

(6) 第五次短期調査 (2003年10月28日～2003年11月7日)

- 1) 帰国報告会資料
- 2) 協議議事録 (M/M)

タイ国下水道技術センタープロジェクト

事前評価調査団(第5次)報告書

平成15年11月6日

1. 背景及び調査の目的

本プロジェクトは、1995年～2000年の間実施された「下水道研修センタープロジェクト(TCSW)」の成果を踏まえ、下水道技術基準作成、財務・法体系の整備、下水道整備に対する広報を含めた下水道技術の研究開発を目的とする本プロジェクトがタイ政府(タイ内務省公共事業局・PWD)より要請され、2001年度短期調査実施案件として採択された。これに対し、2001年10月に第1回短期調査、2002年7月に第2回短期調査、同年10月に第3次短期調査を実施し、関係機関代表者によるワークショップ等を通じて(1)ガイドライン作成、(2)啓蒙、(3)人材育成、(4)情報の4つの活動を柱とするプロジェクトのPDM(案)が作成され、合意された。

しかしながら、第3次短期調査において、タイ側より、2002年10月の省庁再編により下水道行政の枠組みが大きく変化しプロジェクト実施機関であるPWDは下水道行政を所管しなくなるという見通しについて説明がなされ、同時に、下水道行政の枠組みが明らかになるまでプロジェクトの準備作業を中断するよう要望があった。その後省庁再編後の2002年12月に、タイ側より天然資源環境省傘下の下水道公社(WMA)を中心とする実施体制について通報がなされたことを受け、実施体制の確認等のため、第4次調査を実施した。

今般、日本側にて、投入案及びPO案が完成したため、タイ側と協議の上、(1)PO案の合意、(2)双方の投入量の協議、(3)実施体制の再確認を目的として調査を行うこととした。

2. 調査団員

担当分野	氏名	所属	日程
総括	高橋正宏	国土交通省国土技術政策総合研究所 下水道研究部下水道研究官	10月28日～11月6日
下水道事業計画	山本博英	日本下水道事業団技術開発研修本部 技術開発部 主任研究員	10月28日～11月6日
協力企画	伊藤民平	JICA 社会開発協力部社会開発協力第一課 職員	10月28日～11月6日
事業評価	高杉俊晴	日本環境コンサルタント	10月28日～11月6日

3. 調査日程および訪問場所

平成15年10月28日～11月6日(詳細は別添1参照)

4. 調査結果 (別添2 ミニッツを参照)

(1) PDM 及び PO (活動計画)

第4次調査団にて PDM にてプロジェクト期間5年として想定されていたものを3年半とし、期間中はターゲット処理場に絞って活動を行い、ガイドラインの開発までを行うことで先方の合意を得た。

上記案に基づく活動計画(PO)案を先方につき、先方と協議を行った結果、基本的に合意を得た。この結果、プロジェクト開始前にパイプライン専門家を3ヶ月間派遣し、ターゲット処理場の選定作業を行うこととなった。

(2) 双方の投入

<日本側投入>

- ・ 長期専門家：チーフアドバイザー、土木、設備、水質分野の専門家を派遣する。ただし、兼任する方向で調整を行う予定であり、人数は現在未定である。
- ・ 短期専門家：必要に応じて派遣する。
- ・ 供与機材：モバイルラボトリー(自動車：現場での簡易な水質・電気機械の測定などを想定したもの)、情報システム関連機器、研修用機材等。
- ・ 本邦研修：第3ターム、第7タームにターゲット処理場のチーフオペレータとマネージャをOJTの目的で本邦研修を行う。
- ・ その他：ローカルコンサルタント、情報システム構築のためのハードウェア・ソフトウェア・DBソフト開発

<タイ側投入>

- ・ プロジェクトローカルコスト
- ・ ターゲット処理場の改修費用
- ・ 国内における研修の費用
- ・ C/P の配置等

(3) 実施体制の再確認

第4次調査団にて、関係機関の活動に対する関わり方を明確にしたが、今般、C/P の具体名の提示を依頼した。WMAについては、具体名として ANNEX-3 に添付した。他の機関は、今の段階で具体名を記載しても、プロジェクト開始となる来年10月までに移動等で人員が変更となる可能性があるため、職位の記入とした。

(4) ターゲット候補処理施設の視察(絞込み)

今回の処理施設視察の目的は、プロジェクトターゲット候補をタイ側が前回提示した9箇所から5箇所程度に絞りこむことである。

調査及びヒアリングの結果、大きく分類して2タイプの問題を抱える処理施設があることが明確になった。

- ・ タイプ1: 管きよでの問題が大きく、処理場まで汚水が来ていない。もしくは、設計水量に対し極端に少ない。(シーラチャ, チャーアム)
- ・ タイプ2: 処理場まで汚水が来ているが何らかの維持管理上の問題を抱えている(パッタヤ, バトン)

タイプ1の処理施設の改善は管きよの調査からはじめる必要があるため、0からのスタートではなくマイナスからのスタートとなる(0から作り直したほうが早いという意味で)。改善には長い調査期間(特に管きよの漏水箇所の特定、レベル測定など)と多額の費用を必要とするため、今回の3年半のプロジェクトで全て改善評価するのは難しいと判断する。

しかしながら、このタイプの処理施設が多く存在するのも事実でありタイ国全体の維持管理改善を行うためには必須の改善項目である。ターゲットとしての選定は難しいが、管きよの設計、施行、維持管理について技術支援を行うことが重要と考えられる。

タイプ2は既に汚水が処理施設に流入しているが、設計上の問題、維持管理上の問題を抱えているため、日本の技術協力を持って3年半の期間内に成果を上げることが可能と考える。

タイプ2の処理場として今回パッタヤ市、バトン市がWMA側から推薦された。いずれもタイを代表する国際観光都市でありWMAの処理施設選定優先順位は高く、タイ国内のアナウンスメント効果も大きい。今回、パッタヤを視察し雨季と乾季で異なる流入水量、水質の問題が維持管理に影響を与えていること、雨季用にバイパス水路が設置されているが効果的に運用されていない(バイパスゲートが手動であることが原因の可能性あり)ことなどが確認できた。

一方、今回視察したWMA管轄の処理施設において、第2次調査団時点では殆ど作成されていなかった維持管理日報などが利用されていたことなど前回より評価できる項目も増えている。

なお、BMAが所管するクrontoi処理場については現場視察の結果、既にBMA独自に改修を済ませており、前回維持管理上の問題として指摘されたごみの問題、曝気不足の問題などが解決されていた。一方、雨水配管、汚水配管誤接続の問題ははまだ解決されていない。

後日、BMAチャンチャイ氏と打合せの結果、対象処理施設をトゥーホンソン処理場に変更するアイデアが提案された。また、日本側から今後BMAが直面するであろう汚泥処理の問題(特に汚泥中の重金属の問題)について、次期プロジェクトで調査を行ってはどうかと提案したとこ

る、重要な案件であり協力して欲しいと要望があった。

なお、BMA からの最新情報として膜処理、汚泥炭化などが既に BMA に紹介されている事、特に炭化技術については JBIC が持ちかけているとの情報を入手した。

5. その他

・ デンマークの関与について

JICA 事務所及び大使館との協議に基づき、調査団より先方に対して、デンマークの事業内容を明確にする文書の提出を依頼し、その旨 M/M に記載した。また、その内容如何によっては、今後プロジェクト内容の変更もあり得ることを口頭にて伝えた。

調査団が現在得ている情報は、Petchburi と Hua Hin にデンマークが関わっているという点、事業内容としてはパイプラインの改修及び啓発事業を行っている点である。また、ガイドライン作成に関しては、デンマークのプロジェクトにおいては、想定していない点を確認した。

Suchai 氏曰く、デンマークの協力内容はあくまでも個々のローカルな処理場を対象としたものであり、JICA のプロジェクトのような広い範囲のものではないということであった。

・ ガイドラインについて

プロジェクト活動によって最終的に作成されるガイドラインが、具体的にどのようなイメージのものであるのか、その参考例のようなものを日タイ双方で共有し、共通のイメージを持つことが必要と感じた。また、国内におけるガイドラインの認可・普及に関し、他の案件の事例も参考にしつつ、タイにおける制度、慣習を再度確認することが望ましい。

6. 今後の予定

- ・ 調査団帰国後、早期に投入決定のための会議を持ち、専門家、機材を含め、決定する。
- ・ 上記決定を以て、R/D 案を作成し、事務所宛、送付する。
- ・ 来年 1 月以降、R/D 締結後、すぐに機材調達の手続きを開始するとともに、専門家人選手続きを正式に開始する。
- ・ 来年 7 月、パイプライン専門家派遣、ターゲット処理場の選定、その他プロジェクト準備。
- ・ 来年 10 月プロジェクト開始。

以上

調査日程:

	日付	時間	行程
1	10/28 火	11:05	成田発 バンコク行き JL717 便、バンコク着 15:30
2	10/29 水	9:00 10:30 13:30 16:00	JICA タイ事務所 (調査目的、日程の説明) DTEC 表敬訪問 (調査目的、日程の説明) Wastewater Management Authority (WMA) 表敬訪問、日程打合せ JICA タイ事務所及び大使館との打合せ
3	10/30 木	終日	サイト調査 (午前: Sriracha, 午後: Pattaya)
4	10/31 金	午前 午後	WMA における全体会議 (DTEC, PDC, DEQP, DPT, BMA の参加の下、PDM 修正点の合意、PO の合意) BMA のサイト調査 (Klong Toey)
5	11/1 土	10:00	資料作成 (M/M 案、R/D 案)
6	11/2 日		団内打合せ (R/D 修正、サイト調査整理)
7	11/3 月	終日	WMA との打合せ (M/M 案、投入案、R/D 案)
8	11/4 火	終日	サイト調査 (Cha-am)
9	11/5 水	午前 午後	BMA 表敬訪問 M/M 署名
10	11/6 木	10:30 22:30	JICA 事務所及び大使館報告 バンコク発 JL718 便
11	11/7 金	6:10	東京着

MINUTES OF MEETINGS
BETWEEN
THE JAPANESE FIFTH PREPARATORY STUDY TEAM
AND
THE AUTHORITIES CONCERNED OF THE GOVERNMENT
OF THE KINGDOM OF THAILAND
ON THE JAPANESE TECHNICAL COOPERATION
FOR
“THE PROJECT FOR IMPROVEMENT OF SEWAGE TREATMENT PLANTS
MANAGEMENT IN THAILAND”

The Japanese Fifth Preparatory Study Team (hereinafter referred to as “the Team”) organized by the Japan International Cooperation Agency (hereinafter referred to as “JICA”) and headed by Dr. Masahiro Takahashi visited the Kingdom of Thailand from October 28 to November 6, 2003 for the purpose of conducting a preparatory study on Japanese technical cooperation for the “The Project for Improvement of Sewage Treatment Plants Management in Thailand” (hereinafter referred to as “the Project”).

During its stay, the Team had a series of discussions with the Thai authorities concerned with respect to the implementation of the Project.

As a result of the discussions, the Team and the Thai authorities concerned agree to recommend to their respective Governments the matters referred to in the document attached hereto.

Bangkok, November 5, 2003

高橋正宏

Dr. Masahiro Takahashi
Leader
5th Preparatory Study Team
Japan International Cooperation
Agency (JICA)

A. Ampawasiri

Mr. Akanit Ampawasiri
Acting Director General
Wastewater Management Authority
Ministry of Natural Resources and
Environment

ATTACHED DOCUMENT

I. REVISED PROJECT DESIGN MATRIX (PDM)

Both sides agree to implement the Project based on the PDM attached in the Annex-1. The PDM has been modified from the previous version made on July 2003. The major point of modification is that the Project will concentrate into the target STPs and development for other STPs will be covered by Thai side after the Project. The PDM will be subjected to change whenever the necessity arises, following the discussion and agreement between both sides.

1. Title of the Project

Both sides agreed the title of the Project shall be referred to as "The Project for Improvement of Sewage Treatment Plants Management in Thailand" (hereinafter referred to as "the Project").

2. Overall Goal

Both sides confirmed that the overall goal for the Project would be "Sewage Treatment Plants (STPs) are operated efficiently and effectively in Thailand".

3. Project Purpose

The purpose of the Project is "Efficient and effective operation method of STPs is established".

4. Output of the Project

- 1) Guidelines (O&M, P&D) at sewage system appropriate for Thailand (tropical area) are developed.
- 2) Awareness of decision-makers of local governments and general public for sewage works is improved, for collection of sewage charge.
- 3) Managers of target STPs will be able to manage the plant appropriately.
- 4) Chief operators of target STPs will be able to operate the plant appropriately.
- 5) Operation and maintenance information is exchanged among target local governments and target STPs in order to disseminate the guidelines and successful examples.

5. Activities of the Project

- 1-1) Collect data/analyze problems affecting the operation of plant.

- 1-2) Clarify factors contributing to each problem.
- 1-3) Set the target of operation and maintenance (e.g. BOD, sludge, equipment).
- 1-4) Improve the target treatment plants.
- 1-5) Test/run the improved system and evaluate data.
- 1-6) Set the guideline for operation and maintenance.
- 1-7) Set strategies to disseminate the guidelines.
- 2-1) Conduct awareness survey on sewage works to the local governments and general public.
- 2-2) Study the socio-economic background and attitude of the target community.
- 2-3) Plan the strategy to increase awareness of local governments and general public.
- 2-4) Develop material for local governments and public on sewage works.
- 2-5) Prepare draft guideline and methodology.
- 2-6) Implement public relation on sewage works.
- 2-7) Implement awareness campaign of Polluter-Pay Principle to the target population and local governments.
- 2-8) Conduct workshop/seminar for councilors and executives to pay much attention on sewage works.
- 2-9) Evaluate the result of the activities implementation.
- 3-1) Set the qualification standards of managers that should be achieved by the training.
- 3-2) Develop training guideline for STP managers.
- 3-3) Develop materials for manager training.(For trainers and trainee)
- 3-4) Train trainers for OJT (On The Job Training) and training course.
- 3-5) Conduct OJT and training course.
- 3-6) Evaluate the training effect and improve the training guideline.
- 4-1) Set the qualification standards of chief operators that should be achieved by the training.
- 4-2) Develop training guideline for STP chief operators.
- 4-3) Develop materials for chief operator training.(For trainers and trainee)
- 4-4) Train trainers for OJT (On The Job Training) and training course.
- 4-5) Conduct OJT and training course.
- 4-6) Evaluate the training effect and improve the training guideline.
- 5-1) Collect operation and maintenance data report.(daily weekly monthly yearly report)
- 5-2) Collect completed document.(Construction drawings, plants specifications, As-built drawings)

5-3) Develop an information exchange system (e.g. Stand -alone, Local LAN, The Internet)

6. The Implementing Organization

- (1) The implementing organization is the Wastewater Management Authority (WMA).
- (2) WMA will organize the Joint Coordinating Committee and Steering Committee.

7. Duration of the Project

The duration of the Japanese Technical Cooperation for the Project shall be three and a half (3.5) years. The date of the initiation of the Project shall be October 1st, 2004.

II. TENTATIVE PLAN OF OPERATION

Both sides agreed to implement the Project based on the Plan of Operation (PO), which is attached in the Annex-2. The PO will be subjected to change whenever the necessity arises. The PO should be revised following the discussion and agreement between both sides.

III. PROJECT COUNTERPART PERSONNEL

The Study Team asked Thai side to submit the list of counterpart personnel for each activity, and Thai side has proposed the tentative list as shown in the Annex-3. The list will be finalized during the Project preparation period.

IV. TARGET SEWAGE TREATMENT PLANTS (STPs)

Following the discussions of 4th Preparatory Study Team and Thai side, the Team visited and evaluated the possible candidate STPs during the stay. The details of the results are attached in the Annex-4, which will be used as an information for the decision of the target STPs through the discussion between Thai side and a short-term expert to be dispatched as referred to in the article V below.

V. DISPATCH OF A SHORT-TERM EXPERT

Before the commencement of the Project, a short-term expert will be dispatched for the discussion of target STPs and for the preparation of the Project. The Study Team asked Thai side for the arrangement needed for the activities of short-term expert, such as office space.

VI. SCHEDULE BEFORE THE PROJECT COMMENCEMENT

The Team advised the planned schedule until the Project starts, as below.

(1) Signing of Record of Discussion: Between December 2003 to January 2004

The date of the signing of Record of Discussion will be informed through JICA Thailand Office.

(2) Dispatch of a short-term expert: July 2004

(3) Commencement of the Project: October 2004

VII. GUIDELINES

The Team proposed Thai side that the guidelines, which will be developed during the Project implementation, should be agreed by relevant organizations to be distributed in Thailand. The Thai side comprehended the importance of the proposal of the Team and expressed to evaluate and recommend the guidelines to relevant organizations.

The Team further requested WMA to continue the activities of guideline distribution, not only during the Project implementation but also after the Project termination. The Thai side accepted the request of the Team.

VIII. INFORMATION OF OTHER DONORS

The Team requested Thai side to submit the information about projects with other donors currently running. Thai side accepted the request and answered to provide the information until the 15th of December 2003.

LIST OF ANNEX

ANNEX 1: Project Design Matrix (PDM)

ANNEX 2: Plan of Operation

ANNEX 3: Tentative List of Counterpart Personnel

ANNEX 4: STPs Data Sheet

ANNEX-1 Project Design Matrix (PDM)

Project Name: The Project for Improvement of Sewage Treatment Plants Management in Thailand

Duration: 1st Oct 2004 to 31st Mar 2008

Target Area: Target STPs Target Group: Central and Local government officials in wastewater management plants






Date: 2003/11/5

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>Overall Goal Sewage Treatment Plants (STPs) are operated efficiently and effectively in Thailand.</p> <p>Super Goal The water quality of public water bodies is improved.</p>	<ol style="list-style-type: none"> 1. Operation and maintenance for STPs is executed appropriately. 2. () % of STPs in Thailand are operated in the line with the guideline developed. 3. Quality of effluent from STPs is below the national standard (e.g. BOD become less than 20mg/l) 4. O&M guidelines developed with target STPs are utilized by other STPs. 	<p>Post evaluation study report. () % shall be decided after baseline survey.</p>	<ul style="list-style-type: none"> ● People are willing to pay the sewage charge.
<p>Project Purpose Efficient and effective operation method of STPs is established.</p>	<ol style="list-style-type: none"> 1-1. Problems of target STPs are solved. 1-2. Effluent from target STPs will be less than the water quality standard of Thailand. (e. g. BOD less than 20 mg/l) 	<p>Questionnaire survey (before and after) Project report</p>	<ul style="list-style-type: none"> ● STPs have enough budgets. ● Both central and local governments support project activities.
<p>Outputs</p> <ol style="list-style-type: none"> 1. Guidelines (O&M, P&D) at sewage system appropriate for Thailand (tropical area) are developed. 2. Awareness of decision-makers of local governments and general public for sewage works is improved, for collection of sewage charge. 3. Managers of target STPs will be able to manage the plant appropriately. 4. Chief operators of target STPs will be able to operate the plant appropriately. 5. Operation and maintenance information is exchanged among target local governments and target STPs in order to disseminate the guidelines and successful examples. 	<ol style="list-style-type: none"> 1-1. Draft O&M and P&D guideline for target treatment method is formulated. 2-1. Decision-makers of target local government can plan and implement awareness program for Polluter-Pay-Principle. 2-2. 70% of population have knowledge on wastewater in the target area. 2-3. 50% of population have willingness to pay for wastewater fee in the target area. 3-1. All managers in target STPs are trained. 3-2. Managers with appropriate capacity are assigned to the target STPs. 4-1. All chief operators in target STPs are trained. 4-2. Chief operators with appropriate capacity are assigned to the target STPs. 5-1. Information exchange system is developed. 5-2. Target STPs are equipped with information system and technical information is exchanged. 	<p>Questionnaire survey (before and after) Project report Training record.</p>	<ul style="list-style-type: none"> ● Counterpart is secured for the project. ● Guideline development methodology is accepted by the concerned agencies. ● Concerned staffs have capacity to utilize public relation material developed. ● People in STPs service area give good cooperation in fee collection and project activities. ● Tools for information exchange are available.

Activities	Inputs	Pre-conditions
<p>1. Guideline (O&M, P&D) at sewage system appropriate for Thailand are developed.</p> <p>1-1 Collect data/analyze problems affecting the operation of plant.</p> <p>1-2 Clarify factors contributing to each problems.</p> <p>1-3 Set the target of operation and maintenance.(e.g.BOD,sludge,equipment)</p> <p>1-4 Improve the target treatment plants.</p> <p>1-5 Test/Run the improved system and evaluate data.</p> <p>1-6 Set the guideline for operation and maintenance.</p> <p>1-7 Set strategies to disseminate the guidelines.</p> <p>2. Awareness of decision-makers of local governments and general public for sewage works is improved, for collection of sewage charge.</p> <p>2-1 Conduct awareness survey on sewage works to the local governments and general public.</p> <p>2-2 Study the socio-economic background and attitude of the target community.</p> <p>2-3 Plan the strategy to increase awareness of local governments and general public.</p> <p>2-4 Develop material for local governments and public on sewage works.</p> <p>2-5 Prepare draft guideline and methodology.</p> <p>2-6 Implement public relation on sewage works.</p> <p>2-7 Implement awareness campaign of Polluter-Pay Principle to the target population and local governments.</p> <p>2-8 Conduct workshop/seminar for councilors and executives to pay much attention on sewage works.</p> <p>2-9 Evaluate the result of the activities implementation.</p> <p>3. Managers of target STPs will be able to operate the plants appropriately.</p> <p>3-1 Set the qualification standards of managers that should be achieved by the training.</p> <p>3-2 Develop training guideline for STP managers.</p> <p>3-3 Develop materials for manager training.(For trainers and trainee)</p> <p>3-4 Train trainers for OJT (On The Job Training) and training course.</p> <p>3-5 Conduct OJT and training course.</p> <p>3-6 Evaluate the training effect and improve the training guideline.</p> <p>4. Chief operators of target STPs will be able to operate the plants appropriately.</p> <p>4-1 Set the qualification standards of chief operators that should be achieved by the training.</p> <p>4-2 Develop training guideline for STP chief operators.</p> <p>4-3 Develop materials for chief operator training.(For trainers and trainee)</p> <p>4-4 Train trainers for OJT (On The Job Training) and training course.</p> <p>4-5 Conduct OJT and training course.</p> <p>4-6 Evaluate the training effect and improve the training guideline.</p> <p>5. Operation and maintenance information is exchanged among target local governments and target STPs in order to disseminate the guideline and successful examples.</p> <p>5-1 Collect operation and maintenance data report.(daily weekly monthly yearly report)</p> <p>5-2 Collect completed document.(Construction drawings, plants specifications, As-built drawings)</p> <p>5-3 Develop an information exchange system (e.g. Stand-alone, Local LAN, The Internet)</p>	<p>Japanese Side</p> <p>Personnel:</p> <p>Long-term experts in the field of Chief Advisor, Civil Engineering, Mechanical & Electrical Engineering, Water Quality.</p> <p>Short-term experts depend on actual needs.</p> <p>Equipment and materials:</p> <p>Equipment necessary for activities</p> <p>Training material</p> <p>Counterpart Training in Japan</p> <p>Cost sharing for training courses for managers and chief operators</p> <p>Cost sharing to establish the Information Exchange System</p> <p>Cost for contracts with local consultant</p> <p>Thai Side</p> <p>Personnel:</p> <p>Full time counterpart staff for all the field of activities</p> <p>Participation of part-time counterpart from target STPs and local governments</p> <p>Participation of all the managers and chief operators of target STPs to the training courses.</p> <p>Facilities</p> <p>Target STPs</p> <p>Office for Japanese experts</p> <p>Equipment for STPs</p> <p>Local Cost:</p> <p>Necessary budget for improvement of STPs</p> <p>Necessary budget for Public Relation activities.</p> <p>Necessary budget for training courses for managers and chief operators.</p>	<p>● Thai authorities related to sewage water treatment build a consensus to implement this project.</p> <p>● Local government that operate target STPs agree to and accept the project.</p> <p>● Existing and functioning STPs are available.</p> <p>● Target STPs are properly selected.</p> <p>● Working group meeting between central government and local government is set up.</p>

ANNEX 2 Plan of Operation

Activities / Year/Stage	Pre.	1st				2nd				3rd				4th	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Guideline(O&M, P&D)at sewage system appropriate for Thailand are developed.															
*Determination of a target treatment plants.															
1-1 Collect data/analyze problems affecting the operation of plant.															
1-2 Clarify factors contributing to each problems.															
*Preliminary survey															
1-3 Set the target of operation and maintenance.(e.g.BOD,sludge,equipment)															
1-4 Improve the target treatment plants.															
(1) Planning															
(2) Designing															
(3) Contract															
(4) Rehabilitation															
(5) Trial operation															
1-5 Test/Run the improved system and evaluate data.															
1-6 Set the guideline for operation and maintenance.															
1-7 Set strategies to disseminate the guidelines.															
2. Awareness of decision-makers of local governments and general public for sewage works is improved, for collection of sewage charge.															
*Support awareness activities															
2-1 Conduct awareness survey on sewage works to the local governments and general public.															
2-2 Study the socio-economic background and attitude of the target community.															
2-3 Plan the strategy to increase awareness of local governments and general public.															
2-4 Develop material for local governments and public on sewage works.															
2-5 Prepare draft guideline and methodology.															
2-6 Implement public relation on sewage works.															
2-7 Implement awareness campaign of Polluter-Pay Principle to the target population and local governments.															
2-8 Conduct workshop/seminar for councilors and executives to pay much attention on sewage															
2-9 Evaluate the result of the activities implementation.															
3. Managers of target STPs will be able to operate the plants appropriately.															
*Preliminary survey															
3-1 Set the qualification standards of managers that should be achieved by the training.															
3-2 Develop training guideline for STP managers.															
3-3 Develop materials for manager training.(For trainers and trainee)															
3-4 Train trainers for OJT (On The Job Training) and training course.															
3-5 Conduct OJT and training course.															
3-6 Evaluate the training effect and improve the training guideline.															
4. Chief operators of target STPs will be able to operate the plants appropriately.															
*Preliminary survey															
4-1 Set the qualification standards of chief operators that should be achieved by the training.															
4-2 Develop training guideline for STP chief operators.															
4-3 Develop materials for chief operator training.(For trainers and trainee)															
4-4 Train trainers for OJT (On The Job Training) and training course.															
4-5 Conduct OJT and training course.															
4-6 Evaluate the training effect and improve the training guideline.															
5. Operation and maintenance information is exchanged among target local governments and target STPs in order to disseminate the guideline and successful examples.															
5-1 Collect operation and maintenance data report.(daily weekly monthly yearly report)															
5-2 Collect completed document.(Construction drawings, plants specifications, As-built drawings)															
5-3 Develop an information exchange system (e.g. Stand-alone, Local LAN, The Internet)															
(1) Plan															
(2) System development.(hardware)															
(3) System development.(software)															
(4) Installation(server, LAN)															
(5) Test Run and training															

 Long-term Expert, Short-term Expert
 Private Company
 Short-term Expert
 Training in Japan
 consultant

ANNEX-3 List of Counterpart Personnel

Wastewater Management Authority (WMA)

1. Director General
2. Deputy Director General
3. Director of Wastewater Management Department
4. Mr. Suchai Janepojanat
5. Ms. Hatairat Likit-anupark
6. Mr. Chira Wongburana
7. Mr. Akkwat Wettayavatin
8. Mr. Kitti Teerasoradech
9. Mr. Suppamitr Yuvatana
10. Mr. Kitti Uyakul

Department of Public Works and Town and Country Planning (DPT)

1. Director General
2. Director of Town Planned Development Bureau
3. Director of Human Resource Development Institute for Urban Development
4. Director of Environmental Engineering Section
5. Senior Engineer
6. Engineer

Department of Drainage and Sewerage (DDS), BMA

1. Mr. Ponpoj Kannasoot
2. Ms. Jaraspond Jaruchaiyakul
3. Ms. Busmaporn Chaiwanichaya
4. Mr. Jane Waraya
5. Mr. Ukrit Klinsukon
6. Mr. Teerapon Kuttawas

Pollution Control Department (PCD)

1. Director General and/or representatives

Department of Environmental Quality Promotion (DEQP)

1. Director General and/or representatives

Office of the Natural Resources and Environment Policy and Planning (ONEP)

1. Secretary General and/or representatives

Department of Local Administration (DLA)

1. Director General and/or representatives

Department of Technical and Economic Cooperation (DTEC)

1. Director General and/or representatives

ANNEX-4 Data Sheet of STP (2003.10)

No. 1

Name of TP : Sriracha Wastewater Treatment Plant

Ministry District : Sriracha

Address : 92/1 Sriracha nakorn 3 Rd, Aumthur Sriracha, Chonburi Province

TEL : 038-325360

1 . TP Information

Opening Date : 8, Oct, 1997

WMA Starting Operation Date : 15, Oct, 1997

Sewered Population (Planning) : _____ Sewered Population (Operation) : 5,000

TP capacity (Planning) : 18,000 m³/day

TP capacity (Operation) : 800 m³/day

Public Water to Effluent : Sea

Catchments Area: 2,153 km²

Planning Influent Water Quality (BOD,SS,COD) : 400, -, - mg/l

Current Influent Water Quality (BOD,SS,COD) : 40, 150, 80 mg/l

Planning Effluent Water Quality (BOD,SS,COD) : 20, 30, - mg/l

Current Effluent Water Quality (BOD,SS,COD) : 2-3, 10, 20 mg/l

Collect System : Interceptor • Combined • Separated

Number of Relay Pumping Station : 5 (Can work 3)

Prolongation of Sewer Pipe : 3 km

TP System : AS • MAS • OD • RBC • AL

Note: AS(Activated Sludge) • MAS(Modified Activated Sludge) • OD(Oxidation Ditch) • RBC(Rotating Biological Contactor) • AL(Aerated Lagoon)

T

A.

2. Plant

Grid Chamber : • no

(Number of Chamber 1 _____ • Number of Inlet Gate 1 _____)

Number of Sand Pump 2 _____ • Number of Sand Collector 1 _____

Number of Screen - _____)

Main Pump : • no

(Number of Submersible 15 _____ • Number of centrifugal(horizontal) - _____)

Number of centrifugal(vertical) - _____)

Water Treatment : Number of Primary Sedimentation Tank 1(Grit Chamber) _____

Number of Aerated Tank 3 _____

Number of Secondary Sedimentation Tank 6 _____

Disinfection Tank 1 • Water Filtration - _____

Sludge Treatment : Thickening : • no

Digestion : yes • no

Dewatering : • no (Number of Belt-press 2 _____)

Number of Centrifuge - , ,)

Drying Bed : yes • no

Composting : yes • no

Treated Water Reuse : • no

(Utilizatio : Garden Watering _____)

Sludge Reuse : • no

(Utilization : Composting (By the person who need.) _____)

3 . Operating Persons

In charge Division(Local Government) : _____ Department _____ Division _____
Section _____

Occupational Category of Manager : _____ Class : _____

Form of maintenance management : government • private company(commission)

*Near future, management move to private company

<In case of government>

Occupational Category of Chief Operator : - _____ Class : - _____

Number of Working Persons : 8

Class : Number of Technician - _____ • Number of Worker 2 • Number of Part time 8

<In case of commission>

Name of company : WONC (In the future, not have information yet)

Address of company : _____

TEL : _____ E-mail : _____

Home Page URL : _____

Occupational Category of In charge Person(company) : _____ Class : _____

Number of Working Persons : _____

Class : Number of Civil _____ • Number of Mechanical _____ • Number of Electrical _____

Number of Water Quality _____ • Number of Part time _____

Out line of committed job : _____

4 . O&M Budget(Yearly) : Baht

		2000	2001	2002	2003
O & M Budget	Budget	1,926,840	1,829,157	1,715,190	1,930,680
	Electric	772,559	800,000	1,602,248	964,573
	Science materials	82,368	13,182	103,435	2,991
	Workers	113,640	565,257	49,200	390,060
	Maintenance	299,191	168,426	730,266	200,000

O&M Budget : personnel expenses, utility (electric, tap water, lubricating oil), repair

5 . O&M Activities(Present condition)

Yearly sewer plan based on a population : yes • no

Final Documents(Drawing, Equipments List, Equipments Specifications List, etc) : yes • no

Daily Report : yes • no

Monthly Report : yes • no

Yearly Report : yes • no

Financial Report : yes • no

Assent Ledger(Item List) : yes • no

No. 2

Name of TP : Pattaya Wastewater Treatment Plant

Minis parity District : Pattaya

Address : Pattaya city, Chonburi Province

TEL : 038-413461-2 (Office)

1. TP Information

Opening Date : 30, Nov, 2000

WMA Starting Operation Date : 30, Nov, 2000

Sewered Population (Planning) : _____ Sewered Population (Operation) : 5,000

TP capacity (Planning) : 137,500 m3/day

TP capacity (Operation) : 65,000 m3/day

Public Water to Effluent : Sea

Catchments Area: 28.25 km2

Planning Influent Water Quality (BOD,SS,COD) : 120, - , - mg/l

Current Influent Water Quality (BOD,SS,COD) : 30-40, 150, 80, mg/l

Planning Effluent Water Quality (BOD,SS,COD) : 20, - , - mg/l

Current Effluent Water Quality (BOD,SS,COD) : 2-3, - , - mg/l

Collect System : Interceptor • Combined • Separated

Number of Relay Pumping Station : 6 (Main 2, Sub 4)

Prolongation of Sewer Pipe : 7 km

TP System : AS • MAS • OD • RBC • AL

Note: AS(Activated Sludge) • MAS(Modified Activated Sludge) • OD(Oxidation Ditch) • RBC(Rotating Biological Contactor) • AL(Aerated Lagoon)

T

A.

2. Plant

Grid Chamber : yes • no

(Number of Chamber 2 • Number of Inlet Gate 2

Number of Sand Pump - • Number of Sand Collector 2

Number of Screen 2)

Main Pump : yes • no (In plant: Gravity flow)

(Number of Submersible 15 • Number of centrifugal(horizontal) -

Number of centrifugal(vertical) -)

Water Treatment : Number of Primary Sedimentation Tank 4

Number of Aerated Tank 3 (Diffuser)

Number of Secondary Sedimentation Tank 2

Disinfection Tank 1 • Water Filtration -

Sludge Treatment : Thickening : yes • no

Digestion : yes • no

Dewatering : yes • no (Number of Belt-press 2

Number of Centrifuge -)

Drying Bed : yes • no

Composting : yes • no

Treated Water Reuse : yes • no

(Utilization : Cooling, Irrigation, Fire Protection)

Sludge Reuse : yes • no

(Utilization : Composting)

3. Operating Persons

In charge Division(Local Government) : _____ Department _____ Division _____
Section _____

Occupational Category of Manager : _____ Class : _____

Form of maintenance management : government • private company (commission)

*Near future, management move to private company

<In case of government>

Occupational Category of Chief Operator : - _____ Class : - _____

Number of Working Persons : - _____

Class : Number of Technician - _____ • Number of Worker - _____ • Number of Part time - _____

<In case of commission>

Name of company : Environment and Energy _____

Address of company : 12th FL, Unit 1203 Empire Tower 195 South Sathon Rd., Yanawa, Sathon Bangkok
10120 Thailand _____

TEL : 02-6700794-9 _____ E-mail : eeiene@cscoms.com _____

Home Page URL : _____

Occupational Category of In charge Person(company) : _____ Class : _____

Number of Working Persons : 52 (3shift) _____

Class : Number of Civil 1 _____ • Number of Mechanical 2 _____ • Number of Electrical 2 _____

Number of Water Quality 2 _____ • Number of Part time 45 _____

Out line of committed job : - _____

4 . O&M Expenses (Yearly) : Baht

	2003	2004	2005	2006	2007
Total Expenses Cost	75,830,798	55,241,906	57,155,339	59,066,866	59,963,847

O&M Budget : personnel expenses, utility (electric, tap water, lubricating oil), repair

5 . O&M Activities(Present condition)

Yearly sewer plan based on a population : yes • no

Final Documents(Drawing, Equipments List, Equipments Specifications List, etc) : yes • no

Daily Report : yes • no

Monthly Report : yes • no

Yearly Report : yes • no

Financial Report : yes • no

Assent Ledger(Item List) : yes • no

No. 3

Name of TP : Klong Toey Wastewater Treatment Plant

Minis parity District : BMA

Address : _____

TEL : 02-2494488

1 . TP Information

Opening Date : 21, March, 1997

WMA Starting Operation Date : April, 1999

Sewered Population (Planning) : - Sewered Population (Operation) : 7,200

TP capacity (Planning) : - m3/day

TP capacity (Operation) : 1,200 m3/day

Public Water to Effluent : Hualumphong Canal

Catchments Area: 0.05 km2

Planning Influent Water Quality (BOD,SS,COD) : 120, -, - mg/l

Current Influent Water Quality (BOD,SS,COD) : 290, 216, - mg/l

Planning Effluent Water Quality (BOD,SS,COD) : -, -, - mg/l

Current Effluent Water Quality (BOD,SS,COD) : 47, 13.5, - mg/l

Collect System : Interceptor • Combined • Separated

Number of Relay Pumping Station : 1

Prolongation of Sewer Pipe : 2 km

TP System : AS • MAS • OD • RBC • AL

Note: AS(Activated Sludge) • MAS(Modified Activated Sludge) • OD(Oxidation Ditch) • RBC(Rotating Biological Contactor) • AL(Aerated Lagoon)

T

A.

2. Plant

Grid Chamber : yes • no

(Number of Chamber - _____ • Number of Inlet Gate - _____)

Number of Sand Pump - _____ • Number of Sand Collector - _____

Number of Screen - _____)

Main Pump : yes • no

(Number of Submersible 3 _____ • Number of centrifugal(horizontal) - _____)

Number of centrifugal(vertical) - _____)

Water Treatment : Number of Primary Sedimentation Tank - _____

Number of Aerated Tank 1 _____

Number of Secondary Sedimentation Tank 2 _____

Disinfection Tank - • Water Filtration - _____

Sludge Treatment : Thickening : yes • no

Digestion : yes • no

Dewatering : yes • no (Number of Belt-press - _____)

Number of Centrifuge - _____)

Drying Bed : yes • no

Composting : yes • no

Treated Water Reuse : yes • no

(Utilizatio : Use for washing machines _____)

Sludge Reuse : yes • no

(Utilization : Composting (by the person who need) _____)

3. Operating Persons

In charge Division(Local Government) : _____ Department _____ Division _____
_____ Section _____

Occupational Category of Manager : _____ Class : _____

Form of maintenance management : government • private company(commission)

*Near future, management move to private company

<In case of government>

Occupational Category of Chief Operator : - _____ Class : - _____

Number of Working Persons : 7

Class : Number of Technician 2 • Number of Worker 5 • Number of Part time -

<In case of commission>

Name of company : _____

Address of company : _____

TEL : _____ E-mail : eeiene@cscoms.com

Home Page URL : _____

Occupational Category of In charge Person(company) : _____ Class : _____

Number of Working Persohs : _____

Class : Number of Civil • Number of Mechanical • Number of Electrical

Number of Water Quality • Number of Part time

Out line of committed job : _____

T

a.

4 . O&M Expenses (Yearly) : Baht

Expenses Cost	Maintenance=18,000Baht/year Electric=30,000~40,000Baht/Month Total=2.5Baht/m3/Month
---------------	---

O&M Budget : personnel expenses, utility (electric, tap water, lubricating oil), repair

5 . O&M Activities(Present condition)

Yearly sewer plan based on a population : yes • no

Final Documents(Drawing, Equipments List, Equipments Specifications List, etc) : yes • no

Daily Report : yes • no

Monthly Report : yes • no

Yearly Report : yes • no

Financial Report : yes • no

Assent Ledger(Item List) : yes • no

No. 4

Name of TP : Patong Wastewater Treatment Plant

Ministry District : _____

Address : Patong City, Phuket Province

TEL : 02-2494488

1. TP Information

Opening Date : 21, March, 1997

WMA Starting Operation Date : April, 1999

Sewered Population (Planning) : - Sewered Population (Operation) : 13,343

TP capacity (Planning) : 5,250 m³/day

TP capacity (Operation) : 4,950 m³/day

Public Water to Effluent : Public Canal

Catchments Area: 14.46 km²

Planning Influent Water Quality (BOD,SS,COD) : - , - , - mg/l

Current Influent Water Quality (BOD,SS,COD) : 27, 50, 80 mg/l

Planning Effluent Water Quality (BOD,SS,COD) : - , - , - mg/l

Current Effluent Water Quality (BOD,SS,COD) : 47, 13.5, - mg/l

Collect System : Interceptor • Combined • Separated

Number of Relay Pumping Station : 3

Prolongation of Sewer Pipe : _____ km

TP System : AS • MAS • OD • RBC • AL

Note: AS(Activated Sludge) • MAS(Modified Activated Sludge) • OD(Oxidation Ditch) • RBC(Rotating Biological Contactor) • AL(Aerated Lagoon)

T

A.

2 . Plant

Grid Chamber : yes • no

(Number of Chamber - _____ • Number of Inlet Gate - _____

Number of Sand Pump - _____ • Number of Sand Collector - _____

Number of Screen - _____)

Main Pump : yes • no

(Number of Submersible 3 _____ • Number of centrifugal(horizontal) - _____

Number of centrifugal(vertical) - _____)

Water Treatment : Number of Primary Sedimentation Tank - _____

Number of Aerated Tank 4 _____

Number of Secondary Sedimentation Tank 4 _____

Disinfection Tank 1 • Water Filtration - _____

Sludge Treatment : Thickening : yes • no

Digestion : yes • no

Dewatering : yes • no (Number of Belt-press - _____

Number of Centrifuge - _____)

Drying Bed : yes • no

Composting : yes • no

Treated Water Reuse : yes • no

(Utilizatio : _____)

Sludge Reuse : yes • no

(Utilization : _____)

T

A

3. Operating Persons

In charge Division(Local Government) : _____ Department _____ Division _____
Section _____

Occupational Category of Manager : _____ Class : _____

Form of maintenance management : government • private company(commission)

*Near future, management move to private company

<In case of government>

Occupational Category of Chief Operator : _____ Class : _____

Number of Working Persons : 9

Class : Number of Technician 2 • Number of Worker 7 • Number of Part time -

<In case of commission>

Name of company : _____

Address of company : _____

TEL : _____ E-mail : eeiene@cscoms.com

Home Page URL : _____

Occupational Category of In charge Person(company) : _____ Class : _____

Number of Working Persons : _____

Class : Number of Civil • Number of Mechanical • Number of Electrical

Number of Water Quality • Number of Part time

Out line of committed job : _____

T

a.

4 . O&M Expenses (Yearly) : Baht

	2003	2004	2005	2006	2007	2008	2009
Total Expenses Cost	8,355,799	9,160,830	9,282,302	9,508,164	8,718,526	10,406,029	9,171,911

O&M Budget : personnel expenses, utility (electric, tap water, lubricating oil), repair

5 . O&M Activities(Present condition)

Yearly sewer plan based on a population : yes . no

Final Documents(Drawing, Equipments List, Equipments Specifications List, etc) : yes . no

Daily Report : yes . no

Monthly Report : yes . no

Yearly Report : yes . no

Financial Report : yes . no

Assent Ledger(Item List) : yes . no

T

R.

No. 5

Name of TP : Cha-Aum Wastewater Treatment Plant

Ministry District : Cha Aum

Address : Cha Aum municipality Hall, Cha-Aum District Petchburi 76120

TEL : 032-470589

1 . TP Information

Opening Date : End of 2001

WMA Starting Operation Date : _____

Sewered Population (Planning) : - Sewered Population (Operation) : 13,343

TP capacity (Planning) : 17,000 m³/day

TP capacity (Operation) : 1,000-2,000 m³/day

Public Water to Effluent : Sea

Catchments Area: 8 km²

Planning Influent Water Quality (BOD,SS,COD) : pH only

Current Influent Water Quality (BOD,SS,COD) : _____

Planning Effluent Water Quality (BOD,SS,COD) : _____

Current Effluent Water Quality (BOD,SS,COD) : _____

Collect System : Interceptor • Combined • Separated

Number of Relay Pumping Station : 1

Prolongation of Sewer Pipe : _____ km

TP System : AS • MAS • OD • RBC • AL

Note: AS(Activated Sludge) • MAS(Modified Activated Sludge) • OD(Oxidation Ditch) • RBC(Rotating Biological Contactor) • AL(Aerated Lagoon)

T

A.

2. Plant

Grid Chamber : yes • no

(Number of Chamber - _____ • Number of Inlet Gate - _____)

Number of Sand Pump - _____ • Number of Sand Collector - _____

Number of Screen - _____)

Main Pump : yes • no

(Number of Submersible 4 _____ • Number of centrifugal(horizontal) - _____)

Number of centrifugal(vertical) - _____)

Water Treatment : Number of Primary Sedimentation Tank - _____

Number of Aerated Pond 1 _____

Number of Secondary Sedimentation Pond 2 _____

Disinfection Tank - _____ • Water Filtration - _____

Sludge Treatment : Thickening : yes • no

Digestion : yes • no

Dewatering : yes • no (Number of Belt-press - _____)

Number of Centrifuge - _____)

Drying Bed : yes • no

Composting : yes • no

Treated Water Reuse : yes • no

(Utilization : _____)

Sludge Reuse : yes • no

(Utilization : _____)

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3 . Operating Persons

In charge Division(Local Government) : _____ Department _____ Division _____
Section _____

Occupational Category of Manager : _____ Class : _____

Form of maintenance management : government • private company(commission)

*Near future, management move to private company

<In case of government>

Occupational Category of Chief Operator : - _____ Class : - _____

Number of Working Persons : 5 _____

Class : Number of Technician • Number of Worker • Number of Part time

<In case of commission>

Name of company : _____

Address of company : _____

TEL : _____ E-mail : eeiene@cscoms.com

Home Page URL : _____

Occupational Category of In charge Person(company) : _____ Class : _____

Number of Working Persons : _____

Class : Number of Civil • Number of Mechanical • Number of Electrical

Number of Water Quality • Number of Part time

Out line of committed job : _____

T

P.

4 . O&M Expenses (Yearly) : Baht

	2000	2001	2002	2003	2004 (Plan)
Total Expenses Cost	3,000,000	3,000,000	3,000,000	0	1,200,000

O&M Budget : personnel expenses, utility (electric, tap water, lubricating oil), repair

5 . O&M Activities(Present condition)

Yearly sewer plan based on a population : yes no

Final Documents(Drawing, Equipments List, Equipments Specifications List, etc) : yes no

Daily Report : yes no

Monthly Report : yes no

Yearly Report : yes no

Financial Report : yes no

Assent Ledger(Item List) : yes no

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Q.