

2-5-2 Sewage Development

2-5-2-1 Existing Sewerage System

Sewerage system in the Siem Reap Town is under the control of the Sewerage and Public Right Unit, Department of Public Works and Transportation, Siem Reap Province. The total number of staff is only four. Two of staff has a technical educational background, but no particular engineers for sewerage works. Their ordinary job is a simple plan of the system. Data management for the facilities/equipment is not systematically managed and depends on their experiences. They have no equipment for cleaning of wastewater pipes. Furthermore, they have no network map because they have no computer and software.

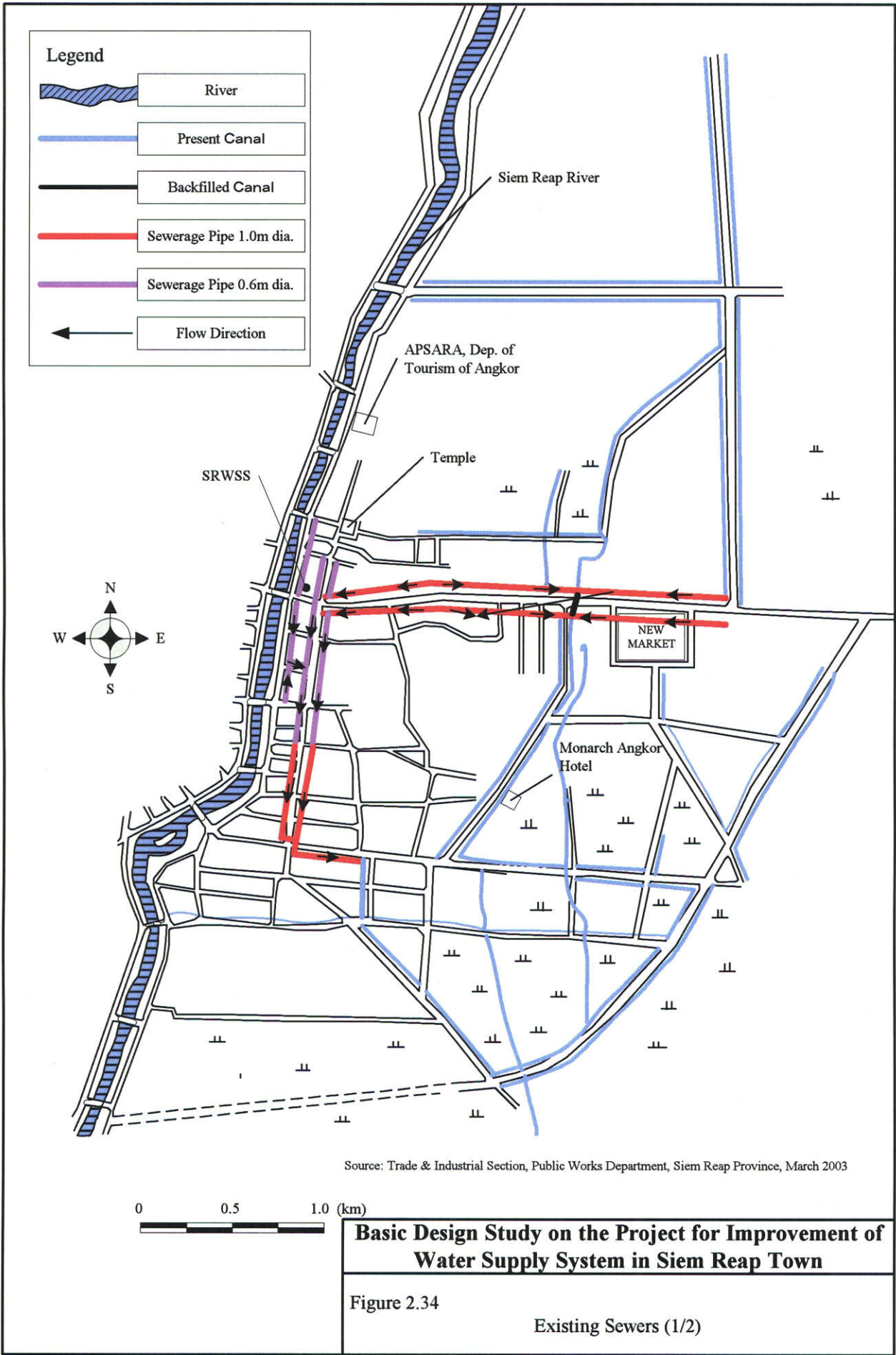
The existing sewers are schematized in Figure 2.34 and Figure 2.35. As shown in those drawings, in the left bank of the Siem Reap River, existing wastewater pipes with a diameter of 1m and about 2km length are installed in both sides of the road in the east to west direction along the national road No. 6. Other existing pipes with a diameter of 1m and about 0.5km length and a diameter of 0.6m and about 1.2 km length are installed in the north-south direction. The wastewater pipes networks are distributed at very limited area of the Siem Reap Town. Around this area, many hotels, guest houses, and restaurants drain wastewater to the sewers. In the right bank of the River, wastewater pipes are installed along the limited streets around the old market. Hotels located in north part drain wastewater to these pipes. These wastewater pipes are connected to the canals that drain from north to south.

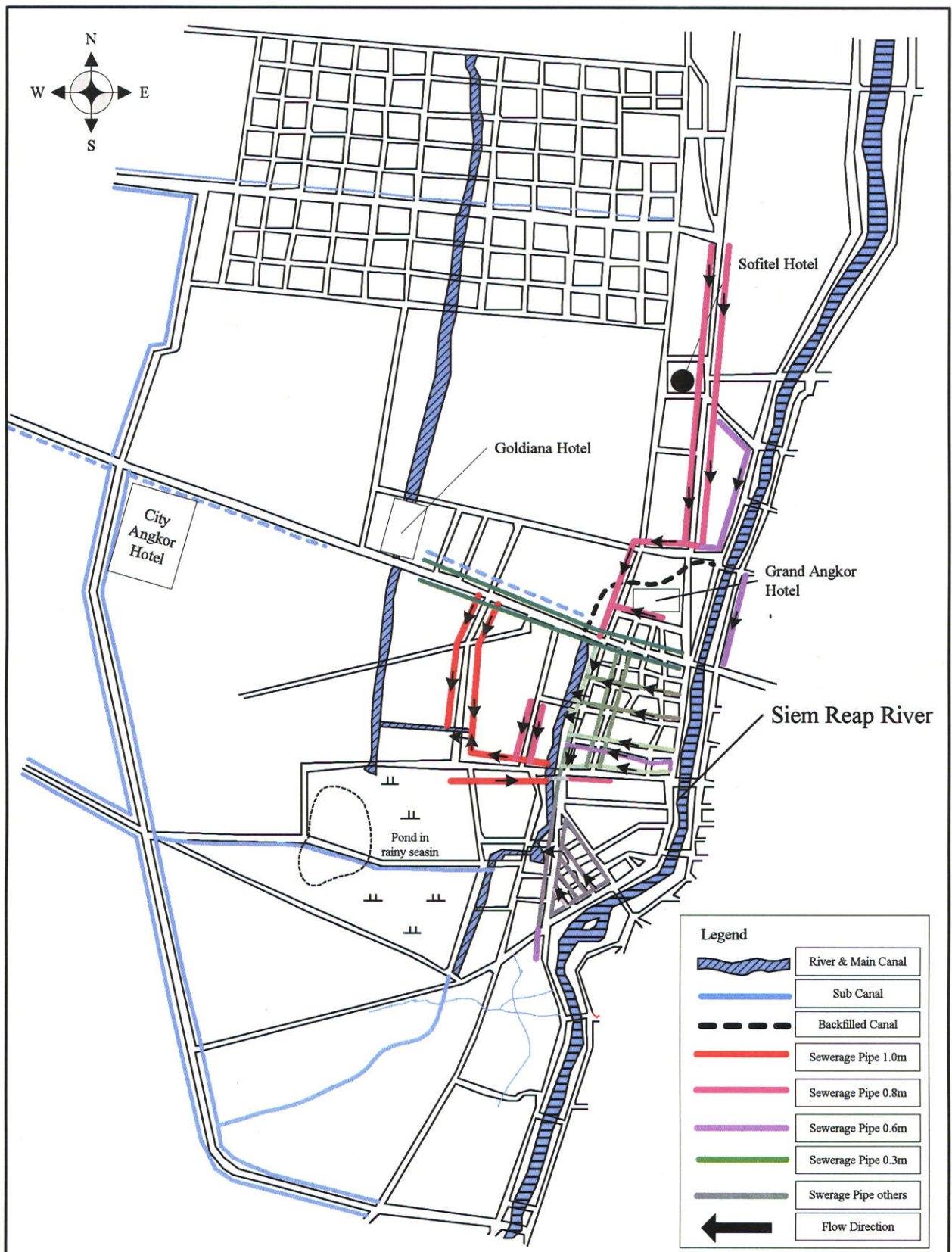
On the other hand, many hotels with large scale are located in the west direction from the Town and to an interchange point for the airport from the national road No.6. These hotels directly drain wastewater to the canals running along the road due to no wastewater pipes. Each hotel is required to settle a septic tank and treated water is discharged to the canals.

The canals are originally public lands that can not privately use by residents. However, the Study Team observed that in many cases, residents living along the canals reclaimed to expand their owned land or buried it to prevent bad smell caused by inflow of wastewater. Moreover, dumping garbage often clogs connection pipes of watercourse in the canals traversed by the road. Therefore, wastewater from the canals overflows in rainy season, which bring about serious unsanitary condition. The Study Team also observed that the end of the canal is connected to paddy field in which wastewater inflows in rainy season and functions as a natural lagoon.

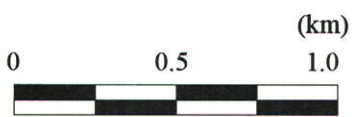
The M/P conducted in 2000 indicated the end of the canal running in the Town was connected to a lagoon that was functioning as a wastewater treatment. However, the system presently has no function as a lagoon because of reclamation of private land owners caused by building constructions around the area. The canals are left neglected without function of wastewater treatment system. Water plants flourish in the canals and drain water seeps only through density roots.

Only affluent residents can construct septic tank because these facilities are very costly. At outer skirt of the residential area along the national road No.6, paddy field widely expands and farmers' stilt houses are distributed. These farmers' families have no permanent type of toilets in their houses. They dig small holes in bushes that they bury after filling up by night soils.





Source: Trade & Industrial Section, Public Works Department, Siem Reap Province, March 2003



Basic Design Study on the Project for Improvement of Water Supply System in Siem Reap Town

Figure 2.35

Existing Sewers (2/2)

Hotels are regulated to provide with septic tanks by the laws and to be supervised by the Provincial Land Management and Urban Planning and Construction Office and to pre-authorize the construction permission by the office before construction. Therefore, these facilities always have the septic tanks.

2-5-2-2 Sewerage Development

After implementing the Project, water supply will be increased. Eventually, sewage will be increased and discharged into public water bodies. Most of residents in the area use of the sealed latrines without a specific treatment system which results in an increase of discharge into the sewerage system. Thus, the development of sewerage system is vital in the future to protect the environment of the Project area.

The following issues are to be managed before or during full-scale sewerage system would be established.

(1) Management of Property Data and Records

Inventory of sewerage system should be prepared and regularly updated for proper maintenance.

(2) Education of Residents

In general, sewage is discharged directly into natural water bodies without treatment in the developing countries. Garbage is thrown everywhere and pilferage of facilities/equipment such as manholes usually occurred. Siem Reap is not exceptional for those happening. It is important to make residents understand the importance of health conditions and awaken their willingness to pay for the tariff.

(3) Maintenance and Expansion of the Existing Sewerage System

In the existing sewerage system, settled water from some treatment systems of residents or hotels is directly discharged into canal through sewers and finally leads into the paddy fields which may work as a natural lagoon system. The existing sewerage system shall be properly well maintained and make use of those facilities as long as possible.

(4) Development of Sewerage System

Individual treatment system is widely utilized because of low construction cost and immediate positive impact to environment. There are so many types of individual treatment systems depend on combination of toilet and understructures. General system employed in the study areas is pit latrine or septic tank. The F/S recommended a staged implementation of sewerage system development. Namely, pit latrine developed in the first step will be replaced by septic tank in the following step. Then sewer connection will be introduced to collect the effluent from residents to a treatment system. However, the proposed staged implementation is apprehensive that residents have to bear the expenses for replacement of their toilets in each stage.

Targeting average residents in the study areas, it is recommendable to make full use of the existing pit latrine or septic tank as a sedimentation tank for pretreatment process, which removes the sediments before introducing the sewage into the treatment system. The collection pipelines can be reduced in size and eventually the total construction cost for the system will be minimized. For the residents, installation of pit latrine or septic tank is not so costly that they will easily accept the development plan in the Town.

Under ADB finance, the Ministry of Tourism (MOT) is now implementing “Mekong Tourism Development

Project” which promotes sustainable tourism in the study area, mitigates environmental degradation, and develops human resources. The project covers 17,000 residents who live in the right bank of the Siem Reap River or western part of the Town. The total allocated budget is approximately 353 million yen. The project composes of i) rehabilitation and connection to the existing sewers, ii) construction of stabilization pond and sludge treatment facilities which receives the drained sludge from septic tanks, and iii) preparation of public hygiene education program. Detailed design shall be completed in 2003 and construction shall be started in 2004 and scheduled to complete in 2007. MIME should promote the project in close cooperation to the MOT.

(5) Strengthening of the Organization

The exiting sewerage system is only made up of open channel or sewers without treatment plant and managed by a small-scale organization. However, the Project will result in an increase of discharge into the public water bodies in the Project areas. For verifying the positive environmental impact of the Project and assuring that any necessary remedial actions are timely identified and acted upon, the environmental monitoring program and strengthening the organization should be implemented as soon as possible.

(6) Development of Human Resources

To strengthen the organization, provision of proper numbers of employee is essential. Well organized training courses should be introduced to the employees periodically. It is also important to retain the well trained resources as long as possible, giving them proper incentive.

(7) Arrangement of Laws/Regulations

Main issues on sewerage works are always laid either due to the lack of settlement of laws and regulations or the laws/regulations are not properly kept. Thus, it is necessary that laws and regulation such as sewerage law (construction/rehabilitation/operation and maintenance of sewerage system), urban planning law (stipulation as an urbanized facilities and benefit principle), environment law, and water pollution prevention act should be enacted in case these are not available.