

**SOCIALIST REPUBLIC OF VIET NAM  
INDEPENDENT - FREEDOM - HAPPINESS**

**INVESTMENT CONSTRUCTION PROJECT**

HAI CHANH COMMUNE WATER SUPPLY SYSTEM  
HAI LANG DISTRICT - QUANG TRI PROVINCE

*QUANG TRI, OCTOBER 23, 2013*

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## **PART A: SUMMARIZATION PROJECT**

- **Name of project:** Hai Chanh commune water treatment factory – Hai Lang district.
- **Type and level of project:** Technology infrastructure project level IV.
- **Group of project:** C
- **Construction location:** Hai Chanh commune, Hai Lang district, Quang Tri province.
- **Investor:** Quang Tri of water supply and construction one number limited company.
- **Consultant:** Vinaconex's Construction Consultant Joint Stock Company.
- **Capacity:** Capacity of Hai Chanh commune water treatment factory is 2.000m<sup>3</sup>/day.
- **Scope supply water:** Supply domestic water for Hai Chanh commune and neighbouring area (include hamlets: Xuch Loc, Vuc Ke, Tan Luong, Hoi Ky, Tan Hiep, Van Phong, Cau Nhi)
- **Total investment value:**

***Total investment value of project*** **20,479,093 thousand VND**

Expenses of main construction and main equipment: 16,739,536 thousand VND

Managing project + Others expenses + clear the ground+ Consultant expense 2,041,038 thousand VND

Standby: 1,698,519 thousand VND

- **Capital:**
  - ODA capital of Italia: **8.357.544 thousand VND**
  - Budget capital: **12.121.548 thousand VND**
- **Rate of working project:** From 2010 to year 2012

## **PART B: GENERAL INTRODUCTION**

### **I. GENERAL INTRODUCTION.**

Hai Lang district have important location about economic-socio and security-defence of Quang Tri province. It is in though the life-line (breath of life) of traffic Northern-Southern as: highway 1A, Thong Nhat railway - Dien Sanh station. Hai Lang district is in the gateway to Quang Tri province, distance from Hue ancient capital Hue 50km, distance from Dong Ha town 21km to Northern.

Hai Lang district has rich potentiality of resource, land. It has worth historical, cultural monuments and tourist centrals, resting. Therefore, Hai Lang district has basic potentiality and internal force to developmental diversified economy: agriculture, forestry, aquiculture, and industries of construction materials, small handicraft and tourist, according the orientation of industrialization modernization.

Hai Chanh commune is central of economic-socio, security-defence of the southeast Hai Lang district, according to the orientation of planning.

The project investment construction works on fresh water supply system is premise for industry of process, server, and makes changing face of society of region concurrence contribute active and important in raising potential, strength of district.

The project investment construction works put task survey assess water supply situation of project area. According basic water using needs and capital permitting, petition contents and suitable solutions to transform and raise capacity of water supply for town system, reach target supply fresh water for impending stage to year 2015 and be premise for raising capacity for next years.

With this project investment construction works, fresh water supplying for Hai Chanh commune and some hamlets to year 2015 resolved basic. It is good influence on development economic, health condition of population. Safety and advantageous fresh water supplying is not only necessary condition for the town finishes proposing tasks but also contribute positive to resolving other socio problems as: protecting environment, planning population, education...

### **II. PREPARING PROJECT BASICS.**

1. General planning of developmental economic-socio of Hai Lang district to year 2010 was established by Quang Tri province people's commune.
2. General planning build development Hai Chanh commune Hai Lang district, Quang Tri province (stage 2003-2010) was made by Quang Tri construction Consultant Company in December 2002.
3. Decide of Hai Lang district people's commune approved project planning development Hai Chanh commune.
4. Specific hydrography data at Tan Hai and Hai Son, climate hydrography document of Quang Tri province.
5. Decree No 108/2006/ND-CP dated September 22, 2006 detail rules and guide executing some words of Investment Law.
6. Decree No 16/2005/ND-CP dated February 7, 2005 of the Government on management of investment projects on the construction of works.
7. Decree No 112/2006/ND-CP dated September 29, 2006 of the Government on modification, addition words of Decree No 16/2005/ND-CP dated February 7, 2005 on management of investment projects on the construction of works.

8. Decision No 1329/2002/BYT/QĐ of Minister of Department of health on issuing standard of sanitation fresh water dated 18th April, 2002.
9. Standard of Viet Nam Construction 33 2006 of Ministry of Construction dated 17th March, 2006.
10. Estimate norm of construction works on survey part according document no 1779/BXD-VP dated August 16, 2007.
11. Norm of Management project expenses and investment construction consultant according document no 1751/BXD-VP dated August 14, 2007.
12. Basic construction unit cost of Quang Tri province
13. Permission (related agreement)
  - + Agreement about source is supplying electric.
  - + Permission about using water source.
  - + Permission about using land for building water intake, pump station level 1.
  - + Other agreements and permissions...

*Notes: In performance process of investment project, propose that the investor care about agreements or permission.*

### III. NECESSARY FOR INVESTMENT

Hai Chanh commune is central of economic-socio, security-defence of Hai Lang district. Now, Hai Chanh commune do not used fresh water, essential water source is raining water, river of water and water from drilled wells... water polluted and did not treat.

So severe conditions: natural calamity, many storm rains, flood, along drought, water source supply for life is polluted. Drought season, water source supply for life is deprived grave. Water is bought from away to supply for eat and drink, life. According to sickness occurs much and long-term as: diarrhoea, dysentery, flu...make difficult to population's life. Before urgent situation, need to have a water supply system for population in this project area.

Fresh water supply system is build early improve life condition for population, overcome deprived of water in summer, improve sanitation environment and health of people.

Fresh water using is reflected level of cultural standards of the people, mind of people will increase. According building and upgrading of enjoying entertainment improve mind culture life at once protect environment.

Construction works on fresh water supply system as planning ensure standard of sanitation, water is supplied stable and enough for life in force as like as require development in the future is necessary and conformable to people and Hai Chanh commune Government and neighbouring hamlet of wishes.

Quang Tri province people's committee permitted investment construction works on Hai Chanh commune water supply system, Hai Lang district, Quang Tri province. It is basis of investment capital of Japan bank international cooperate (JBIC)

### IV. THE PARTICULAR OF AREA PROJECT.

#### 4.1- Natural conditions.

##### 1- Geography:

Hai Chanh commune locates the southwest of Hai Lang district, contiguous Highway 1A, Highway 1A, provincial road 49B, Thong Nhat Northern-Southern railway with My Chanh station pass My Chanh town.

- Total area: 120ha
- Eastern - Northern: adjoining to O Lau River.
- Southern: adjoining residential quarter/area.
- Northern: adjoining Hai Son commune, Hai Lang district.
- Western-Northern: adjoining Thac Ma River.
- Western: adjoining residential quarter/area (Hai Lang district)
- Eastern: adjoining residential quarter/area (Hai Lang district)

## **2- Topography:**

Topography is heave, not even and flat terrain. Topography is slightly slanted from Southern to Northern.

|                |       |
|----------------|-------|
| Maximum level: | 23.60 |
| Minimum level: | 7.22  |
| Average level: | 15.54 |

## **3- Climate:**

Hai Chanh commune is in coastal Southern area 4 climate (tropical monsoon climate zone). Climate divides up with two distinct seasons:

Rainy season: From October to March of next year, climate is colder Southern Centrals, popular wind blow Western Northern – Eastern Southern way.

Dry season: From April to September, the project area is under the influence of Western and Western Southern wind, dry and hot air, Eastern wind blow with steam at night.

- Temperature air:

- + Annual average temperature:  $24 \pm 25^{\circ}\text{C}$ .
- + Temperature in highest month (from May to July):  $35\text{--}39^{\circ}\text{C}$ , sometimes is  $40^{\circ}\text{C}$ .
- + Temperature in lowest month (January and December):  $8\text{--}18^{\circ}\text{C}$ .

- Rainy:

- + Annual average rainy: 2.500 ÷ 2.700mm.
- + Highest rainy 4,195mm in September, October, November (take 70 ÷ 80% rainy of year)

- Moisture:

- + Average moisture: 80%
- + Highest moisture: 91%
- + Lowest moisture: 30%
- + Usual moisture: 50%

## **4- Hydrogeology:**

- Pore waters distribution is limit, concentrate essential at strait plain coastal and the origin of aggradation and wind of sea. Water level is much changed. Level water is distant underground 3-5m. Tasteless water is in top, when drilling depth usually is 30m, water usually is salty.

- Cleft water distribution is commodious and takes almost all area of province. In general, chapped gravelly soil has less aquifer level. Strike joints according chapped dislocation has better aquifer level.

- According assessing economic-socio general planning of province, district, geological borehole at town, land of physical – chemical analysis result does not discover useful mineral need note, but water ground level catch alum.

#### **4.2- Existing economic, population and socio foundation.**

##### **1. Existing economic:**

Total incomes of budget in year 2007 are 918.4 million VND, get 115% planning.

Total expenses of budget in year 2007 are 880.3 million VND.

Result of fields, concrete as:

- Small handicraft: Maintenance and development of traditional careers as carpenter, bricklayer, mechanic... Total value of small handicraft, year 2007 is 12.607 billion VND, takes 22.5% economic structure.

##### **- Trade server:**

Develop strong at My Chanh market and along the Highway 1A, 49A. Circulate of commodity market develop moderately good, rich commodity, stable price. Total value of trade server year 2007 is 23.534 billion VND, takes 42% economic structure.

##### **- Agriculture, forestry:**

Total area of cultivate year 2007 is 1049.05ha, in there area of rice is 599.6ha, area of others is 449.45ha, as planning. Average yield of rice year 2007 is 110 quintal/ha. Yield of food (rice, maize) is 3,311.2 tons; in there yield of rice is 3,300 tons. Yield of maize is 11.2 tons; of cassava is 4,440 tons, of batata is 120 tons, of green peas is 67 tons, of chilli is 2.46 tons, of peanut is 157.6 tons, of pepper is 37.5 tons...

The breed is attended step by step, density increase, takes 47% agriculture structure.

Total area of forest of commune is 1,735.4 ha.

##### **- Investment of basic construction:**

Total capital of investment basic construction of budget year 2007 is 2.635 billion VND.

In there:

|                                |                 |
|--------------------------------|-----------------|
| Budget of superior:            | 785 million VND |
| Budget of commune:             | 25 million VND  |
| Developmental country program: | 837 million VND |
| Eastern-Western meeting:       | 550 million VND |
| Distribution people:           | 437 million VND |

##### **2. Existing population, labour:**

According data of Quang Tri province Statistical department (year 1999) population of Hai Chanh commune is 7181 persons. Town has 2,875 persons with 575 households (year 2002), labour is moderately good, ensure development of economic-socio branch.

**Table of population to December 31<sup>st</sup>, 2007**

| No. | Units    | Household | Persons |
|-----|----------|-----------|---------|
| 1   | My Chanh | 614       | 3215    |
| 2   | Xuan Loc | 187       | 812     |

|   |              |             |             |
|---|--------------|-------------|-------------|
| 3 | Tan Luong    | 141         | 615         |
| 4 | Vuc Ke       | 90          | 347         |
| 5 | Hoi Ky       | 150         | 715         |
| 6 | Tan Hiep     | 83          | 487         |
| 7 | Cau Nhi      | 212         | 959         |
| 8 | Van Phong    | 79          | 356         |
|   | <b>Total</b> | <b>1556</b> | <b>7506</b> |

With rate of increasing natural population is 1.1%, preparing to year 2015, population of project area will be  $7,506 \times (1+1.1\%)^8 = 8,170$  (persons)

**General table of define level poor at project area year 2005**

| No. | Hamlet       | Total household | Total poor household stage 2005-2006 | Total household define level poor stage 2006-2010 |
|-----|--------------|-----------------|--------------------------------------|---------------------------------------------------|
| 1   | My Chanh     | 517             | 24                                   | 106                                               |
| 2   | Xuan Loc     | 156             | 18                                   | 22                                                |
| 3   | Tan Luong    | 135             | 8                                    | 33                                                |
| 4   | Vuc Ke       | 89              | 5                                    | 22                                                |
| 5   | Hoi Ky       | 115             | 8                                    | 32                                                |
| 6   | Tan Hiep     | 75              | 4                                    | 23                                                |
| 7   | Cau Nhi      | 190             | 8                                    | 39                                                |
| 8   | Van Phong    | 74              | 4                                    | 14                                                |
|     | <b>Total</b> | <b>1351</b>     | <b>79</b>                            | <b>291</b>                                        |

In year 2007, populations' lives of commune have difficulty, defiant by natural calamity: rain cool in the winter, drought in the summer, two floods make waterlogged 50% area of cultivation. The sickness develops.

According to table of situation making economic-socio planning year 2007 and development economic-socio planning year 2008 of Hai Chanh commune in January 2008;

- Rate of increasing natural population: 0.8%
- Rate of poor household in project area 21.15%
- Rate of undernourishment children: 15%
- Rate of having 3th baby: 18%
- Rate of house use water deep well: 82%
- Rate of house use sanitation toilet: 45.9%
- Making employment for about 70 labours, in there export labour is 03 person.

**3. Existing using land.**

Area of natural land at town is 120ha, in there:

|                            |         |
|----------------------------|---------|
| + Land of public building: | 11.8 ha |
| + Land of population:      | 29.2 ha |
| + Land of industry:        | 3.4 ha  |
| + Land of rice-field:      | 17.3 ha |
| + Land of traffic:         | 8.5 ha  |
| + Land of cemetery:        | 7.8 ha  |
| + Wild land:               | 42 ha   |

**4. Socio foundation.**

\* House:

In general, houses build unprompted, planning of population area has not, so confusion and unsynchronous. In there, essential is a building with a tiling roof (take 62.26%), temporary house 28%, a building with a flat roof 3.8%, house made of brick 5.9%

\* Public building and administrative building:

Now, My Chanh town has two post offices. My Chanh market act and develop stable.

- Industry land: Hai Chanh brick-tile enterprise.

- Health system: 1 health station

- Education: Area has some schools from preschool education to junior high school included: preschool education, 2 primary schools, junior high school.

Besides some others publics will be built.

## V. EXISTING TECHNOLOGY FOUNDATION

### 5.1. Existing traffic:

- Foreign traffic:

+ Road: Highway 1A passes through town: 2,400m and Highway 49B length 2,200m.

+ Northern-Southern railway run pass My Chanh station.

- Interior traffic:

+ Some roads and pathways take form before.

+ Transport is multiform.

### 5.2. Existing supplying water

Now, water supply pipes have not, population use raining water, river of water and water from drilled wells... So severe conditions: natural calamity, many storm rains, flood, along drought, water source supply for life is polluted. Drought season, water source supply for life is deprived grave. Water is bought from away to supply for eat and drink, life. According to sickness occurs much and long-term as: diarrhoea, dysentery, flu...make difficult to population's life. Before urgent situation, need to have a water supply system for population in this project area.

### 5.3. Existing supplying electric:

Electric system is relative stable but unsynchronous. Area has 3 step-down stations 10/0.4KV; has high voltage line, light, telephone line.

### 5.4. Existing draining and sanitation environment

Area has not draining system and sanitation environment. Sewage and rubbish let out environment.

## VI. THE PLANNING ORIENTATION OF DEVELOPMENT URBAN AREAS

### 6.1. Connection areas take form and develop urban area:

- Hai Chanh commune is economic, culture centrals of Hai Lang district

- Geography location and traffic is advantage: Highway 1A and Northern-Southern railway run pass and geography can finish, widen in the future.

### 6.2. Scale land.

Total area of necessary development construction at Hai Chanh commune is 120ha in there:

|                                                 |         |
|-------------------------------------------------|---------|
| + Land of centrals:                             | 16.5 ha |
| + Land of population:                           | 61.7 ha |
| + Land of industry, green, sporting:            | 5.0 ha  |
| + Land of small handicraft:                     | 4.2 ha  |
| + Land of traffic:                              | 16.3 ha |
| + Land of protection Northern-Southern railway: | 3.4 ha  |
| + Land of cemetery:                             | 7.8 ha  |
| + Developmental land:                           | 5.1 ha  |

Land is distributed construction as concrete project, houses at streets: 2-3 floors garden-house: 1-2 floors.

#### Balance table of land

| No. | List of land                                                                           | Planning  |          |
|-----|----------------------------------------------------------------------------------------|-----------|----------|
|     |                                                                                        | Area (ha) | Rate (%) |
| 1   | Land of centrals (administrative trade, culture, public service, health, education...) | 16,5      | 13,75    |
| 2   | Land of population:                                                                    | 61,7      | 51,42    |
|     | - Existing population land                                                             | 29,2      |          |
|     | - New population land                                                                  | 32,5      |          |
| 3   | Land of green park, sporting, water                                                    | 5         | 4,17     |
| 4   | Land of industry, small handicraft                                                     | 4,2       | 3,5      |
| 5   | Land of traffic                                                                        | 16,3      | 13,58    |
|     | - Internal roads                                                                       | 13,4      |          |
|     | - Urbans roads                                                                         | 2,9       |          |
| 6   | Land of protection Northern-Southern railway, verdure land protect                     | 3,4       | 2,83     |
| 7   | Land of cemetery                                                                       | 7,8       | 6,5      |
| 8   | Developmental land                                                                     | 5,1       | 4,25     |
|     | Total                                                                                  | 120       | 100      |

### 6.3. The planning orientation of project area

+ Trade service area: My Chanh market maintains action and development stable. Size of service business along Highway 1A and 49B will be extended, encourage diversified business, capital support, encourage population of trade, special produce of regional.

+ Culture, administrative area: improve, upgrade existing buildings. Build some preschool education, office to made new face of town.

+ Green park - sport: to put succession green-space along central of town; to build some parks in area.

#### **6.4. Planning of construction basic foundation.**

##### **+ Electric supply system, public light:**

Will be improved, upgraded electric grid 10/0.4KV and pad-mounted substation distribute for area 10/0.4KV, capacity 150KVA, 180KVA, 320KVA ensure supplying electric with radius from substation to farthest house hold 400-600m by low voltage cable system 0.4KV, ABC cable twist 4A70 and centrifugal ferro-concrete column 10.5m high.

Light system of street with distance 38-40 m/column is invested.

##### **+ Draining and sanitation environment:**

Draining, sewerage system design pipe DN400-500, let out river. After draining and sanitation environment project is build, own life draining system will be build.

Organize collection rubbish network for town.

Displace, concentrate, planning tombstone, separate area, grow green protect environment.

### **VII. WATER SUPPLY SCALE AND CAPACITY SIZE OF WATER SUPPLY SYSTEM.**

#### **7.1. Water supply scale**

Domestic water supply for Hai Chanh commune and neighbouring area (include hamlets: Xuan Loc, Vuc Ke, Tan Luong, Hoi Ky, Tan Hiep, Van Phong, Cau Nhi)

\* According general table of ravenous-poor situation, stage 2006-2010 of Quang Tri province Labour and Social Welfare Service, average rate of ravenous-poor household in water supply scale is 21.15%.

#### **7.2. Capacity size of water supply system.**

##### **1. Basic calculation**

Population size of Hai Chanh commune, Hai Lang district, Quang Tri province and population of neighbouring area prepare to year 2015.

##### **2. Population size**

According preparing, project area to year 2015 is **8,190** persons.

##### **3. Standard of using water to year 2015**

Water using needs is calculated according population of town analysis. Water needs is calculated the population mechanical, natural growth rate, public water needs, small handicraft of town to year 2015. Besides, another needs as: to water for the plants, clean roads, water leak out water system network and standby water.

Quantity of water get as require of Ministry of public health, pressure of most disadvantage place is 16m, ensure supply for house 3th floor.

##### **7.4. The regulation coefficients of water consumption**

The regulation coefficients of water consumption  $K_{ng-max}$ ,  $K_{ng-min}$ , are calculated based on social activities, factories's operations and demands for domestic uses by season. Hai Chanh commune, Hai Lang district has hot and sunny months, to take regulation coefficient  $K_{day-max} = 1.4$ . Water needs of Vietnam small city depend on working two shifts on day, domestic water quantity concentrate the rush hour. To take regulation coefficient  $K_{hour} = 1.7$

**General table of using water needs stage to year 2015**

| No. | Water needs                                        | Scale    | Standard of using water | Qaverage. day | kmax-day | Qmax-day:    |
|-----|----------------------------------------------------|----------|-------------------------|---------------|----------|--------------|
| 1   | Domestic water                                     | 8.190 ng | 100 (l/ng.ngđ)          | 819           | 1,40     | 1.147        |
| 2   | Water for industry and handicraft                  |          | 10% Qsh                 | 82            | 1,40     | 115          |
| 3   | Water for tourist, service                         |          | 10% Qsh                 | 82            | 1,40     | 115          |
| 4   | Water for the plants, clean roads                  |          | 10% Qsh                 | 82            | 1,40     | 115          |
| 5   | To leak out water system network and standby water |          | 20% Q1-4                | 213           | 1,40     | 330          |
| 6   | Water for station self                             |          | 10% Q1-5                | 128           | 1,40     | 179          |
|     | <b>Total</b>                                       |          |                         | <b>1.405</b>  |          | <b>2.000</b> |

### 7.5. Capacity of water treatment factory

Capacity of My Chanh town water treatment factory to year 2015 is 2,000m<sup>3</sup>/day. The investment construction works on water treatment station, capacity 2,000m<sup>3</sup>/day concomitant with building transmission and distribution pipelines ensure capacity 2,000m<sup>3</sup>/day.

## VIII. RAW WATER SUPPLYING SOURCE

### 8.1. Surface water

My Chanh town has rich surface water be in location enclosing by two rivers: O Lau River and Thac Ma River run from Western meet at town and let out Sea. The rivers usually have water.

Quantity of water source of two rivers at town is ensured good for domestic water about physical-chemical and microorganism field.

### 8.2. Underground water:

Pore waters distribution is limit at Quang Tri, concentrate essential at strait plain coastal and the origin of aggradation and wind of sea. They compose unheight and rather plane white sand field. Water level is much changed. Level water is distant underground 3-5m. Tasteless water is in top, when drilling depth usually is 30m, water usually is salty.

Cleft water distribution is commodious and takes almost all area of province. In general, chapped gravelly soil has less aquifer level. Strike joints according chapped dislocation has better aquifer level.

Investment works on exploiting underground water at this area is costly, have to investigate, explore boring to assess capacity and quantity water.

According to reflection of population, all deep wells and water from drilled wells are caught alum and are been dry in dry season.

### 8.3. To choose water source

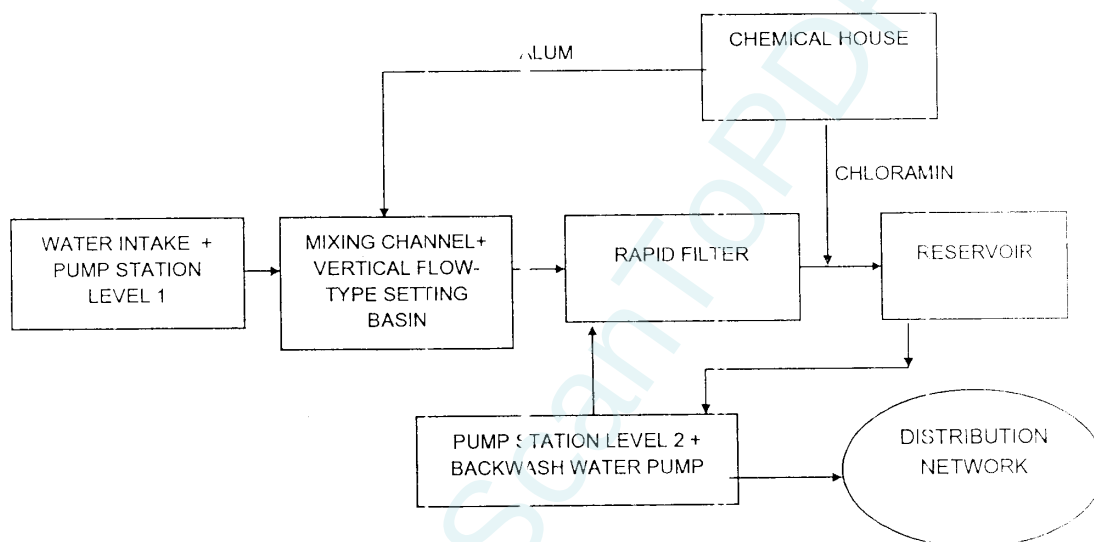
According capacity of water supply system stage to year 2015 and the planning orientation of My Chanh town to year 2020

According ability supplying and quantity of surface water source, underground water source at project area

*\* To choose raw water source to supply for my chanh town water supply system, hai lang district, quang tri province stage 2015 is surface water source of O Lau River.*

## IX. TECHNOLOGICAL SOLUTION

### 9.1. Technological processing



### 9.2. The works of water treatment factory

#### 1. Pump station level 1

Built water intake, water intake hole and pump station level 1: area 200m<sup>2</sup>. Pump station level 1 is build near O Lau River. To install 02 pumps, capacity 84m<sup>3</sup>/day in pump station level 1 and have place to install for stage extension.

+ Electric system: 01 transformer 50KVA

#### 2. Treatment station

- The works in treatment station

+ Vertical flow-type setting basin capacity 2000m<sup>3</sup>/day

+ Rapid filter block capacity 2000m<sup>3</sup>/day,

+ Reservoir W=500m<sup>3</sup>

+ Mud treatment tank

+ Pump station level 2: area 75m<sup>2</sup>, size 5.2m x 14.4m, ferro concrete column, brick wall, flat floor.

03 pumps level 2 with Q=54m<sup>3</sup>/h, H=32m and 01 backwash water pump Q=210m<sup>3</sup>/h, H=12m

+ Chemical house: area 26m<sup>2</sup>, size 7.3m x 3.6m ferro concrete column, brick wall, flat floor. The chemical house has:

04 Chloramin bottles kind 65kg and 02 sets Clorator kind 0÷1 kg/h

02 pumps supply water for Ejector Q=2m<sup>3</sup>/h; H= 50m.

02 mixing alum kettles and 02 alum metering pumps Q=0÷100l/h

01 variable-frequency board control 03 pumps level 2 capacity 11KW.

- + Technological pipe system in treatment station,
- + Manufacture control house: area 70m<sup>2</sup>
- + Fence and internal yard-road: 800m
- + Electric system: 01 transformer 100KVA
- + Electric line system 10KV

### **3. Main water supply network**

Water supply system is iron-cast pipelines, uPVC pipelines, diameter from DN50 to DN300

- Ductile iron pipe DN200: 1,430m
- Ductile iron pipe DN150: 1,595m
- Ductile iron pipe DN100: 5,313m
- uPVC pipe DN63: 6,000m
- uPVC pipe DN90: 2,000m
- Steel pipe DN100-DN250: 600m

#### **9.2. Pipeline solution**

- Water supply system is build suitable with ratify planning. Pipeline network is put along traffic network and water using object. Pipeline network is circle and branch.
- New building pipeline network have to task transmission and distribution water to using water point at project area. Network ensures that supply continuous, enough flow and pressure to water using objects.

Existing pipelines need to let out, check working pressure before connect with new installing pipe.

New installing pipes are designed according planning road and existing road (have planed yet), almost pipelines are put underground with average depth 0.8m.

- Raw water pipeline leads water from pump station level 1 to treatment station along existing road and be put underground with average depth 1.1m.

#### **9.3. Construction location of pump station level 1 and other treatment water works**

##### **a- Construction location of water intake pipe, pump station level 1**

- According ratify planning document, investigate in face and specific hydrography datas at Hai Tan and Hai Son were supplied by Quang Tri province Centre for meteorology hydrography forecast on September 2008. To choose construction location of water intake pipe, pump station level 1 at O Lau River side.

##### **b- Construction location of water treatment works**

- According planning document, construction land fund: Build water treatment station 2,000m<sup>3</sup>/day at Hai Chanh commune football ground, rather high topography and advantage transmission water at project area.

#### **9.4. Technological water treatment diagram**

- According result of test for raw water at water taking area.
- According calculated capacity of water supply system 2,000m<sup>3</sup>/day.

##### **\* Technological water treatment project:**

Raw water from O Lau River is run by pipe to water intake hole. From water intake hole, pump station level 1 pump to water treatment station with capacity 2,000m<sup>3</sup>/day. Water is treated by mixing tank, vertical flow-type setting basin, and rapid filter. Water

after filter is sterilized by Chloramin and run to reservoir. Fresh water from reservoir will be pumped water using objects by pump level 2 pass pipe networks.

**\* Advantages-disadvantages analysis:**

**Advantages:**

- + Being applied for many water plants in Vietnam.
- + The work is neatly arranged, easily automated, and simple operated.
- + Small initial investment funds, low management cost.
- + Vertical flow-type setting basin is very easy to install, replace, and able to treat the ground water with high concentration of iron.
- + Rapid tank is simple operated, and has high efficiency. Filter sand is easy to buy with reasonable price; it also has long service life.
- + Treated water pumping station is ensured to continuously and sufficiently provide water for the town. It also can actively supply water for fire fighting.

**Disadvantages:**

- + It wastes of electric for operation and using, increasing management expenses.
- + It wastes of water for backwashing because the volume of filter sand is great.

## **X. SOLUTION OF CONSTRUCTION, FIRE PROTECTION, AND POWER SUPPLY AND CONNECTED NETWORK.**

### ***10.1. Construction solution***

Construction location of water intake pipe, pump station level 1 according investigate in face is alluvial deposits river side, average load intensity. So foundation is consolidated before building construction.

Water treatment station is built in foundation of football ground, at town. Land has rather good load intensity, choose construction solution mixing tank coordinate vertical flow-type setting basin to save construction area, decrease building expenses; operation, management is simple and network. Others works, according technological demand, are build single. The works are built by ferro concrete or ferro concrete frame to increasing firm and stable.

### ***10.2. Water supply for fire protection***

Quantity of water supplied for fire protection is calculated and stored in the reservoir. This is the water source being available whenever necessary. The pipeline network is reckoned to be responsible for the case of fire even happened in the rush-hour of water consumption. Town need install at place of crowd population as market, petrol station, culture area, service, doing business. The water is taken from the pipes of  $\Phi 100 \div \Phi 200$ . Because loan capital is limit, in force invest 05 fire hydrants DN125, 01 fire hydrant install at gate of water treatment station. Beside, it also should salvage existing water from rivers, ponds, and canals for this purpose.

### ***10.3. Electric supplying solution***

Electric network supply for water treatment station and pump station level 1, is priority source ensure that equipments work stable 24h/day.

For initiative supplying electric continuous and stable, building and installing at pump station level 1 01 transformer 50KVA, at water treatment station 01 transformer 100KVA, with high voltage line 10KVA.

## **XI. USING LAND DEMAND AND CLEARING; THE GROUND SOLUTION**

### **11.1. Using land demand**

Water intake pipe, pump station level and management pump station road (see drawings of pump station level 1 and management pump station road) are designed near O Lau River, with area 200m<sup>2</sup>.

Water treatment station is built as planning of commune (see drawings of plan of water treatment station). Area of water treatment station is 4,000m<sup>2</sup>.

### **11.2. Clearing the ground solution.**

All area of water supply system need use 4,200m<sup>2</sup>, in there land near river is 200m<sup>2</sup> and land of town is 4,000m<sup>2</sup>. Land is managed by Hai Chanh commune people's committee, Hai Lang district.

In this project, a part of expenses for making up and clearing the ground, the investor co-ordinate Hai Chanh commune people's committee, management Government offices perform taking back land and clearing the ground.

## **XII. MAJOR CONTENTS OF INVESTMENT REPORT STAGE 2015.**

### **A- Direct investment**

#### **\* Pump station level 1:**

1. To build water intake pipe, water intake hole and pump station level 1, capacity 2,000m<sup>3</sup>/day

The water intake pipe is one steel pipe DN300, L=20m lead to water intake hole. Water intake hole is rectangle, ferro concrete structure, size A x B x H = 6,00x6,00x8,00m (size of receiving hole 3,00x6,00x8,00m, suction hole have two holes, size 3,00x3,00x8,00m), water intake gate in flood season, size 0,80x0,80m.

The pump station level 1 is built a half part sinking, a half part floating. The part in underground is oval, ferro concrete structure, others part is rectangle, brick structure size 6.0x9.0m. To install 02 centrifugal pumps vertical motor (01 working pump, 01 standby pump) with technological parameter:

$$Q = 84 \text{ m}^3/\text{h}.$$

$$H = 36 \text{ m}.$$

- The pump of water leaking suction:  $Q = 2 \text{ m}^3/\text{h}$ ;  $H = 15 \text{ m}$ .

- Vacuum pump with feeding buck:  $Q=30\text{m}^3/\text{h}$ ;  $H=400\text{mmHg}$ .

2. Raw water pipeline is steel pipe DN200, pressure PN10, L=450m, standard of pipe is ASTM A53.

3. To build transformer station 50KVA and 450m aluminum line pith steel AC-35 and 05 tension pole 14m.

#### **\* Water treatment station:**

##### **1. Mixing bucket, vertical flow-type setting basin has reaction section**

###### Mixing bucket:

- To build 01 ferro concrete mixing bucket, size

$$A \times B \times H = 0,4\text{m} \times 1,99\text{m} \times 0,9\text{m}$$

###### Vertical flow-type setting basin has reaction section

To build 04 Vertical flow-types setting basin has reaction section by ferro concrete, size of each tank is  $A \times B \times H = 4,6\text{m} \times 4,6\text{m} \times 7,05\text{m}$

## **2. Rapid filter**

- To build rapid filter has 04 sections filter, size of 01 section is  $A \times B \times H = 2,0m \times 2,1m \times 4,5m$

## **3. Reservoir:**

- To build 01 ferro concrete reservoir 500m<sup>3</sup>, size  $A \times B \times H = 12m \times 12m \times 3,9m$

## **4. Pump station level 2 + Chemical house**

- Pump station level 2 coordinate chemical house, brick wall, load frame structure ferro concrete flat roof, size  $A \times B = 12,4 \times 14,4m$ . To install 04 pumps included:

+ 03 treated pumps level 2, (in there 01 pump for standby), technological parameter:  $Q = 54m^3/h$ ,  $H = 32m$

+ 01 variable frequency board control 03 fresh pumps level 2, capacity 11KW.

+ 01 washback pump  $Q = 210m^3/h$ ,  $H = 12m$

- Chemical house divide 2 rooms, in there:

+ Technological chloramin room: install 04 chloramin bottle kind 65kg and 02 Clorator settle type 0-1kg/h, in there 01 settle for standby; install 02 pump supply water for Ejector  $Q = 2m^3/h$ ;  $H = 50m$ .

+ Technological alum room: install 02 buckets inox 0,5m<sup>3</sup> to mixing alum, 02 blade mixers  $N = 0.37 Kw$ ,  $n = 190 v/min$ ; 02 metering pumps  $Q = 0-100 l/h$ ,  $H = 30m$ .

## **5. Treated mud tank:**

Mud from vertical flow-type setting basin has reaction section and rapid filter is treated by treated mud tank. To build 01 treated mud tank with 02 sections take turns working, wall made of stone, size  $A \times B \times H = 6 \times 16 \times 2,5$

Sewage pump from chamber:  $Q = 5m^3/h$   $H = 7m$

## **6. Technological pipe**

- Steel pipe  $\Phi 50 \div \Phi 250$ : total length 600m.

- Sewage uPVC pipe DN110 internal water treatment station  $L = 200m$ .

- Sewage ferro concrete pipe DN300 internal and outside of water treatment station  $L = 200m$ .

## **7. Production management house**

- To build production management house include functional room, house 1st floor with ferro concrete structure, size  $A \times B = 9,9 \times 6,8m$ .

## **8. Garage**

- Garage has size  $4,5 \times 8m$ , structure is steel column frame, steel framing, corrugated iron covering.

## **9. To grade, gate, fence, yard-road**

- Water treatment station has to grade from average natural level +20,40m to level +21,0m. Size of grading is 4,000m<sup>2</sup>.

- Brick fence of water treatment station 110mm, buttressed wall, perimeter 256m.

- Internal yard-road of water treatment station by concrete grade 150#,  $s = 800m^2$

## **10. Dynamic electricity and light**

To install 01 transformer 100KVA in water treatment station

To build transformer station 100kVA, 04 electric pole-centrifugal concrete 14m and 600m aluminum line pith steel AC-35 leak electric from 10KV network to transformer station 100KVA.

To build 07 pressure burner columns (8m height)

### **11. Transmission and distribution pipeline network.**

- Transmission and distribution pipeline network level 1, 2 use ductile iron pipe and ductile iron spare part assemble by rubber washer according standard ISO 2531-K9, pipe is covered cement internal according standard ISO4179-1995, outside pipe is covered rust protection zinc admixture according standard ISO8179-1995 and top outside pipe is covered bitum according standard BS3416, test pressure 50Kg/cm<sup>2</sup>.

Ductile iron pipe - DN200, L= 1.430m;

Ductile iron pipe - DN150, L= 1.595m

Ductile iron pipe - DN100, L= 5.313m;

- Distribution pipeline network level 3 use uPVC pipe and spare part.

u.PVC pipe - DN63, L= 6,000m

u.PVC pipe - DN90, L= 2,000m

- To build and install 1,556 (conected to 100% household with total households are 1,556) water meters DN15 (for domestic household).

- Transmission and distribution pipeline network is installed gate valve, air valve, exhause valve... at necessary place.

- Fire hydrant is installed in transmission pipeline DN100; in force invest 05 fire hydrants type DN125,

### **12. Fathom dynamiting bomb mine at water intake station and water treatment station**

Area of fathom dynamiting bomb mine at water intake station and water treatment station is 4200m<sup>2</sup>.

#### **B- Indirect investment**

- The investment preparation phase: including cost for hydrography survey, topography survey, exploration boring, and water survey, for data collection and for report preparation consultancy, engineering designs, construction designs, and appraisal etc.

- The investment implementation phase: including cost for survey of detail designed, detail designed drawings, bidding document preparation, compensation and site clearance; cost for supervision of equipment installation; management cost; and cost for PMU etc.

- The completion phase: including cost for finishing the work, cost for appraisal and making payment; cost for training workers pre-testing, checking, operating, and for technical support etc.

## **XIII. INVESTMENT FORM, MANAGEMENT AND RATE OF PROJECT.**

### **13.1. Investment form**

Classification capital works on water supply system Hai Chanh commune include:

- Non-refundable ODA funds of Government of Italia
- Corresponding (Counterpart) capital

### 13.2. Management project

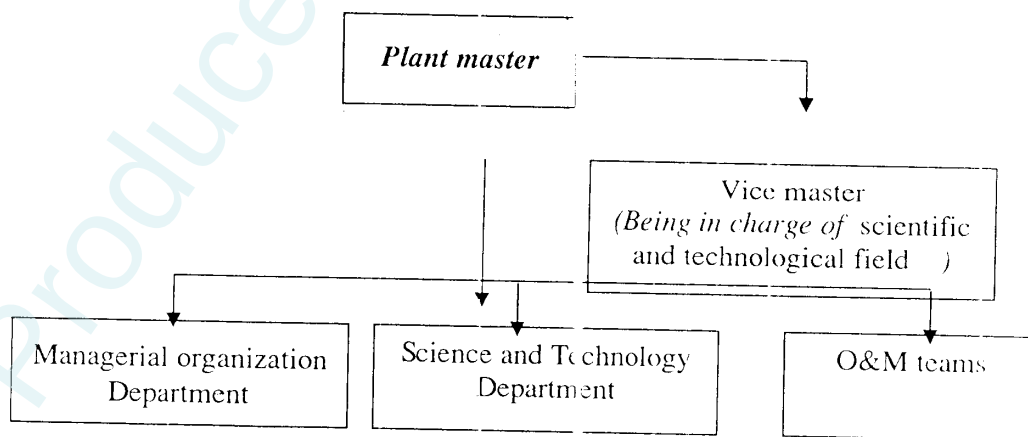
- Management project form: The investor is Quang Tri water supply and construction a number limited company, direct manage and organize project.
- To perform project: Workings of project are organized according regulations in force of Government about basic construction of investment management.
- The completion project, the buildings will be check and take over, hand over enterprise directly under Quang Tri water supply and construction a number limited company to manage and operate.

### 13.3. Rate of project: (See table of rate)

### XIV. Water supply management after operated.

- The water supply enterprise directly under Quang Tri water supply and construction a number limited company will be managed, operated and maintained with 10 staffs.
- Capacity training on management, technique and operation.
- Strict network management, installion of water-meters for all consumers to collect money and to reduce water leakage.
- Raising public awareness on benefits of using clean water, protection of water sources and water supply system.
- Usually supervising, testing the quality of water source and treated water to have timely solution if there is any problem
- Making ensurement of enviromental sanitation, the Province People's Committee and related agencies should early review over the issues of drainage, waste and sanitation in the town during the water supply system construction process.
- Limiting the water source protection area at O Lau River according to the state regunations. Preventing waste water and rubbish from absorting into the water layer, effecting on source of water; Creating advantage conditions for effective operation of the town water supply system; Improving the health of people; contributing to increa production productivity; and promoting economic development and urban civilization.

#### Water supply management organation.



## XV. ANALYSIS INVESTED EFFECT, ECONOMIC-SOCIO OF PROJECT

### 15.1. Target and method

#### a- Target

The targets of analysis economic effectiveness of project, include:

- Defining the most best of economic effectiveness according to economic parameter and target.
- Establishing Economic - Finance targets, to ensure that steady finance during investment time and suitable payment of used-service person, and social general advantages of project.
- Anticipating the selling price according/due to design, defined assess and operated processing which were put forward/offered in the project.
- Defining ability recover invested capital according to defined turnover
- Planning being provide fund according to construction plan and suitable with the rate of process.

#### b. Method

*Analysis projects:* According to finance target, assess project about ability using water price to recover capital as target. Method of analysis is research on finance target of project, assess to perform size. From there, defining preferential project.

*Propose water sale price:* In fact, Vung Ang water Company has to be in compensation for losses now. Because, cost of production is high but cost of using is low. In the future, Vung Ang Company needs to calculate the water sale price for consumers reasonable, enough for subsistence and development.

*Analysis finance coefficients:* Profitable coefficients (of the project) were calculated in all the time of project. Including: net present value (NPV), internal rate of return (IRR), finance benefit and economic benefit of project

### 15.2. Investment effect

#### 1. Total investment value

Total investment value is calculated according basic designed drawings - quarter IV, year 2008

|                                                                           |                         |
|---------------------------------------------------------------------------|-------------------------|
| Expenses of main construction and main equipment:                         | 16,739,536 thousand VND |
| Expenses of connecting to household:                                      | 2,225,080 thousand VND  |
| Managing project + Others expenses + clear the ground+ Consultant expense | 2,041,038 thousand VND  |
| Standby:                                                                  | 1,698,519 thousand VND  |

Construction and equipments Expenses/Costs: It was calculated since quarter IV year 2008 as unit prices and norms in force. Total expenditure is follow Circular 05/2007/TT-BXD dated 25/07/2007 "The guide making and management investment expenses of building construction".

Others expenses: They were calculated as Decree 99/2007/NDD-CP July 13th 2007, Circular 03/2008/TT-BXD January 25th 2008 "The guide correct estimate of building

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construction", Document 1751/BXD-VP August 14th 2007 of Ministry of Construction about "Expenses norm of managing project and investment consultant project", Circular 33/2007/TT-BTC April 09th 2007 of Ministry of Finance.

Standby/Provision: It is used to potential problems, slippage in prices and unanticipated working and calculated errors (standby of potential problems is 10% of construction, equipments and others expenses)

## **2. Capital**

### **a. Non-refundable ODA funds of Government of Italia**

**Non-refundable ODA funds of Government of Italia** is VND **8.357.544** thousand, take 40.81% total investment value and apportion for investment construction and equipment

### **b. Budget capital:**

*Budget capital:* is VND **12.121.548** thousand, take 59.91% total investment value,

-Cost of Construction: 5.779.833 Thousand VND

-Cost of equipment: 210.000 Thousand VND

-Distribution and transmission network: 2.601.948 Thousand VND

-Cost of consultant, project management, site clearance, others: 2.041.038 Thousand VND

- Provision: 1.698.519 Thousand VND

## **3. Period of analysis assessing project**

Period of working-project is 30 years. Period of analysis assessing project is 30 years as from beginning investment project (2010-2040).

## **4. Turnover (see sheet 3)**

Turnover of project depends on capacity and water sale price

Average water supplying capacity is 2,000m<sup>3</sup>/day (see sheet 3);

Loss of water: 25%

Output of water commodities: 1,500m<sup>3</sup>/day (equal produced commodities reduce loss of water)

## **5. Price and expenses (see sheet 5)**

Price of 1m<sup>3</sup> clean water is calculated as Joint Circular 104/2004/TLTBTC-BXD November 8th, 2004. From 2008, the expenses raise 5%/year, specific:

- Expenses of direct investment.
- Expenses for direct labours
- Expenses of general product.
- Others expenses
- Net profit
- Value-added tax
- Sewage fees

### **a. Expenses of direct investment:**

Chemical expenses (alum + chloramin);

Electric expenses;

Expenses of water sample test;

Others auxiliary equipment expenses;

**b. Expenses of direct labours:**

Management and operation of factory: 10 persons.

**c. Expenses of general product.**

Includes: Depreciation fixed assets, expenses for frequently maintaining or repairing these expenses are calculated by value of project's fixed assets fixed assets of project is new investment excepts loan interest during construction period

Depreciation/of fixed assets: Joint Circular 104/2004/TTLT BTC-BXD November 08th 2004 is guided: Depreciation of fixed assets is made JBIC capital and corresponding capital. It is deducted by Circular 2006/2003/QĐ-BTC September 12th 2003 of Ministry of Finance "The straight line depreciation method. Period of depreciation of fixed assets is taken as:

- Pipes and spare parts/equipments: 30 years
- Others: 30 years
- Equipment: 10 years

Expenses of maintain, repairing: According the experience, it is taken 0,05% of expenses of construction and equipment.

**d. Others expenses:**

Management Expenses and sale expenses: According our experience it is taken 5% of expenses of direct labour.

Net profit: According rules, it is taken 2% of turnover (included business income tax)

**e. Taxes:**

The taxes are calculated as rules of Ministry of Finance, specific:

Value-added taxes : 5% of benefit before taxes

Sewage fees: 10% of benefit before taxes

**f. Sale price:**

After calculation/calculating, water sale price (it is enough to compensate for expenses) is VND 4,796 đồng/m<sup>3</sup>.

**15.3. Analysis finance effect of project** (see table 9)

However, it is social security project; net profit is difference between income and expenses. The income of project reduces expenses; deduct depreciation of fixed assets and financial duty. To 19th year since investing to project, the project begin have profit. Net profit of the project will increase after that. When period of project is finished, basic financial index get with rate of return is 8%/years:

Internal rate of return IRR: 7.56%

Net present value NPV: 8.128 million VND

Benefit/Cost: 1.09 times/folds.

**15.4. Analysis socio-economic effect of project**

The project: □ Hai Chanh commune water treatment factory, Hai Lang district has some socio-economic effects, such as:

The project will settle difficult domestic water at project area. To increase level, quantity and water supply service and using water object from water supply system, living standards of population gradually improve.

The project will settle using water no suit hygiene, raising community's health, reducing disease of eyes, diarrhoea, gynaecology, serve labour, product, life and others better.

- To have a part in protect security, improve environment, increase cultural/intellectual standards of the people, make premise advantage for development basic technological foundation, impulse the development of industrialization, modernization.

- In the working processing, the project will be made more employment and increase income of labour. Rate of poor house decrease.

- Quang Tri construction and water supply a number limited company increase benefit and active effect.

## **XVI. ENVIRONMENTAL IMPACT ASSESSMENT**

### **16.1. Objectives.**

Environmental impact assessment report is a science and technical tools to analysis; forecasting indirect and direct impacts to natural environmental of project, then finding optimal alternate to limit bad-effects to natural environment. Therefore, Environmental impact assessment report will much contribute to protect environment and steady developing.

Executing environmental protection law, following by Decree No 175/CP dated 18/10/1994 of Government on environmental impact assessment report. Vinaconex construction consultant joint stock Company has executed environmental impact assessment for Hai Chanh commune water supply.

There are purposes of report:

- Project impact assessment to natural environment and social
- Preparation and Suggestion of measures to protect environment; having sensible treatment among project development demands and environment protection in this project area.

### **16.2. Basic document**

Environmental impact assessment report bases on these documents:

- Environmental protection law of Government No 52/2005/QH11.
- Regulations on environmental protection- Policy reporter in 1995.
- Decree of Government on Guidance to implement the Environmental Law No175/CP dated 18/10/1994.
- Reserves law No 08/1998/QH10 of the National Assembly, the 3rd Meeting dated May 20, 1998.
- Vietnam construction standard tập I, II, III.

### **16.3. Impacts of the project on the environment and inhabitants.**

#### **1. Impacts in the project preparation phase.**

- In preparation phase, the work is land clearance phase to execute the construction and service items of project construction such as evacuation, clearance plan, subgrading and road working.

- Impacts on environment and inhabitants in phase can be predicted as follows:

#### **a/ Impacts on inhabitants:**

- Source: Using plan for construction project, housing clearance, compensation cost, resettlement proceedings, resettlement, etc.
- Impact: Households are scrambled housing, effected psychological, unsuitable resettlement or the difficulty in administrative formalities.
- Level: There are cultivated soils, blind areas, and little inhabitants in this area. Therefore, site clearing work will not be much effect. However, the investor will make reconnaissance work and quantity statistic to minimize effect on households in area.

**b/ Impacts on the soil:**

- Source: Using soil to install construction and clearing site to install pipes
- Impacts: Several cultivated lands and land tenures will be changed by using purposes; soil ecosystem in project area which will be changed.
- Level: Using soil resource to prepare makes sure to impact to nature. However, it is not remarkable environmental hazards. Moreover, using soil resources are no longer value to build useful construction so aforesaid impacts can be accepted.

**c/ Impacts on the air:**

- Source: By activities of motorized means to clear site.
- Impacts: Arising dusts, noxious fumes and noises into the air of this area, there is affected human's health and normal development of ecosystem.
- Level: It's not remarkable affect because clearing site and subgrading are performed at open area. Moreover, this operation is performed in short-time, a temporary work.

**d/ Impacts on the water:**

- Source: By the construction subgrading will have short-term effects on soil resource.
- Impact: Soil is cleared-out by rain-water which sweep away waste into around source of water to increasing turbidity and indirect effect to air-ecosystems.
- Level: To bring bad effects if subgrading work has been carried out in rainy season. There is a low-level temporary phase.

**e/ Conclusion:**

From aforesaid impacts are predicted in project preparation phase, human being impact need to care about. Agreement between owner and substantial damage of household gets to solve this impact. This important problem gets to carry out absolutely and quickly to advantage deploy in the next phases

**2. Impacts in the project execution phase**

In this phase, there are major works as follows:

- Set up the site hut, yards to gather labours equipments materials.
- Transport of plant and material.
- Building, processing manufacture of plants and constructional elements.
- Equipments, materials installation.
- Clearance of site to operation.
- Running test, load test and pressure test.

From construction works, Impacts to environment and human-being in phase can be predicted as follows:

**a/ Impacts on the soil:**

- Source: Using ground area to execute building and to service execution as: earthworking, aggrandizement, foundation consolidation, site hut and yards.

- Impact: To change ingredient and quality of surface-ground on construction site and ground-ecosystem in project area.

- Level: The effect of impacts is small because ground is converted building purpose to build social- benefit building. However, having reactive precaution for surface- construction site and having flood control measures after load test.

#### **b/ Impacts on the air:**

- Source: Air-borne dust because of execution and means of transportation. Dust from materials. Execution, fume and atmospheric noise are from means of transportation, dynamic drivers and motorized means.

- Impacts: Increasing air-borne dust content, waste air of project area and over along routes. There are affected unhealthy influence of labour and households

- Level: The effects of impacts are small because of small-scale construction, short-time execution, sparsely living populated in there. Impacts have been affected to labour in construction site. It's necessary to equip protective measures for worker.

#### **c/ Impacts on the water :**

- Source: Sewage from construction works, domestic of sewage from site hut, rain-water sweep away wastes on ground as refuse, sand, soil, construction materials etc... Water consumption is blowed-off by load-construction test and pressure test.

- Impacts: Result in ground water pollution and surface water as increasing mud content, water turbidity, organic content... Direct or indirect impacts will affect to underwater-ecosystem from there.

- Level: The effects of impact and environmental range are small and short time because of low-toxic in water.

#### **d/ Impacts due to well boring activities :**

- Activities of drill will cause noises in bore area. However, drilling work takes place in short time (about several weeks) so impacts aren't worth considering.

#### **e/ Impacts on inhabitants:**

- Source: The effects of environment are direct or indirect impacts to human-being, especially quality of air attenuation in zone because of dust, atmospheric noise, exhaust fume etc...

- Impacts: To affect to inhabitants which not only in the short term (the decline of health, labour effectiveness...) but only in the long time (occupational diseases).

- Level: Labour in construction site is the most affected. Having protective measures, improving working conditions, life activities and aware of construction worker need to care.

#### **f/ Conclusion**

- After examination of effects in project execution phase, most environment impacts have low effects in the short time because building operation area is not large in the project area.

### **3. Impacts in the operation phase of project**

- When project is entered operation, impacts in this phase will long-term and regular effects, to connect closely operation being of project. Therefore, to attack special

importance to impacts which has ability to real adverse effect to environment? There are impacts in operation phase of project.

**a/ Impacts on the water:**

- Source: Because ground water excavation has capacity with 1.500 m<sup>3</sup>/ day and night. Source of sewage blow off environment from constructions of project: collection rain-water in project zone, sewage from process line of project, waste water of department sanitation, waste living of workers.

- Impacts: To change quality of water resource as increasing iron content, increasing mineral. About waste water from different production operations of project, it impacts on environment, is specific characteristics of water treatment industry. Waste water of filtering basin has high iron content; water turbidity is high but no toxic. Waste water from department sanitation, laboratory also gets noxious influence to source of water.

- Level: Waste water of constructions in project has noticeable affect to around water resource, especially clean water. Therefore, it's necessary to local water treatment before it shuts- out environment.

**b/ Impacts on the soil :**

- Source: Solid waste, others have been arisen in operation processing of project as filtration sludges and waste living of workers.

- Impacts: This wastes shut out soil-environment which change ingredients and quality of soil and to affect to soil-ecosystem at there. Administrators have to solve site planning location to receive this waste amount.

- Level: Effect to soil environment is not big when solid wastes are eliminated, especially having separate dumping ground. Ground water excavation is not affect to chromaticity of soil in area.

**c/ Impacts on the air:**

- Source: Dust and toxic fumes are eliminated by hauling containers of chemical which goes to water plant. Noise and vibrating sound are from pump and mechanic amendment factory.

- Impacts: These factors have been affected to air environment, bad effects to health of works.

- Level: All this factors have low level impacts in small zone because Project zone is placed away settlements, equipments and driving machines have been installed in factory.

With chlorine gas which is leaked out, it will affect to health of workers. However, it is equipped alarms and protection equipment if it is happening in the chemical house.

**d/ Impacts on inhabitants:**

- All impacts to environment in project operation which is direct, indirect affected to health, especially workers in construction site.

-Beside, in operation processing, quality of water is affected to consumers if operation management is not strict. Therefore the quality of water supervision needs to strengthen, and to maintain equipment in treatment station.

- However, it's necessary to supply clean water for consumers to improve health, to avoid the epidemics, to develop socio- economic.

**e/ Conclusion:**

- After prediction and to analysis impacts to environment and human in operation project, the major impact is waste-water resources: sewage, solid waste... It's necessary

to control these sources. We care about technical to treat water because ingredients and quality of waste water is easily treatment.

**16.4 The safety precautions of nuisance impacts of project to environment and human being.**

- In order to gets a good quality insurance after project has been operated, need to precauted nuisance impacts to environment and human being.

- In preparation phase, compensation works, evacuations have to put into effect faithfully and legitimation to avoid nuisance impacts to human as: proceed with study, status statistic, value of construction access ment, and compensation unit price, simple proceedings...

- In the operation phase of project, it's necessary to notice measures and work progress in order that construction has been built quickly, not affect to environment. To care about safety labour, protectionism installation for workers, ensuring labour environmental sanitation for workers. Setting-up construction load test processing to water intake, testing pipes safety and ensuring non-flood out for around zone after bleeding.

- With rain water of filtering basin, water intake will focus on drainage of treatment station. With waste water of living will treat by digestion tank before blowing off drainage of treatment station. With waste water has much iron content, we have treated as follows: Clean water will transport by  $\Phi 300$  reinforce concrete pipe to manhole, Iron muds will be divided in there. Waste water of treatment satation will blow off general drainage system in town.

-At present, Hai Chanh commune has no drainage system. All most waste water are blowed off environment, so its cause to be polluted around environment and water resource in town. It's necessary to build a drainage system for living to avoid to polluted environment.

- Solid wastes are from operation processing of factory which is arised as iron waste and domestic waste. There are annual collected and periodic take to prescribed place.

- During operation processing of project, quality of water resource is usually supervised to realize change and having measure to suitable treat. Quality of water after treatment is supervised at the same time to ensure safety water-supply to consumers.

**XVIII. RECONMENDATIONS**

- In order to have the Hai Chanh water treatment factory project being early executed, it's necessary to be under the direct guidance of Quang Tri province People's Committee and close co-ordination of related committees, branches and departments such as department of planning and investment, department of construction, department of finance, department of science, technology and environment, department of agriculture and rural development, Yendinh district and Quanlao town people's committee ...

We would like to have some reconmendat ons as follows:

1. To receive timely JBIC capital, the investor need to perform stage of detail designed drawings, total estimate and approve detail designed drawings in quarter 1 year 2009.
2. The investor clear the ground after the project approves.
3. The investor close co-ordination of O Lau River management departments, Hai Chanh commune people's committee to protect river source is not polluted according rules of Government, ensure that supply long-term and good quantity.

4. The capital is limit, so the project is not concerned with investment construction works on sewage treatment for water treatment factory. In the next year, the investor gather mobilize legal capital, to build sewage treatment constructions for the project act effect and firm.

**C - APPENDIX (SEE APPENDIX VIETNAMESE)**

- 1- Results of water samples analysis*
- 2- Estimate the total investment*
- 3- Table of the total of investment and economic-financial analysis*

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