

For the 2nd Stage, there will be several alternatives in combination with the 1st Stage alternatives as shown in Table 2.

Table 2 Alternatives by Combination of Locations and Stages

Alternatives	1 st Stage at Chinaimo		1 st Stage at Kaolieo		1 st Stage at Thangone	
	1 st Stage 2007	2 nd Stage 2012	1 st Stage 2007	2 nd Stage 2012	1 st Stage 2007	2 nd Stage 2012
C-1	40,000					60,000
C-2				60,000		
K-1			40,000			60,000
K-2		60,000				
T-1		60,000			40,000	
T-2				60,000		
T-3						60,000

On the table shown above, alternatives K-2 and T-1 are the plans which would enable an expansion of 60,000 m³/day in Chinaimo Treatment Plant, in the 2nd Stage. However, there is no space for an expansion of 60,000 m³/day at the Chinaimo Treatment Plant, since expansion of the reservoir for distribution will take place as discussed in the previous section and as shown on Figure 2.

Because of a limitation of land space available in the Chinaimo Treatment Plant, alternatives K-2 and T-1 were omitted from further study of available alternatives. The screened alternatives for comparison are shown on Table 3.

Table 3 Screened Alternatives for Comparative Study

Alternatives	1 st Stage at Chinaimo		1 st Stage at Kaolieo		1 st Stage at Thangone	
	1 st Stage 2007	2 nd Stage 2012	1 st Stage 2007	2 nd Stage 2012	1 st Stage 2007	2 nd Stage 2012
C-1	40,000					60,000
C-2				60,000		
K-1			40,000			60,000
T-2				60,000	40,000	
T-3						

4 Methodology of Comparative Study

The flow of the comparative study for the screened alternatives is as follows:

1. Facility Planning for each alternative
2. Preliminary cost estimates for the planned facilities for each alternative
3. Conversion of financial costs to economic costs
4. Calculation of the Net Present Value
5. Selection of the best alternative by the least cost method
6. Evaluation of the selected best alternative

5 Facility Planning for Each Alternative

(1) Treatment Plant

In order to meet the treatment capacity for future demand in 2015, the total capacity of the plants should be 200,000 m³/day. This means that the capacity of 100,000 m³/day in the three treatment plants should be increased by the year 2015. This should be done in two stages, 40,000 m³/day in 2007 and 60,000 m³/day in 2012. As mentioned, there are basically three options for the increase of treatment capacity and the alternatives to be compared are combinations of these three options.

- Expansion of Chinaimo Treatment Plant
- Expansion of Kaolieo Treatment Plant
- Construction of New Treatment Plant in Thangone Area

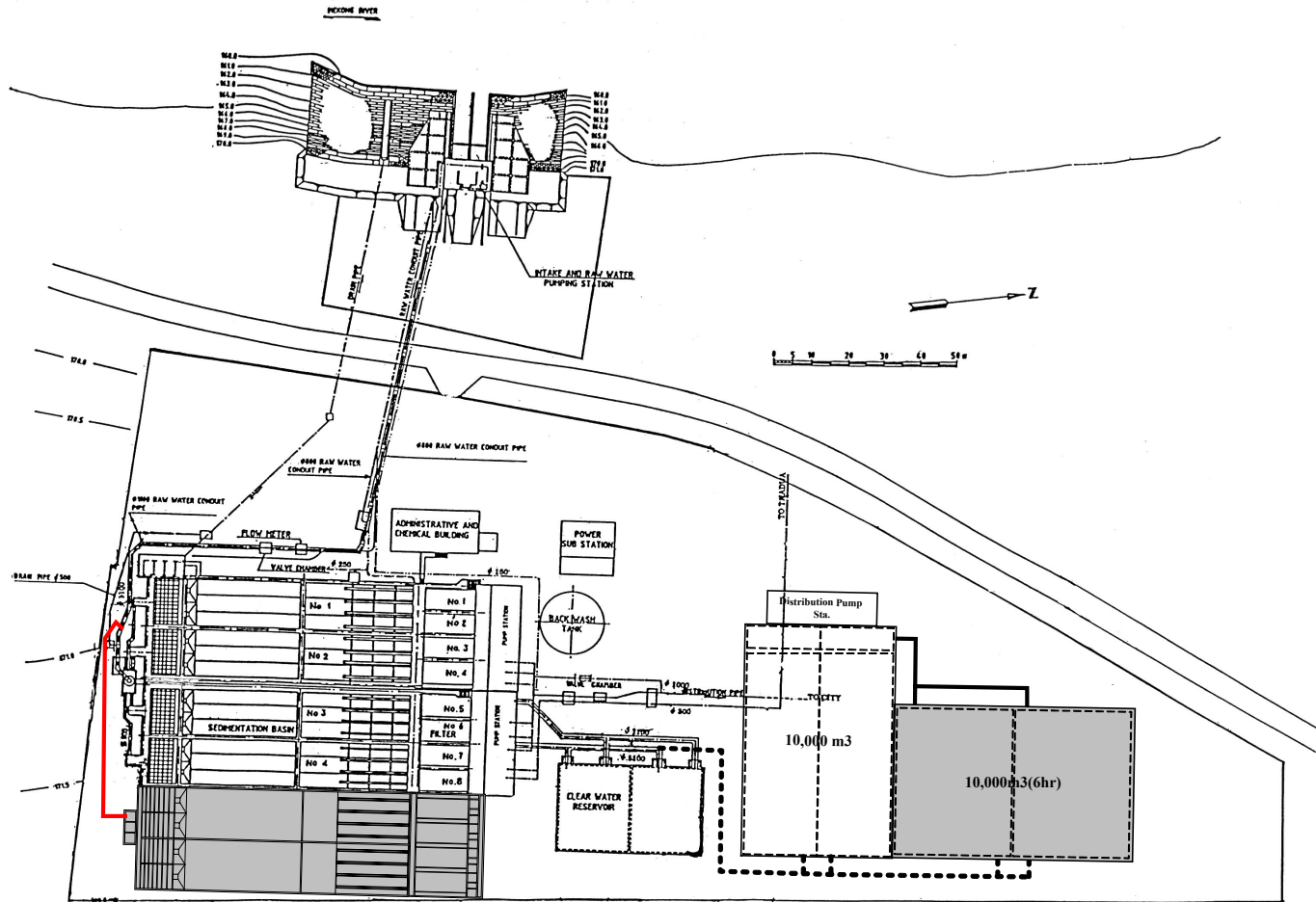
The treatment process for each option is same as for the existing Chinaimo Treatment Plant, which is as follows:

- Rapid Mixing: Gravitational force mixing by weir
- Flocculation: Up and down baffling type
- Sedimentation: Horizontal flow with launder trough
- Filtration: Rapid sand filtration, simultaneous air and water backwash

1) Chinaimo Treatment Plant

Expansion of the Chinaimo Treatment Plant is considered only for the 1st Stage, 40,000 m³/day as mentioned in the previous section. For expansion of the treatment plant, additional intake structures will not be required but the replacement of intake pumps will be required. Figure 4 shows a plan of the Chinaimo Treatment Plant expansion for Alternatives C-1 and C-2.

Figure 4 Plan of Chinaimo Treatment Plant Expansion: 40,000 m³/day for Alternatives C-1 & C-2



2) Kaolieo Treatment Plant

The same treatment process used at the existing Chinaimo Treatment Plant should be applied for expansion of the Kaolieo Treatment Plant. As the existing intake tower, at the opening of the intake gate, does not have enough capacity, additional intake facilities for expansion should be considered. For the case of a 60,000 m³/day expansion in 2nd Stage, since land space for an additional distribution reservoir is not available within the plant premises, construction of distribution centre in the town is planned.

Figure 5 shows the expansion of the 1st Stage, 40,000 m³/day for the Alternative K-1 and Figure 6 shows the expansion of the 2nd Stage, 60,000 m³/day for the Alternatives C-2 and T-2.

3) Thangone Treatment Plant

The treatment process used in the Thangone Treatment Plant is as same as that used at the existing Chinaimo Treatment Plant. The capacity of the sedimentation basin, in other words the detention time of water in the basin, is planned to be less than the Chinaimo Treatment Plant because of the lower turbidity of water from the Nam Ngum River.

Figure 7 shows a construction plan of 40,000 m³/day for Alternatives T-2 and T-3. Figure 8 shows the planned construction of 60,000 m³/day for Alternatives C-1 and K-1. Figure 9 shows the planned construction for the expansion of 60,000 m³/day for Alternative T-3.

As shown in these figures, in the case of Thangone Treatment Plant, some sludge treatment facilities will be required since the Nam Ngum River water is utilized for irrigation purposes downstream of the planned plant location.

Unfortunately Thangone Irrigation College, Ministry of Agriculture and Forestry is in the planned location of the Thangone Treatment Plant. However, according to consultations with the agency concerned, alternative land space will be available in Thangone area for expansion of the treatment plant.

Figure 5 Plan of Kaolieo Treatment Plant Expansion: 40,000 m³/day for Alternative K-1

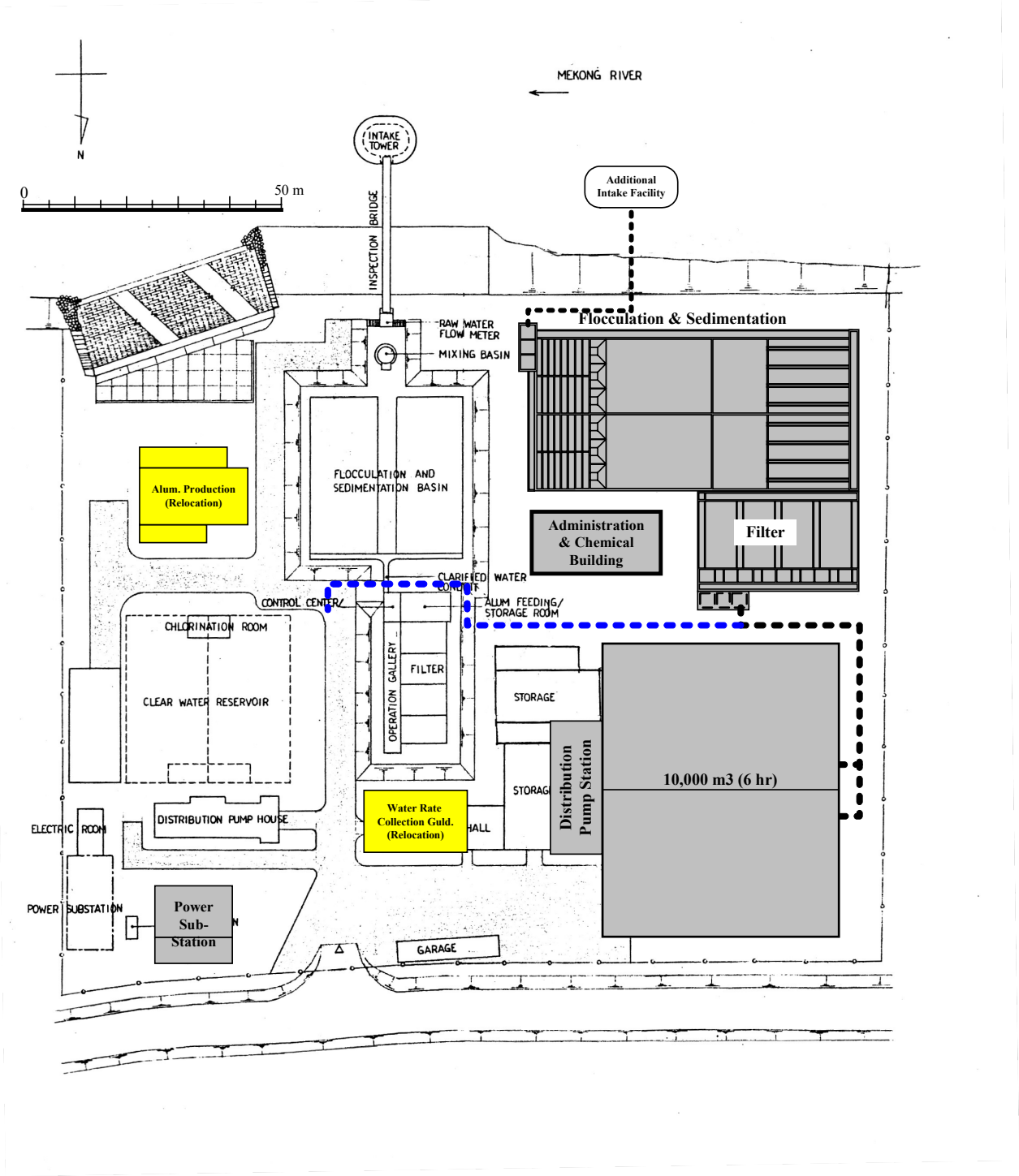
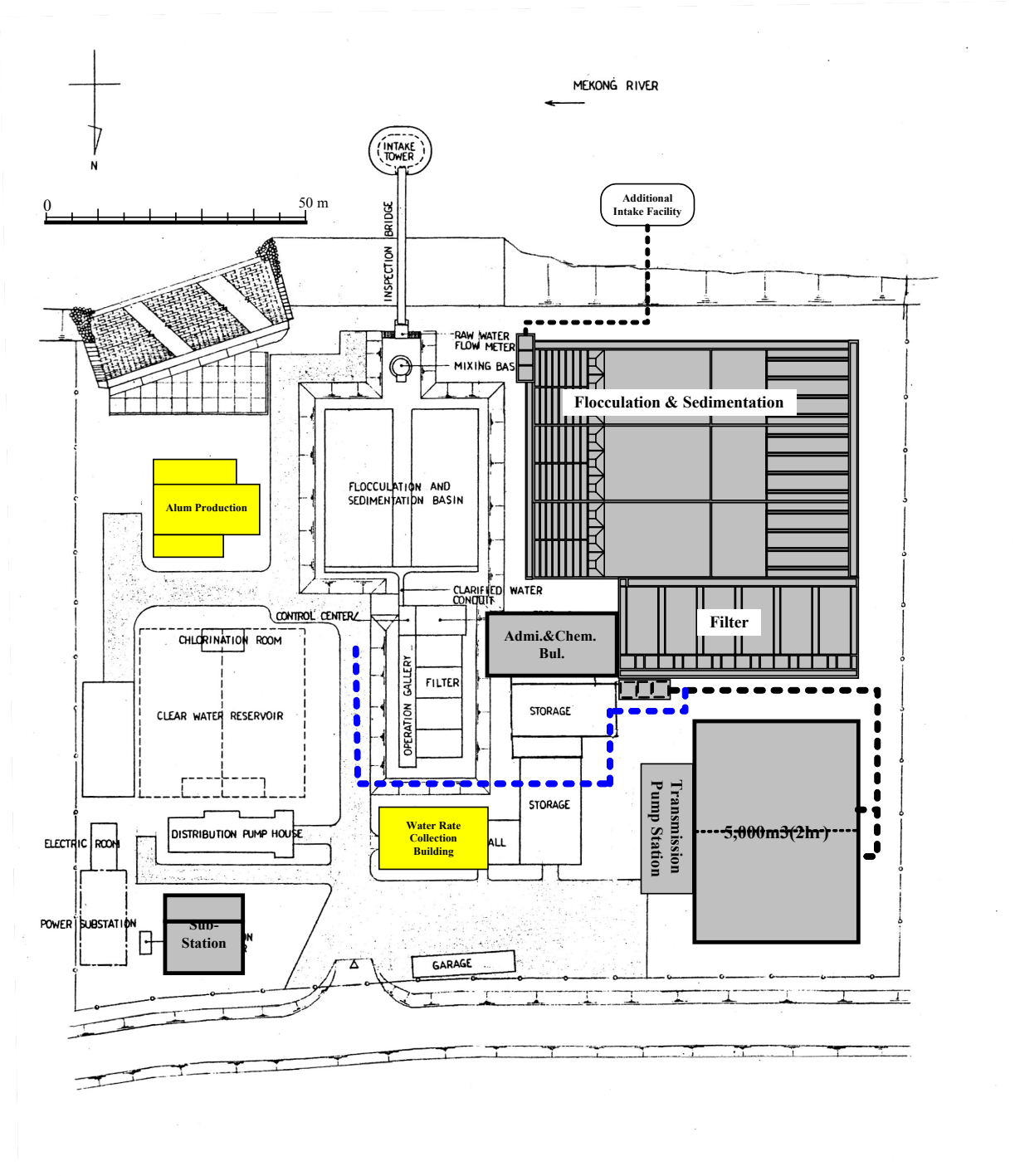


Figure 6 Plan of Kaolieo Treatment Plant Expansion: 60,000 m³/day for Alternatives C-2 & T-2



Note: Because of a limitation of the land space available, a distribution reservoir will be constructed at the distribution centre near the town and the reservoir in the treatment plant is designed as a clear water tank for transmission pumps.