The site of phase 1, 2 and 3 will be excavated down to the impermeable clay/ marl layer to prevent the leachate from going into the ground and from polluting the groundwater. Every phase site is divided into two sections by embankment, one of which has capacity of one year operation, in order to minimise the production of leachate. The leachate from the first section of phase 1 will be collected into the stabilisation pond, treated and discharged out of the site because the effectiveness of circulation onsite is not expected without accumulated waste. The leachate from the second section of phase 1 site will be collected into the regulation pond and circulated without being discharged outside. Therefore, there will be no impact of leachate from the second year on the surrounding area.

On the contrary the amount of surface water will increase. The rainwater fallen on the site where is not in operation will be discharged directly because it is not polluted. Thus, in this project, the waterway will be improved to prevent flooding downstream.

The land for intermediate treatment facilities like a sorting plant and a compost plant will be cut and filled, and made flat. The location of the plants and ground plane are as shown in Figure 14-40.

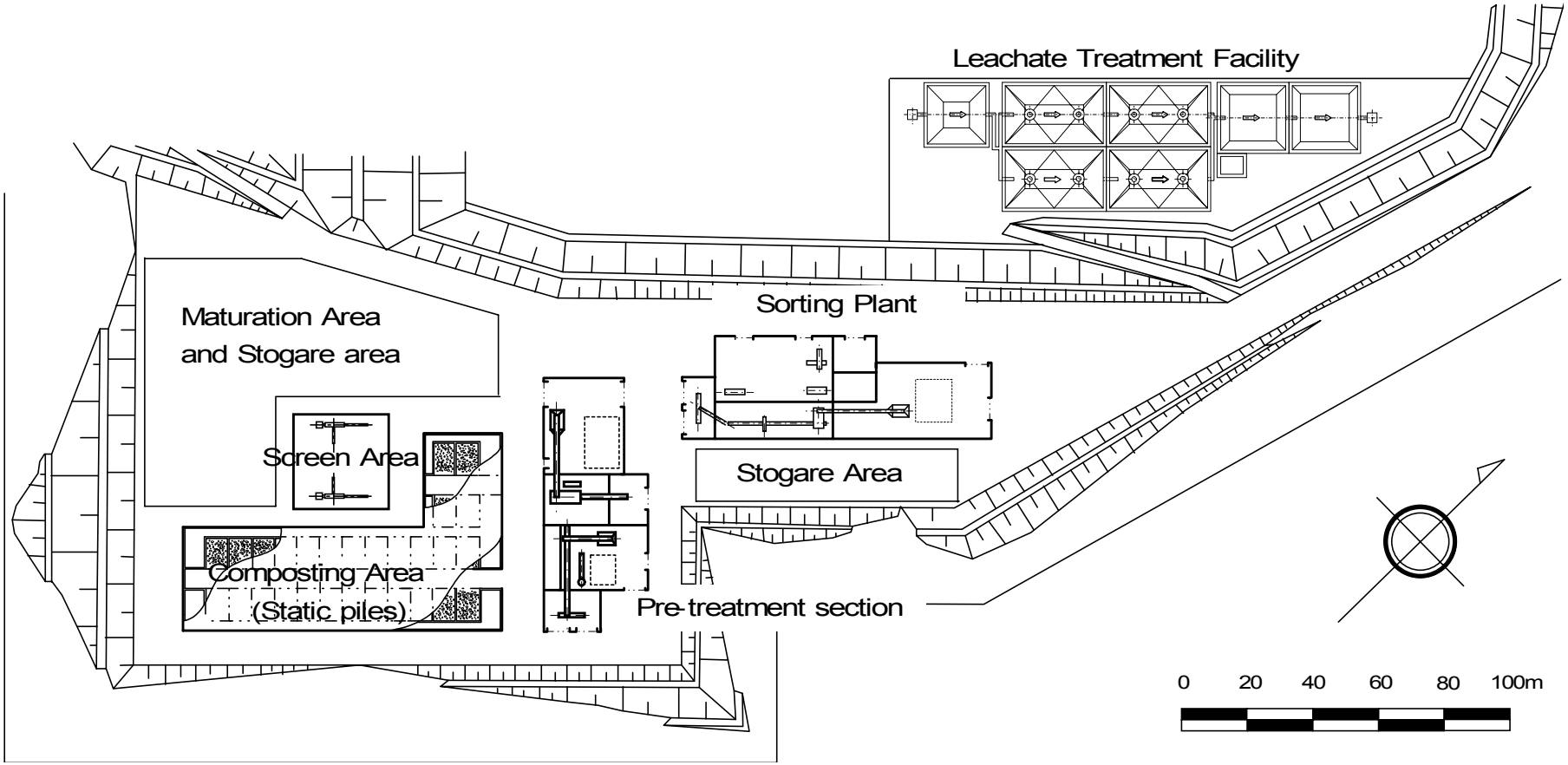

Figure 14-40: Location of Intermediate Treatment Facilities

The proposed site is located in the area for quarrying activities. It is estimated that over 80% of the material for cement has already been removed from the proposed site and the remainder 20% is mainly located in the phase 3 site. It will be also removed by the time when the construction of the phase 3 site starts in 2004.

There is no big tree in the proposed site. In this project the great deal of green trees will be planted in the buffer zone surrounding the whole area of the project to prevent the disposal operation from being viewed.

On the stage of construction of disposal site for municipal waste and medical waste, a few heavy machines like bulldozers, backhoes and dump trucks will operate for earthworks. There may be probability of impact on the environment by noise. The noise owing to construction of sorting plant and compost plant will also occur. The noise and vibration from large trucks, which transport the materials for construction, may impact on the surrounding area. However, there are very few houses within 1,000m radius of the proposed site.

14.5.2 Activities during Operation Stage

The detailed information can be obtained in " **Operation Plan of Cimsa Site Development of Annex 11 in Volume III** ".

Activities during operation stage consist of municipal waste disposal, medical waste disposal, transportation of waste, and operation of sorting plant and compost plant.

a. Municipal Waste Disposal Site

At disposal site, waste is disposed of every day. In 2005 the amount of waste hauled to the site will be 659 t/day. Among this 88 t/day is transported to the sorting plant and 103 t/day is to the compost plant. The final amount of waste to be treated at disposal site will be 539 t/day, including other waste. The equipment for sanitary landfill consists of two bulldozers, two dump trucks, one wheel loader, one backhoe and one water tank truck.

After the waste is dumped from the collection vehicle, the bulldozer levels the waste and covers it with soil to prevent the landfill fire and offensive odour from breaking out. Daily covering with soil also prevents feeding dogs or birds and growth of vectors and vermin.

Leachate will not be discharged from the second section of phase 1 site and whole area of phase 2 and 3. As the impermeable clay is kept at the bottom of the site, leachate is collected through the pipe into the regulation pond and circulated to the area in operation. It is expected that the volume of leachate will be reduced by the evaporation and concentration of pollutant will decrease.

Landfill gases will be dispersed into the open air through the ventilation system. It can prevent the landfill fire and explosion.

a.1 Landfill Method

The landfill methods are divided into three types; open dumping, sandwich and cell method. The open dumping method can not abate offensive odours, generation of disease vectors and noxious insects, and also does not make well compaction.

- With the sandwich method, soil is spread to cover solid wastes filled horizontally. Where the landfill site is narrow, this method is effective, but if the site is wide, solid wastes are left uncovered for a couple days, resulting in generation of offensive odours, etc.
- With the cell method, soil is spread daily to cover solid wastes dumped. Through this method a highly compacted landfill can be obtained and this prevents scattering of solid waste, generation of offensive odour and the breeding of disease vectors and noxious insects. Therefore, the cell method should be applied.

a.2 Cover Soil

Cover soil is to be placed as in the method shown above and the thickness of each layer is as follows.

- daily covering soil: 20 cm
- final covering soil: 100 cm (depending on the ultimate use)

Accordingly, the ratio of cover soil to the disposal volume of waste will be 20 %, excluding final covering soil.

a.3 Landfill Procedure

a.3.1 Basic Plan

JICA study team has proposed that development of the landfill site shall be done at 3 phases. Phase 1 and phase 2 construction will be commenced in 2001 and phase 3 in 2004.

a.3.2 Landfill Procedure

Area and volume of Phase 1 landfill site shall be 5 ha and 463,000m^3 respectively. Those of Phase 2 landfill site shall be 4 ha and 397,000m^3 respectively. MSW can be filled for the period of 3 years at both phases. Area and volume of Phase 3 landfill site shall be 4 ha and 297,000m^3 respectively. MSW can be filled for the period of 1 year at this phase.

- Landfill operation shall be executed from downstream towards upstream in order to connect leachate collection pipe easier. Rainfall drainage pipe shall be provided from upstream section adjacent to the landfill area in order not to mix the rainfall water and leachate. This rainfall drainage pipe shall be extended according to the progress of landfill operations.
- Gas removal equipment shall be installed according to the progress of landfill operation.
- Municipal solid waste shall be covered by soil everyday in order to keep environmental conditions in the landfill area and its surroundings.
- Municipal solid waste shall be compacted by heavy vehicle in order to secure the landfill volume and stabilise the landfill waste.
- Heavy vehicle used for covering and compaction shall be inspected and maintained regularly.

The landform after the termination of operation is as shown in Figure 14-41.

b. Medical Waste Disposal Site

The medical waste disposal site is strictly controlled. The entrance is usually locked and nobody except the relevant staff can enter the site. At the site, the special collection vehicle hauls medical waste two times per day and medium type of bulldozer levels the waste and covers it with soil immediately. The leachate is not discharged outside and circulated and treated within the medical waste disposal site.

b.1 Landfill Implementation

Landfill implementation of the medical landfill is shown in Table 14-30.

Table 14-30: Landfill Implementation of the Medical Landfill

Item	Sub-Item	During Operation
Landfill Implementation	landfill method	-cover soil immediately after dumping of medical waste - landfill division by divider(1 year / divider) - cover soil from quarry site in landfill site
	final disposal foundation	article 34 of design standard
	Disposal site floor	article 35 of design standard
	drainage system	article 36 of design standard
	deposition of waste	article 37 of design standard
	top cover	article 38 of design standard
	gas removal	Every 50 meters(vertically and horizontally)
	vegetation of disposal site	article 39 of design standard
Leachate	system	-recirculation system -gravity fall from slope surface
Rain water	drainage system	-individual collection and direct discharge

b.2 Landfill Procedure

The area and the volume of medical waste landfill site are 3 ha and 57,500m^3 respectively. Medical waste can be filled for the period of 19 years at this site.

- Landfill operation shall be executed from downstream towards upstream in order to prevent leachate amount to be increased due to rainfall water flowing from upstream. Therefore temporary drainage shall be constructed at upstream section adjacent to the landfill area in order not to mix the rainfall water and leachate. This temporary drainage shall be abolished and changed to the leachate drainage system according to the progress of landfill operations.
- Gas removal equipment shall be installed according to the progress of landfill operation.
- Medical waste shall be covered by soil immediately after dumping in order to keep environmental conditions in the landfill area and its surroundings according to the Regulation on Control of Medical Wastes
- Medical waste shall be compacted by heavy vehicle in order to secure the landfill volume and stabilise the landfill waste.
- Heavy vehicle for covering and compaction shall be fixed for medical waste use only.

- Operators, drivers and workers for medical waste landfill operation shall be fixed. They have to take a shower after daily operation and have to take a periodical medical examination.
- It must be fenced and forbidden entering at Medical landfill site and must be locked at gate.

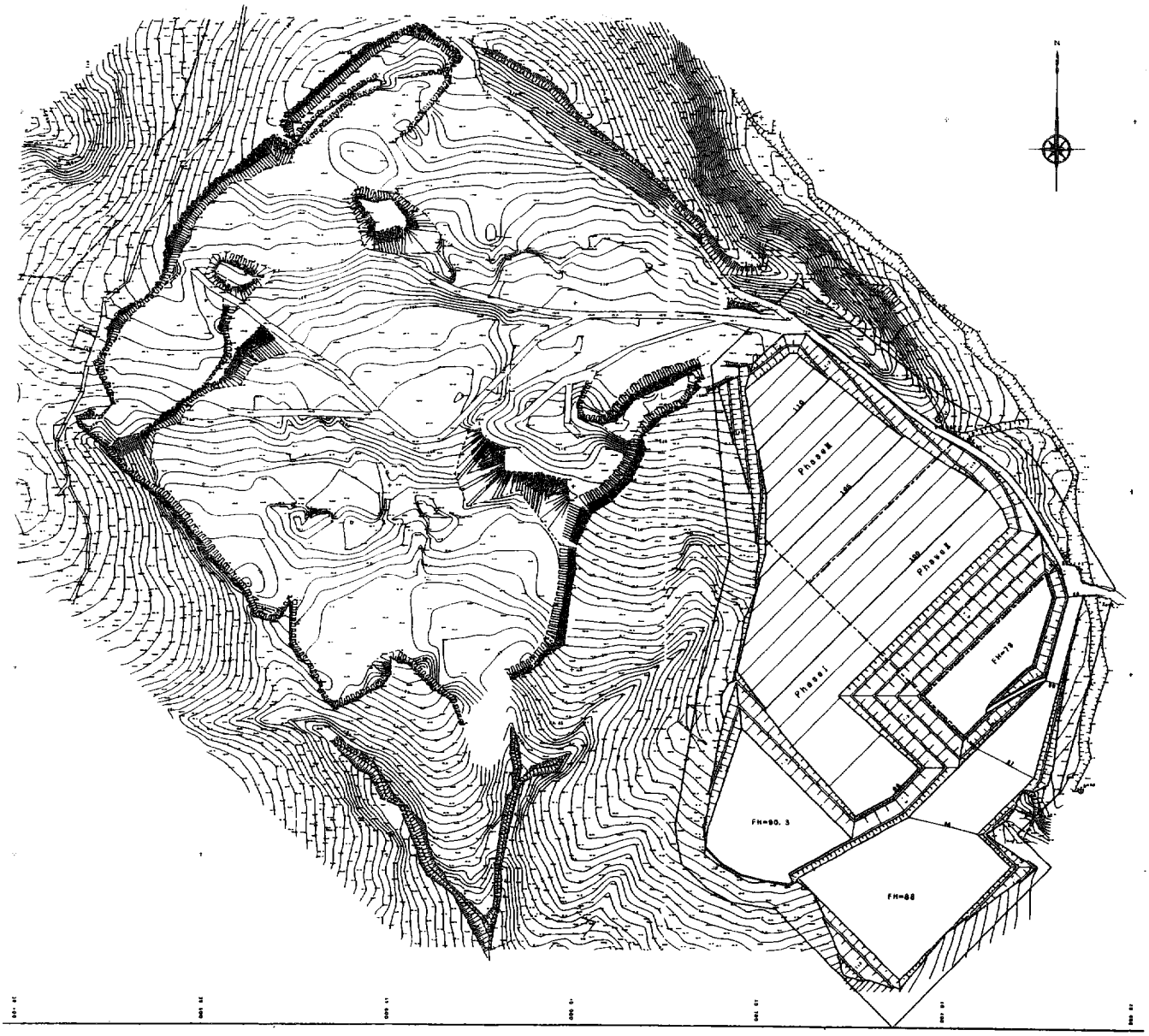

Figure 14-41: The Land Shape after the Termination of Operation

c. Sorting Plant

The proposed operation plan is as follows (Figure 14-42).

c.1 Weighbridge

It is used to weigh wastes or recovered materials.

- Wastes delivered to the site is weighed by the weighbridge on arrival.
- After being weighed, wastes are transferred to the sorting plant, compost plant or landfill site depending on their types.

c.2 Waste Reception and Storage Area

The non-compostable wastes are received in and fed to the sorting line from this area.

- The non-compostable wastes, after weighed, are unloaded in this area.
- The wheel loader supplies the unloaded wastes to the feed hopper.
- When the delivered wastes is beyond the plant capacity, the excess will be moved to the storage area by the wheel loader.

c.3 Hand Sorting Section

This section segregate recyclable materials from the non-compostable waste.

- After fed by the feed hopper and the feeding conveyor, plastic bags are torn and opened by the plastic bag breaker and wastes are put on the hand-sorting conveyor.
- The magnetic separator equipped above the hand-sorting conveyor recovers ferrous metal. For the other items, the workers on the both sides of the conveyor pick up specific items pre-assigned to each of them.

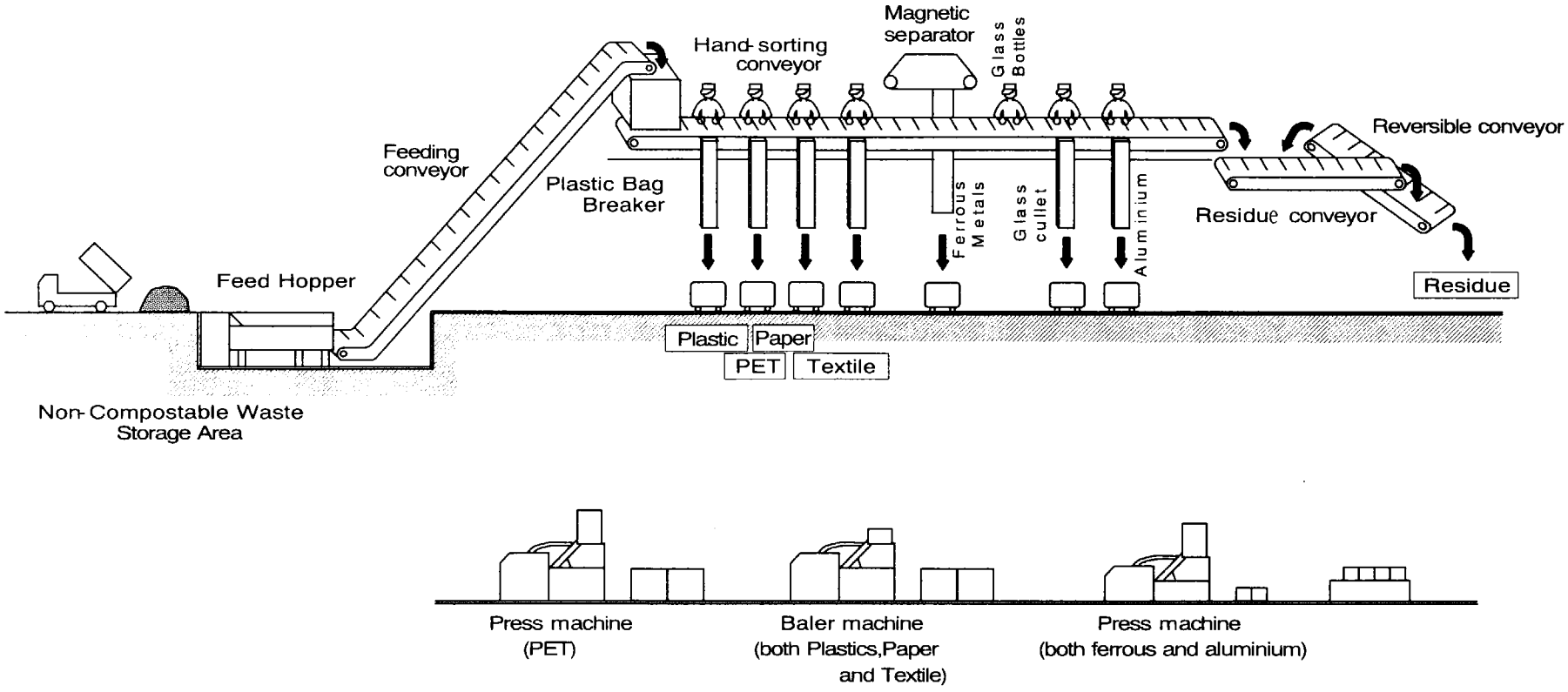

Figure 14-42: Sorting Plant

The items will be picked up in a following manner.

- Items of relatively large size, such as paper, plastic film and textile, are picked up in the first stage to facilitate sorting in the following stage.
- Ferrous metal is sorted by the mechanical equipment in the next stage.
- Glass bottles and cullet are sorted in the third stage.
- Finally non-ferrous metals is picked up.

- The sorted recyclable materials are collected through the shoots into the specific boxes downstairs except for the glass bottles which will be collected in boxes provided near the workers to prevent them being broken.

c.4 Product Section

The recovered materials are pressed or baled in this section.

- The boxes for recovered material collection under the shoots have to be replaced when full. The boxes full of materials is moved to the proper place for further processing.
- The press machine handles ferrous metal, aluminium cans and PET bottles while the baler machine handles plastic film, paper and textile.
- The press machine and the baler machine are planned to have large handling capacity for high machine efficiency. They are, thus, used for plural items by turns.

c.5 Stock Yard and Transport Section

Recovered materials would be stored temporally in the stock yard. It will be divided into several sub-sections for the following items. b

- Ferrous metal (pressed product)
- Aluminium (pressed product)
- PET bottles (pressed product)
- Paper (baled product)
- Plastic film (baled product)
- Textile (baled product)
- Glass (cullet and bottles)

- Each item is moved to the pre-determined sub-section of the stock yard by the workers.
- The recovered materials are shipped by recycling dealers who are supposed to come to the plant. The plant workers will load the materials on the dealers' trucks by a forklift. The trucks must be weighed on leaving.
- Waste residue remained after sorting recyclable materials are loaded on the dump trucks by the residue conveyor, and disposed of at the landfill site.

d. Compost plant

The proposed operation plan is as follows.

d.1 Weighbridge

It is used to weigh waste or recovered materials.

- Wastes delivered to the site is weighed by the weighbridge on arrival.
- After being weighed, wastes are transferred to the sorting plant, compost plant or landfill site depending on their types.

d.2 Waste Reception and Storage Area

The compostable wastes are received in and proceed to the pre-treatment process from this area.

- The compostable wastes, after weighed, are unloaded in this area.
- A wheel loader supplies the unloaded waste to a feed hopper.
- When the delivered wastes is beyond the plant capacity, the excess will be moved to the storage area by the wheel loader.

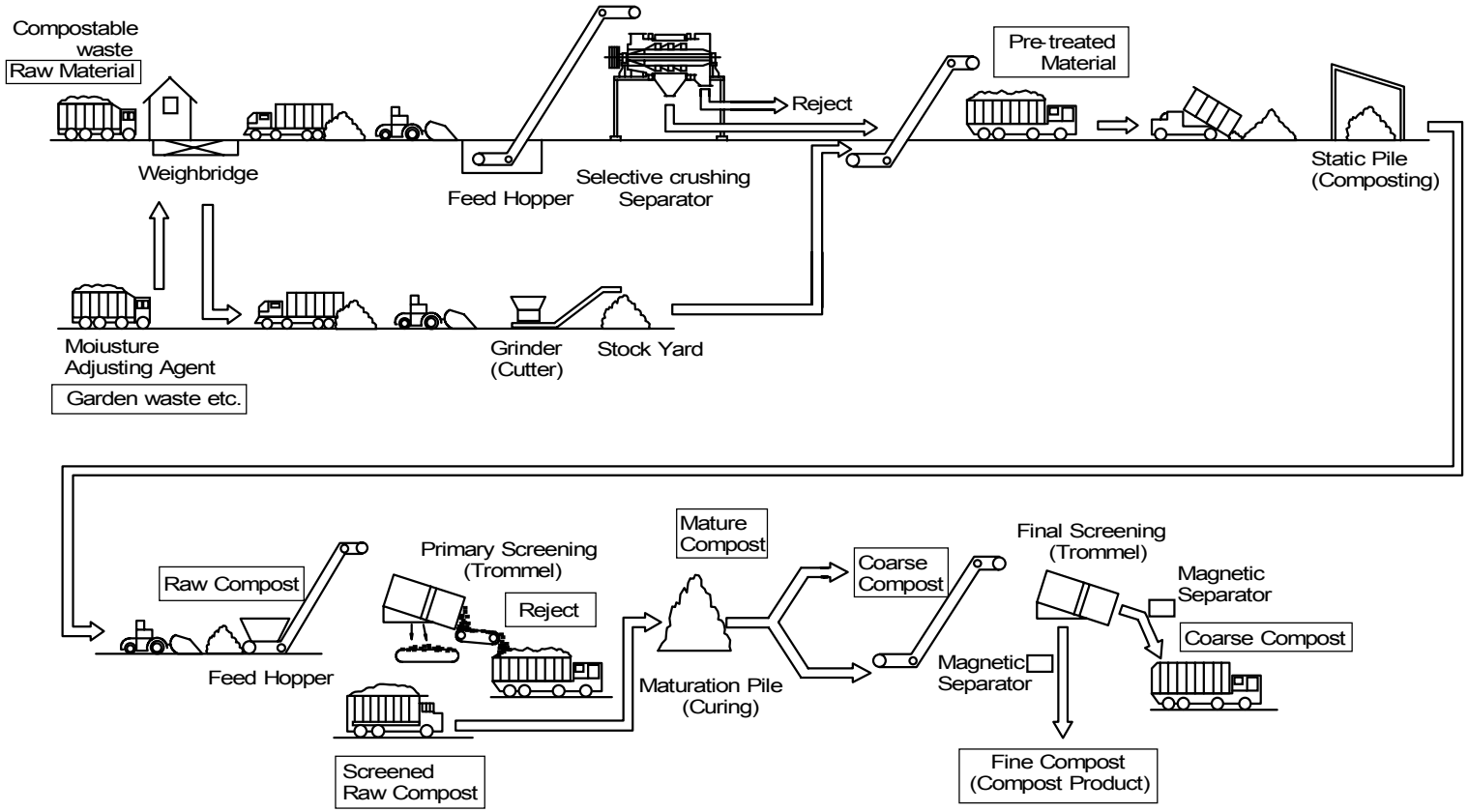

Figure 14-43: Compost Plant

d.3 Pre-treatment Section

The raw materials are selectively crushed and materials unsuitable for composting such as plastics and metals are rejected in this section.

- The key facility is the SCS, which can divided the raw materials into two groups: fragile wastes including kitchen wastes and wet paper, and the other robust or flexible wastes such as plastic sheets, fibres and cans. The former group proceeds to the composting section as pre-treated materials. The latter is called rejects.
- While the raw materials are processed by the SCS, plastic bags are torn and the compostable materials are crushed into pieces.
- The crushed raw materials are sieved and moved to the stock yard by the conveyor equipped with the magnetic separator.
- In the stock yard, the pre-treated materials are loaded onto the dump trucks by the wheel loader and transferred to the composting area.
- Recovered ferrous metal is delivered to the sorting plant.
- The rejects are loaded on the dump trucks by the wheel loader and transported to the sorting plant for material recovery.

The pre-treatment section layout is presented in Figure 14-44.

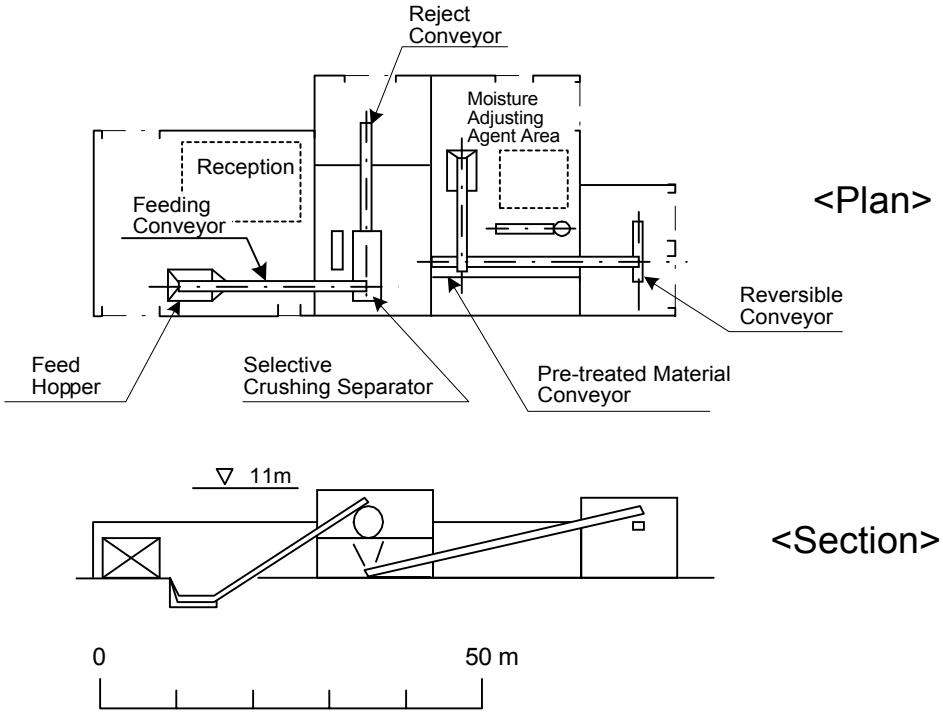

Figure 14-44: Layout of the Pre-treatment Section

d.4 Composting Area (Static piles)

The pre-treated materials undergoes composting in this are which is divided into 28 sections to form 28 static piles.

- The pre-treated materials are unloaded in one section and formed into a pile by a wheel loader.
- After pile formation, the materials require air control in the early stage, turning by the wheel loader, and moistening by the water truck.
- After 28 days of composting period, the raw compost is loaded on the dump trucks by the wheel loader and proceeds to the primary screen process.

The Composting area (Static piles) layout is presented in Figure 14-45.

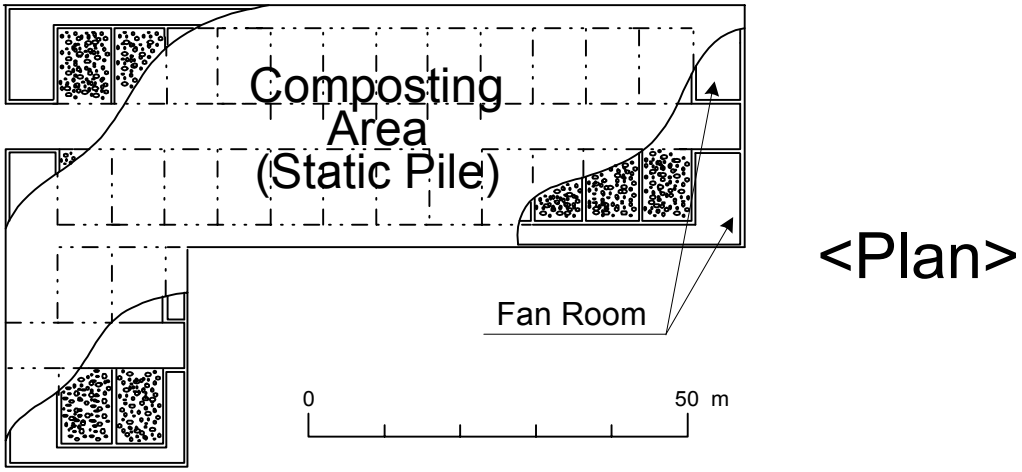

Figure 14-45: Layout of the Composting Area (Static piles)

d.5 Primary Screen Equipment

The primary screen equipment comprises a supplying conveyor, trommel, product conveyor with a magnetic separator, residue conveyor and ballistic inertial separator. The sieve size of the trommel is 25mm. The underflow is the material for further processing and the oversize material is the rejects.

- The raw compost is unloaded in the supply are of the primary screen section.
- The unloaded raw compost is placed on the supplying conveyor by the wheel loader and fed to the trommel.
- The trommel screen sieves the raw compost.
- The underflow materials will be conveyed to their stock yard. Meanwhile, ferrous metal is removed by the magnetic separator and glass and gravel by the ballistic inertial separator.
- The underflow raw compost is loaded on the dump trucks by the wheel loader and delivered to the maturation area.

- The oversize materials remained on the sieves are the rejects to be disposed of at the landfill site.

The primary screen equipment layout is presented in Figure 14-46.

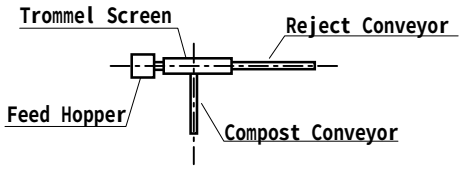

Figure 14-46: Layout of the Primary Screen Equipment

d.6 Maturation Area

The maturation of the screened raw compost takes place in this area. A roof is not necessary. Unlike the composting area, this area is not physically divided into sections but the area should be clearly marked whenever the mature pile is formed. Although the maturation period is to be 60 days, the planned area size is enough to store compost produced in 90 days to allow the adjustment of product shipping in response to the market demand.

The floor of the maturation area will be equipped with pipes so that the area will serve as odour removal facility.

- The screened raw compost is unloaded from the dump trucks and formed into maturation piles by the wheel loader. The pile formation does not require particular skills.
- After the maturation period, the materials are loaded on the dump trucks by the wheel loader and delivered for final screen processing.

d.7 Final Screening Equipment

The final screen equipment is primarily similar to the primary screen equipment but the mesh size of the trommel screen is 12mm, instead of 25mm. The screen should be removable so that the mesh size can be changed depending on market demand.

- The mature compost is unloaded in the supply are of the primary screen section.
- The unloaded mature compost is placed on the supplying conveyor by the wheel loader and fed to the trommel.
- The trommel screen sieves the mature compost.
- The underflow materials will be conveyed to their stock yard. Meanwhile, ferrous metal is removed by the magnetic separator and glass and gravel by the ballistic inertial separator.
- The mature compost can be shipped as it is, or be packed in plastic bags with net weight of 50kg.

- The compost, if shipped without packed, is loaded on the dump trucks by the wheel loader. For the packed compost, a forklift is used.
- The oversize material on the sieves are the rejects to be disposed of at the landfill site.

14.5.3 Impact on Environment and Mitigation Measures

14.5.3.1 Economic Activities

Loss of bases for economic activities(e.g., land) and loss of income for scavengers

a. Construction

a.1 Negative Impact

The proposed site in Cimsa is located in the area for quarrying activities. It is estimated that over 80% of the material for cement has already been removed from the proposed site and the remainder 20% is mainly located in the phase 3 site. It will be also removed by the time when the construction of the phase 3 site starts in 2004 because quarrying activities will continue. Therefore, the construction of disposal site will have no negative economic impact on the company which gets the raw material from the proposed site.

a.2 Positive Impact

It is estimated that the construction of various facilities for Cimsa Site Development Project will employ many workers(labourers, drivers, equipment operators supervisors, etc), thus increasing economic activity in the area. Therefore, this construction will be economically beneficial.

b. Operation

b.1 Negative Impact

The present waste dumping system in Mersin provides an economic benefit for the scavengers who pick up reusable items from the disposal site. The total number of scavengers is 20 at Mersin dumping site and it is estimated that the recovered waste amount by scavengers at the dumping site totals 549tons/year in 1999 and the annual income generated by scavengers is estimated to be 9.4 billion TL. However, as the scavenging activities will not be allowed in the proposed disposal site, the income of them will be lost.

b.2 Positive Impact

In this project the separate collection system is to be introduced. The waste is separated into two categories, i.e., compostable waste and non-compostable waste. Non-compostable waste is transported to the sorting plant. Paper, plastics, bottle and can, etc. are separated and reused as resources through the sorting plant. The waste will be changed into the productive materials and produce new economic values. The income due to the recyclable materials will be more than 18.7 billion/year of the total income of compost plant workers and scavengers.

The compost plant is also introduced in this project because it is proved that there is the demand for high quality compost in the farm land surrounding Mersin city. The

compostable waste is collected separately and the compost is produced in the plant. The waste will produce new economic values.

Both of intermediate treatment facilities like the sorting plant and the compost plant will require a lot of workers. As the scavengers, who will be prohibited to pick up the recyclable materials at the disposal site, are accustomed to handle and sort the waste, they may have an opportunity to be possibly employed as the workers.

Therefore, it is expected that negative impact is negligible relatively.

c. Aftercare

c.1 Negative Impact

No negative impact is expected.

c.2 Positive Impact

When the new disposal site is finally completed it is expected that another disposal site will be constructed to replace it. All workers associated with this proposed disposal site in Mersin (waste vehicle workers, landfill staff, etc.) will presumably be offered employment at another disposal site.

The recommended future land use for the completed disposal site will be recreational purposes. Citizens will get the benefit of physical and/or mental refreshment in the recreational area. It will provide the improvement of economic productivity of people.

14.5.3.2 Traffic and Public Facilities

Impact on traffic conditions and public facilities near the proposed disposal site and along the access road.

No impact is expected on the public facilities because there is no public facility near the proposed site and along the access road.

a. Construction

a.1 Negative Impact

There are many kinds of construction works in this project, like plantation of buffer zone, earthworks for disposal site, building of a sorting plant and a compost plant, and construction of stabilisation pond. The traffic volume caused by the construction will be a little since the trucks transport the material for construction once in a while, and the impact on traffic condition will be negligible.

a.2 Positive Impact

Positive impact is not expected.

b. Operation

b.1 Negative Impact

At first the impact on the pedestrian should be considered. There are very few people walking on the access road. It proves that the employees of the company located at the entrance of the access road commute by bus or car. 45 persons of pedestrian go to and

from the Tekke village during 12hours and the number is 8 persons/hour even at peak. Therefore, the impact on the pedestrian is negligible.

The increase of traffic volume on the access road to the Cimsa site in the future depends on the increase of population in Tekke Village and activation of quarry. Thus, it is considered suitable to adopt the growth rate 2.8% / year(1998-2005) shown in Main Report of this project, which is introduced on the base of population growth rate and GDP. The rate of growth in 2005 to 1999 is estimated to be 118%.

2005/1999 : $(1+0.028)^6$ 1.18

The traffic volume in 2005 is shown in Table 14-31. The vehicles are arranged into two categories, small one and large one. Truck, bus, and minibus are categorised into large vehicle, and car, motorcycle and tractor are into small vehicle.

Survey point A is in front of the company on the access road to Tekke Village. Survey point B is on the access road to Tekke Village from the junction and Survey point C is on the access road to the proposed site from the junction. Therefore, part of the large vehicles counted at point A pass to the proposed site and the rests may go to and from the company. The number of large trucks to /from the quarry site is 36 vehicles / hour on the average.

Table 14-31: Projected Traffic Volume (2005)

unit: vehicles/hour

time	survey point A		survey point B		survey point C	
	small	large	small	large	small	large
7:00-8:00	53	140	12	9	2	41
8:00-9:00	50	107	9	6	2	37
9:00-10:00	41	92	7	5	2	24
10:00-11:00	47	100	12	8	5	37
11:00-12:00	55	111	13	4	8	31
12:00-13:00	35	70	8	6	0	28
13:00-14:00	41	89	11	2	1	31
14:00-15:00	58	101	15	7	2	40
15:00-16:00	68	123	6	2	2	32
16:00-17:00	39	100	15	5	6	50
17:00-18:00	27	103	13	6	1	54
18:00-19:00	27	65	24	4	2	27
Total	541	1,201	145	64	33	432

Note: survey point A : Access road in front of the company
survey point B : Access road to Tekke Village
survey point C : Access road to the proposed site

As shown in "5.3.9 Air Pollution", the number of collection vehicles will be 96 vehicles / day in 2005. From the result of field survey of collection vehicles at the existing dumping site in Mersin, the peak times when collection vehicles concentrate are 9-12 o'clock in the morning. As it is 42.9% of whole day volumes, traffic volume of collection trucks during 9 to 12 o'clock are as follows:

96 x 0.429 / 3 x 2 (round trip) = 27vehicles/ hour

The traffic volume including the collection vehicles in 2005 is as follows:

Table 14-32: Traffic Volume in 2005

unit: vehicles/hour

Time	Survey point A		Survey point B		Survey point C	
	small	large	small	large	small	large
9:00-10:00	41	119	7	5	2	51
10:00-11:00	47	127	12	8	2	64
11:00-12:00	55	138	13	4	2	58

Since the number of collection vehicles is small and the capacity of the every road is enough, traffic jam is not expected. Therefore, the impact on the traffic condition will be negligible.

c. Aftercare

c.1 Negative Impact

No negative impact is expected.

c.2 Positive Impact

Positive impact is not expected.

14.5.3.3 Public Health

Deterioration of public health and sanitary conditions in the area around the proposed site due to the waste disposal.

a. Construction

a.1 Negative Impact

As described in "14.5.3.9 Air Pollution", dust generated from the construction activities and exhaust gases from construction vehicles may impact on public health in the surrounding area. However, the dust will be controlled by the regular use of water sprays and exhaust gases are considered to be negligible because the number of construction equipment is small.

a.2 Positive Impact

Before operation of Cimsa disposal site, the existing dumping site is closed. The smoke and offensive odour due to landfill fires will be terminated.

b. Operation

b.1 Negative Impact

Waste dumping site often promotes growth in the population of vectors and vermin which give a negative impact on surrounding area. However, in this project it is proposed to operate the disposal site as a sanitary landfill, which will minimise this problem. Moreover, pesticides may be used if required.

Leachate from the waste disposal site may impact on public health. However, leachate will be collected to the treatment pond and circulated into the disposal site to prevent

the downstream area from being polluted from the second year of operation. During first one year the leachate will be collected in stabilisation pond and discharged outside after treatment. As the infiltration of leachate into the ground is to be prevented by impermeable clay/ marl layer at the bottom of the site and impermeable sheet on the slide slope, it is expected there are very few opportunities of groundwater and surface water to be polluted by the leachate.

Landfill fires may impact on public health. Although landfill fires have occurred very often at existing dumping site in Mersin and smoke with dust has been dispersed, in the proposed Cimsa site gases will be ventilated in a controlled manner and landfill fires will be controlled by a sanitary landfill. Therefore, there are very few opportunities of landfill fires.

It is expected that the overall negative impact on public health will be negligible.

b.2 Positive Impact

Positive impact is not expected.

c. Aftercare

c.1 Negative Impact

Leachate and landfill gases will continue to be produced during the aftercare stage after the termination of operation although production rates and strengths will diminish with time. When the site may be used as a recreational area, leachate and gases should be inspected regularly to protect the public health of citizens who may gather there for recreation. The public health will not be hurt because the inspection of leachate and gases is to be conducted according to the monitoring plan.

c.2 Positive Impact

Positive impact is not expected.

14.5.3.4 Hazards/ Risks

Increase in natural disasters (e.g., landslides) and man-made hazards (e.g., landfill gas explosions, fires) due to the disposal site

a. Construction

a.1 Negative Impact

The natural environment of the proposed site has already been profoundly altered by the development of quarrying operations. It seems that there is a low probability of natural disasters occurring in this area and that the ground structure is relatively stable. The landform will be changed because the proposed site should be excavated until the impermeable stratum appears. However, the amount of alteration is not much in scale compared with the man-made alterations of the natural environment. The depth of excavation will be approximately 15m at most. The height and the gradient of slopes formulated by cutting is approximately 10m at most and 1 : 2 respectively.

Therefore, there will be very few opportunities of landslide.

a.2 Positive Impact

Positive impact is not expected.

b. Operation

b.1 Negative Impact

There is the possibility of being exposed to the hazards and risks. Access to the disposal site will be restricted to approved personnel only. Thus, the general public, including scavengers, will not be allowed entry to the disposal site, especially to the medical waste disposal site. This will prevent these people from being exposed to the hazards and risks.

The adoption of the policy to prohibit the disposal of hazardous, toxic, radioactive and liquid wastes, except medical waste at the medical waste disposal site to be separately constructed from the municipal waste disposal site, will help to prevent them finding their way into the groundwater or surface waters. They cause direct harm to humans or indirect harm through the food chains. However, there will still be other dangerous objects within the waste accepted for disposal (broken glass, rusty tins, spoiled food) which pose a small risk of injury to the workers for waste collection, treatment and landfill. This risk can be minimised by equipping them with proper clothing and handling equipment(e.g., gloves, boots).

The medical waste disposal site is to be constructed separately from the municipal waste disposal site and controlled strictly to access. A bulldozer of medium type will operate independently to dispose of the medical waste there. The waste will be covered with soil immediately when it is hauled from the collection vehicle. The worker and the driver will wear masks, gloves and boots on the site.

The medical waste disposal site is to be equipped with the impermeable sheet, and the leachate including hazardous pollutants will not be discharged outside and treated by circulation.

Another operational hazard concerns the occurrence of landfill gas explosions. Uncontrolled generation of gas from the disposal site may also result in spontaneous fires. The proposed disposal site design provides for the ventilation of landfill gases in a controlled manner to the atmosphere, thus minimising this impact.

The likelihood of flooding is very small because the watershed is small (24ha) and the water way is to be improved in this project.

Presently at existing dump site in Mersin the waste is not completely covered with soil. The outbreak of landfill fires is a common problem there all the year round. The fire will pose a similar risk at the new disposal site, but this risk will be minimised by the proper sanitary landfill practices.

The overall negative impact is considered to be low, provided proper sanitary landfill practices are implemented and controlled strictly.

b.2 Positive Impact

Positive impact is not expected.

c. Aftercare

c.1 Negative Impact

On closure of the disposal site, further decomposition of waste within the disposal site will occur, which may result in subsidence of the land over the disposal site. The impact of subsidence will depend on how soon and for what purpose the site is put to use after closure. No significant negative impact is expected because it will be used as a green park or a recreational area.

During the aftercare period, the generation of landfill gas continues to occur and hence there is still a risk of consequent fires and explosions. However, no significant impacts are expected provided the gas ventilation facilities are inspected and maintained regularly.

c.2 Positive Impact

Positive impact is not expected.

14.5.3.5 Groundwater

Changes in groundwater level.

a. Construction

a.1 Negative Impact

There is no change in groundwater in dry season because the rainwater is very little. At the first stage, whole area except phase 3 will be constructed at the same time. As the impermeable clay/ marl layer will be kept at the area of phase 1 and 2, and impermeable sheet will be installed at medical waste disposal site, the rainwater on the area cannot infiltrate into the ground and flow out of the proposed site. The impermeable area is 10ha. Thus, the provision of the water to the aquifer will be less than usual after completion of the construction .

a.2 Positive Impact

Positive impact is not expected.

b. Operation

b.1 Negative Impact

The operation area in every phase is as follows:

Phase 1	5ha
Phase 2	4ha
Phase 3	4ha
Medical waste site	2ha
Intermediate treatment site	3ha
Total	18ha
+ buffer zone (green belt):	6ha

Among these areas, the impermeable clay/ marl layer will be kept at the site of phase 1, phase 2 and impermeable sheet will be installed at medical waste disposal at first stage. Thus, the rainwater which falls on the area 10ha totally is not permeated into

the ground, partly discharged directly into the waterway, partly collected into the stabilisation pond. The site of every phase is divided into some sections by embankment to reduce the leachate productivity. The leachate in the first section prepared in phase 1 site will be treated in the stabilisation pond and discharged into the waterway for one year because it cannot be circulated onsite due to the lack of accumulated waste. The rainwater on other parts of the site is discharged separately outside because it is not polluted. Therefore, most of rainwater on 10ha site will be discharged during the operation in the first section of phase 1 site. The amount worthy of rainwater on the 3ha site will decrease.

11ha x (0% - 30%) = - 3.3ha
11ha: area of impermeable clay and sheet (phase 1, 2 and medical waste disposal)
0%: permeability of impermeable clay and sheet
30%: permeability of existing land

On the other hand, the water retaining capacity of the buffer zone of 4.5ha, which will be constructed at the first stage, will increase because of plantation of green trees. On the assumption that it increases from 30% to 70%, the rain water on the area of 1.8ha is expected to be provided to the aquifer.

4.5ha x (70%-30%) = +1.8ha

The loss of groundwater by impermeable clay/ marl layer and sheet may be made up 60% by the appearance of green zone.

1.8 / 3.3 x 100 = 54.5 %

Furthermore, it is expected that the groundwater is also provided from the waterway. Therefore, the shortage of water to be provided to the aquifer will be a little and the impact on groundwater will be negligible.

The shortage of water to be provided to aquifer, which is amount worthy of rainwater on the site of 1.5ha (= 1.8 - 3.3), will continue for four years until the site of phase 1 and 2 is full with waste. Then, the shortage of groundwater will be amount worthy of rainwater on the site of 2.1 ha after disposal starts at phase 3 site.

15ha x (0% - 30%) + 6ha x (70% - 30%) = - 2.1ha
15ha : area of phase 1, 2, 3 and medical waste disposal
0% : permeability of impermeable clay and sheet
30% : permeability of the existing land
6ha : area of buffer zone
70% : permeability of buffer zone

However, the impact on the downstream area will not be problematic because the amount of loss is not much and it is restricted during rainy season.

b.2 Positive Impact

Positive impact is not expected.

c. Aftercare

c.1 Negative Impact

Since the surface of the disposal site is to be capped with soil completely after the termination of operation and most of the rainwater falling there will be discharged directly out of the site, the volume discharged into the waterway will increase. On assumption that the ratio of runoff from the site in operation is 50% and the rest 50% is circulated in the site, and it from post-operation site is 70%, the runoff of surface water would increase 20%. Therefore, the water provision from the surface water to the aquifer through the waterway will increase. Especially, 100% of the rainwater on the medical waste disposal site will be discharged outside because the site is to be capped with impermeable sheet.

It is expected that the impact on groundwater will be less than the case of operation stage.

c. Positive Impact

Positive impact is not expected.

14.5.3.6 Hydrological Situation

Change in surface water bodies due to inflow of runoff and the disposal site

a. Construction

a.1 Negative Impact

There is no change in surface water in dry season because rainwater is very little and no water is in the water way. Although there is no change in surface water discharged from the construction site during earthworks, the amount of discharge will increase after appearance of the impermeable clay layer. The existing waterway will be improved to make the increased surface water run off.

a.2 Positive Impact

Positive impact is not expected.

b. Operation

b.1 Negative Impact

Since there is no water in the waterway downstream of the proposed site in the dry season, no impact will be given on the hydrological condition. The operation area will be divided into some sections so that the disposal can be conducted for one year and the production of the leachate can be minimised. At the first stage most of rainwater on the site of phase 1, phase 2 and medical waste disposal, except the section in operation, will be diverted unpolluted from the disposal site and will flow into waterway directly.

Thus, the amount of the surface water discharged from the proposed site will increase compared with the present situation.

On the other hand the rainwater on the buffer zone will be stored because the zone is planted and water retaining capacity increases. The amount of surface water increased

by impermeable clay and sheet cannot be reduced sufficiently by the amount stored in the ground by buffer zone. However, as the excess amount of water is not much, it is expected that there is little impact on the hydrological condition.

Increased volume		Decreased volume
11ha x (100% - 70 %)	>	4.5ha x (70% - 30%)

*11ha : area covered with impermeable clay and sheet (phase 1,2 and medical waste disposal)
*100% : run-off coefficient of impermeable clay and sheet
*70% : run-off coefficient of existing land
* 4.5ha : area of buffer zone prepared on the first stage
*30% : run-off coefficient of buffer zone

b.2 Positive Impact

Positive impact is not expected.

c. Aftercare

c.1 Negative Impact

Since the surface of the disposal site is to be capped with soil finally, 70% of rain water on the site will flow into the waterway without infiltrating into the waste. Hence, the total amount of surface water flowing out of the site will not change in comparison to the present. Therefore, the impact on the hydrological condition will be negligible.

c.2 Positive Impact

Positive impact is not expected.

14.5.3.7 Fauna and Flora

Changes in flora and fauna leading to obstruction of breeding, extinction of species due to the disposal site

a. Construction

a.1 Negative Impact

Construction works will have a negligible negative impact on fauna and flora since these have already been severely depleted by quarrying activities. There is virtually no vegetation cover on the site which has led to a low population of birds and other wildlife in the area. Therefore, the impact on flora and fauna by construction works will be negligible.

a.2 Positive Impact

In this project a lot of green trees are to be planted around the proposed site to prevent the disposal activities from being viewed. The area of it is 6ha and width is 30m. The new habitat is created for fauna. The site for buffer zone may be changed into a new natural environment for flora and fauna in the future.

b. Operation

b.1 Negative Impact

Waste dumping site often promotes growth in the population of vectors and vermin, such as flies, mosquitoes, cockroaches and rats, which can have a negative impact on surrounding ecosystems. However, it is proposed to operate the disposal site as a sanitary landfill which will minimise this problem. Furthermore, pesticides may be used if required. Hence, the impact of vectors and vermin associated with the waste disposal site on flora and fauna will be negligible.

Noise from disposal equipment and waste collection vehicles will have a negligible impact on flora and fauna within the vicinity of the proposed disposal site because the heavy machine and large trucks have been already operating there for a long time.

Leachate will be collected to the stabilisation pond and treated before discharged outside into the waterway at first. After the beginning of operation in the second section at phase 1 site, the leachate will be circulated into the disposal site without being discharged out of the proposal site. Therefore, it will not give any impact to flora and fauna within the vicinity of the disposal site.

Landfill gases will be ventilated in a controlled manner and should not cause harm to flora and fauna within the vicinity of the landfill.

b.2 Positive Impact

The landfill fires have been occurring very often at the existing dumping site, which may impact on flora and fauna. The operation is terminated and the environment for inhabiting will be improved.

c. Aftercare

c.1 Negative Impact

The main impact on flora and fauna during the aftercare stage will be similar in nature to the impact during operation described above. After completion of disposal, leachate and landfill gases will be produced in smaller quantities and be weaker in composition. The monitoring system of gases and leachate should be planned and need to be continued for a long time.

c.2 Positive Impact

It is not long before green trees will be planted on the site and it will be used as a green park or recreation area for citizens. The green trees may possibly attract many birds. The new environment for flora and fauna may be realised in combination with green buffer zone.

14.5.3.8 Landscape/ Aesthetics

Changes in topography and vegetation due to construction and operation of the disposal site, and deterioration in environmental aesthetics

The original landscape and aesthetics have already been profoundly destroyed by quarrying operations in the area. The site has little vegetation cover and bare rocks contribute its low aesthetic quality.

a. Construction

a.1 Negative Impact

Negative impact is not expected. The facilities constructed at the proposed site will not be conspicuous, because the highest building will be 15m on the ground while the surrounding area is open and huge, and the waste disposal site will be prepared below the original ground level.

a.2 Positive Impact

The green trees will be planted around the proposed site to prevent the operation activities from being viewed.

The landscape at the existing dumping site in Mersin will be improved because of termination of operation

b. Operation

b.1 Negative Impact

No negative impact is expected.

b.2 Positive Impact

On the result of landscape survey, it proved that the site could not be seen from the surrounding settlement of Burhan village(north-west). Although the proposed site can be seen slightly from the settlement of Tekke village(south-east to the site), the view will be improved with the appearance of green buffer zone as shown in Figure 14-48b.

The landfill fire, scatter of waste and disperse of offensive odour at the existing dumping site will be terminated.

c. Aftercare

c.1 Negative Impact

No negative impact is expected.

c.2 Positive Impact

After the termination of operation the site will be capped with soil, and may be planted with green trees and used for a recreational zone. It is expected that the original land shape may be nearly restored. Therefore, positive impact will be expected.

(1) View from Tekke Village
The entrance of the proposed site is located beyond the line of tall trees.
The site cannot be seen from the village.

(2) View from Burhan Village
The proposed site is located beyond the hill and cannot be seen from the village.

Figure 14-47: View of the Existing Proposed Site