

2.3 Operation and Maintenance

2.3.1 Operation and Maintenance System

WSD consists of four sections: Procurement, Store & Maintenance Section, Sanitation Section, Water Distribution Section, and Tube wells, Electrical & Mechanical Section.

Operation and maintenance of each section are as follows.

- Water Distribution Section: Operation of BPS1 and maintenance/replacement of pipeline.
- Tube wells, Electrical & Mechanical Section: Operation of BPS2 and tube wells.
- Sanitation Section: Inspection of septic tank, desludging work from septic tank.

2.3.2 Procurement and Storage

WSD consists of 4 sections and each section procures domestic products, materials, and consumables through the financial department of MCDC. However foreign products are procured by the Procurement, Store & Maintenance Section. Procured equipment is stored at two main warehouses in the compound of BPS2. The warehouses are covered with wooden walls and partitioned with wire nets. This easily allows invasion by mice, birds, insects and flooding.

2.3.3 Workshop and Laboratory

(1) Workshop

WSD has no workshop, while Motor transport and workshop department of MCDC has a workshop for construction vehicles and machines. However WSD repairs drilling machines and equipment by itself without using the workshop of MCDC.

(2) Laboratory

WSD has a laboratory for water quality monitoring. The laboratory is located at Booster Pumping Station No.1 and managed by the water distribution section of WSD. Two chemists and one assistant are employed in the laboratory. Main equipment and activities of laboratory are as follows.

(a) Equipment

PH monitor, color test kit, Electrical conduct meter, Turbidity meter, and DO meter

(b) Activities

-Physical test and chemical test at two tube wells

-Physical test and chemical test for outlet of BPS1 biweekly

-Bacteria test for outlet of BPS1 every 3 months (entrusting to the laboratory of the Public Health Department in Mandalay)

2.3.4 Meter Reading and Bill Collection System

(1) Meter Reading

In principal, a water meter is installed at all consumers who receives piped water service of WSD. Reading of water meters is done by water tariff section of revenue department of MCDC once in every three months. The result of reading is transferred to a computer section of administration department of MCDC.

(2) Bill Collection System

A water bill issued by the computer section is delivered to the household through the water tariff section of revenue department every three month. The household shall go to the township office to pay the water tariff. Then staffs of the water tariff section go to the township office to collect money every day.

3 STUDY ON WATER RESOURCES POTENTIAL

3.1 Surface Water Resources

3.1.1 The Ayeyarwaddy River

(1) Description of the River

The River Ayeyarwaddy (hereinafter referred to as Ayeyarwaddy) flows from north to south in the central mostly flat land of Myanmar originating from a place called Machanbaw, the northern most point of Myanmar in Kachin State, where two small rivers called Meikha and Meilikha join together (See Fig. 3.1.1). The highest mountain in this state is Kahakaborazai (5880 m above sea level). From this point, the river flows southward for a distance of 150 km toward Myitkyina and from there to Bahmo for a distance of 147 km in the southern direction. From Bahmo to Thabyehla, the river changes its course flowing westward for a distance of 72 km. At Thabyehla, the river again changes its course to southward direction and flows a distance of 337 km to Mandalay passing through Katha where the Shweli River joins Ayeyarwaddy. At Sagaing, about 10 km downstream of Mandalay, where the Dotehtawaddy River joins Ayeyarwaddy, the river changes its course again flowing toward Myinmu in the western direction for a distance of 49 km. Then the river changes its course again in the south-west direction and flows toward Sale for a distance of 164 km passing through Yezagyo where Chindwin River joins Ayeyarwaddy. From there, the river flows toward Magway in the southern direction for a distance of 85 km. This stretch of Ayeyarwaddy (river length : 308 km) from Mandalay to Magway flows through the central dry zone passing through the cities like Yezagyo, Myingyan, Pakokku, Nyaung U, Chauk, Sale and Yenangyaung. These cities that are short of good potable water are endowed with the opportunity of using the Ayeyarwaddy water for drinking. From Magway, the river flows toward south passing through the cities like Min Hla, Aunglan, Pyay, Kyangin and Hinthada for a distance of 358 km. From Hinthada to the Andaman Sea, the river continues to flow southward. A big delta is formed from Nyaungdon to the river mouth. The river length of Ayeyarwaddy from its origin to its river mouth is approximately 1600 km.

Ayeyarwaddy catchment consists of the entire area of Kachin State and Sagaing Division and part of the area of Mandalay, Magway and Pegu Divisions. The upper catchment of Ayeyarwaddy extends up to the territories of the Republic of China on the left bank and India on the right.

(2) Salient Features of the River

The noteworthy feature of Ayeyarwaddy is that the riverbed has a very mild gradient of 1/13,000 (average) almost throughout its entire length. Thus the Ayeyarwaddy flow is silent and serene. Even

at time of flood, the river does not make noise although it may erode the riverbanks from place to place. The catchment area of the river at Mandalay is 120,190 km^2. The river has a catchment area of 128,315 km^2 from its source to the point of confluence with Chindwin. The river has a catchment area of 63,470 km^2 from confluence with Chindwin to its river mouth. The total catchment area of Ayeyarwaddy is 191,785 km^2 from the source to the river mouth that is approximately 25% of the total land area of Myanmar (refer to Fig.3.1.1). At Sagaing Gauging Station, the average annual flow is 262 billion cubic meters (8309 m^3/sec) and the maximum discharge ever recorded during the previous 26 years (1973-1998) is 30,180 m^3/sec (refer to Hydrology Report). Flow characteristics of Ayeyarwaddy at Sagaing are shown in Table 3.1.1. The minimum discharge ever recorded during the previous 26 years and the maximum discharge of 20 years' return period at Mandalay intake sites are shown in Table 3.1.2 together with their corresponding water levels.

Table 3.1.1 Flow Features of Ayeyarwaddy at Sagaing GS (Flow: m^3/sec)

Name of River	Station	Recorded Years	Drainage Area km^2	*High Flow	**Normal Flow	+Low Flow	++ Drought Flow	Mean Monthly Discharge 26 years
Ayeyarwaddy	Mandalay Intake Site 1	26	120,190	9558	3921	2001	1093	8309

*High Flow: The discharge that is guaranteed to be flowing continuously for 95 days in a year.

**Normal Flow: The discharge that is guaranteed to be flowing continuously for 185 days in a year

+Low Flow: The discharge that is guaranteed to be flowing continuously for 275 days in a year.

++Drought Flow: The discharge that is guaranteed to be flowing continuously for 364 days in a year.

Table 3.1.2 The Flood Discharge of 20 years Return Period, the Minimum Discharge and Corresponding Water Levels

River Station	Flood Discharge (m^3/sec) m^3/sec		Water Level = Corresponding Gauge Height + Elevation of Zero of Gauge (Elevation in meter)		Difference of Water Levels (m)	Remarks
	Flood	Minimum	Flood Level	Minimum		
Ayeyarwaddy At Sagaing G.S.	32,500	1,093 (recorded)	12.40+57.743=70.143	1.69+57.743=59.433	10.71	
Ayeyarwaddy at Mandalay Intake Site I (13.3 km from Sagaing G.S.)	32,499 (by C.A. ratio)	1,093	71.154	60.444	10.71	W.L. Gradient= (1/13158)
Ayeyarwaddy at Mandalay Intake Site II (10 km from Sagaing G.S.)	32,499 (by C.A. ratio)	1,093	70.903 (Computed)	60.193 (Computed)	10.71	W.L. Gradient (1/13158)

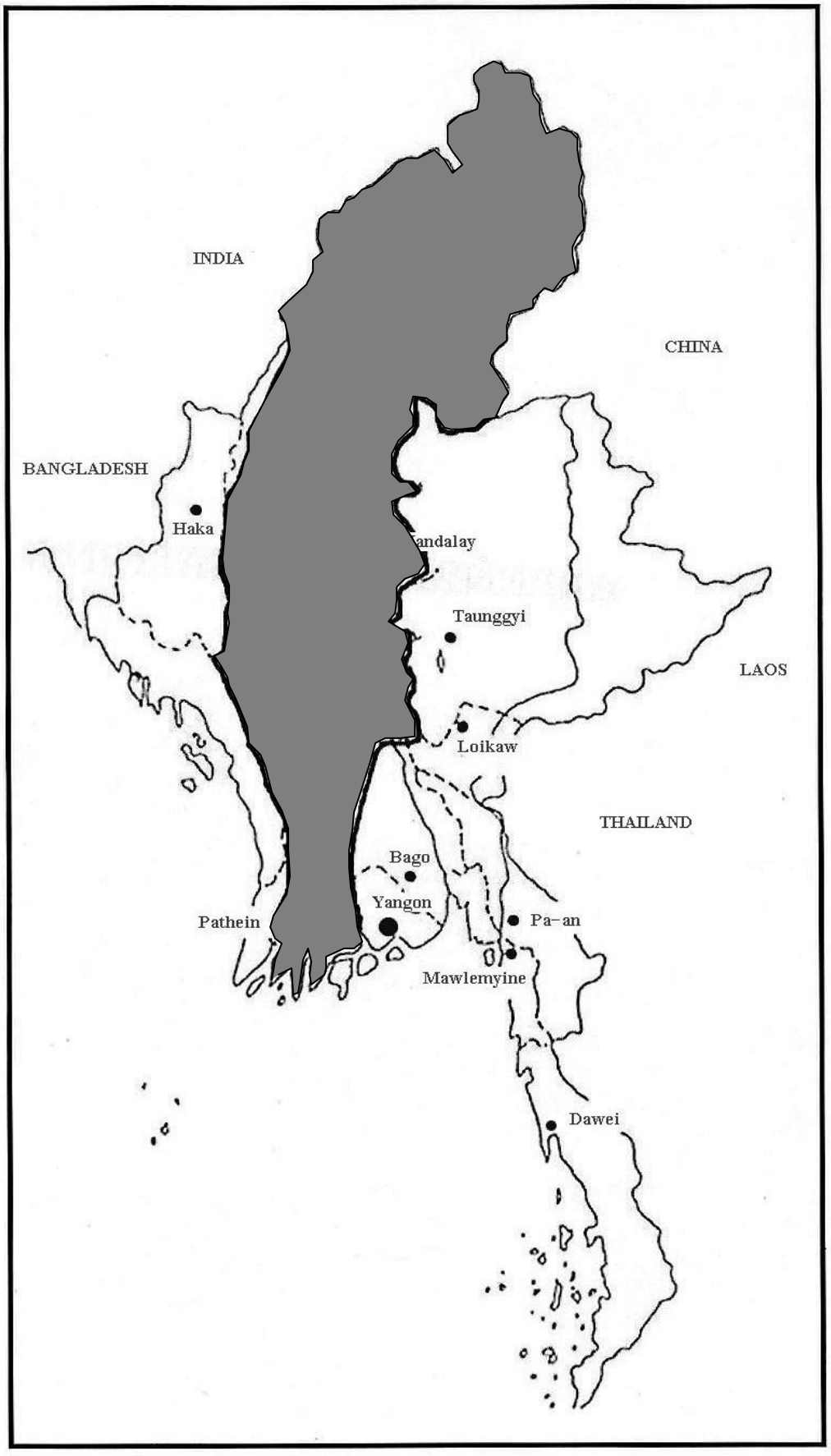

Fig.3.1.1 Catchment Area of the Ayeyarwaddy River

From these tables, it is found that there is a large difference between the maximum (highest) discharge and the minimum (lowest) discharge in the case of Ayeyarwaddy, with the maximum discharge 30 times bigger than the minimum discharge (30,180 m^3/sec against 1093 m^3/sec). Thus the difference in water level between the highest discharge and the lowest discharge is also big; that is 10.71 m which is considerable for a pump-house design. As a result of discharge variation, the river width is generally changing from 500 m to 2000 m and the bank erosion leads to change of river course.

(3) Geological Features

The river flows through Inner Burman Tertiary Basin covered with tertiary sedimentary rocks and shales, bluish black/gray, minor fine to medium grained sand stone, the sandy alluvial deposit area called Irraawaddy formation. This Irrawaddy formation is composed of medium to coarse grained, yellow brown to blue gray, sand and gravel bosely cemented, current bedded, abundant fossil wood and calcareous nodules, clay beds, minor red bed, flluviatile. This formation is generally prone to erosion by river current. As it is soft and dry due to excessive dry and hot weather, especially in the central dry zone, the river channel erodes easily and the river is widened, as a result the river course is always changing at some places.

(4) Sediment Condition

During flood periods, the flow velocity of the Ayeyarwaddy River increases with an increase of discharge volume and the increased velocity results in erosion of channel bed and banks, occasionally accompanied by landslides. Thus the eroded soil particles are transported downstream as sediment load with the river current, and larger solids move along the streambed as bed load. When sediment-laden water reaches the sea or delta, the velocity and turbulence of the river are greatly reduced. The larger suspended particles and most of the bed load are deposited forming a delta at the mouth of the river or at the confluence with another river. However, smaller particles can remain in suspension in the water for a longer period of time.

The suspended sediment load measurements of the Ayeyarwaddy River has been intensively carried out by the Department of Meteorology and Hydrology (DOMH) at the Sagaing and other gauging stations. The suspended load rating curves are derived from the results of the measurements. The sediment discharge-rating curve for Ayeyarwaddy, according to DOMH is expressed by the following equation.

$$Qs = a\,Q^b \quad \text{----------} \quad (1)$$

Where Q = Water discharge in m3/sec, Qs = Suspended load in ton/sec

Here, for Ayeyarwaddy River

a =6.38

b=1.807

The mean water discharge of Ayeyarwaddy at Sagaing is 8309 m^3/sec being the average value of 26 years from 1973 to 1998. Substituting this value in equation (1) yields

$Qs = 6.38*10^{-8} *8309\text{^}1.807$

$= 0.772$ ton/sec

$= 24,347,000$ ton/year

$= 24.35x10^6$ ton/year

This discharge is equal to 203 m^3/sq.km./year. This discharge is high, but for a large scale river like Ayeyarwaddy, this discharge seems to be normal.

(5) Utilization of the Ayeyarwaddy Water

The river Ayeyarwaddy has not been utilized in the past for a significant purpose. The Ayeyarwaddy water has been recently utilized for pump irrigation and drinking water supply. Water from Ayeyarwaddy is utilized for the following projects:

Table 3.1.3 Utilization of the Ayeyarwaddy Water

Name of Project an Agency	Water Use and Volume Withdrawn
(a) Nyaung U water supply system by DDA	700,000 gals/day to Nyaung U City
(b) Taungzin water supply system by Australian Development Assistance Bureau (ADAB)	1.2 million gals/day to 103 villages (approximately 100,000 population, by main pumps and booster pumps with 59 miles of pipeline).
(c) Letpanchibo and other Pump Irrigation Projects around Myingyan by Ministry of Irrigation and Agriculture	4 million gals/day (approximate)
(d) Chauk Water Supply System by Myanmar Oil Corporation and DDA	2 million gals/day (approximate)
(e) Other Users	1 million gals/day (estimated)

These abstractions are done in the area downstream of Myingyan. The total abstraction volume for drinking water and irrigation is altogether approximately 8.9 million gals per day which is 28 m^3/min (0.47 m^3/sec). This volume of water is insignificant compared to the lowest discharge of 1093 m^3/sec. Thus abstraction from Ayeyarwaddy for Mandalay City water supply (2.6 m^3/sec) will not pose any problem so far as water volume is concerned. But Ayeyarwaddy's water level drawdown may be a serious problem. Care should be exercised in determining the river drawdown level for the

design of intake structure on Ayeyarwaddy.

In fact the Ayeyarwaddy River has been used since ancient time for navigation only. The river has been used as a navigable link between lower Myanmar and upper Myanmar especially in those days when no railroads were in existence. When abstraction increases with the lapse of time, it is apprehended that navigation would become difficult in the dry season posing a national transportation problem.

According to the Master Plan for the Mandalay City, it is envisaged that 2.6 m^3/sec of water shall be pumped up from the Ayeyarwaddy River at a place near 22nd Road for improvement of the city's water supply system. The water intake has been proposed to locate at two sites both of which are suitable as intake site. But the intake at a place near 22nd Road is proposed for final selection. The river Ayeyarwaddy flows just by the side of Mandalay City. Hence the Ayeyarwaddy water is to be considered a comparatively reliable and economical source for the purpose of water supply to Mandalay City.

3.1.2 The Dotehtawaddy River

(1) Description of the River

The River Dotehtawaddy (hereinafter referred to as Dotehtawaddy), known as the Myitnge River in the lower reach and as the Namtu River in the upper reach, has a total drainage area of some 27,904 km^2. The river originates from Mount Loi Sawang on the northern Shan Plateau in Shan State and flows down to Mandalay plain for 540 km, passing through Namtu, Namma, Hsipaw and Shwesayan village and empties into Ayeyarwaddy at a place about 13 km downstream and south-west of Mandalay. In the upper reach from Hsewi to Yeywa, the river flow is rapid with an average gradient of one by 670 and in the lower reach from Yeywa to the Ayeyarwaddy River the flow velocity is low with an average gradient of one in 4000 (refer to Fig.3.1.2. The Dotehtawaddy River Longitudinal Profile). The river water is yellowish brown during and after rainfall as the river passes through the shale and silty sandstone or limestone areas. The yellowish brown color of the water means that the river has brown silt and brown silty clay in suspension. In case the water contains various kinds of chemicals, it is consequently likely to be chemically hard. The river water is generally clean in dry season especially in the upper reach. But in the lower reach from the area around Yangon-Mandalay railway crossing toward the confluence point with Ayeyarwaddy, the river is rather contaminated due to the wastewaters discharged from the economic and industrial activities of Mandalay City.

Reconnaissance study of the Dotehtawaddy river section between Shwesayan gauging station and Myitnge Railway Bridge (total length 40.8 km) reveals the following.

(a) The river regime is well defined without abrupt meandering or change of river course

(b) The river's both left and right banks are in good condition without any bank erosion. The banks are made up of brown clayey silt and brown clayey limestone that have a high resistance to erosion due to river current. That is why the sediment discharge of the Dotehtawaddy River is rather small in quantity, without resulting in the river meandering or change of river course.

(c) The normal velocity of the river's natural flow is estimated around 0.5 to 1.2 m/sec. The velocity will be increased to 1.2 to 1.8 m/sec with the increase of river discharge. The flow or the river current is not disturbed at all as no tributary river joins the Dotehtawaddy River although small waterless tributaries, two on right bank and one on left bank are seen. They are seasonal-flow rivers of small size.

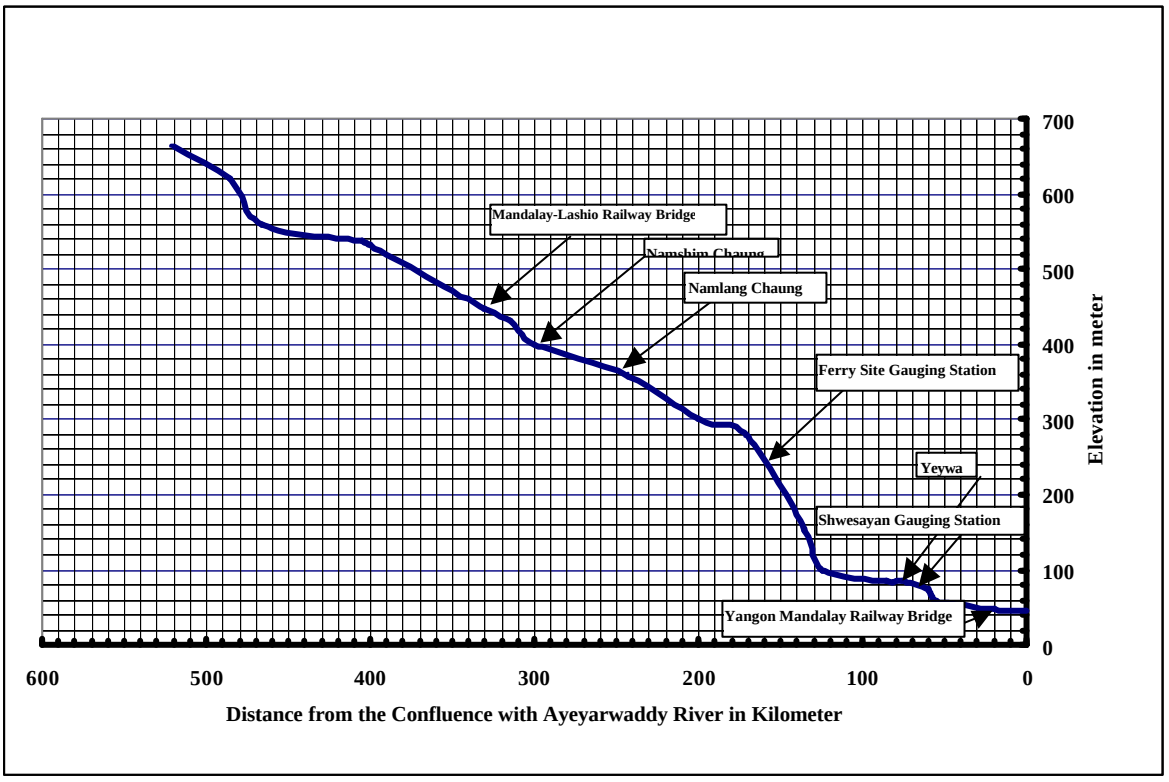

Fig. 3.1.2 Dotehtawaddy River Longitudinal Profile

(d) The river water is brown and the turbidity is rather high as the brown clays are dissolved in it. The water remains colored for about 6 months from June to December in the year. The water quality (refer to Water Quality report) is assessed to be good except at the lower section of the river from the discharge point of industrial wastewater, near the railway bridge, to the

confluence point with Ayeyarwaddy.

(e) The river section between Shwesayan and the railway bridge is 40.8 km. The river water of that section is not utilized on a significant scale either for irrigation or for drinking by the people living nearby the river. Only small pumping sites at three or four locations for domestic water supply are seen. Thus it is to be concluded that the utilization of that section of Dotehtawaddy for the domestic water supply of Mandalay city may neither require any adjustment with any other user, nor pose any problems as to acquiring water right.

(f) At Salin on the upper Dotehtawaddy, about 18-km from Shwesayan G.S., Myanma Electric Power Enterprise is planning to construct a dam and hydropower station (power capacity 700 MW). When the project is completed in 2005, the Dotehtawaddy discharge shall be regulated. As the hydropower generation is not a consumptive use of water, it shall not be conflicting with the present Master Plan of Mandalay City Water Supply.

(g) Sometimes the Dotehtawaddy water overflows its banks, but due to the clayey soil condition as stated above, no bank erosion has taken place. The river is not widened and it returns to its original course after flooding.

(h) The river Dotehtawaddy is found to meander forming an island at the center of the flow only at one place about 2 km (river length) upstream of the Myitnge Railway Bridge or 19.5 km from the confluence with Ayeyarwaddy. This is presumed to be due to the fact that the backwater of Ayeyarwaddy reaches up to that point and has influence on the Dotehtawaddy flow. Due to such influence, the river velocity abruptly dropped there, thus an island was formed at the middle of the river channel.

(i) Flooding usually takes place on the right-bank stretch of land from the railway bridge to Talingyi village, located about 14 km from the Myitnge railway bridge forming a flood-water depth of 1.5 m to 2.5 m. In time of such flooding the villagers have to leave their villages taking all their belongings. It is learnt that flooding occurred due to the high discharge of the river as well as due to the high Ayeyarwaddy water level, which obstructs the discharge of Dotehtawaddy River especially during its high flood.

(j) The proposed water intake site that is free from flooding is at Nheitkyeikshitsu about 16 km upstream of Myitnge Railway Bridge. That site is considered to be suitable for locating the future intake structure for the water supply to Mandalay City.

(2) Salient Features of the River

The noteworthy feature of the river Dotehtawaddy is that the riverbed has a very steep gradient of 1/670 in the upper reach from Hsewi to Yeywa. Thus the flow is rapid. Hence Yeywa hydroelectric power station project is now in progress. The average annual flow is 17 billion cubic meter (541

m^3/sec) derived from the discharge records at Shwesayan gauging station. Flow characteristics of the Dotehtawaddy river at Shwesayan gauging station are shown in Table 3.1.4. The minimum discharge ever recorded during the previous 26 years and the maximum discharge of 20 years' return period at the Dotehtawaddy proposed intake site are shown in Table 3.1.5 together with their corresponding water levels.

Table 3.1.4 Flow Features of Dotehtawaddy (Flow: m^3/sec)

Name of River	Gauging Station	Recorded Years	Drainage Area km^2	High Flow	Normal Flow	Low Flow	Drought Flow	Mean Monthly Discharge 26 Years
Dotehtawaddy	Shwesayan	26	27,904	665	375	218	88	541

Table 3.1.5 The Flood Discharge of 20 years Return Period, the Minimum Discharge and Corresponding Water Levels

River	Flood Discharge (m^3/sec)		Water Level = Corresponding Gauge Height + Elevation of Zero of Gauge (Elevation in meter)		Difference of Water Levels (m)	Remark
	Flood	Minimum	Flood Level	Minimum		
Dotehtawaddy At Shwesayan G.S.	3,930* (1/20 Flood)	88 (recorded)	12.28+68.8 =81.08	1.21+68.8 =70.01	11.07	
Dotehtawaddy at Projected Intake Site (19.6 km from the railway bridge or 21.2 km from Shwesayan G.S.)	3,945 (by C.A ratio: 28006/27904)	88.3 (by C.A. Ratio)	76.30 (81.08-21200/4435)	65.23	11.07	W.L. Gradient (1/4435)
Dotehtawaddy At Shwesayan G.S.	3,100 (1/10 Flood)	88 (recorded)	10.80+68.80 =79.60	1.21+68.8 =70.01	9.59	
Dotehtawaddy at projected Intake Site (19.6 km from the railway bridge or 21.2 km from Shwesayan G.S.)	3111 (by C.A. ratio:28006/ 27904)	88 (recorded)	74.82 (79.60-21200/4435)	65.23	9.59	W.L. Gradient (1/4435)

Note * Flood magnitude is of the order of 20 years' return period according to Gumbel's flood frequency curve

High Flow: The discharge that is guaranteed to be flowing continuously for 95 days in a year.
Normal Flow: The discharge that is guaranteed to be flowing continuously for 185 days in a year
Low Flow: The discharge that is guaranteed to be flowing continuously for 275 days in a year.
Drought Flow: The discharge that is guaranteed to be flowing continuously for 364 days in a year.

From these tables, it is found that there is a large difference between the maximum (highest) discharge ever recorded and the minimum (lowest) discharge ever recorded in the case of the Dotehtawaddy River, with the maximum discharge 50 times bigger than the minimum discharge (4,496 m^3/sec

against 88 m3/sec). Thus the water level difference between the highest discharge and the lowest discharge is also big; that is 11.07 m which is considerable for a pump-house design. As a result of discharge variation, the river width changes from 80 m to 180 m.

(3) Geological Features

The river flows through the Loungshe Formation which is composed of shale, bluish blackminor sandstone, conglomamerate, limestone, marine.

(4) Sediment Condition

Although the flow velocity of Dotehtawaddy increases with an increase of discharge volume, bank erosion is insignificant in the case of Dotehtawaddy because of the fact that the flow takes place through clayey sandstone and clayey limestone area. But there are a lot of fine particles of bluish limestone and brown sandstone dissolved or in suspension in the Dotehtawaddy water. The suspended particles or bed load are not deposited at the point of confluence with the Ayeyarwaddy River and no delta is seen at the confluence with Ayeyarwaddy. However, smaller particles remain in suspension in the water for a long period until the end of Monsoon season.

The suspended sediment load measurements of the Dotehtawaddy River have not been carried out by the Department of Meteorology and Hydrology (DOMH). The sediment discharge rating curve for Dotehtawaddy is therefore not available.

(5) Utilization of the Dotehtawaddy Water

When small-scale users are taken into account, several Dotehtawaddy water users can be listed up. Of all the users, Paleik Textile Mill water intake and pump irrigation water intake are the major users. But their intake volume is rather small and can be considered negligible compared to the minimum flow 88 m^3/sec ever recorded at Shwesayan gauging station. Paleik textile mill water intake near Paleik City, about 30 km south of Mandalay, is designed with a floating-barge type intake to cope with a large difference between the highest water level and the lowest water level of the Dotehtawaddy River.

No problem is reported at present with regard to the decrease of water level accompanied by the decrease of the lowest discharge of Dotehtawaddy River caused by numerous abstractions. However when the users increase in the near future, water quality as well as water quantity of the Dotehtawaddy River would become a problem. Therefore, monitoring of the quality and quantity of

wastewater discharged into the river and water withdrawn from the river should be done to save the river from excessive drawdown and contamination leading to an environmental disaster.

At present Yeywa hydro-electric power project is in progress at Yeywa to utilize the Dotehtawaddy water for electric power generation (700 MW). Most time of the year, the power station shall be discharging water at a constant rate. From the power station operation studies, it is learnt that the minimum discharge of the power station or the minimum discharge of Dotehtawaddy, after the completion of the Yeywa hydropower project, is 210 m^3/sec and the maximum discharge, when combined with the spillway discharge, becomes 1,138 m^3/sec. In this case, the difference of high-flow water level and low-flow water level shall be reduced to 4.4 m at the Shwesayan Gauging Station. Thus the water environment for the Dotehtawaddy water users shall be considerably improved with stable discharge and low fluctuation in water level.

(6) Comparison of the Dotehtawaddy River and the Ayeyarwaddy River

The following table shows the comparison of the Dotehtawaddy River and the Ayeyarwaddy River from the aspect of hydrological characteristics related with the utilization of the river as a water source for Mandalay City water supply.

Table 3.1.6 Comparison of Ayeyarwaddy and Dotehtawaddy

No.	Feature	Ayeyarwaddy	Dotehtawaddy	Remarks
1	Lowest Discharge ever Recorded within the Last 26 Years (1973-1998)	1093 m^3/sec	88 m^3/sec	Ayeyarwaddy discharge is quite stable.
2	The Difference of the Highest Water Level and the Lowest Water Level	10.71 m	11.07 m	Ayeyarwaddy's water level difference is less than Dotehtawaddy's.
3	Physical Quality of Water	Light brown with sands in suspicion during rainy season	Dark brown with high absorption of clay and limestone during rainy season	Dotehtawaddy's water treatment is considered more expensive than that of Ayeyarwaddy
4	Water Intake Location in terms of Distance from the City	Just by the side of the City	Approximately 10 km from the City's center	Ayeyarwaddy with a short pipe line means less expensive for the construction of water supply facilities

From the above table, it is confirmed that the utilization of the Ayeyarwaddy water is more advantageous than that of the Dotehtawaddy water.

Fig.3.1.3 Catchment of the Dotehtawaddy River