

PILOT PROJECT C

**IMPROVEMENT OF
FINAL DISPOSAL PLANNING
AND OPERATION**

PILOT PROJECT C: IMPROVEMENT OF FINAL DISPOSAL PLANNING AND OPERATION

The purpose of the Pilot Project C is to strengthen the capabilities of the relevant SWMRMC and Municipalities' staff on planning, design, construction supervision and operation of sanitary landfill site in order to eliminate open dumping and also to develop the landfill system suitable for the Kathmandu Valley. For realizing this achievement, the various activities were performed as described in Main Report and Supporting I Report. Also several technical reports and/or outcomes for capacity development were generated in the course of the Pilot Project activities.

The following are the outlines of the reports/outcomes being compiled herewith. C-1, C-2 and C-3 were a series of reports/outcomes generated under the Training on Initial Environmental Examination (IEE) for Long-term Landfill Site Development.

C-1: Practice of Evaluation of Potential Landfill Sites at Bungamati

Through the discussion of the Umbrella Concept, one (1) candidate site in Okharpauwa area (Banchare Danda) and two (2) candidate sites in Bungamati area (Pharsidol North and Pharsidol South) were nominated as the long-term LFSs for KMC and LSMC. C-1 of the Pilot Project C was to i) evaluate the suitability among the latter two sites of Bungamati, and ii) to select the optimum one from environmental, social, and technical/engineering viewpoints. The Pharsidol North site was selected as the optimum one.

C-2: Practice of Scoping and TOR for Banchare Danda Landfill Site in Okharpauwa

C-2 of the Pilot Project C was carried out with the aim at capacity development of the Nepalese side through a practice on preparation of draft scoping report and TOR for EIA on Banchare Danda long-term LFS, with fulfilling the requirements stipulated in Nepalese legislation (Environmental Protection Acts, Environmental Protection Rules, etc.) and the National EIA Guideline for Solid Waste Management Project for Municipalities of Nepal, SWMRMC. The outcome of the C-2 was intended to have a document which would be able to be used for official process of the EIA in Nepal, excluding the public notice and public meetings.

C-3: Practice of Scoping and TOR for Pharsidol North Landfill Site in Bungamati

After selection of Pharsidol North site through the C-1 practice, C-3 was carried out with the same aim as the C-2 with targeting Pharsidol North LFS.

C-4: Practice of EIA at Taikabu Landfill Site

C-4 was an outcome generated through capacity development activities on EIA for landfill site development by targeting Taikabu LF, being composed of i) outcome of preparing a concept design which was a prerequisite condition to conduct EIA, and ii) outcome of examining possible impacts and necessary mitigation measures to be incorporated into EIA.

C-5: Detailed Design and As-built Drawings for Improvement Work at Sisdol Short-term Landfill

C-5 was a technical report generated through the design and development of Sisdol Short-term LF of which the aim was to transfer the technology on cost effective and environmentally friendly landfill system to the Nepalese side.

C-6: Operation Manual for Sisdol Landfill

As one of technology transfer to the Nepalese side for well operating a sanitary semi-aerobic landfill, an Operation Manual of Sisdol Landfill was prepared by the JICA Study Team, and has been revised jointly by the Team and Nepalese side through the operation practice at the site under the Pilot Project C. C-6 is the latest version of Operation Manual of Sisdol Landfill, and the Manual would be revised again by the Nepalese side, if necessary along with accumulating the experiences of Sisdol operation.

C-7: Environmental Monitoring at Sisdol Landfill Site

C-7 was a technical report showing the water quality monitoring on Sisdol S/T-LF, which was carried out with the aim that the Nepalese side could have a capability to confirm the technical validity and lessons learnt for appropriate manner of semi-aerobic landfill.

Pilot Project C-1

***Practice of Evaluation of
Potential Landfill Sites at Bungamati***

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1. INTRODUCTION

1.1 Background

A study carried out in 1997 by Department of Mines and Geology had identified 19 possible landfill sites. Solid Wastes Management and Resources Mobilization Center (SWMRMC) has been trying to develop the landfill sites from these sites. Number of possible sites were initiated and had to be dropped because of opposition and objections from the local people. Some of the sites were found technically not suitable for the landfill site. SWMRMC has developed the sanitary landfill site (SLS) for solid wastes disposal of Kathmandu Valley Municipalities at Sildol in Okharpauwa VDC of Nuwakot district. The Sildol SLS is in operation from June 5, 2005. This site could accommodate wastes disposal for 3 years only. By the end of third year of Sildol LFS operation, another landfill site has to be ready.

Under these backgrounds, the selection practice of the Long term Land Fill Sites for the municipalities of the Kathmandu Valley targeting Pharsidol North and Pharsidol South two identified sites, which are located in the close proximity of KMC and LSMC, was conducted as part of Pilot Project C.

1.2 Objectives

The objectives of the evaluation is to select the optimum site for the long term landfill site with due consideration of environmental, social and technical aspects.

1.3 Methodology

SWMRMC has recently prepared a guideline for solid wastes management for the Municipalities of Nepal. The guideline comprises of checklist for initial environmental examination (IEE) of the potential landfill site. The guideline is the matrix of parameters v/s level of impacts. The guideline divides the parameters in six broad categories. Each parameter has been assigned relative weightage and the impacts have been divided into three levels. The relative weightage and the level of impact derive a score of each parameter. List of parameters with given relative weightage is presented in Table 1-1.

Table 1-1 List of Parameters and Their Relative Weightage

	Parameters	Relative Weightage
1	Land scape / geology	17 %
	Surrounding Slopes	4
	Basement of Sanitary Landfill	3
	Permeability of Subsoil	5
	Availability of Liner Materials	2
	Availability of Cover Soils	3
2	Hydrology	20 %
	Watershed	2
	Management of Surface water runoff	3
	Groundwater and level movement	4
	Distance from sources such as springs wells and stream	4
	Use of water downstream	3
	Absorptive capacity of water body receiving leachate	1
	Danger of floods	3
3	Sanitary landfill potential & access	12 %
	Capacity	3
	Potential of extension	2
	Distance from source of waste	5
	Access to sanitary landfill site	2
4	Biotic environmental	10 %
	Vegetation/ Forest	3
	Wildlife	2
	Aquatic life	2
	Rare and endangered species	3
5	Socio-economic and cultural environment	23 %
	Distance of the settlement or institution from the site	4
	Land use at the site	2
	Land ownership at the site	3
	Cultural/religious site	4
	Impact on local economy	3
	Traffic	1
	Aesthetic	1
	Attitude of local people	5
6	Sanitary land fill management and general safety	18 %
	Leachate treatment	5
	Landfill gas management	2
	Birds hazard to aircraft	3
	Control of spreading of odour and waste	3
	Buffer zone	5

Source : SWMRMC Guidelines

The field reconnaissance at all the given sites and prepared preliminary evaluation of all sites were implemented. It was presented in a workshop on May 16, 2005. It was suggested to make the evaluation in a larger groups involving representative from stakeholders such as SWMRMC, KMC, LSMC and KRM. An evaluation was carried by the representatives from the stakeholders on May 25, 2005. It was a kind of brain storming of the counterpart personnel in the making the evaluation.

2. PILOT PROJECT AREA

2.1 Location

Both Pharsidol North and Pharsidol South site are located in the Ward no 9 of Bungamati VDC of Lalitpur District. Khuipa Village one of old settlement of Jyapu community group of Newar ethnic group is located on the nose of small hill. Pharsidol North is located on the northern valley of this settlement and Pharsidol South is located on the southern valley.

2.2 Access

The site is about 10 km from center of Kathmandu, Teku and 5 km from the ring road, Satdobato, Lalitpur. It is about 1 km from Bungamati Village. There is a black top road upto Bungamati. Remaining is a gravel road.

2.3 Physical Environment

The size of valley of Pharsidol North is about 45 ha whereas it is about 25 ha in Pharsidole South. The surrounding slope of the valley in the North Site is comparatively flatter than South site. Pharsidol North Site is directly visible from the other side, settlements of Chalnakhel VDC of Kathmandu district. Pharsidol North is located in greater distance to Khuipa Village compare to Pharsidol South. But there are six houses on the western edge of the Pharsidol North site. Pharsidol South is located at 12.5° from the axis of the Tribhuvan International runway whereas Pharsidol South is located at 13.5°.

2.4 Biological Environment

Land use of both sites is cultivated land. There is no major biological resources as such in the sites as well as in the vicinity. There are no wild life and aquatic life as such in the site and in the vicinity.

2.5 Socio-economic Environment

The total population of the Khiupa village is 1,052 comprising 45 households with 126 males and 117 females. The people of the village belong to Newar ethnic groups. Majority of the people are engaged in agriculture. The village has potential for cereals, vegetables and potato development. The village is linked with motorable road. There is electricity and drinking water supplies in the village. About 45 ha of private cultivated land needs to be acquired for the development of the site. There is no physical infrastructure within the proposed landfill site area. However there are number of brick kilns in the operation in the vicinity of the site.

2.6 Cultural Environment

The Khuipa village bears a significant cultural and religious importance due location of second temple and a religious house of god Machhindra Nath. Rato Machindra Nath god is kept in Bungamati Village. The **chariot festival** of Rato Machindra Nath in Lalitpur which is celebrated by the majority of Kathmandu and Lalitpur municipality and its surrounding VCDs. Prior to the chariot festival, the idol is taken to Khuipa Village enroute to give the bath in Katuwal Daha. After the bathing ceremony in Katuwal Daha, the idol is brought back in Khuipa Village and taken to chariot festival in Pulchowk, Lalitpur. This Chariot festival goes on for almost a month. It ends with Bhoto Jatra in Jawalakhel attended by high dignitaries and Royal Family members. The Maharjans of the Khiupa Village are culturally and religiously assigned to collect the timber and twigs necessary for the construction of the chariot.

Similarly Bungamati Jatra (festival) is also one of the well known festival of Jyapu ethnic group of Newar community. On the ninth day (nawami) of Dasahara festival, Rato Machindra Nath idol is brought to the Khuipa Village, kept over night and performed ritual pooja. The Bungamati Jatra commences from the next morning. After the Jatra the idol is taken back to Bungamati Village.

3. Evaluation

The evaluation of the sites was carried out using the Checklist for Initial Environmental Examination of Potential Sanitary Landfill Site given in the Guideline of the Solid Wastes Management for Municipalities of Nepal, 2005. Biological and socio-economic and cultural environment is same for both sites whereas the physical environment of Pharsidol North is comparatively better than Pharsidol South. It also has a larger capacity. The total score of Pharsidol North is 326 whereas the total score of Pharsidol South is 312 only. The Detail Checklist of both sites is presented in Annex 2. It is summarized in Table 3-1.

Table 3-1 Summary of IEE Evaluation

Parameter	Relative weightage	Remarks		
		Pharsidol North	Pharsidol South	Remarks
Landscape/geology	17%	79	71	Steep slope surrounding in Pharsidol South
Hydrology	20%	66	66	
Sanitary landfill potential and access	12%	42	42	
Biotic environments	10%	50	50	
Socio-economic and cultural environment	23%	35	35	
Sanitary landfill management and general safety	18%	54	48	Proximity with airport is closer for Pharsidol South
Total	100%	326	312	

Source: Task forces of SWMRMC, KMC, LSMC

4. Conclusions

The advantage of both Pharsidole sites is the close proximity from the KMC and LSMC. They are located within the Kathmandu Valley, about 5 km from the edge of the Ring Road. But the location of Khuipa Village within the immediate vicinity of Pharsidol sites is the most critical and disadvantage issue because Khuipa Village carries highly significant cultural value of Rato Machchendra Nath.

Among the two sites of Pharsidol, Pharsidol North is found to be better sites compared to South because of the following reasons:

- The area of Pharsidol North is almost double compare to South
- The surrounding slopes of Pharsidol North are flatter
- Proximity to the Tribhuvan International is greater in Pharsidol North
- Distance to Khuipa Village is greater from Pharsidol North

One of the disadvantage of Pharsidol North site is that it is directly visible from the settlement of Chalnakhel VDC of Kathmandu District located on the other side of Bagmati River.

Pilot Project C-2

***Practice of
Scoping and TOR for EIA
on Banchare Danda Landfill Site
in Okharpauwa***

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SCOPING SESSION

1 INTRODUCTION

1.1 Background

Solid Wastes Management and Resources Mobilization Center (SWMRMC) has developed the sanitary landfill site at Sisdol in Okharpauwa VDC of Nuwakot district. The Sisdol SLS is in operation from June 5, 2005. The EIA report of Sisdol SLS was approved by Ministry of Environment and Population with the condition that Ministry of Local Development should initiate the EIA Study of Banchare Danda Landfill Site without any delay because the Sisdol Landfill site is useful for the short term period only. Sisdol Landfill site has been developed two phase. At present the infrastructure for the Valley 1 has been completed. It has capacity for about 18 months period. Infrastructure development for Valley 2 is ongoing. It will have capacity for another 18 months. Sisdol Landfill site can accommodate waste disposal for 3 years period. By the end of third year of Sisdol LFS operation, another landfill site has to be ready. Under these backgrounds, Banchare Danda Landfill Site is selected one of the candidates for the long term landfill site. Sisdol SLF is considered to be a good precedent in sanitary semi-aerobic manner from the viewpoint of not only the engineering/technical but also environmental/social issues. The proposed landfill site at Banchare Danda will also in semi aerobic system.

The Schedule 2 of the EPR, 1997 obliges the Proponent, intending to construct Landfill Site for more than 1,000 ton of waste per year or serving more than 10,000 populations has to prepare the EIA report according to the legal process (HMG/N, 1997). As this type of project should directly follow the EIA process and there is no need for screening the proposal.

Prior to the EIA study a scoping exercise is required to draw the terms of reference for the EIA study. The main objective of the scoping exercise is to provide key issues that should be included in the Terms of Reference (TOR) for EIA study. The National EIA guidelines (Chapter IV), including the draft EIA guidelines for the Wastes Management Sector, 1996 and recently completed Guidelines for Solid Wastes Management Project in the Municipalities of Nepal also call for ensuring public involvement, collecting relevant information, identifying major issues of public concerns, evaluating the seriousness of the issues, and establishing priorities for EIA study.

With this in background, this document for the Scoping includes:

- information on the project,
- legal requirement for environmental assessment,¹
- objectives of environmental scoping,
- existing environmental conditions,
- scoping methodology,
- priority issues, and
- work schedule

¹ Legal requirement such as publication of public notice, collection of issues and concerns from the VDCs have not been complied yet.

1.2 Project Description

1.2.1 Location

The proposed landfill site is located at the boundary of Ward 4 of Okharpauwa VDC of Nuwakot District and Ward 9 of Chatre Deurali VDC of Dhading District. It is situated at latitude 307318 N and longitude 621520 E. The Kalpu Khola meanders towards east at this location. This khola is the political boundary between Nuwakot District and Dhading District. Western part of the khola is Dhading District whereas east part is Nuwakot District. The project intends to open up a channel at the throat of the meandered section so that the meandered area and its vicinity could be used for the landfill site. The total area of the meandered area is 45 ha with maximum height of 50 m. The area comprised of about 2 ha of river bed, 8 ha of cultivated land, 40 ha of barren land. This site is located about 2.5 km east of Sisdol Landfill Site.

1.2.2 Access

The proposed site is about 26 km from Kathmandu. The access road to Sisdol Landfill site is connected from Tinpipale (at 18 km of Kathmandu Trisuli Road). Remaining 8 km length has been recently completed mainly for the Sisdol Landfill site. SWMRMC is extending this road to Banchare Danda, the proposed site, This extension is about 2.5 km. It is understood that the extension of the road is a part of agreement with the local community in the operation of Sisdol Landfill site.

1.2.3 Waste Generation

The proposed landfill is meant for: Kathmandu Metropolitan City (KMC), Lalitpur Sub Metropolitan City (LSMC), and Kirtipur Municipality (KRM). Solid wastes will be collected from collection points of these municipalities, taken to i) the existing transfer station located at Teku, and ii) the planned transfer station at Balaju, for transporting the wastes to the proposed landfill site. A waste processing facility (WPF) is also under being planned with functions of segregation as well as composting in order to reduce the waste amount to be disposed of at the proposed site.

The total population of these municipalities is estimated at 1,096,472 in 2008 with the population growth rate 3.2 %, total population is estimated at 1,368,743 in 2015. With average waste generation rate of 0.445 kg/capita/day in 2008, total 487.9 ton of solid waste will be generated per day. Out of which 156.1 ton will be recycled and 331.8 ton of waste will be taken to the landfill site. The annual waste generation volume is presented in Table 1.2-1.

Table 1.2-1 The Annual Waste Generation Volume

Year	Population	Waste Generation Rate (Kg/cap/d) ^{*1}	Total Waste Quantity (mt/day)	Disposal Quantity (mt/day)
2008	1,096,472	0.445	487.9	331.80
2009	1,132,532	0.454	514.1	354.40
2010	1,169,784	0.463	541.6	309.10
2011	1,208,271	0.472	570.1	334.10
2012	1,246,524	0.482	600.5	359.60
2013	1,285,993	0.492	632.4	315.20
2014	1,326,720	0.502	665.4	339.00
2015	1,368,743	0.512	700.3	357.20

*1: Weighted average of three municipalities

Source: JICA Study Team

1.2.4 Concept of Proposed Landfill Site

The proposed landfill type is semi-aerobic in which the leachate of the waste deposit is collected in pond through perforated pipes embedded in graded boulders. The outlet pipe of leachate collection pipe is kept at least 1.0 m above leachate full supply level. Fresh air is drawn into the layers thereby introducing an aerobic condition around the pipes. The leachate collection pipes are connected to the number of vertical vent pipes, which are extended beyond the waste deposit level so that the air could pass through the leachate collection pipes and semi aerobic condition is maintained in landfill site. In order to prevent the leachate percolation to the ground water the entire landfill site is sealed by the thick clay layer. The collected leachate will be retained in the leachate retention pond and be pumped back on the surface of the waste deposit. The schematic presentation of Semi-aerobic System is shown in Figure 1.2-1.

The main design concept for the proposed semi aerobic land fill site is presented in Table 1.2-2

Table 1.2-2 Concept Design Consideration

Sanitary landfill system	Semi-aerobic, level 3 + (composite liner)
Horizontal liner	Geo-membrane (2 sheets) + clay (1.0 m) with groundwater drainage
Leachate treatment	Biological treatment (aeration and re-circulation) and natural reed bed)
Landfill gas	Passive venting
Waste dams	Reinforced concrete for Banchare Danda (25 m)
Perimeter slope	Basically maintain present slopes with slight adjustment

Source: JICA Study Team

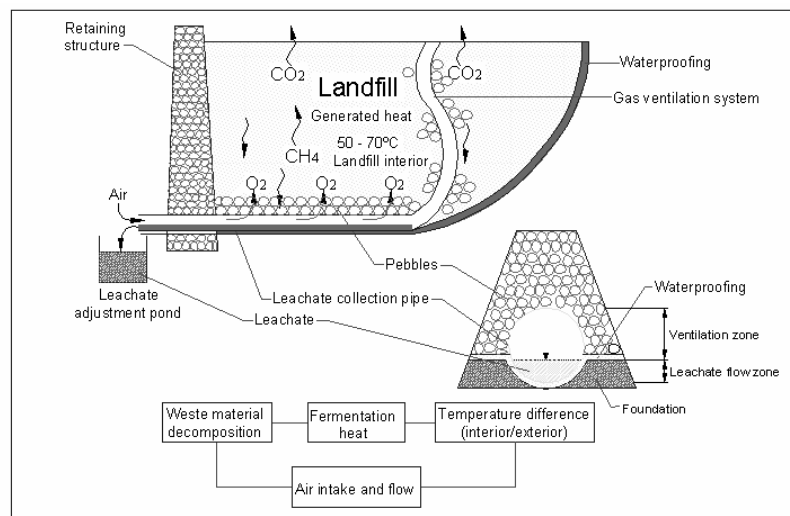


Figure 1.2-1 Schematic Semi-aerobic System

Source: The Fukuoka Method, Fukuoka City Environmental Bureau

1.3 Policies, Laws, Guidelines and Manuals

1.3.1 Environmental Policy

The environmental consideration was mooted in the development projects and a program was initiated since the early 1980s. HMG formulated environmental polices in the Sixth Plan (1980-'85) on the need for carrying out EIA study for infrastructure projects and

programs. The need for EIA study was further emphasized in the Seventh and the Eighth Plan.

The Ninth Plan (1997-2002) endorsed environmental pollution as a serious problem at the policy level and stress on the need of public participation in initiating the environmental protection and management programs. It further emphasized on the establishment and implementation of emission standards on water, air, noise and land pollution. The policy further stressed on the need and development of appropriate policy in different sectors. To strengthen the local institution on the solid wastes management, National Council for the Solid Wastes Management was constituted in 1997. The council framed a National Policy on Wastes Management in 1998. The policy comprised of most of the ingredients for the effective solid wastes management such as strengthening of local bodies in wastes management and sanitation services, launch public awareness promotional programs for the wider public participation, involve NGOs and CBOs in the solid wastes management, make wastes disposal system based on the solid wastes quality and nature, promotion of recycling and reuse of the solid wastes, encouragement of wastes reduction at the sources, involvement of the private parties at the different level of solid wastes management and make the financially self reliant solid wastes management institution.

The Tenth Plan (2002-2007) also emphasized on carrying out environmental impact assessment. This Plan has also made commitment to conduct Strategic Environmental Assessment (SEA). The Tenth Plan has included establishment of Environmental Protection Center under Ministry of Population and Environment as well as Environment Protection Fund by effective implementation polluters pay principle and polluter prevention fee. This plan has clearly visualized that the cost of wastes management will have to be shared by the polluters.

1.3.2 Environmental Legislation

Recognizing the role and benefit of EIA study in making the development projects and programs environmentally sound and sustainable, HMG has enforced the *Environment Protection Act (EPA), 1997* and the *Environment Protection Rules (EPR), 1997*. The legislation obliges the proponent(s) to prepare EIA report for the prescribed projects by following the legal process as detailed out in the EPR, 1997.

Article 3 of the EPA, 1996 obliges the proponent to conduct EIA study for the prescribed proposals. The Act warns the proponent not to implement any prescribed proposals without approving EIA reports (Article 4). Article 6 of the Act empowers the concerned Ministry and Ministry of Environment, Science and Technology (MOEST) to approve the IEE and EIA report respectively. The proposals, requiring EIA study are prescribed in Schedule 2 of the EPR, 1997.

EIA processes are elaborated in the *Environment Protection Rules, 1997* (amendment 1999). Rule 4 of the EPR empowers MOEST to determine the Scoping Report for all proposals requiring EIA study. Prior to the preparation of the Scoping Report, the proponent should publish a 15-day notice in the national daily newspaper to let the Village Development Committees or Municipalities, health posts, schools and other stakeholders know about the proposal and provide them an opportunity to offer their written opinions and suggestions with regard to the issues that should be looked into during the EIA study. The regulation also obliges the proponent to include the concerns and suggestions of the individuals and

institutions in the Scoping Report and process for its determination by MOEST. It should determine the Scoping Report as per Rule 4 of the EPR, 1997 (amendment 1999) in the proposed or amended form.

1.3.3 Relevant Acts

Solid Wastes (Management and Resources Mobilization) Act, 1987:

This act was exclusively formulated for the purpose of the solid waste management mainly in the cities. This act led the formation of SWMRMC with the authority and responsibility to manage all aspects of Solid waste including collection, transportation, treatment and disposal of solid wastes including hazardous wastes. But the Local Self Governance Act in 1999 has made the local municipalities responsible for the municipal solid waste management, which also authorizes to punish the polluters. With enactment of this Local Self Governance Act Solid Wastes Act, 1987 has been less effective.

Town Development Act, 1988:

This act empowers the Town Development Committee to regulate, control or prohibits any activities which will have an adverse effect on public health or the aesthetics of the town or any way pollutes the environment.

Municipality Act, 1990:

It stipulates the legal provision for the urban environmental protection, sanitation services prevention/control of pollutants and management of solid and liquid wastes detrimental to public health.

Local Self Governance Act, 1999:

This act has made District Development Committee as the apex of the local government. It has made municipalities responsible for managing the municipal solid wastes and even empowers to fine up to Rs. 15,000.00 to the polluters for the haphazard disposal of solid wastes. It also contains the provision of conservation of natural resources and cultural values with the jurisdiction.

1.3.4 Other Legislation

Few other legislation is also attracted for the construction the Landfill site. The site comprised of a community forest areas. The *Forest Act, 1992* (amendment 1998) emphasizes development and implementation of approved work plan in different category of forests - national forests, community forests, leasehold forests, private forests and religious forests. The work plan should contain a list of activities that should be implemented in the forests. The forestry legislation has a special provision and empowers HMG/N to enforce its Article 68 to provide parts of any types of forests for the implementation of a national priority plan with the assurance that it does not adversely affect the environment significantly (MFSC, 1995). The Forest Rules, 1995 (amendment 1999) further emphasizes the need for managing forests as per the work plan. Furthermore, HMG/N has given legal protection status to 13 plant species and banned felling, transportation and export of champ (*Michelia champaca*), khayer (*Acacia catechu*), and sal (*Shorea robusta*). Legislation related to protected area management is not attracted in this project as the propose landfill site does not have such species.

The *Local Self Governance Act, 1999* contains several provisions for the conservation of soil, forest and other natural resources, use of construction materials such as sand, gravel and

stone and implement environmental conservation activities (Articles 28, 43, 93, 96, 111, 189, and 201). Article 3 and 4 of the *Land Acquisition Act, 1977* empowers HMG to acquire land for any activity by providing compensation as determined.

1.3.5 EIA Guidelines

Before and after the enforcement of EPA (1997) and EPR (1997), various environmental guidelines have been developed to integrate the environmental aspects in development projects and programs. Before mid-1990s, HMG/N endorsed and implemented the procedural environmental guidelines such as National EIA guidelines in 1993, and separate EIA guidelines for Forestry and Industry Sectors in 1995 (NPC, 1993, and MFSC and MOIC, 1995). These guidelines assist the proponent to identify the likely impacts of the projects on the environment, propose mitigation measures and conduct monitoring to make the projects environmentally sound, less costly (economically feasible) and technically appropriate. These guidelines facilitate the proponents to prepare the project level environmental assessment (IEE or EIA) reports

SWMRMC has recently prepared Guidelines for Solid Wastes Management Projects in the Municipalities of Nepal, 2005. It is the most important guideline that facilitates the proponents, consultants and the contractors to integrate environmental aspects in the wastes management. This guide lines gives detailed require of environment legislation for the waste management and guides the proponent, consultants and contractor in preparing the environmental studies such as environmental screening, IEE, environmental scoping, preparation of ToR, EIA study of waste management.

The review of legal and administrative instruments indicates that the proponent should prepare EIA report based on environmental legislation and this Scoping Report is one of the components of legal compliance. These instruments will further be assessed during the EIA study and mitigation measures will be proposed based on identified and predicted impacts on environment to minimize them during the road construction and operational stages.

1.4 Objectives of Environmental Scoping

The main objectives of the Scoping are to inform the stakeholders about the project, receive their comments and suggestions on relevant environmental issues and identify priority environmental issues for addressing during the preparation of the EIA report. The specific objectives are to:

- identify environmental concerns and issues for consideration in the EIA report;
- provide an opportunity for public involvement in determining the environmental aspects to be assessed;
- document and sort out relevant environmental issues raised by the stakeholders;
- prioritize environmental issues that should be incorporated in the TOR for EIA study and
- focus the study on reasonable alternative.

1.5 Proponent

SWMRMC, Ministry of Local Development, is the proponent for this LFS.

1.6 Project Area Delineation

The physical location of the solid waste disposal site and its infrastructures are the main site, which will be acquired for the construction of the project. Apart from that, the project will have its impact on its vicinity for the longer distance. The waste disposal activity may leave bad odor in its vicinity. How far the odor will remain, it is difficult to predict at this stage. However some of the studies carried out else where in the other developing countries specifies that a landfill site should have buffer distance of about 300m.

Birds hazard and ground water contamination by the leachate are the two major issues that will be having long distance impact due to the landfill site. According to the guideline of ICAO/CAAN, airport strip of the international should be located at least 3 km radial distance from the edge and the air path should be cleared for 12.5⁰ from the axis of the air strip whereas there is no guide line or regulation as such for the location of the ground water well in Nepal. It depends upon the technical precautionary measures taken in the design and soil type.

2 EXISTING ENVIRONMENTAL CONDITIONS

2.1 Physical Conditions

The proposed landfill site is deeply meandered valley of Kalpu Khola. Area of the valley will be about 25 ha. Height of the valley is 100 m, which gives the large capacity for the land, fill site. The present land use of valley will be river bed (6), irrigated land (8%), private barren land (15%) and government barren land (71 ha).

The soil types in the valley are basically alluvium on the riverbeds and composed of granite and gneiss boulders and also the boulders of the meta-sandstone. On the lower part of the hill slope contain of the colluvium as well as the residual soils and composed of meta-sandstone and gneiss. But on the upper part of the hill slope is composed of thick residual soil, which is originated from the weathering product of the gneiss and schist.

The hill slope is around 40⁰-60⁰ at the lower to middle parts of the site and the upper part is about 10⁰ degree.

The proposed landfill site experience the sub-tropical climate with an annual precipitation of about 1,847 mm. Out of which 70 % of the rainfall occurred in 3 months monsoon period (July-Sept.). The area experience and average temperature at the valley of Kalpu Khola in Okharpauwa is 21°C with maximum and minimum temperature of 41°C and 4°C respectively. As reported in the mean monthly discharge of Kalpu Khola ranged from minimum 0.31 m³/s in may to maximum of 5.79 m³/s in August.

Geologically the proposed landfill site is located on the metasandstone, schist of the Tistung Formation of the Bhimphedi Group, Kathmandu Complex, and Central Nepal. The Tistung Formation is composed of dark grey, fine-grained metasandstone intercalated with the dark grey schist and phyllite. Geologically, the area covers part of north flank of the Mahabharat synclinorium and occupying of Shivpuri gneiss. But in the project area, the gneiss is exposed only in the north of the Kalpu Khola.

The rocks around the site are fresh to slightly weathered in condition with attitude of N40W/45 (dip direction/dip amount). But on the upper part the slope is about 10 degree. The hill-slope around the site is covered with colluviums as well as the residual soils. The thickness of the colluviums is less than 1 m in the lower part of the site and about 1-1.5 at the middle part of the site whereas the upper part is cover with residual soil and is about 3-4 m in thickness. The lower part from riverbed, the thin to thick bed (0.1 to 1 m in thickness) rocks is exposed. The rocks are very less fractured but highly fractured in the northern part of the valley due to a local fault. The gully erosions are not well developed around the site. In the northern part of the site some of the tributaries have brought some debris. The central part of the site is composed of alluvium deposits at the northern part whereas the other part is composed of the fresh rocks.

The main geological structure of the site is the local fault at the northern edge extending from east to west and this separates the gneiss and the meta-sandstone of the Tistung Formation. The fault is considered not so active because there are no fresh slides in the vicinity. Some of old slides are covered with vegetations and not reactivated. Hence this fault is considered as the imbricate fault of the Kalpu Khola Fault, which is also extending east to west direction.

The proposed site is located with facing to the Kolpu Khola, and river diversion and training works will be necessary for the site development.

There are no discharge gauging stations for the Kolpu Khola, thus the hydrological conditions (river flow regime) at the proposed site are unknown. However, the following information which have been consolidated for Sisdol Short-term LF development are available for facilitating the discussion on the hydrological conditions related to the proposed site.

- 1) According to the data recorded at the Kakani rainfall gauging station which is located within the catchment of the Kolpu Khola, mean annual rainfall is 2,894 mm, and the maximum daily rainfall is ranging from 74mm to 161mm in 25 years (1972-1990, 1995-2000).
- 2) Runoff analysis (flood discharge volume analysis) was preliminarily made at the Sisdol point, as shown in the table below.

**Table 2.1-1 Probable Flood Discharge Volume in Each Return Period
(Estimated at Sisdol Point)**

Return period (year)	2	5	10	25	50	100
Probable flood discharge volume	263	316	352	396	430	462

Source: JICA Study Team

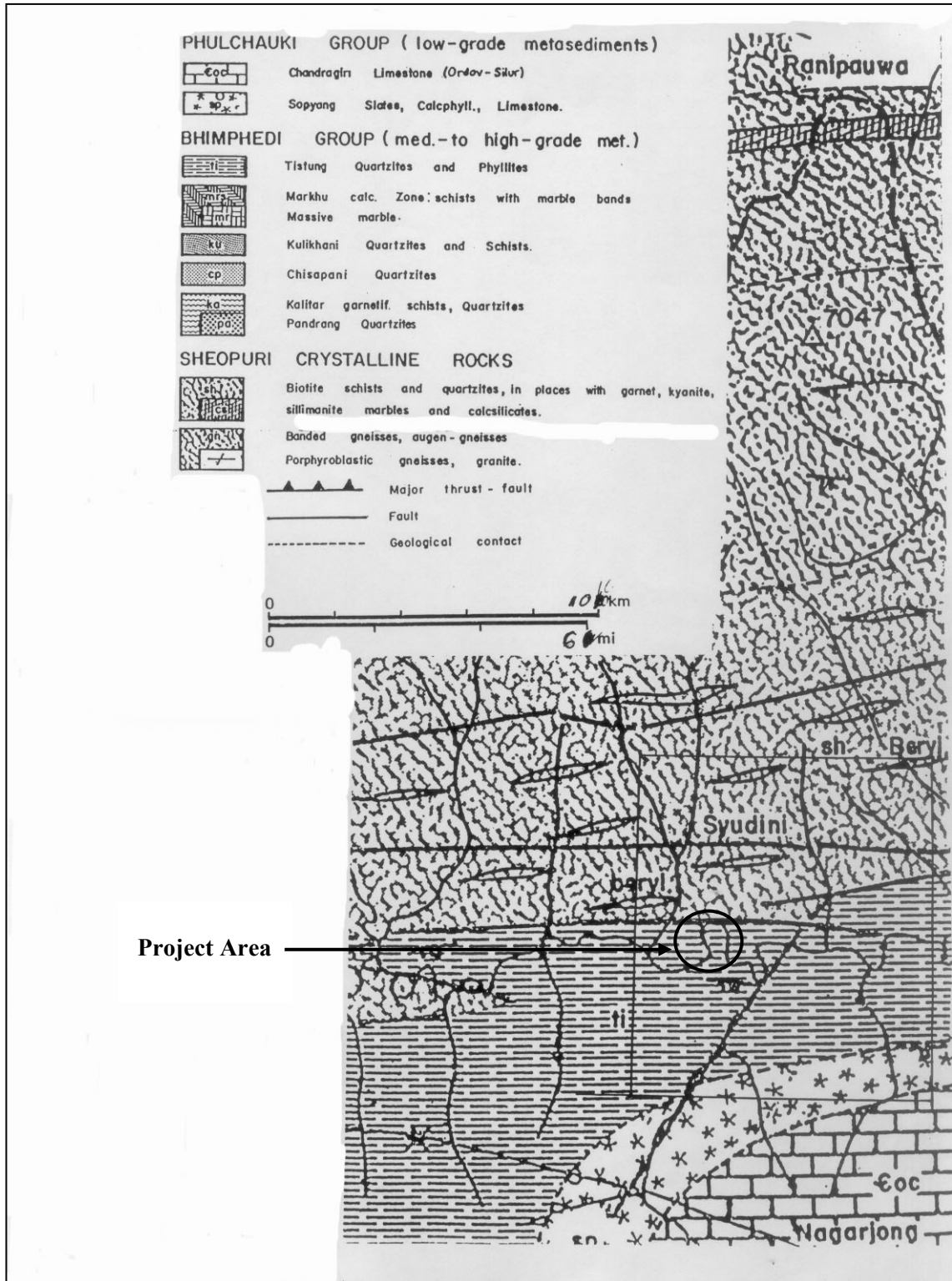


Figure 2.1-1 Geological Map

Source : DOMG

2.2 Biological Resources

The proposed landfill site does not have big tree of size 30 cm diameter at the breast height (dbh). The western hill slope of the proposed site is covered by Thulo Thumka Tatha Banchare Pakha Community Forest. This community forest has not been formally registered yet in the District Forest Office as they are located in the administrative boundary of two districts namely Nuwakot and Dhading. As reported by the local people, 34 households from the Seudeni Village is maintaining and utilizing part of the this community forest. The commonly found vegetation species in the project area vicinity are sallo (*Pinus roxburghii*), Kyamun (*Ficus semicordata*), Utis (*Alnus nepalensis*), chilaune (*Schima wallichii*), Dhanyero (*Woodfordia fruticosa*), titepatu (*Artemisia indica*), bhogate (*Citrus spp.*), amla (*Embllica officinalis*) and dhaheri (*Woodfordia fruticosa*).

The occasionally seen animals in the community forest are jackal (*Canis aureus*), porcupine (*Hystrix indica*), salak (*Manis spp.*). Commonly seen birds are dhukur (*Emerald dove*), jureli (*Pycnonotu cafer*), koili (*Eudynamys scolopacea*) crow (*Corvus macrorhynchos*), kaliz (*Lophura leucomelana*), titra (*Francolinus francolinus*), and dhobi (*Copsychus saularis*). Common reptiles found in the study area are; Snakes, lizards, Gohoro etc.

The Kalpu River has does not have many fish in the water. Hile (*Channa orientalis*) and Katle (*Katla katla*) are two species that had been reported. Both are local and common species.

2.3 Socio-economic Characteristics

The total population of the Seudeni village is 1,052 comprising 200 households with 533 males and 519 females. The people of the village belong to Brahmin and Chhetri ethnic groups. Majority of the people are engaged in agriculture. The village has potential for vegetables and potato development. The village is not linked with motorable road. At present, there is no electricity in the village. About 1.5 ha of khet land in the proposed site belonging to the people of the village needs to be acquired for the development of the site. These lands have round the year irrigation facilities. Apart from the small irrigation channel, there are no other physical structures in the proposed land fill site.

The total population of the Katunje Dee gau Village is 1,235 comprising 238 households with 602 males and 603 females. The people of the village belong to Tamang ethnic group. Majority of the people are engaged in agriculture. The village has potential for vegetables and potato development. The village is not linked with motorable road. There is no electricity in the village. About 1.5ha of khet land in the site belonging to the people of the village needs to be acquired for the development of the site. No physical structures will be required to demolish for the project. Table 2.3-1 presents the land use, population, and ethnicity of the proposed landfill sites.

Table 2.3-1 Land Use, Population and Ethnicity in/around the Proposed Landfill Site

Administrative location of the site	Common village name covering the site	Nos. of HHs in village	Ethnic Groups	Remarks
Ward No. 9 of Okharpauwa VDC of Nuwakot District	Seudeni	238	Brahminan and Chhetri	<ul style="list-style-type: none"> - Agricultural land and community forest can be observed in the site. - About 3 ha of agricultural land in the site will be likely acquired.
Ward No.4 of Chhatre Deurali VDC of Dhading District	Katunje Dee Gaun	200	Tamang	

Paddy, wheat and maize are the major cereal crops grown in the agricultural and of the proposed landfill sites. The farmers do cultivate tomato also in small scale. The cropping intensity of these lands was reported to be 225 %.

2.4 Cultural Resources

Preliminary investigation indicates that there are no cultural heritage sites within the proposed site and its vicinity with few exceptions of Pattis, Chautaras and temples.

3. SCOPING METHODOLOGY

In order to conduct the Scoping, the environmental legislation focuses on the publication of public notice only. However, a number of methods have been included in the National EIA guidelines, 1993 to facilitate the preparation of such Report. Among them the most recent and relevant for this study is the Guidelines for Solid Wastes Management in the Municipalities of Nepal. The guideline emphasizes the need for making a plan for public involvement, collecting relevant data and information, providing necessary information to the people through all available media, identifying major issues of public concern, evaluating the seriousness of the issues, establishing priorities for EIA, and developing a strategy for addressing priority issues. Within this broad framework, the following methods have been used to conduct this Scoping.

3.1 Literature Review

Relevant information were collected through extensive review of literature. Information contained in the EIA Study of Sisdol Landfill Site, preliminary study of Banchare Danda Landfill site and District/Village Profile was reviewed. In addition, environmental legislation (EPA, 1996 and EPR, 1997), Guidelines for the Solid Wastes Management in the Municipalities were reviewed with due consideration on the type of information required for the Scoping Exercise. Apart from these, other relevant documents on airport and groundwater were also reviewed.

3.2 Public Notice ²

To comply with the existing environmental legislation and with the intention of informing the stakeholders about the project, Solid Wastes Management and Resources Mobilization Center published a 15 day public notice on _____ in the daily Gorkhapatra. Furthermore, the copies of the public notice were also pasted at the offices of the VDC's of the project area for providing local people an opportunity to offer their comments and suggestions and *Muchulkas* of public notice in the schools of the project .

The public notice calls upon the different stakeholders to offer suggestions and concerns on natural system, cultural practices, social system, economic and human activities, and interrelationships of environmental components as also indicated in the format of the public notice released by SWMRMC in the guideline. The concerns and issues offered by the local institutions such as DDC, VDCs, school, hospital, health post or concerned people are included.

Information provided by the stakeholders and the concerned parties have been duly considered in selecting the priority issues for EIA study.

3.3 Reconnaissance Survey³

A reconnaissance survey was conducted in preparing this Scoping Report from _____ to _____. The team made the reconnaissance survey of the project area and interacted with the local people. Besides, the proponent has interacted several times with the local people through the focused group discussion. This has facilitated the local people to understand the likely environmental issues of the landfill project. In addition, the Proponent organized a workshop on⁴ _____ to share information and seek the inputs of the local people and other stakeholders.

3.4 Issues Prioritization Methods⁵

Possible issues for the SWM by landfill were identified from the guidelines and similar studies carried out earlier. These issues were discussed with the local people likely to be affected by the project. They are prioritized according to the local condition.

4. ISSUES IDENTIFIED AND RAISED

4.1 Issues Preliminarily Identified from the Technical Viewpoint

(1) Physical Issues

Air Pollution: Air pollution would be worsened by waste transportation vehicles, although the increment of the traffic volume will be insignificant. Heavy equipment operation for the

² Public notice, public consultation, collection of issues and concerns from the VDCs and other local institutions has not been made yet. They have to be completed.

³ Date of reconnaissance survey to be included.

⁴ Date of workshop to be inserted

⁵ Issues collected from VDCs and local institutions will have to prioritize

site construction and operation might bring about the air pollution, although the impact will be confined within the limited area. Landfill gas will be generated in operation stage of the site.

Water Quality: Leachate generated from the landfilling area will potentially pollute the quality of i) groundwater around the site, and ii) river water of Kalpu Khola being used for the agriculture purpose in the downstream. In construction stage, it would be necessary to pay an attention on the water pollution due to discharging turbid/alkaline wastewater from the civil/concreting work areas.

Soil Pollution: There would be a risk to contaminate the soil in/around the site, if hazardous wastes would be mixed in the wastes to be disposed of in the site.

Noise: Noise would be worsened by waste transportation vehicles, although the increment of the traffic volume will be insignificant. Heavy equipment operation for the site construction and operation might bring about noise, although the impact will be confined within the limited area.

Geology: The geological condition of the proposed site is sound with an exception of existence of local fault at the northern edge. This fault passes from east to west direction and separates the gneiss and the metasandstone of the Tistung Formation. The fault is not so active because of the existing slides are covered with vegetations and not reactivated. This fault is considered as the imbricate fault of the Kalpu Khola Fault which is also extending east to west direction. The proposed site will include the existing river bed of Kalpu Khola. In general the river bed could be highly permeable to semi permeable with the possible contamination of surface water and ground water.

Hydrology: The catchment area of the proposed site comprises of number of small gullies which will need due consideration in managing the monsoon season high discharge flood. In addition the proposed site will have to be protected from the high flood of Kalpu Kola because the landfill site will be constructed at the meandered section of Kalpu Khola by making the river diversion.

Offensive Odor: Local concerns on odor will be raised based on the past experiences of SWM-related projects in the Valley.

(2) Biological Issues

The ecosystem in/around the proposed site is considered to be generally poor. However, due consideration should be paid on the small plots of unregistered community forests, likely disturbance of the movement of wild life, and aquatic biota in Kalpu Khola. The site operation would attract the birds and other animals from outside.

(3) Socio-economic and Cultural Issues

Resettlement and Land Acquisition: Involuntary resettlement due to the site development is not expected. Although the most of the land in the site is under the governmental ownership, the proposed project would occupy agricultural land, barren land, community forest area. Valuation and compensation of these lands could be one of the issues.

Local Economy: Simple project affected families (PAF) and severely project affected families (SPAF) needs to be identified with the acceptable criteria. Priority should be given

to SPAF and PAF while benefit sharing from the proposed project, in such ways as providing an employment opportunity. In addition, the waste pickers would be attracted to the site in spite of the distance from the city area. There could come out the issues on i) necessity of restriction of the waste picking activities in the site for securing the effective site operation as well as the safety of waste pickers, and ii) prevention from the health hazard of the waste pickers due to the hazardous/medical waste possibly mixed in the municipal waste.

Acceptance by the Local People: One of the most positive aspects of the proposed site is that the local people are mentally prepared and ready to accept the landfill site. Landfill Site at Sisdol is already in operation, which is about 2.5 km away from the proposed site. It is also located in Ward 4 of Okharpauwa VDC. A local committee (OSLSMCC) has already been formed to negotiate with the government and municipalities for the operation and maintenance of the landfill site. For Sisdol Landfill Site, local people have made trade off for local development against permitting the waste of Kathmandu valley to be disposed off in their area.

Transportation: KMC and LSMC could save so far their transportation cost of the waste, since Bagmati river dumping was being practiced with very short distance from Teku T/S or collection points within the cities. However, increment of the transportation cost is inevitable when the proposed Banchare Danda site starts to provide a service, therefore, KMC and LSMC are necessary to be ready for securing or allocating the budget with involving the central government as required in order to sustain the operation of the proposed site.

The road from Balaju to Tinpipale is single lane and passing through the edge of the Nagarjun Forest (Protected Forest for Royalty). And there has been objection and protest from the enroute settlement areas while transporting the wastes to Gokarna landfill site in the past. In order to reduce the traffic congestion and other probable obstacles, a by-pass road from Balaju to Tinpipale is under being designing. However, due consideration should be paid on the settlement area along the transportation road from Kathmandu to Banchare Danda during the operation stage of the site.

Accidents and Diseases: Risk of traffic accidents would be increased due to new traffic generation of waste transportation vehicles. Risk of infectious hazard would be remarked if the medical waste would not be properly managed.

Administrative Boundary: As stated earlier, the Kalpu Khola forms administrative boundary for Okharpauwa VDC of Nuwakot District and Chatre Deurali VDC of Dhading District. The proposed project intends to change the course of Kalpu Khola by opening the neck of the meandering part. If the Kalpu khola remains the administrative boundary (which is very likely) in dividing the district boundary, Some of the land of Dhading district will be transferred to Nuwakot district.

Location of Settlement in the nearby Vicinity: Seudeni Village of Ward no 4 of Okharpauwa VDC is located at the northern hill top of the proposed site whereas the Dee Village of ward no 9 of Chatre Deurali VDC is located on the southern hill slope of the proposed site. Both the village are within 300 m aerial distance from the edge of the proposed site. Aesthetic and odour could be concern for both the villages.

4.2 Issue Raised in the Course of Public Involvement⁶

Interaction meeting was held with the local committee for the waste management in Okharpauwa. Focused group discussion was held in Seudeni Village and Dee Gaon. People are mentally prepared that the Banchare Danda would be the next landfill site after Sisdol. The project will bring adequate fund for the local area development. The issues raised by the local people during the interaction meeting are listed below:

- Waste dumping will not be permitted. It has to be a Sanitary landfill with providing such measures as soil cover and leachate control at least in the same manner of Sisdol.
- The agricultural lands are irrigated and fertile. Grow three crops in a year.
- Land and other property compensation should be paid at the market price.
- Local people should get priority for the employment during construction
- Project information should be disseminated to the local people in time.
- Along with the landfill site, other development activities also should follow.
- Offensive odor from the landfill area should be controlled properly.
- Construction workers should be properly supervised in order not to encroach excessively local natural resources such as forest and wild life.
- Due considerations should be paid when construction materials exploited from the surrounding areas, in order to avoid/reduce the occurrence of associated impacts such as resettlement or environmental pollution.
- Local development program should be considered and secured along with the landfill development.
- Public health hazard should be avoided.

The concerns and suggestions of affected VDCs are presented in Annex 3 and summarized here below⁷:

5. PRIORITY EIA ISSUES FOR EIA STUDY

One of the reasons for the people of Okharpauwa VDC has agreed to have landfill site for the Kathmandu Valley is possible package of development activities in the area as an incentive. After seeing Sisdol Landfill Site, people are convinced that the proposed landfill site will not be dumping site. It will be a Sanitary Landfill Site.

The EIA study helps in identifying the likely impacts of the proposed actions on the environment. Even a small action may cause environmental impacts. As the EIA study should focus on the project, all issues raised by the stakeholders may not be equally important or relevant to the project. They may have number of issues. In this context, the Scoping Exercise should focus on sorting the issues directly related to the project in consideration. The basic philosophy of scoping exercise is to inform the stakeholders about the nature of the project, seek their opinions and suggestions, document all issues and select only priority issues for environmental impact assessment.

⁶ Probable issues that could be raised have included here. They will have to be revised depending upon the actual issues raised by the local people.

⁷ This part will have to be compiled after completing the official procedure on the public notice as well as receiving the written comments from the concerned VCD(s).

5.1 Physical Issues

5.1.1 Construction Stage

- Landscape disturbance, land stability, landslide, soil erosion, etc., due to the topographic change;
- Change in air quality due to dust and exhaust emission, change in water quality due to civil/concreting works, and noise level;
- Location and operation of quarries and borrow pits;
- Hydraulic change and river bank protection due to the river diversion works;
- Safety measures;

5.1.2 Operation and Maintenance Stage

- Land stability, landslide, and soil erosion, including geological hazard as the local fault passes through northern edge of the proposed site;
- Surface water hydrology;
- Air quality;
- Bad smell,
- Water quality (both surface and ground water) related to leachate generation and control
- Noise;
- Leachate;
- Gas generation, emission and migration;
- Availability of cover material
- Human health associated with the change in air quality and noise level along the road alignment.

5.2 Biological Issues

5.2.1 Construction Stage

- Loss of forest area as a part of land acquisition;
- Possible impact on flora, fauna (biodiversity);
- Disturbance to wildlife movement, and possible hunting and poaching;
- Use of forest products by the construction workers and construction activities;
- Community forests and associated issues;

5.2.2 Operation and Maintenance Stage

- Birds hazard;
- Impact on and growth of community forest;
- Loss of aquatic life;
- Disturbance to the wild life.

5.3 Socio-economic and Cultural Issues

5.3.1 Construction Stage

- Loss of agricultural land;
- Loss of agricultural products;
- Effect on irrigation schemes;
- Effect on health, sanitation and safety of local people and workers;
- Availability of local construction workers, employment opportunities and
- Mobilization of local people for construction.

5.3.2 Operation and Maintenance Stage

- Impact on local economy including the issues on the waste pickers;
- Community infrastructures;
- Aesthetic values;
- Public health hazard and
- Quality of life values.

5.4 Management Issues

After detail analysis of likely impacts of the project on the local environment, attempts should be made to manage both beneficial and adverse environmental impacts. Environmental management issues should be dealt with in detail during the EIA study for both construction and operational stages. The environmental management plan should take into account the mitigation measures for each impact identified, monitoring of impacts and environmental auditing components with environmental management responsibilities. The study should also highlight the reinstatement of public services likely to be affected by the project during its construction. Furthermore, the EIA study should take into account the project execution issues, as appropriate, strict management of contractor's work and use of appropriate technologies for construction.

6. WORK SCHEDULE

The work schedule for the EIA Study has been prepared to match with the overall time frame of the proposed land fill site development. It is to be noted that the recently commenced Sisdol Landfill Site has the capacity for three years only. At the end of third year this land fill site has to be ready. A work Schedule for the EIA Report Preparation and approval is presented in Figure 6.1-1.

S. No.	Activities	2005				2006				
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1	Submission of the Scoping Report and the TOR	■								
2	Approval of the Scoping Report and the TOR	■	■							
<u>EIA Study</u>										
3	Team mobilization			■						
4	Literature Review and preparation of field works			■						
5	Field Study				■					
6	Data compilation and Laboratory Testing					■				
7	Draft Report Preparation and Submission						■			
8	Preparation of Materials and Public Hearing							■		
9	Final Report Submission								■	
10	Approval of EIA Report									■

Figure 6.1-1 Proposed Schedule for EIA Report Preparation and Approval⁸

⁸ The schedule will have to be revised at the time to finalizing the Scoping Report.

TOR SESSION

1. NAME OF THE PROPONENT AND ADDRESS

Solid Wastes Management and Resources Mobilization Centre
Ministry of Local Development
Pulchowk, Lalitpur
Post Box:
Telephone:
Fax:

2 GENERAL INTRODUCTION OF THE PROPOSAL

Solid Wastes Management and Resources Mobilization Center (SWMRMC) has developed the sanitary landfill site (SLS) for solid wastes disposal of the Kathmandu Valley Municipalities at Sisdol in Okharpauwa VDC of Nuwakot district. The Sisdol SLS is in operation from June 5, 2005. The EIA report of Sisdol SLS was approved by Ministry of Environment and Population with the condition that Ministry of Local Development will initiate the EIA Study of Banchare Danda LFS without any delay because the Sisdol Landfill site is useful for the short term period only. Sisdol LFS has been developed two phase. At present the infrastructure for the Valley 1 has been completed. It has capacity for about 18 months period. Infrastructure development for Valley 2 is ongoing. It will have capacity for another 18 months. Sisdol Landfill site can accommodate waste disposal for 3 years period. By the end of third year of Sisdol LFS operation, another landfill site has to be ready.

Under these backgrounds, the selection on of the Long term Land Fill Sites for the municipalities of the Kathmandu Valley was conducted. Banchare Danda Landfill Site is one the candidates for the long term landfill site. Sisdol SLF is considered to be a good precedent in sanitary semi-aerobic manner from the viewpoint of not only the engineering/technical but also environmental/social issues. The proposed landfill site at Banchare Danda will also in semi aerobic concept.

2.1 Project Description

(same as the Section 1.2 of the Scoping Session)

3. OBJECTIVES

The main objectives of the EIA study are to:

1. Identify, predict and evaluate the potential impacts of the proposed landfill site at Banchare Danda, Okharpauwa;
2. Calculate loss of different categories of land, property, forest and other resources as a part of site clearance and maintaining the buffer zone for the proposed landfill site;
3. Recommend benefits augmentation measures, and preventive, curative, and compensatory measures to minimize the adverse environmental impacts along with environmental management plan;

4. Provide information for decision-makers about the environmental implications of the proposed landfill site and associate cost for benefits augmentation and adverse impact mitigation.

In order to meet the above objectives, the Proponent should collect and analyze environmental information in the Project area which comprises of proposed landfill site and its buffer zone as shown in above Figure 2.2. The EIA study should make every effort to quantify and evaluate site-specific impacts to the extent applicable in all resources within the direct impact zone.

4. REQUIRED INFORMATION AND DATA COLLECTION METHODS

The proponent should review literature(s), collect and analyse primary and secondary information on physical, biological and socio-economic and cultural resources within the project area. Available data from Sisdol Landfill Site should be reviewed. The Proponent should focus, but not limited to, the information collection on local physiography, geology/hydro geology, watershed condition, hydrology (surface/groundwater), soil condition and environmental pollution such as water quality, air pollution and noise major elements of physical environment for both construction and operational stages of the Project. The proponent should also estimate the loss of different land uses as a part of site clearance.

The proponent has an intention to include the following studies into the data collection and analysis:

- Water quality will be analyzed in and around the proposed site including the river and groundwater. The boreholes for groundwater quality analysis are expected to be installed in the course of the basic/detailed design stage. The analytical date will be determined with referring to the related standards as well as the EIA Guidelines prepared by SWMRMC.
- Water quality will be analyzed in and around the Sisdol Landfill Site including the river, groundwater and leachate. Landfill gas will be also measured in the Sisdol site. These information will be useful for examining the future environmental conditions in and around the proposed site. The secondary data such as the monitoring results being performed along with the Sisdol operation will be also studied.
- The operational condition of the Sisdol Landfill Site will be reviewed based on the site observation, hearing to the officials, and/or the records/reports related to the site operation, in order to have a supportive information for examining the likely impacts as well as for developing the mitigation measures and management plan. The review will include the odor, cover soil, leachate control system, landfilling activities and conditions, heavy equipment performance, in-coming waste volume and characteristics, traffic volume generation due to the waste transportation, status of complaints/grievances from the local, status of waste picking, animal/bird attracting, etc.
- Hydrological analysis especially for runoff/flood analysis will be made by participating in the basic/detailed design works to make sure the river diversion works. In order to have a quantitative analysis, at first, the Proponent has an intention to conduct the field study such as the river survey of Kolpu Khola at the section of up/down stream of the proposed site (planimetry, cross/longitudinal section profiles), gauging of river flow and

rainfall in daily basis, geological conditions of river banks and bed, etc. The data/information such as rainfall and other meteorological aspects will be also collected from the existing observation station(s) and used for analysis. Design team and EIA team will have a careful discussion and study of runoff/flood analysis based on the above data/information in order to have a well-designed river diversion for avoiding the damage on the proposed site and facilities due to flood and river bank erosion.

The proponent should estimate the approximate loss of different categories of forest areas including community forest. Approximate quantity of forest products, preferably of tree species, should be calculated and environmental impacts should be predicted and evaluated. Information and possible impacts on wild mammals, birds and fishes should also be assessed and evaluated.

Baseline information on socio-economic information such as population, major economic activities, loss of agriculture produces, and social services facilities etc. should be well documented in the EIA report. The report should also include information on land acquisition, compensation and rehabilitation issues. Existing cultural heritage within the Project area if any should also be documented along with impact evaluation and prediction.

The baseline information should be quantified to the extent possible. Similarly, impacts identified, evaluated and predicted should be quantified to the extent applicable. Each impact should be examined along with its significance. The Proponent should recommend benefit augmentation measures and adverse impacts mitigation measures for each impact identified and predicted.

In order to meet the above objectives, the Proponent may use different methods for information collection and impact assessment. The Proponent may also use secondary information through published and unpublished reports, and maps and photographs interpretation. Information on physical environment can be collected through literatures, maps and field measurement. Calibrated equipment to be used to quantify information and standard methods should be used for the field testing and laboratory testing. The Proponent may use data sheets to collect the field level information.

Socio-economic information can be collected by using questionnaire, checklists, observation, interviewing with the local people, focus group discussion, participatory rural appraisal (PRA), discussion with district level offices, VDCs and community groups. The Proponent should collect information on possible damage of infrastructures, and community services through checklists and focus group discussion. Information on land acquisition and compensation issues should be collected through household survey of the households located within project area.

The proponent may use the standard methods and techniques for impact identification, prediction and evaluation as also included in the National EIA Guidelines 1993 and Guideline for Solid Wastes Management Project in the Municipalities of Nepal. These data should be analysed and interpreted in narrative form as appropriate, and they should be included at appropriate places in the EIA report and the appendices.

5. POLICIES, LEGISLATION AND GUIDELINES

The Proponent should review, but not limited to, the following policies, laws (with amendments) and guidelines in the final EIA report. They are:

5.1 Policies and Strategies

- Tenth Plan policies with emphasis on solid wastes management
- National Conservation Strategy, 1988
- Nepal Environmental Policy and Action Plan, 1993
- Solid Wastes Management National Policy, 1996
- Forest Policy, 1991

5.2 Laws

- Environmental protection Act, 1996
- Solid Wastes (Management and Resources Mobilization) Act, 1987
- Town Development Act, 1988
- Municipality Act, 1990
- Soil and Watershed Conservation Act
- Local Self Governance Act, 1999
- Land Acquisition Act, 1997
- Forest Act, 1992
- Environmental Protection Rules, 2054
- Local Self-Governance Regulation, 2057

5.3 Guidelines, Manuals

- National EIA Guidelines, 1993
- Guidelines for Solid Wastes Management Projects in Municipalities of Nepal, 2005
- EIA Guidelines for Forestry Sector, 1995
- Forest Produce Collection, Sale and Distribution Guidelines, 2000
- IEE Manual for Forestry Sector; Nepal Biodiversity Sector
- IEE and EIA Review Guideline for Forestry Sector

The Proponent should clearly relate these instruments with the Project activities, and also clearly document their adequacies and inadequacies to make the project environment-friendly and sustainable.

6. TIME, BUDGET AND STUDY TEAM

6.1 Time

(same as the Chapter 6 of the Scoping Session)

6.2 Budget

As indicated by the proponent, a total of NRs. _____ (inclusive of VAT) has been allocated to complete this EIA study.

6.3 Study Team

The proponent should mobilize a multi-disciplinary team of subject specialists with good orientation on environmental aspects to prepare an EIA report. At least, the following specialists should be mobilized to complete this EIA study.

- Team Leader/ Environmental Specialist
- Solid Wastes Specialist
- Forestry Specialist/ Ecologist
- Engineering Geologist
- Sociologist/ Socio-economist
- Hydrologist
- River Engineer
- Policy and Legal Expert

The Proponent may also mobilize necessary field level assistants and other support staff to collect the field level data, verify secondary information, and data analysis.

7. SCOPE OF WORK

The Proponent should prepare the EIA report considering the following the priority issues which are also included in the Scoping Report:

7.1 Physical Issues

(same as the Section 5.1 of the Scoping Session)

7.2 Biological Issues

(same as the Section 5.2 of the Scoping Session)

7.3 Socio-economic and Cultural Issues

(same as the Section 5.3 of the Scoping Session)

7.4 Management Issues

(same as the Section 5.4 of the Scoping Session)

8. ENVIRONMENTAL IMPACTS

The proponent should elaborately identify, predict and evaluate each impact of the Project activities on the environment quantitatively, to the extent possible, for both construction and operational stages. The lessons and experience of Sisdol Landfill Site should be considered. Each impact identified, predicted and evaluated by using standard methods and techniques on physical, biological, socio-economic and cultural aspects should be documented in the final EIA report. The impacts should mention its nature, magnitude, extent and duration using appropriate symbols and definitions with due consideration on the Guidelines for Solid Wastes Management Project in Municipalities of Nepal. Magnitude of the impact should further be classified into site specific, local and regional; and the duration of impact should

be further classified into short term, medium term and long term. Environmental impacts can be presented in the matrix form.

9. ALTERNATIVE ANALYSIS

Alternative analysis should be an integral part of the EIA report. The proponent should analyze the likely environmental impacts of project activities in each possible alternatives with due consideration on.

- design
- project site
- technology management methods, schedule, required raw materials
- acceptability;
- other relevant points

Each alternative should be compared in terms of environmental impacts and benefits, and the best alternative should be recommended for project construction and mitigation measures should be proposed.

In addition No Action Option should be compared with implementing variations in the design of the proposed project.

10. MITIGATION MEASURES

In order to avoid and/or minimize adverse environmental impacts, cost effective and locally implementable mitigation measures should be included in the EIA report. The adverse impacts mitigation measures should be categorized as preventive, corrective (curative/rehabilitative), and compensatory measures. The Proponent should include environmental protection measures (EPMs) in the final EIA report. The EPMs should be included for both construction and operational stages. It is essential to integrate the experiences and lessons obtained through the Sisdol Landfill Site operation into the examination of mitigation measures. Cooperation and consultation mechanism involving the OSLSMCC and local communities are also to be discussed as a part of mitigation measures and/or environmental management plan (EMP) in order to have a good implementation and operation of the project as well as a mutual understanding and consensus among the stakeholders.

11. COSTS AND BENEFITS OF THE PROJECT

The proponent should include analysis-based cost for benefits augmentation and adverse impacts mitigation measures to the extent possible in the EIA report. The environmental cost sharing, if any, should also be included in the main EIA report.

12. ENVIRONMENTAL MANAGEMENT PLAN

The environmental management plan (EMP) should be an integral part of the EIA report. The cost of mitigation measures, manpower and organizational requirement to implement the mitigation measures will be discussed with the responsible agencies and their consent will be enquired. Monitoring of the implementation of proposed mitigation measures should be the part of EMP.

The proponent should include monitoring parameters for both construction and operational stages in the main EIA report. It should also include schedule of monitoring, methods and primary responsible agency for monitoring, preferably in the matrix form. The primary responsible agencies will be consulted before assigning the responsibility. Monitoring activities will be classified in terms of baseline, impact and compliance monitoring. Manpower requirement for the monitoring activities will be listed out. Estimated cost for environmental monitoring should be included in the main report.

Similarly EMP should comprise of environmental auditing. The environmental auditing is the integral part of EPR, 1997. It obliges MOEST to conduct environmental auditing two years after the project is completed. During the study, an auditing plan should be prepared to assess the effectiveness of the implemented mitigation and compensatory measures. The study identifies the auditing parameters clearly for the major environmental issues identified in the EIA study. The study will prepare the cost for auditing works including requirement of the manpower.

13. OTHER INFORMATION

The EIA report should also include relevant information, references, annexes, map, photo, tables, charts, graphs and questionnaires, as applicable. Relevant information should be concisely presented in the main report and detail information can be given in annexes. The reference should follow the format as indicated in Schedule 6 of EPR 1997 i.e. Author, date of publication, title of materials, name of publication or journal, year, volume, number, page number as appropriate.

14. THE REPORT FORMAT

The proponent should prepare the final EIA report based on the Schedule 6 of the EPR 1997. The proponent, however, may rearrange and group ingredients listed in the Schedule 6 while preparing the final EIA report. In any case, the EIA report should not omit any components as mentioned in this TOR and the Schedule 6 of the EPR 1997. The EIA report may be formatted as follows:

- Executive Summary (both in English and Nepali languages)
- Table of Contents
- Acronyms

Chapter 1: Introduction

Chapter 2: Policy, Laws and Institution

Chapter 3: Existing Environmental Conditions

- Chapter 4:** Alternative Analysis
- Chapter 5:** Potential Environmental Impacts and Mitigation Measures
(Beneficial impacts, Benefits augmentation measures, Adverse impacts, Mitigation measures)
- Chapter 6:** Environmental Management Plan (EMP)
(Implementation plan of environmental protection measures, environmental monitoring, framework of environmental auditing, organization and staffing for EMP implementation, directives and coordination aspects, reporting requirements and estimated budget for EMP implementation.)
- Chapter 7:** Conclusion and Recommendation
- References
 - Appendices
 - Figures
 - Tables

15. DELIVERABLES

The Proponent should submit fifteen (15) copies of the final EIA Report to the Ministry of Environment, Science and Technology as per Rules 11 (1) of the Environment Protection Rules 1997.

Pilot Project C-3

***Practice of
Scoping and TOR for EIA
on Pharsidol North Landfill Site
in Bungamati***

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SCOPING SESSION

1. INTRODUCTION

1.1 Background

Solid Wastes Management and Resources Mobilization Center (SWMRMC) has developed the sanitary landfill site (SLS) at Sildol in Okharpauwa VDC of Nuwakot district. The Sildol SLS is in operation from June 5, 2005. The EIA report of Sildol SLS was approved by Ministry of Environment and Population with the condition that Ministry of Local Development will initiate the EIA Study of another landfill site without any delay because the Sildol Landfill site is useful for the short term period only. Sildol Landfill site has been developed two phase. At present the infrastructure for the Valley 1 has been completed. It has capacity for about 18 months period. Infrastructure development for Valley 2 is ongoing. It will have capacity for another 18 months. Sildol Landfill site can accommodate waste disposal for 3 years period. By the end of third year of Sildol LFS operation, another landfill site has to be ready. Under these backgrounds, the selection on of the Long term Land Fill Sites for the municipality for the Kathmandu Valley was exercised.

There are two possible landfill sites within the vicinity of Khuipa Village of Bungamati VDC at Lalitpur district namely Pharsidol North and Pharsidol South. Both are located at north and south of Khuipa Village respectively. Among the two possible sites, Pharsidol North is evaluated to be better site due to relatively stable slope of surrounding area, better angular distance from the airport and larger capacity compare to Pharsidol South. This scoping practice was conducted for Pharsidol North.

The Schedule 2 of the EPR, 1997 obliges the Proponent, intending to construct Landfill Site for more than 1,000 ton of waste per year or serving more than 10,000 populations has to prepare the EIA report through legal process (HMG/N, 1997). As this type of Project should directly follow the EIA process and there is no need for screening the proposal.

Prior to the EIA study a scoping exercise is required to draw the terms of reference for the EIA study. The main objective of the scoping exercise is to provide key issues that should be included in the Terms of Reference (TOR) for EIA study. The National EIA guidelines (Chapter 4), including the draft EIA guidelines for the Wastes Management Sector, 1996 and recently completed Guidelines for Solid Wastes Management Project in the Municipalities of Nepal also call for ensuring public involvement, collecting relevant information, identifying major issues of public concerns, evaluating the seriousness of the issues, and establishing priorities for EIA study.

With this in background, this document for the scoping practice includes:

- information on the Project,
- legal requirement for environmental assessment¹,
- objectives of environmental scoping,
- existing environmental conditions,
- scoping methodology,
- priority issues, and

¹ Legal requirement such as publication of public notice, collection of issues and concerns from the VDCs have not been complied yet.

- work schedule

1.2 Project Description

1.2.1 Location

The proposed landfill site is located in ward no 9 of Bungamaiti VDC of Lalitpur District. It is situated at latitude 3056225 N and longitude 628025 E. The site is bounded by Bungamati VDC itself. Khuipa Village is located on the south and Chalnakhel VDC of Kathmandu District is located on the north. The site is directly visible from the settlement of Chalnakhel VDC. The total area of this valley area is 45 ha with maximum height of 50 m. The area is mainly cultivated private land.

1.2.2 Access

The proposed site is about 10 km from center of Kathmandu, Teku and 5 km from the ring road, Satdobato, Lalitpur. It is about 1 km from Bungamati Village. There is a black top road upto Bungamati. The remaining is gravel road.

1.2.3 Waste Generation

The proposed landfill is meant for municipalities of the Kathmandu Valley namely: Kathmandu Metropolitan City (KMC), Lalitpur Sub Metropolitan City (LSMC), and Kirtipur Municipality (KRM). Solid waste will be collected from collection points of these cities, taken to i) the existing transfer station located at Teku, and ii) the planned transfer station at Balaju, for transporting the wastes to the proposed landfill site. A waste processing facility (WPF) is also under being planned with functions of segregation as well as composting in order to reduce the waste amount to be disposed of at the proposed site.

The total population of these municipalities is estimated at 1,096,472 in 2008 with the population growth rate 3.2 %, total population is estimated at 1,368,743 in 2015. With average waste generation rate of 0.445 kg/capita/day in 2008, total 487.9 ton of solid waste will be generated per day. Out of which 156.1 ton will be recycled and 331.8 ton of waste will be taken to the landfill sites. The annual waste generation volume is presented in Table 1.2-1.

Table 1.2-1 The Annual Waste Generation Volume

Year	Population	Waste Generation Rate (Kg/cap/d) ^{*1}	Total Waste Quantity (mt/day)	Disposal Quantity (mt/day)
2008	1,096,472	0.445	487.9	331.80
2009	1,132,532	0.454	514.1	354.40
2010	1,169,784	0.463	541.6	309.10
2011	1,208,271	0.472	570.1	334.10
2012	1,246,524	0.482	600.5	359.60
2013	1,285,993	0.492	632.4	315.20
2014	1,326,720	0.502	665.4	339.00
2015	1,368,743	0.512	700.3	357.20

*1: Weighted average of three municipalities
Source: JICA Study Team

1.2.4 The Concept of Proposed Landfill Site

The proposed landfill type is semi-aerobic in which the leachate of the waste deposit is collected in pond through perforated pipes embedded in graded boulders. The outlet pipe of

leachate collection pipe is kept at least 1.0m above leachate full supply level. Fresh air is drawn into the layers thereby introducing an aerobic condition around the pipes. The leachate collection pipes are connected to the number of vertical vent pipes, which are extended beyond the waste deposit level so that the air could pass through the leachate collection pipes and semi aerobic condition is maintained in landfill site. In order to prevent the leachate percolation to the ground water the entire landfill site is sealed by the thick clay layer. The collected leachate will be retained in the leachate retention pond and be pumped back on the surface of the waste deposit. The schematic presentation of Semi-aerobic System is shown in Figure 1.2-1.

The main design concept for the proposed semi aerobic land fill site is presented in Table 1.2-2

Table 1.2-2 Concept Design Consideration

Sanitary landfill system	Semi-aerobic, level 3 + (composite liner)
Horizontal liner	Geo-membrane (2 sheets) + clay (1.0 m) with groundwater drainage
Leachate treatment	Biological treatment (aeration and re-circulation) and natural reed bed
Landfill gas	Passive venting
Waste dams	Earthen
Perimeter slope	Basically maintain present slopes with slight adjustment

Source: JICA Study Team

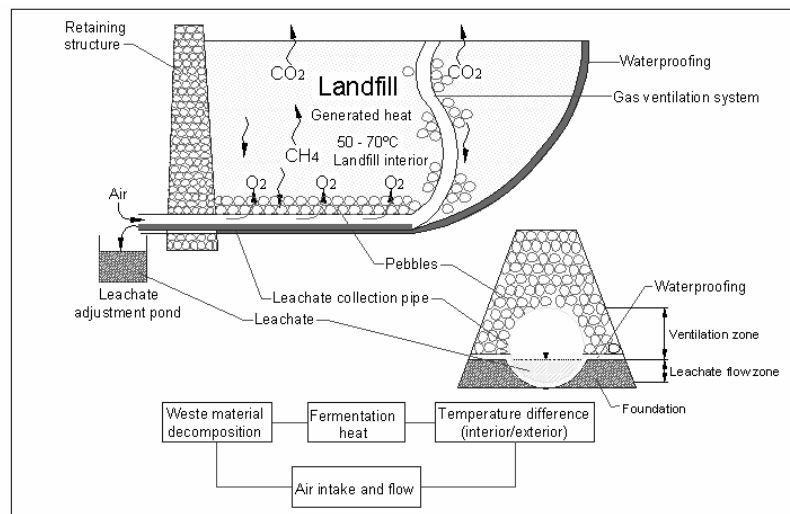


Figure 1.2-1 Schematic Semi-aerobic System

Source: The Fukuoka Method, Fukuoka City Environmental Bureau

1.3 Policies, Laws, Guidelines and Manuals

1.3.1 Environmental Policy

The environmental consideration was mooted in the development projects and programs was initiated since the early 1980s. HMG/N formulated environmental polices in the Sixth Plan (1980-'85) on the need for carrying out EIA study for infrastructure projects and programs. The need for EIA study was further emphasized in the Seventh and the Eighth Plan.

The Ninth Plan (1997–2002) endorsed environmental pollution as a serious problem at the policy level and stress on the need of public participation in initiating the environmental protection and management programs. It further emphasized on the establishment and

implementation of emission standards on water, air, noise and land pollution. The policy further stressed on the need and development of appropriate policy in different sectors. To strengthen the local institution on the solid wastes management, a National Council for the Solid Wastes Management was constituted in 1997. The council framed a National Policy on Wastes Management in 1998. The policy comprised of most of the ingredients for the effective solid wastes management such as strengthening of local bodies in wastes management and sanitation services, launch public awareness promotional programs for the wider public participation, involve NGOs and CBOs in the solid wastes management, make wastes disposal system based on the solid wastes quality and nature, promotion of recycling and reuse of the solid wastes, encouragement of wastes reduction at the sources, involvement of the private parties at the different level of solid wastes management and make the financially self reliant solid wastes management institution.

The Tenth Plan (2002-2007) also emphasized on carrying out environmental impact assessment. This Plan has also made commitment to conduct Strategic Environmental Assessment (SEA). The Tenth Plan has included establishment of Environmental Protection Center under Ministry of Population and Environment as well as Environment Protection Fund by effective implementation polluters pay principle and polluter prevention fee. This plan has clearly visualized that the cost of wastes management will have to be shared by the polluters.

1.3.2 Environmental Legislation

Recognizing the role and benefit of EIA study in making the development projects and programs environmentally sound and sustainable, HMG has enforced the Environment Protection Act (EPA), 1997 and the Environment Protection Rules (EPR), 1997. The legislation obliges the proponent(s) to prepare EIA report for the prescribed projects by following the legal process as detailed out in the EPR, 1997.

Article 3 of the EPA, 1996 obliges the proponent to conduct EIA study for the prescribed proposals. The Act warns the proponent not to implement any prescribed proposals without approving EIA reports (Article 4). Article 6 of the Act empowers the concerned Ministry and Ministry of Environment, Science and Technology (MOEST) to approve the IEE and EIA report respectively. The proposals, requiring EIA study are prescribed in Schedule 2 of the EPR, 1997 and all national highways and major roads require EIA clearance before project construction.

EIA processes are elaborated in the Environment Protection Rules, 1997 (amendment 1999). Rule 4 of the EPR empowers MOEST to determine the Scoping Report for all proposals requiring EIA study. Prior to the preparation of the Scoping Report, the proponent should publish a 15-day notice in the national daily newspaper to let the Village Development Committees or Municipalities, health posts, schools and other stakeholders know about the proposal and provide them an opportunity to offer their written opinions and suggestions with regard to the issues that should be looked into during the EIA study. The regulation also obliges the proponent to include the concerns and suggestions of the individuals and institutions in the Scoping Report and process for its determination by MOEST. It should determine the Scoping Report as per Rule 4 of the EPR, 1997 (amendment 1999) in the proposed or amended form.

1.3.3 Relevant Acts

Solid Wastes (Management and Resources Mobilization) Act, 1987:

This act was exclusively formulated for the purpose of the solid waste management mainly in the cities. This act led the formation of SWMRMC with the authority and responsibility to management all aspects of Solid waste including collection, transportation, treatment and disposal of solid wastes including hazardous wastes. But the Local Self Governance Act in 1999 has made the local municipalities responsible for the municipal solid waste management which also authorizes to punish the polluters. With enactment of this Local Self Governance Act Solid Wastes Act, 1987 has been less effective.

Town Development Act, 1988:

This act empowers the Town Development Committee to regulate, control or prohibits any activities which will have an adverse effect on public health or the aesthetics of the town or any way pollutes the environment.

Municipality Act, 1990:

It stipulates the legal provision for the urban environmental protection, sanitation services prevention/control of pollutants and management of solid and liquid wastes detrimental to public health.

Local Self Governance Act, 1999:

This act has made District Development Committee as the apex of the local government. It has made municipalities responsible for managing the municipal solid wastes and even empowers to fine up to Rs. 15,000.00 to the polluters for the haphazard disposal of solid wastes. It also contains the provision of conservation of natural resources and cultural values with the jurisdiction.

1.3.4 Other Legislation

Few other legislation is also attracted for the construction the Landfill site. The site comprised of a community forest areas. The Forest Act, 1992 (amendment 1998) emphasizes development and implementation of approved work plan in different category of forests - national forests, community forests, leasehold forests, private forests and religious forests. The work plan should contain a list of activities that should be implemented in the forests. The forestry legislation has a special provision and empowers HMG/N to enforce its Article 68 to provide parts of any types of forests for the implementation of a national priority plan with the assurance that it does not adversely affect the environment significantly (MFSC, 1995). The Forest Rules, 1995 (amendment 1999) further emphasizes the need for managing forests as per the work plan. Furthermore, HMG/N has given legal protection status to 13 plant species and banned felling, transportation and export of champ (*Michelia champaca*), khayer (*Acacia catechu*), and sal (*Shorea robusta*). Legislation related to protected area management is not attracted in this project as the proposed landfill site does not have such areas.

The *Local Self Governance Act, 1999* contains several provisions for the conservation of soil, forest and other natural resources, use of construction materials such as sand, gravel and stone and implement environmental conservation activities (Articles 28, 43, 93, 96, 111, 189, and 201). Article 3 and 4 of the *Land Acquisition Act, 1977* empowers HMG to acquire land for any activity by providing compensation as determined.

1.3.5 EIA Guidelines

Before and after the enforcement of EPA (1997) and EPR (1997), various environmental guidelines have been developed to integrate the environmental aspects in development projects and programmes. Before mid-1990s, HMG endorsed and implemented the procedural environmental guidelines such as National EIA guidelines in 1993, and separate EIA guidelines for Forestry and Industry Sectors in 1995 (NPC, 1993, and MFSC and MOICS, 1995). These guidelines assist the proponent to identify the likely impacts of the projects on the environment, propose mitigation measures and conduct monitoring to make the projects environmentally sound, less costly (economically feasible) and technically appropriate. These guidelines facilitate the proponents to prepare the project level environmental assessment (IEE or EIA) reports

HMG has recently prepared Guidelines for Solid Wastes Management Projects in the Municipalities of Nepal, 2005. It is the most important guideline that facilitates the proponents, consultants and the contractors to integrate environmental aspects in the wastes management. This guide lines gives detailed require of environment legislation for the waste management and guides the proponent, consultants and contractor in preparing the environmental studies such as environmental screening, IEE, environmental scoping, preparation of ToR, EIA study of waste management.

The review of legal and administrative instruments indicates that the proponent should prepare EIA report based on environmental legislation and this Scoping Report is one of the components of legal compliance. These instruments will further be assessed during the EIA study and mitigation measures will be proposed based on identified and predicted impacts on environment to minimize them during the road construction and operational stages.

1.4 Objectives of Environmental Scoping

The main objectives of this Scoping exercise are to inform the stakeholders about the project, receive their comments and suggestions on relevant environmental issues and identify priority environmental issues for addressing during the preparation of the EIA report. The specific objectives are to:

- identify environmental concerns and issues for consideration in the EIA report;
- provide an opportunity for public involvement in determining the environmental aspects to be assessed;
- document and sort out relevant environmental issues raised by the stakeholders;
- prioritize environmental issues that should be incorporated in the TOR for EIA study and
- focus the study on reasonable alternative.

1.5 The Proponent

The Solid Wastes Management and Resource Mobilization Center (SWMRMC), Ministry of Local Development Works is the proponent for this proposal.

1.6 Project Area Delineation

The physical location of the solid wastes disposal site and its infrastructures are the main site, which will be acquired for the construction of the project. Apart from that, the project will

have its impact on its vicinity for the longer distance. The wastes disposal activity may leave bad odor in its vicinity. How far the odor will remain it is difficult to predict at this stage. However the some of the studies carry out else where in the other developing countries specifies that a landfill site should have buffer distance of 300m.

Birds hazard and ground water contamination by the leachate are the two major issues that will be having long distance impact due to the landfill site. According to the guideline of ICAO/CAAN, airport strip of the international should be located at least 3 km radial distance from the edge and the air path should be cleared for 12.5⁰ from the axis of the air strip whereas there is no guide line or regulation as such for the location of the ground water well in Nepal. It depends upon the technical precautionary measures taken in the design and soil type.

2. EXISTING ENVIRONMENTAL CONDITIONS

2.1 Physical Conditions

The proposed landfill site is a valley of cultivated land located on south of Khuipa Village. Area of the valley is about 45 ha. Height of the valley is 50 m which gives the large capacity for the land fill site. The present land use of valley is cultivated private land. The soil types in the valley are basically clay/loam. The surrounding slopes of the site are steep but relatively stable slope.

Khuipa Village is located within 300 m from the south edge of the proposed site. There are six houses at the northern edge of the proposed site. There is a small water spring, which is used by the local people where they come for cultivation.

Geologically, the proposed sites lie in the Chandragiri Limestone of the Phulchauki Group of the Kathmandu Complex, central Nepal. The thick valley fill sediments covered the bedrocks of the Chandragiri Limestone. The proposed site is covered with the sediments of the Lukundol Formation. The Lukundol Formation is composed of alternation of thick to thin dark brown to black clays and medium- to fine grained micaceous sands with occasional yellow to white diatomous clays. This formation is about 115 m in thickness. The upper part of this formation is Itaiti Formation, frequently found in the proposed sites. The Itaiti Formation is composed of boulder-cobble beds with sandy matrix and fine sands, silty clays and carbonaceous black mud.

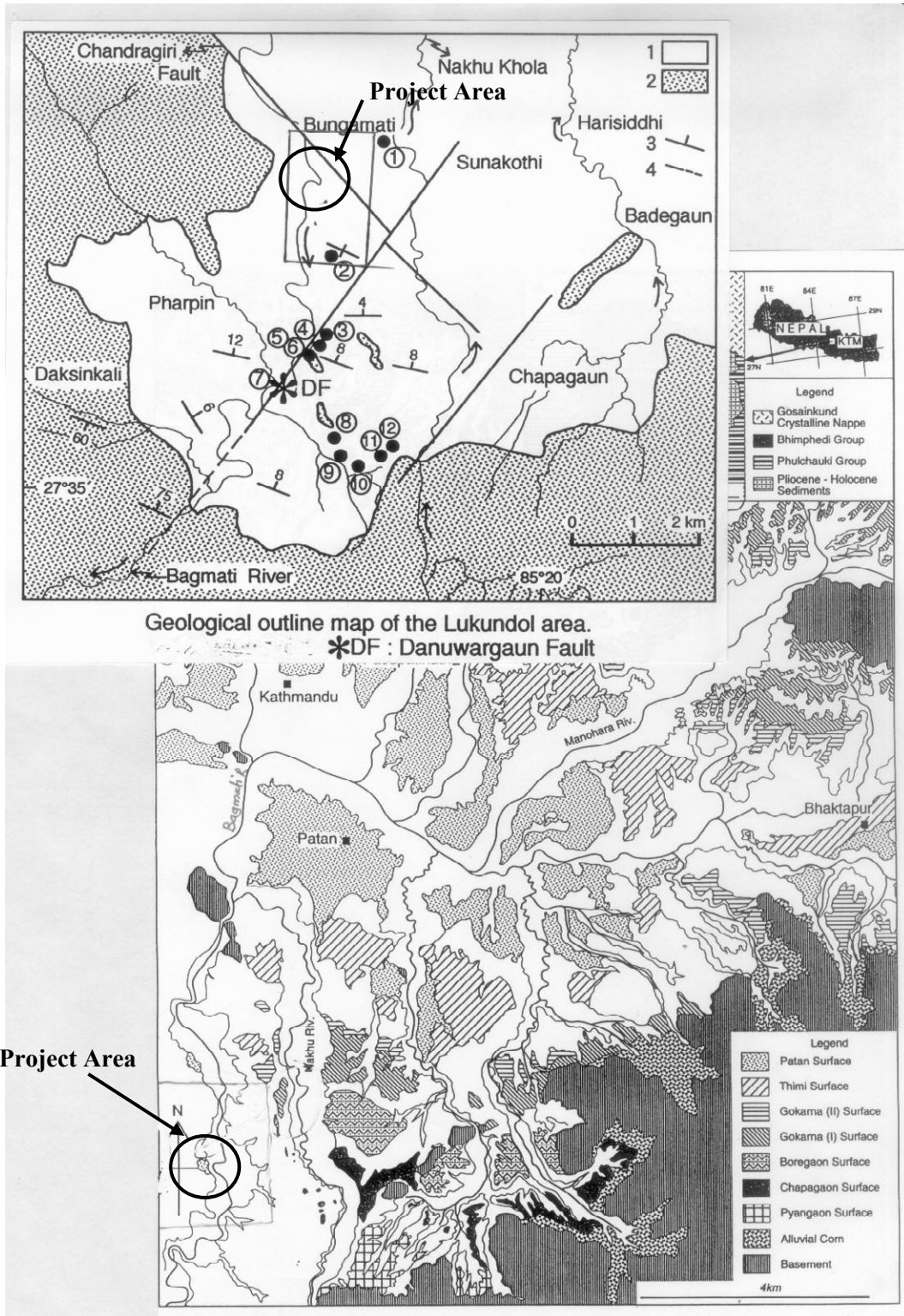


Figure 2.1-1 Geological Map

Source: DOMG

There are no major rivers/streams near the proposed site. The nearest one is the Bagmati river, whose discharge is at a minimum in April and May and starts to rise with the onset of the monsoon with the peak usually in July or August. The average monthly flow of Bagmati observed at Chobhar is presented in the table below based on the available information. However, it is noted that the data in the table do not show the natural flow, since much water extraction exists in the upstream of Chobhar.

**Table 2.1-1 Average Monthly Discharge of the Bagmati River at Chobhar
(CA: 585 km²)**

Unit: m³/s

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2.51	1.84	1.55	1.78	2.47	14.55	45.38	53.43	35.41	16.46	6.98	3.90

Source: Environmental Impact Assessment Report on Melamchi Water Supply Project, August 2000

2.2 Biological Resources

Since the proposed landfill site is cultivated private land, there no major biological resources as such in the proposed site as well as in the vicinity. There is little pole size vegetation. There are no wild life and aquatic life as such in the proposed site or in the vicinity.

2.3 Socio-economic Characteristics

The total population of the Khiupa village is 1052 comprising 45 households with 126 males and 117 females. The people of the village belong to Jyapu community of Newar ethnic groups. Majority of the people are engaged in agriculture. The village has potential for cereals, vegetables and potato development. The village is linked with motorable road. There is electricity and drinking water supplies in the village. About 45 ha of private cultivated land needs to be acquired for the development of the site. There is no physical infrastructure within the proposed landfill site area. However there are number of brick kilns in the operation in the vicinity of the proposed site.

Table 2.3-1 presents the land use, population, and ethnicity of the proposed landfill sites.

Table 2.3-1 Land Use, Population and Ethnicity of the Proposed Landfill Site

Administrative location of the site	Common village name covering the site	Nos. of HHs in village	Ethnic Groups	Remarks
Ward No. 9 of Bungamti VDC of Lalitpur District	Khiupa (Phaicha)	45	Newar	- There can be observed the second temple and house of Rato Machhindra Nath - Agricultural land use is observed dominantly.

Paddy, wheat and maize are the major cereal crops grown in the agricultural and of the proposed landfill sites.

2.4 Cultural Resources

The Khuipa village bears a significant cultural and religious importance due location of second temple and a religious house of god Rato Machhindra Nath. Rato Machindra carries strong cultural value and worshipped by almost all the people from the Kathmandu Valley. Rato Machindra Nath god is kept in Bungamati Village. The **chariot festival** of Rato

Machidra Nath in Lalitpur which is celebrated by the majority of Kathmandu and Lalitpur municipality and its surrounding VCDs. Prior to the chariot festival, the idol is taken to Khuipa Village enroute to give the bath in Katuwal Daha. After the bathing ceremony in Katuwal Daha, the idol is brought back in Khuipa Village and taken to chariot festival in Pulchowk, Lalitpur. This Chariot festival goes on for almost a month. It ends with Bhoto Jatra in Jawalakhel attended by high dignitaries and Royal Family members. The Maharjans of the Khuipa Village are culturally and religiously assigned to collect the timber and twigs necessary for the construction of the chariot.

Similarly Bungamati Jatra (festival) is also one of the well known festival of Jyapu community of Newar. On the ninth day (nawami) of Dasahara festival, Rato Machindra Nath idol is brought to the Khuipa Village, kept over night and performed ritual pooja. The Bungamati Jatra commences from the next morning. After the Jatra the idol is taken back to Bungamati Village.

3. SCOPING METHODOLOGY

In order to prepare the Scoping Report, the environmental legislation focuses on the publication of public notice only. However, a number of methods have been included in the National EIA guidelines, 1993 to facilitate the preparation of such Report. Among them the most recent and relevant for this study is the Guidelines for Solid Wastes Management in the Municipalities of Nepal. The guideline emphasizes the need for making a plan for public involvement, collecting relevant data and information, providing necessary information to the people through all available media, identifying major issues of public concern, evaluating the seriousness of the issues, establishing priorities for EIA, and developing a strategy for addressing priority issues. Within this broad framework, the following methods have been used to prepare this document for the scoping practice.

3.1 Literature Review

Relevant information was collected through extensive review of literature. Information contained in the EIA Study of Sisdol Landfill Site, preliminary study of Bancharedanda Landfill site and District/Village Profile was reviewed. In addition, environmental legislation (EPA, 1996 and EPA, 1997), the Guidelines for the Solid Wastes Management in the Municipalities were reviewed with due consideration on the type of information required for the Scoping Exercise. Apart from these, other relevant documents on airport and groundwater were also reviewed.

3.2 Public Notice ²

To comply with the existing environmental legislation and with the intention of informing the stakeholders about the project, SWMRMC published a 15 day public notice on _____ in the daily Gorkhapatra. Furthermore, the copies of the public notice were also pasted at the offices of the VDC's of the project area for providing local people an

² Public notice, public consultation, collection of issues and concerns from the VDCs and other local institutions has not been made yet. They have to be completed.

opportunity to offer their comments and suggestions and Muchulkas of Public notice in the schools of the project area.

The public notice calls upon the different stakeholders to offer suggestions and concerns on natural system, cultural practices, social system, economic and human activities, and interrelationships of environmental components as also indicated in the format of the public notice released by SWMRMC in the guideline. The concerns and issues offered by the local institutions such as DDC, VDCs, school, hospital, health post or concerned people.

Information provided by the stakeholders and the concerned parties have been duly considered in selecting the priority issues for EIA study.

3.3 Reconnaissance Survey³

A reconnaissance survey was conducted in preparing this Scoping Report from _____ to _____. The reconnaissance survey of the project area and interacted with the local people was also conducted. Besides, the proponent has interacted several times with the local people through the focused group discussion. This has facilitated the local people to understand the likely environmental issues of the road project. In addition, the Proponent organized a workshop on⁴ _____ to share information and seek the inputs of the local people and other stake holders.

3.4 Issues Prioritization Methods⁵

Possible issues for the Solid Waste Management by Landfill were identified from the guidelines and similar studies carried out earlier. These issues were discussed with the local people mainly likely project affected people. They are prioritized according to the local condition.

4. ISSUES IDENTIFIED AND RAISED

4.1 Issues Preliminarily Identified from the Technical Viewpoint

(1) Physical Issues

Air Pollution: Air pollution would be worsened by waste transportation vehicles, although the increment of the traffic volume will be insignificant. Heavy equipment operation for the site construction and operation might bring about the air pollution, although the impact will be confined within the limited area. Landfill gas will be generated in operation stage of the site.

Water Quality: Leachate generated from the landfill area will potentially pollute the quality of hydrosphere around the site including groundwater. In construction stage, it would be necessary to pay an attention on the water pollution due to discharging turbid/alkaline wastewater from the civil/concreting work areas.

³ Date of reconnaissance survey to be included.

⁴ Date of workshop to be inserted

⁵ Issues collected from VDCs and local institutions will have to prioritize

Soil Pollution: There would be a risk to contaminate the soil in/around the site, if hazardous wastes would be mixed in the wastes to be disposed of in the site.

Noise: Noise would be worsened by waste transportation vehicles, although the increment of the traffic volume will be insignificant. Heavy equipment operation for the site construction and operation might bring about noise, although the impact will be confined within the limited area.

(2) Biological Issues

The ecosystem in/around the proposed site is considered to be generally poor. However, due consideration should be paid on the small plots of unregistered community forests, likely disturbance of the movement of wild life, and birds/animal attracting from outside.

(3) Socio-economic and Cultural Issues

Resettlement and Land Acquisition: Involuntary resettlement due to the site development is not expected, unless the relocation of houses within the expected buffer zone would be designed. The most of the land in the site is under the private ownership for farming, thus a certain magnitude of land acquisition and compensation is expected.

Waste Pickers: The waste pickers would be attracted to the site since the site is planned in the suburban area of KMC and LSMC. There could come out the issues on i) necessity of restriction of the waste picking activities in the site for securing the effective site operation as well as the safety of waste pickers, and ii) prevention from the health hazard of the waste pickers due to the hazardous/medical waste possibly mixed in the municipal waste.

Cultural Value: A dyao chen (house of god) of Rato Machindra Nath is located in Khuipa Village. The Rato Machindra Nath idol is taken to this dyao chen two times a year for starting the culturally important festivals namely Rato Machindra Nath Jatra in Lalitpur and Bungamati Jatra in Bungamati. Former festival bears great cultural value among the Newar Community of Kathmandu and Lalitpur. Later festival is celebrated by the Bungamati people. The resident of the Khuipa Village is mainly Jyapu ethnic group of Newar community which has very strong community bondage. They are culturally and religiously assigned to collect the timber and twigs necessary for the construction of the chariot. They considered themselves privileged people as they have assigned for such an important role.

Non availability of buffer zone: Khuipa Village is located in very close proximity (within 300 m) from the proposed site. Unpleasant and bad odour of land fill site may carry to the village. Birds may carry the waste on the roof top, which was also a major nuisance in the Gokarna dumping site. The vultures are among the birds that are attracted in the landfill site. According to the local culture if a vulture sits on a house, it is a bad sign to the house which may bring trouble and bad luck. No body would like to see a vulture sitting on of his/her house.

Acceptance by the Local People: The local people economically sound. They being closely associated with Rato Machindra Nath, they carry high cultural importance among the ethnic group. They may not like to see that solid wastes of the city people being disposed in their vicinity. The area being located close to the city they already have necessary infrastructures for the development. Hence local people may not accept the proposal of having landfill site in their vicinity.

Aesthetic Value: The proposed site is directly visible from the settlement of the Chalnakhel VDC of Kathmandu VDC.

Accidents and Diseases: Risk of traffic accidents would be increased due to new traffic generation of waste transportation vehicles. Risk of infectious hazard would be remarked if the medical waste would not be properly managed.

Close Proximity of Ground Water Tube Well: The proposed site is in the close proximity (within 1,000 m) from one of the ground water tube well which supplied drinking water to KMC and LSMC.

Accessibility: Transportation of the wastes could be one of the major recurrent costs in the operation of the landfill site. Since the proposed site is within 10 km from Kathmandu the site is accessible by an all weather road the transportation cost will be comparatively low. This is the major attraction of this site.

Tribubhan International Airport: Issues regarding the clearance from the Tribubhan International Airport would be raised, although the proposed site is located in outside of an obstacle limitation surface of the airport.

4.2 Issue Raised in the Course of Public Involvement ⁶

Interaction meeting was held with the local committee. Focused group discussion was held in Khuipa. The issues raised by the local people during the interaction meeting are to be listed.

The concerns and suggestions of different VDCs are presented in _____ and summarized here below⁷:

5. PRIORITY EIA ISSUES FOR EIA STUDY

The EIA study helps in identifying the likely impacts of the proposed actions on the environment. Even a small action may cause environmental impacts. As the EIA study should focus on the project, all issues raised by the stakeholders may not be equally important or relevant to the project. They may have number of issues. In this context, the scoping exercise should focus on sorting the issues directly related to the project in consideration. The basic philosophy of scoping exercise is to inform the stakeholders about the nature of the project, seek their opinions and suggestions, document all issues and select only priority issues for environmental impact assessment.

5.1 Physical Issues

5.1.1 Construction Stage

- Landscape disturbance, land stability, soil erosion, etc., due to the topographic change;
- Change in air quality due to dust and exhaust emission, change in water quality due to civil/concreting works, and noise level;

⁶ Probable issues raised through the public notice/consultation will have to be compiled here.

⁷ This part will have to be compiled after completing the official procedure on the public notice as well as receiving the written comments from the concerned VCD(s).

- Hydrosphere of groundwater field;
- Location and operation of quarries and borrow pits;
- Safety measures.

5.1.2 Operation and Maintenance Stage

- Land stability and soil erosion;
- Air quality;
- Bad smell;
- Water quality (both surface and ground water) related to leachate generation and control;
- Noise;
- Hydrosphere of groundwater field;
- Gas generation, emission and migration;
- Availability of cover material;
- Human health associated with the change in air quality and noise level along the road alignment.

5.2 Biological Issues

5.2.1 Construction Stage

- Use of forest products by the construction workers and construction activities

5.2.2 Operation and Maintenance Stage

- Birds hazard

5.3 Socio-economic and Cultural Issues

5.3.1 Construction Stage

- Loss of agricultural land
- Loss of agricultural products
- Effect on health, sanitation and safety of local people and workers
- Availability of local construction workers, employment opportunities
- Mobilization of local people for construction
- Population displacement and relocation

5.3.2 Operation and Maintenance Stage

- Impact on the cultural value (Rato Machindra Nath)
- Impact on local economy including the issues on the waste pickers
- Aesthetic values
- Groundwater resource and water supply
- Public health hazard
- Quality of life values

5.4 Management Issues

After detailed analysis of likely impacts of the project on the local environment, attempts should be made to manage both beneficial and adverse environmental impacts. Environmental management issues should be dealt with in detail during the EIA study for both construction and operational stages. The environmental management plan should take into account the mitigation measures for each impact identified, monitoring of impacts and

environmental auditing components with environmental management responsibilities. The study should also highlight the reinstatement of public services likely to be affected by the project during its construction. Furthermore, the EIA study should take into account the project execution issues, as appropriate, strict management of contractor's work and use of appropriate technologies for construction.

6. WORK SCHEDULE

The work schedule for the EIA Study has been prepared to match with the overall time frame of the proposed land fill site development. It is to be noted that the recently commenced Sisdol Landfill Site has the capacity for three years only. At the end of third year this land fill site has to be ready. A work schedule for the EIA Report Preparation and approval is presented in Figure 6.1-1.

S. No.	Activities	2005				2006				
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1	Submission of the Scoping Report and the TOR	■								
2	Approval of the Scoping Report and the TOR	■	■	■						
<u>EIA Study</u>										
3	Team mobilization			■						
4	Literature Review and preparation of field works			■	■					
5	Field Study			■	■	■				
6	Data compilation and Laboratory Testing				■	■				
7	Draft Report Preparation and Submission					■	■			
8	Preparation of Materials and Public Hearing							■		
9	Final Report Submission								■	
10	Approval of EIA Report									■

Figure 6.1-1 Proposed Schedule for EIA Report Preparation and Approval⁸

⁸ The schedule will have to be revised at the time to finalizing the Scoping Report.

TOR SESSION

1. NAME OF THE PROPONENT AND ADDRESS

Solid Wastes Management and Resources Mobilization Centre
Ministry of Local Development
Pulchowk, Lalitpur
Post Box:
Telephone:
Fax:

2. GENERAL INTRODUCTION OF THE PROPOSAL

Solid Wastes Management and Resources Mobilization Center (SWMRMC) has developed the sanitary landfill site (SLS) at Sisdol in Okharpauwa VDC of Nuwakot district. The Sisdol SLS is in operation from June 5, 2005. The EIA report of Sisdol SLS was approved by Ministry of Environment and Population with the condition that Ministry of Local Development will initiate the EIA Study of another landfill site without any delay because the Sildol Landfill site is useful for the short term period only. Sisdol Landfill site has been developed two phase. At present the infrastructure for the Valley 1 has been completed. It has capacity for about 18 months period. Infrastructure development for Valley 2 is ongoing. It will have capacity for another 18 months. Sisdol Landfill site can accommodate waste disposal for 3 years period. By the end of third year of Sisdol LFS operation, another landfill site has to be ready. Under these backgrounds, the selection on of the Long term Land Fill Sites for the municipality for the Kathmandu Valley was exercised.

There are two possible landfill sites within the vicinity of Khuipa Village of Bungamati VDC at Lalitpur district namely Pharsidol North and Pharsidol South. Both are located at north and south of Khuipa Village respectively. Among the two possible sites, Pharsidol North is evaluated to be better site due to relatively stable slope of surrounding area, better angular distance from the airport and larger capacity compare to Pharsidol South. This TOR practice was conducted for Pharsidol North.

2.1 Project Description

(same as the Section 1.2 of the Scoping Session)

3. OBJECTIVES

The main objectives of the EIA study are to:

1. Identify, predict and evaluate the potential impacts of the proposed landfill site at Pharsidol North, Bungmati
2. Calculate loss of different categories of land, property, forest and other resources as a part of site clearance and maintaining the buffer zone for the proposed landfill site

3. Recommend benefits augmentation measures, and preventive, curative, and compensatory measures to minimize the adverse environmental impacts along with environmental management plan
4. Provide information for decision-makers about the environmental implications of the proposed landfill site and associate cost for benefits augmentation and adverse impact mitigation.

In order to meet the above objectives, the Proponent should collect and analyze environmental information in the project area which comprises of proposed landfill site and its buffer zone. The EIA study should make every effort to quantify and evaluate site-specific impacts to the extent applicable in all resources within the direct impact zone.

4. REQUIRED INFORMATION AND DATA COLLECTION METHODS

The proponent should review literature(s), collect and analyze primary and secondary information on physical, biological and socio-economic and cultural resources within the Project area. Available data from Sisdol Landfill Site should be reviewed. The Proponent should focus, but not limited to, the information collection on local physiography, geology/hydro geology, watershed condition, hydrology (surface/groundwater), soil condition and environmental pollution such as water quality, air pollution and noise major elements of physical environment for both construction and operational stages of the Project. The Proponent should also estimate the loss of different land uses as a part of site clearance.

The proponent has an intention to include the following studies into the data collection and analysis:

- Water quality will be analyzed in and around the proposed site including the river and groundwater. The boreholes for groundwater quality analysis are expected to be installed in the course of the basic/detailed design stage. The analytical date will be determined with referring to the related standards as well as the EIA Guidelines prepared by SWMRMC.
- Water quality will be analyzed in and around the Sisdol Landfill Site including the river, groundwater and leachate. Landfill gas will be also measured in the Sisdol site. These information will be useful for examining the future environmental conditions in and around the proposed site. The secondary data such as the monitoring results being performed along with the Sisdol operation will be also studied.
- The operational condition of the Sisdol Landfill Site will be reviewed based on the site observation, hearing to the officials, and/or the records/reports related to the site operation, in order to have a supportive information for examining the likely impacts as well as for developing the mitigation measures and management plan. The review will include the odor, cover soil, leachate control system, landfill activities and conditions, heavy equipment performance, in-coming waste volume and characteristics, traffic volume generation due to the waste transportation, status of complaints/grievances from the local, status of waste picking, animal/bird attracting, etc.

Baseline information on socio-economic information such as population, major economic activities, loss of agriculture produces, and social services facilities etc. should be well documented in the EIA report. The report should also include information on land

acquisition, compensation and rehabilitation issues. Existing cultural heritage within the Project area if any should also be documented along with impact evaluation and prediction. Regarding the religious and cultural issues in and around the proposed site, intensive and careful consultation and survey will be prerequisite with involving the stakeholders especially local communities.

The baseline information should be quantified to the extent possible. Similarly, impacts identified, evaluated and predicted should be quantified to the extent applicable. Each impact should be examined along with its significance. The proponent should recommend benefit augmentation measures and adverse impacts mitigation measures for each impact identified and predicted.

In order to meet the above objectives, the proponent may use different methods for information collection and impact assessment. The proponent may also use secondary information through published and unpublished reports, and maps and photographs interpretation. Information on physical environment can be collected through literatures, maps and field measurement. Calibrated equipment to be used to quantify information and standard methods should be used for the field testing and laboratory testing. The proponent may use data sheets to collect the field level information.

Socio-economic information can be collected by using questionnaire, checklists, observation, interviewing with the local people, focus group discussion, participatory rural appraisal (PRA), discussion with district level offices, VDCs and community groups. The Proponent should collect information on possible damage of infrastructures, and community services through checklists and focus group discussion. Information on land acquisition and compensation issues should be collected through household survey of the households located within project area.

The proponent may use the standard methods and techniques for impact identification, prediction and evaluation as also included in the National EIA Guidelines 1993 and Guideline for Solid Wastes Management Project in the Municipalities of Nepal. These data should be analyzed and interpreted in narrative form as appropriate, and they should be included at appropriate places in the EIA report and the appendices.

5. POLICIES, LEGISLATION AND GUIDELINES

The Proponent should review, but not limited to, the following policies, laws (with amendments) and guidelines in the final EIA report. They are:

5.1 Policies and Strategies

- Tenth Plan policies with emphasis on solid wastes management
- National Conservation Strategy, 1988
- Nepal Environmental Policy and Action Plan, 1993
- Solid Wastes Management National Policy, 1996
- Forest Policy, 1991

5.2 Laws

- Environmental protection Act, 1996
- Solid Wastes (Management and Resources Mobilization) Act, 1987

- Town Development Act, 1988
- Municipality Act, 1990
- Soil and Watershed Conservation Act
- Local Self Governance Act, 1999
- Land Acquisition Act, 1997
- Forest Act, 1992
- Environmental Protection Rules, 2054
- Local Self-Governance Regulation, 2057

5.3 Guidelines, Manuals

- National EIA Guidelines, 1993
- Guidelines for Solid Wastes Management Projects in Municipalities of Nepal, 2005
- EIA Guidelines for Forestry Sector, 1995
- Forest Produce Collection, Sale and Distribution Guidelines, 2000
- IEE Manual for Forestry Sector; Nepal Biodiversity Sector
- IEE and EIA Review Guideline for Forestry Sector

The proponent should clearly relate these instruments with the project activities, and also clearly document their adequacies and inadequacies to make the project environment-friendly and sustainable.

6. TIME, BUDGET AND STUDY TEAM

6.1 Time

(same as the Chapter 6 of the Scoping Session)

6.2 Budget

As indicated by the Proponent, a total of NRs. _____ (inclusive of VAT) has been allocated to complete this EIA study.

6.3 Study Team

The proponent should mobilize a multi-disciplinary team of subject specialists with good orientation on environmental aspects to prepare an EIA report. At least, the following specialists should be mobilized to complete this EIA study.

- Team Leader/ Environmental Specialist
- Solid Wastes Specialist
- Hydrogeologist/Geohydrologist
- Anthropologist/Sociologist
- Socio-economist
- Policy and Legal Expert

The Proponent may also mobilize necessary field level assistants and other support staff to collect the field level data, verify secondary information, and data analysis.

7. SCOPE OF WORK

The proponent should prepare the EIA report considering the following the priority issues which are also included in the Scoping Report:

7.1 Physical Issues

(same as the Section 5.1 of the Scoping Session)

7.2 Biological Issues

(same as the Section 5.2 of the Scoping Session)

7.3 Socio-economic and Cultural Issues

(same as the Section 5.3 of the Scoping Session)

7.4 Management Issues

(same as the Section 5.4 of the Scoping Session)

8. ENVIRONMENTAL IMPACTS

The proponent should elaborately identify, predict and evaluate each impact of the project activities on the environment quantitatively, to the extent possible, for both construction and operational stages. Each impact identified, predicted and evaluated by using standard methods and techniques on physical, biological, socio-economic and cultural aspects should be documented in the final EIA report. The impacts should mention its nature, magnitude, extent and duration using appropriate symbols and definitions with due consideration on the Guidelines for Solid Wastes Management Project in Municipalities of Nepal. Magnitude of the impact should further be classified into site specific, local and regional; and the duration of impact should be further classified into short term, medium term and long term. Environmental impacts can be presented in the matrix form.

9. ALTERNATIVE ANALYSIS

Alternative analysis should be an integral part of the EIA report. The proponent should analyze the likely environmental impacts of project activities in each possible alternatives with due consideration on.

- design
- project site
- technology management methods, schedule, required raw materials
- acceptability
- other relevant points

Each alternative should be compared in terms of environmental impacts and benefits, and the best alternative should be recommended for project construction and mitigation measures should be proposed.

In addition No Action Option should be compared with implementing variations in the design of the proposed project.

10. MITIGATION MEASURES

In order to avoid and/or minimize adverse environmental impacts, cost effective and locally implementable mitigation measures should be included in the EIA report. The adverse impacts mitigation measures should be categorized as preventive, corrective (curative/rehabilitative), and compensatory measures. The Proponent should include environmental protection measures (EPMs) in the final EIA report. The EPMs should be included for both construction and operational stages.

11. COSTS AND BENEFITS OF THE PROJECT

The proponent should include analysis-based cost for benefits augmentation and adverse impacts mitigation measures to the extent possible in the EIA report. The environmental cost sharing, if any, should also be included in the main EIA report.

12. ENVIRONMENTAL MANAGEMENT PLAN

The environmental management plan (EMP) should be an integral part of the EIA report. The cost of mitigation measures, manpower and organizational requirement to implement the mitigation measures will be discussed with the responsible agencies and their consent will be enquired. Monitoring of the implementation of proposed mitigation measures should be the part of EMP.

The proponent should include monitoring parameters for both construction and operational stages in the main EIA report. It should also include schedule of monitoring, methods and primary responsible agency for monitoring, preferably in the matrix form. The primary responsible agencies will be consulted before assigning the responsibility. Monitoring activities will be classified in terms of baseline, impact and compliance monitoring. Manpower requirement for the monitoring activities will be listed out. Estimated cost for environmental monitoring should be included in the main report.

Similarly EMP should comprise of environmental auditing. The environmental auditing is the integral part of EPR, 1997. It obliges MOPE to conduct environmental auditing two years after the project is completed. During the study, an auditing plan should be prepared to assess the effectiveness of the implemented mitigation and compensatory measures. The study identifies the auditing parameters clearly for the major environmental issues identified in the EIA study. The study will prepare the cost for auditing works including requirement of the manpower.

13. OTHER INFORMATION

The EIA report should also include relevant information, references, annexes, map, photo, tables, charts, graphs and questionnaires, as applicable. Relevant information should be concisely presented in the main report and detail information can be given in annexes. The reference should follow the format as indicated in Schedule 6 of EPR 1997 i.e. Author, date of publication, title of materials, name of publication or journal, year, volume, number, page number as appropriate.

14. THE REPORT FORMAT

The proponent should prepare the final EIA report based on the Schedule 6 of the EPR 1997. The proponent, however, may rearrange and group ingredients listed in the Schedule 6 while preparing the final EIA report. In any case, the EIA report should not omit any components as mentioned in this TOR and the Schedule 6 of the EPR 1997. The EIA report may be formatted as follows:

- Executive Summary (both in English and Nepali languages)
- Table of Contents
- Acronyms

Chapter 1: Introduction

Chapter 2: Policy, Laws and Institution

Chapter 3: Existing Environmental Conditions

Chapter 4: Alternative Analysis

Chapter 5: Potential Environmental Impacts and Mitigation Measures

(Beneficial impacts, Benefits augmentation measures, Adverse impacts, Mitigation measures)

Chapter 6: Environmental Management Plan (EMP)

(Implementation plan of environmental protection measures, environmental monitoring, framework of environmental auditing, organization and staffing for EMP implementation, directives and coordination aspects, reporting requirements and estimated budget for EMP implementation.)

Chapter 7: Conclusion and Recommendation

- References
- Appendices
- Figures
- Tables

15. DELIVERABLES

The Proponent should submit fifteen (15) copies of the final EIA Report to the Ministry of Population and Environment as per Rules 11 (1) of the Environment Protection Rules 1997.

Pilot Project C-4

***Practice of EIA
at Taikabu Landfill Site***

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I. EIA RECOMMENDATIONS ON TAIKABU LANDFILL SITE

1. Background

Bhaktapur Municipality (BKM) is planning to develop a sanitary landfill in Taikabu near Phaidhoka in the Tathali VDC. The proposed Taikabu landfill site (LFS) is expected to take care of municipal solid waste collected from BKM and Madhyapur Thimi Municipality (MTM) along with other VDCs of the district for next 30 to 40 years.

This document was prepared as part the pilot project of practice of Environmental Impact Assessment (EIA) targeting at the planned Taikabu Landfill Site. The document contains recommendations to the EIA which is being proceeded by BKM and the concept design of the landfill site which is necessary for the EIA study.

2. Project Description

An appropriate system of sanitary land filling of type "Recirculatory Semi-aerobic" will be adopted. This system is scientific and is expected to be appropriate in Nepalese context, as it is technically simple and cost-effective. As regards the classification of LFS by level, the proposed system will correspond to a level higher than 3 (i.e. 3+). With a liner system and simple leachate treatment. The leachate will be collected in a retention pond through properly sized perforated pipes (main and branch leachate pipes) embedded in graded gravels/ boulders as filter material. For the treatment of leachate collected, there will a retention pond with its volume sufficient for retaining the leachate produced (design leachate volume: 250 cum/d) for a period of 14 days. The leachate collected in the pond will be regularly aerated through an aerator. The aerated leachate will be further re-circulated to spray over landfill cells for its simple anaerobic biological treatment. As other waste treatment facilities such as compost facility and recycling area are also being integrated, the treated effluent quality of Taikabu landfill leachate can be expected to be relatively better and well within the acceptable Nepalese standard. To be more on the safe side, necessity for additional treatment e.g. through a natural treatment system such as a constructed wetland or charcoal plant will be considered at the detailed design stage.

The proposed landfill at Taikabu (Tedole) will be developed as a waste management centre, rather than only as a final disposal site. The individual facilities to be constructed/installed are as follows, while the necessity and dimension of each facility should be examined at the detailed design along with filed soil investigations especially installation of a geomembrane as liner facility.

1) Waste retaining facility: a waste bordering dam (an earthen bund at the foot of the landfill area)

2) Storm drainage facility: perimeter drain of pre-fabricated U-shaped concrete channel

3) Leachate collection facility: main leachate collection pipe of perforated 600 mm dia. NP3 Hume pipe, branch leachate collection pipe of perforated 300 mm dia. NP3 Hume pipe, leachate retention pond (14 days retention capacity) of light reinforced concrete, 30 cm thick drainage layer of riverbed shingles (grain size 30-50 mm)

4) Liner facility: preparation of compacted basement on possibly existing geological barrier, 2 layers of clay with 25 cm compacted thickness ($K \leq 0.5 \times 10^{-9}$ m/s), and/or 1 layer of 1.5 mm thick geomembrane

- 5) Landfill gas venting facility:** 160 mm dia. perforated vertical PVC pipes, cylindrical gabions (over the leachate collection pipes manholes) filled with stone/boulder
- 6) Leachate treatment facility:** 8 kw leachate recirculation pump connected to hose pipe and sprinklers, floating type slow speed surface aerators of 10 HP, supplementary leachate treatment plant (depending upon necessity at the detailed design stage), a control room for the operation of aeration/ leachate recirculation
- 7) Landfill control facility:** groundwater monitoring wells (4 – 6 nos.)
- 8) Other related facilities:** access road (black-topped with double bituminous surface topping), temporary graveled service road, a rainwater collection pond (750 m³ capacity), treated effluent discharge structure, two-storey office building cum. counter /guard house/lab/toilet of plinth area 15x12m, a mechanical workshop, equipment/ vehicle shed and parking area, weighbridge (capacity 20 ton), entrance gate and site fencing, buffer zone (50-100m wide green belt with appropriate plantations), buffer zone road (3.5 m wide gravel road) along the site fencing, recycling area of concrete platform (size:25 x 25m) and 4 recycling containers, compost plant (size: 105 x 38m for up to 2.5 ton/d output and 185 x 38m for 5 tons/d output), a compost demonstration field, utilities (water supply, electricity, etc.)

The Phase 1 operation starts with the waste filling from an altitude of 1,328 m above sea level (ASL) at the waste bordering dam and extends upwards to a maximum altitude of 1,352 m covering a basement area of 3.1 ha (out of the total 6.6 ha). Based on the incoming waste figures provided and some assumption, it will have a landfill capacity of 378,141 m³, and a landfill period of 15 to 16 years. The Phase 2 operation starts with the waste filling from an altitude of 1,334 m ASL (near the centre of total landfill basement) and extends upwards and downwards throughout the whole landfill area up to a maximum altitude of 1,380 m. It will cover a landfill basement area of 3.5 ha (out of total 6.6 ha) with a landfill capacity of 1,747,284 m³ and an additional landfill period of 17 years. The capacity of the total landfill site has been estimated at 2,125,425 m³ of compacted waste. The lifespan has been tentatively estimated at 32–33 years. The consideration of an additional 10% incoming waste to account for the bazaar areas of the adjoining villages (as per expectation of BKM) will reduce the lifespan to 31–32 years.

3. Overall Baseline Condition

3.1. Biophysical Condition

(1) Ecological Environment

The proposed LFS site of Taikabu is a small oval bowl shaped lowland with gradual slope towards the Southwest to the Tabbyakhusi River. The proposed landfill site has a warm temperate climate. The annual rainfall is about 1,604 mm. It has an altitude of 1,329 m ASL.

The area is characterised mainly by warm temperate vegetation. The dominant plant species are uttis (*Alnus nepalensis*) and bans (*Dendrocalamus strictus*) bakaino (*Melia azedarach*) and paiyun (*Prunus cerasoides*) as well as bains, Titepati (*Artemisia dubia*), banmara (*Eupatorium adenophorum*) and bhimsenpati (*Budleja asiatica*).

Different mammals and birds and reptiles are to be found there. Tiger, Leopard, Rhesus monkey, Porcupine, Jackal, Jungle cat, Mongoose, Fox, Wild boar, Leopard cat, Hare and

Himalayan squirrel are some of the more common mammals while leopards and tigers are only seen occasionally. Birds visit the site from outside some of them during the winter and some pass through as migratory ones. Among the reptiles, common garden lizards (*Calotes versicolor*) are fairly widely seen. Not many snakes are reported from the area. It is suspected that Himalayan trinket snake (*Elaphe hodgsoni*) and Variegated keelback (*Amphisesma platyceps*) are not uncommon. Among the amphibians common tree frog (*Polypedates maculatus*) and bullfrog (*Rana tigrina*) are very frequently seen. Marbled toad (*Bufo stomaticus*), known as “Ghori Byan” among the local people, is reported usually by the wet areas near the farm guardhouses. In the Tabbyakhusi, locally known fish named as Asla and Hile are reported to found.

(2) Water Quality

In order to grasp the current conditions of groundwater and surface water quality in and around the proposed landfill site, the supplemental water quality survey was conducted as part of the activities of the Pilot Project C-1.2. Before the water quality sampling, the site was visited to identify appropriate sampling locations that would represent water quality of the site. Following locations were selected for the sampling.

1) Ground water

- Stone Spout (locally named ‘Ganaune Dhara’)
- Well

2) Surface water

- Tabya Khushi River upstream (upstream of the proposed landfill site)
- Tabya Khushi River downstream (downstream of the proposed landfill site)

The well in Taikabu is used for drinking purpose by few surrounding households as well as the farmers working near the well. Similarly, the water from Stone Spout is used mainly for drinking purpose. The water from the Tabya Khushi River is used solely for irrigation.



Sampling at Well



Sampling at Tabya Khushi River

The sampling conducted two times, on June 7, 2005 and June 30, 2005. The results of the water quality measurement in situ and laboratory analysis are shown in Tables 3-1 and 3-2.

Table 3-1 Result of Water Quality Analysis (June 7, 2005)

Parameters	Unit	Ground water		Surface water	
		Stone Spout	Well	Tabya Khushi upstream	Tabya Khushi downstream
Turbidity	NTU	10	100	>2,000	>2,000
Colour	-	no	Light yellow	brown	brown
Odour	-	Iron nail smell	Light iron nail smell	soily	soily
Water temperature	oC	18	17	21	21
Air temperature	oC	28	28	28	28
Velocity	m/sec	NA	NA	0.73	0.9
Discharge	m ³ /sec	NA	NA	0.55	0.56
pH (22°C)	-	6.6	6.1	7.2	7.3
Electrical Conductivity	uS/cm	280	260	125	135
Dissolved Oxygen (DO)	mg/L	3.7	1.1	6.1	6.0
Total Dissolved Solids (TDS)	mg/L	210	241	100	73
Total Suspended Solids (TSS)	mg/L	9	28	1,576	928
Hydrogen Carbonate (HCO ₃ ⁻)	mg/L	88	50	30	30
Biochemical Oxygen Demand (BOD)	mg/L	0.70	0.90	31.00	29.00
Chemical Oxygen Demand (COD)	mg/L	6.5	5.5	95.0	97.0
Oxygen Consumed	mg/L	0.96	1.44	92.0	88.0
Chloride ion (Cl ⁻)	mg/L	10	12	13	39
Fluoride	mg/L	0.99	0.70	0.06	1.22
Calcium ion (Ca ⁺⁺)	mg/L	35	30	13	13
Sodium ion (Na ⁺)	mg/L	8.78	11.30	7.14	6.53
Sulfate ion (SO ₄ ⁻)	mg/L	<1	<1	<1	<1
Sulfite ion (SO ₃ ⁻)	mg/L	4.00	4	3.50	3.50
Sulfide as S	mg/L	2.00	1.60	1.20	1.20
Ammonia- Nitrogen (NH ₄ -N)	mg/L	2.85	1.36	4.36	8.31
Nitrate Nitrogen (NO ₃ -N)	mg/L	0.28	0.93	3.24	0.38
Nitrite Nitrogen (NO ₂ -N)	mg/L	0.02	0.01	0.08	0.08
Total Nitrogen (T-N)	mg/L	4.41	3.98	10.76	13.13
Phosphorus Phosphate (PO ₄ -P)	mg/L	0.78	0.61	3.34	2.08
Oil & Grease	mg/L	1.80	1.40	3.40	1.80
Arsenic (As)	mg/L	ND (<0.005)	0.007	0.033	0.010
Cadmium (Cd)	mg/L	0.002	0.003	0.003	0.003
Total Chromium	mg/L	0.028	0.021	0.043	ND (<0.02)
Hexavalent Chromium	mg/L	ND (<0.02)	ND (<0.02)	0.020	0.040
Copper	mg/L	0.002	0.003	0.028	0.026
Lead	mg/L	0.021	0.042	0.096	0.088
Mercury	mg/L	ND (<0.001)	ND (<0.001)	ND (<0.001)	ND (<0.001)
Nickel	mg/L	ND (<0.01)	ND (<0.01)	ND (<0.01)	ND (<0.01)
Selenium	mg/L	ND (<0.005)	ND (<0.005)	ND (<0.005)	ND (<0.005)
Zinc	mg/L	0.03	0.03	0.12	0.10
Iron	mg/L	9.07	13.47	10.01	8.07
Manganese	mg/L	0.60	1.37	2.09	1.68
Fecal Coliform	CFU	35/100ml	201/100ml	76X10 ¹⁰ /ml	80X10 ¹⁰ /ml

Note: NA: Not Applicable; ND: Not Detectable
Samples were measures and analyzed by ENPHO

Table 3-2 Result of Water Quality Analysis (June 30, 2005)

Parameters	Unit	Ground water		Surface water	
		Stone Spout	Well	Tabya Khushi upstream	Tabya Khushi downstream
Turbidity	NTU	5	60	250	300
Color	–	Colorless	Grey	Light brown	Brown
Odor	–	Iron nail smell	Faint iron nail smell	Faint soily	Faint soily
Water temp	°C	19	19	23	23
Air temp	°C	27	28	27	27
Width	m	NA	NA	2	2
Depth	m	NA	NA	0.2	0.2
Velocity	m/sec	NA	NA	0.5	0.6
Discharge	m ³ /sec	NA	NA	0.2	0.24
pH (25 ⁰ C)	-	6.5	6.0	7.6	7.7
Electrical Conductivity	uS/cm	275	300	325	310
Dissolved Oxygen (DO)	mg/L	1.00	0.50	6.50	6.50
Total Dissolved Solids (TDS)	mg/L	200	258	204	274
Total Suspended Solids (TSS)	mg/L	62	24	132	192
Hydrogen Carbonate (HCO ₃ ⁻)	mg/L	82	50	72	74
Biochemical Oxygen Demand (BOD)	mg/L	6.5	3.0	7.5	9.0
Chemical Oxygen Demand (COD)	mg/L	42.5	16.5	40.0	32.5
Oxygen Consumed	mg/L	39.04	9.28	39.68	30.04
Chloride Ion (Cl ⁻)	mg/L	6	5	15	12
Fluoride	mg/L	0.53	0.36	0.83	0.84
Calcium ion (Ca ⁺⁺)	mg/L	80	74	92	94
Sodium ion (Na ⁺⁺)	mg/L	9.38	10.82	10.15	11.27
Sulfate ion (SO ₄ ⁻)	mg/L	2.06	1.64	2.89	2.67
Sulfite ion (SO ₃ ⁻)	mg/L	2.50	2.50	5.50	6.00
Sulfide as S	mg/L	<0.4	2.00	1.20	0.80
Ammonia- Nitrogen (NH ₄ -N)	mg/L	4.67	3.45	6.69	4.25
Nitrate Nitrogen (NO ₃ -N)	mg/L	0.03	0.02	3.48	3.41
Nitrite Nitrogen (NO ₂ -N)	mg/L	0.03	0.01	0.23	0.38
Total Nitrogen (T-N)	mg/L	7.53	4.88	13.34	11.40
Phosphorus Phosphate (PO ₄ -P)	mg/L	0.34	0.34	0.51	0.74
Oil & Grease	mg/L	57.2	27.8	44.2	44.6
Arsenic (As)	mg/L	ND (<0.005)	ND (<0.005)	ND (<0.005)	ND (<0.005)
Cadmium (Cd)	mg/L	ND (<0.001)	ND (<0.001)	ND (<0.001)	ND (<0.001)
Total Chromium	mg/L	ND (<0.02)	ND (<0.02)	ND (<0.02)	ND (<0.02)
Hexavalent Chromium	mg/L	ND (<0.02)	ND (<0.02)	ND (<0.02)	ND (<0.02)
Copper	mg/L	ND (<0.02)	ND (<0.02)	ND (<0.02)	ND (<0.02)
Lead	mg/L	0.026	0.018	0.017	0.005
Mercury	mg/L	ND (<0.005)	ND (<0.005)	ND (<0.005)	ND (<0.005)
Nickel	mg/L	ND (<0.01)	ND (<0.01)	ND (<0.01)	ND (<0.01)
Selenium	mg/L	ND (<0.005)	ND (<0.005)	ND (<0.005)	ND (<0.005)
Zinc	mg/L	0.01	0.03	0.02	0.01
Iron	mg/L	9.70	13.21	8.61	3.90
Manganese	mg/L	0.64	1.50	0.52	0.53
Fecal Coliform	CFU	1,700/100ml	400/100ml	5,900/100ml	7,100/100ml

Note: NA: Not Applicable; ND: Not Detectable
Samples were measured and analyzed by ENPHO

3.2 Socio-economic and Cultural Condition

The Tathali VDC is inhabited by various ethnic groups of people. The total population of Tathali VDC is 5,652 with almost 2,827 men and 2,825 women. There are Chhetri 43%, Newar 40%, Brahman 7% and others 10%.

The mainstay of the economy in the VDC is agriculture. However brick kilns dominate the dry period landscape of the western part of VDC. The proposed LFS area is still occupied in all seasons by agricultural activities. In the far eastern land of the VDC the land is occupied by forest.

Industrial activities are not much to be found here, but the most popular industry of brick making cannot be ignored. The VDC has an all weather motorable road, which connects the eastern edge of the Bhaktapur Municipality with Nala. Further south at the edge of the VDC there is another road linking the Bhaktapur municipality with Nala.

The life of the people is guided by Hindu traditional value system with slight modification exhibiting local Buddhist or even indefinable peculiarities of local beliefs and customs, providing a picture of what may be called an excellent example of religious tolerance. The society is cohesive in nature and very cooperative.

The main occupation of the local people is agriculture. Almost all of the people in the site are farmers. Being so close to the urban market area, most of the people do have some other activity facilitated by the factor of proximity. Obviously the brick kilns near by attract them and other subsidiary jobs in the city itself. Apart for them they raise some livestock, for their own consumption and for selling the products in the market.

Water related diseases that mostly occur due to poor sanitation are quite common in the project area. Piped water system by installing water tanks at places are found but due to lack of awareness and unreliable water supplies local people still found to prefer drinking water from dug wells and spring sources. Open defecating practices are found common although some households are observed using sanitary toilets.

Large sections of the people are still illiterate. The women are more so as compared to men. The literacy rate among the people of the VDCs is 57 % while among the males it is 79 % and 41% among women.

4. Possible Impacts

4.1. Biophysical Impacts

The likely major impacts on physical environment are project related changes on land use, erosion and sedimentation, drainage and hydrology, air, noise and water pollution etc.

Land use changes as a consequence of the proposed landfill site development will be basically due to acquisition of land required for providing solid waste dumping, composting and waste segregation facilities. Quite a considerable land needed for the project is cultivated. Hence, there will be permanent land use change, which will potentially bring loss of agricultural production. The access road to the proposed landfill site is expected to be quite short. But construction activities may cause erosion, sedimentation and runoff diversions from the catchment.

The construction and operation is not expected to bring major changes in the local climate. The unmanaged runoff and inadequate soil cover at the landfill site may have a direct bearing on the volume of leachate formation.

Changes in water quality of the surface water and groundwater bodies are likely to occur due to the disposed waste in the site and composting facility, the run-offs of soil excavated sites. Key parameters that are likely to be affected are pH of water, increase in ammonia, nitrates and nitrites, increase in chlorides, and microbiological contamination.

Change in local air quality is expected during construction and operation. The air pollution level due to fugitive dust may get worse during the dry season of the year. Other significant air pollution will be the odor pollution from the decaying solid waste both at the LFS, waste processing facility and leachate. The level of air quality will be not much impaired in the LFS vicinity during post operation phase. Various activities likely to cause noise and vibration during construction and operation phase include vehicle movement and operation of heavy equipment.

As the LFS lies in the agricultural land, environmental impacts on the vegetation and natural ecosystem do not seem to be significant. However, removal of vegetation from LFS and other areas during site clearance might cause some loss of terrestrial habitats. The trees that are to be felled do not include species protected by the Nepalese law, Forest Act 1993, nor listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) or the Red Data Book prepared by the International Union for Conservation of Nature and Natural Resources (IUCN). Changes in aquatic ecology are expected. The indirect impact, however, will arise from the use of the local vegetation for fuel wood by the construction and operation workers. Since the area is not a permanent habitat of those mammals, serious loss of habitat of the mammals due to LFS is not expected.

Some bird species visit the place during winter season and some pass through as migrants, no rare and endangered bird species are recorded in and around the site. The development site itself is not a natural habitat of these birds. So there will be no loss of the habitat. The impacts on terrestrial fauna and habitat by the implementation of the proposal will therefore, be of low significance.

The illegal poaching is a likely activity of the construction and operation workforce. Aquatic ecology of the Tabbyakhusi may be affected during the construction but not so much by the operational activities in the landfill site. The major cultural and socio-economic issues that could be taken into consideration in the EIA appear to be loss of agricultural land, acquisition of land and dwellings, resettlement and relocation, public attitude and co-operation, and quality of life values.

Land to be occupied by the LFS and other components will be acquired by the project. Most of it will be the agricultural land; the landowners and the tenant farmers will be affected. They have to be identified clearly and accurately.

4.2 Social Structure and Cultural Impacts

The affected household and population, living there for centuries should be identified. Loss of land and property will promote disintegration of traditional family bond.

The basis for estimating population displacement and relocation requirements is the baseline socio-economic data and land and property. It should also indicate if those households who lose their residence have other residences elsewhere, a higher prevalence of water related diseases such as dysentery, diarrhea, skin diseases etc might also be reported.

The acquisition of land will reduce the land holding size and hence loss of social status and livelihood. If the landfill activities will be carried out with the help of labour intensive techniques, wherever possible, and if the local people would show interest in working with waste disposal activities the construction of access road will help to boost economic activities in the area. Increase in the vehicular traffic would increase the chances of accidents and discomfort to the commuters and the people near the transport line. The proposed LFS location, mode of activities and involvement of external workforce does not seem to have significant impacts that proper management of LFS and other facility sites is essential to abate pollution vis-a-vis to improve public health status of the community people.

The LFS will have minimum or no effect on aesthetic values. No archaeological and historical sites will be directly affected. Hence, the impacts on cultural values will not be significant.

4.3 Suggestions for Impact Prediction

Usually the potential environment impacts of solid waste management are different in different components. They should be thoroughly examined and checked and predicted at each of the stages of the process of the management such as the collection system, delivery system, disposal system and landfill site. A checklist is the simplest and most convenient one. Such lists are used in combination with variations of the interaction matrix. Prediction of impacts depends upon baseline information and described in quantitative and qualitative terms.

The lessons and experience of Sisdol Landfill Site should be learned and reviewed for impact examination. In addition, it is essential to integrate the experiences and lessons obtained through the Sisdol Landfill Site operation into the examination of mitigation measures and/or development of environmental monitoring/management plan.

5. Basic Framework for Environment Management Plan (EMP)

In EIA process identification, prediction and evaluation of the significance of impacts are very important steps. The next step of implementation of project activities is guided virtually through the Environmental Management Plan (EMP), which includes monitoring and auditing requirements. The mitigation measures for avoiding or reducing the adverse environmental effects should be monitored very rigorously by developing appropriate indicators. The Division of Environment, MOEST, will prepare a post environmental audit report after two years of the completion of construction.

5.1 Legislative Requirement and Guidelines

Nepal's legislative measures EPA, 1997 and EPR 1997 require that EMP should be prepared and submitted as a part of the EIA report. Two guidelines are to be followed while

conducting the EIA of Taikabu LFS. The National Guidelines for Solid Waste Management Projects in the Municipalities of Nepal issued by SWMRMC; and Guidelines for Environmental and Social Considerations issued by Japan International Cooperation Agency (JICA). The objectives of an EMP are to formulate monitoring plan for baseline, impact and compliance and to formulate environment-auditing plan to be implemented during and after the project implementation. For each of the impact corresponding mitigation measure should be developed. The indicators selected should reflect the condition of particular component upon measurement.

5.2 Mitigation Measures

(1) Biophysical Environment

In the access road, bioengineering techniques and other slope stability measures to control erosion and sedimentation are suggested. Excavation of earth for covering layer needs to be controlled in a balanced manner. Soil excavated from the waste processing facility and other facilities as part of land development has to be stored in a safe manner with protection against erosion. The existing natural drainage facility should be maintained by constructing drains underneath the proposed LFS. A fully covered watertight drain should be constructed across the LFS up to the Tabbyakhushi. The proper drainage above the LFS proposed fill height is recommended for design and construction to divert the off site storm run off from entering into the active LFS during operation and post operation phase of the project. Similarly, the segregation, composting and reusable depot sites require separate drainage for storm water runoff and leachate released from the wastes.

In the proposed LFS, as the control of the leachate generated in the landfill area, clay liner should be placed, and leachate control system should be installed including the retention pond, recirculation system, aerator, and experimental small plant for biological treatment of the leachate.

For countermeasure for odor, the daily soil cover should be applied as the primary control method. Odor in post-closure phase should be controlled by the placement of a final capping cover.

Use of vehicles should comply with HMG/N's emissions standards. Vehicular emission testing of all the construction and operation vehicles should be undertaken. Some appropriate sort of breathing protection masks should be used; and fencing of the site can restrict entry of animals and humans within the facility.

To minimize the impacts of noise and vibration regular maintenance of all equipment and vehicles, fittings of mufflers to all equipment, speed restriction to waste transportation vehicles are recommended. However, within the site some noise due to operation of equipment exists. The afforested buffer zone contributes in minimizing the noise to near by settlements.

To minimize the unwanted loss of vegetation from site clearance and preparation of construction and operation works; it is proposed to peg all the LFS and other facility areas and permission for vegetation clearance should be given only when it is most essential. Plantation of locally available tree species should be carried out and should be maintained longtime so as to ensure that the planted trees grow sufficiently. Fencing of the area prohibits encroachment of the afforested areas from the grazing cattle. Restriction to enter

the LFS occupied area should discourage illegal harvesting of forest species and progressive rehabilitation and afforestation program on planting of trees should be initiated to areas where landfill operations are completed.

To minimize the impacts on aquatic ecology, the water quality of the Tabbya Khushi River needs to be maintained within the limit that is required for aquatic life.

Visual impacts, if any, should be mitigated during reclamation by developing the land area with interesting and pleasant landscaping including vegetation with trees and shrubs as required.

(2) Socio-Economic Environment

To avoid and to minimize the social and economic hardship of the affected families and communities, a resettlement policy framework is suggested:

Involuntary displacement should be minimized if inevitable, resettlement and rehabilitation plans should be conceived and executed as an integral part of the project, traditional land rights should be recognized and compensated; the principle of prompt and adequate compensation at replacement cost should be adopted for all losses and to all affected households. Cost of rehabilitation should be provided. Affected households without legal title should be supported after due exploration under humanitarian ground; Affected families should have easy access to effective dispute resolution procedures; project affected families should get priority in employment in the project. Compensation for land and other property should be fixed through negotiations involving community consensus as far as possible. They should have representation in the CFC. Affected families should be informed fully and consulted on resettlement and compensation options. External workforce should not be allowed in settlement areas Alcohol and gambling by the LFS laborers in the LFS and vicinity areas, should be prohibited.

To minimize the impacts on water supply and sanitation, community water source protection programs should be launched. Effective solid waste management at LFS should be strictly followed and public awareness campaign on sanitation and health education aspects should be launched in the local community. To minimize the impacts of loss of agricultural produce appropriate agricultural extension programs and livelihood skill training programs etc. should be implemented and to enhance local economy and infrastructure special environmental improvement programs should be formulated and implemented with consultation and participation of local body and project affected people.

To minimize the level of risks on occupational health, awareness campaign placing traffic signal signs and bill boards at appropriate places, fencing of LFS area, a provision of protection gears to all workers, regular information campaign to Provision for gas collection system with release pipes of provision of protection gears to all workers such as boots, gloves, helmets, earplugs etc. and provision of compensation on the loss of life or impairment should be launched.

Due consideration should be paid on the waste picker issues from the viewpoints of effective and safe operation of the site as well as of avoidance of accidents or health hazard on waste pickers.

6. Procedural Issues for EIA Study including Land Acquisition

HMG/N has from time to time declared policies or enacted specific legislative measures, which are directly relevant to EIA in general, and Solid Waste Management (SWM) in particular.

6.1 Legislative Measures

The existing legislative measures listed in the following are not to be contradicted while making environmental recommendations for the construction of a landfill project besides morally binding provisions of international conventions such as CITES.

- The Constitution of the Kingdom of Nepal, 1990,
- Tenth Plan (2002-2007) of HMG/N,
- Environmental Protection Acts (1997) & Rules (1997 and as Amended 1999),
- Solid Waste Management and Resource Mobilization Act, 1987 and SWMRMC Rule were formulated in 1989,
- Town Development Act 1992,
- Local self Governance Act (1999),
- Industrial Enterprises Act (1992),
- Forest Act, 1993, and Forest Policy (1993);
- Land Acquisition Act 1977 (Amendment 1992),
- Water Resource Act (WRC) 1992,
- Guthi (Trust) Corporation Act 2033 (1976),
- Water Resource Act (WRC) 1992, and Hydropower Development Policy (2001),
- Electricity Act 2049 (1992), and
- Ancient Monument Protection Act (1956);

6.2 Guidelines

The SWMRMC Guidelines aims to provide an environmental basis for implementing SWM projects including LFS projects, a basis for compliance with EPR, 1997 and environmental standards and norms, a basis for developing and implementing SWM projects, waste management facilities and landfill sites construction and operation in a safe and environmentally sound manner.

6.3 Public Involvement

The mandatory methods of public involvement are public notice and public hearing. A Public Involvement Facilitating Team should be used to explain the project and the public involvement process. Good open and frequent communications always help encourage dialogue and reduce misunderstandings.

Some good techniques may be termed workshops including Brain Storming, Force Field Analysis, Focus Group Discussion and Appreciative Planning and Action. Surveys are useful qualitative means for determining the socio-economic status of the local people, resource use pattern, public attitude, values and perceptions on a variety of issues. Rapid Rural Assessment (RRA) and Participatory Rural Appraisal (PRA) are methods based on a systematic sequence of interdisciplinary activities for producing accurate information and analysis of rural life and resource condition. There are other forms of participatory appraisals such as Participatory Action Research (PAR), Participatory Learning and Action

(PLA), Appreciative Inquiry (AI) and Appreciative Planning and Action (APA). Rapid participatory and appreciative appraisals are known for their useful key tenets of appreciation, participation, empowerment, teamwork, flexibility, optimal ignorance, adequate probing, and triangulation. Even during Monitoring and Evaluation participatory methods are very useful. Engaging stakeholders in meaningful and productive ways can be extremely beneficial.

6.4 Procedures for Land Acquisition/Compensation and Resettlement

Updating Information about Property: The data regarding the property of the people and, if necessary, cadastral survey should be implemented. Details of all trees and other assets should be recorded. Landowners and tenants should be identified, along with the areas of the land and property after proper process of entitlement. A general description of the PAFs should be prepared with major socio-economic indicators. Then a profile of the Severely Project Affected Families (SPAFs) should be prepared. The value of the land and property to be permanently acquired at their replacement cost should be assessed, and compensation and rehabilitation grant for all PAFs for presentation to the CFC should be conducted.

Resettlement and Rehabilitation Study: The groundwork for an institutional framework should be developed for implementing the Resettlement and/or Rehabilitation Plan, including land and property acquisition and other relevant programs. The organizational structure, manpower and budget for the institutional unit should be arranged. Furthermore, the government agencies and NGOs operating in the project site should be identified for their direct/indirect involvement for implementing the activities associated with resettlement and rehabilitation.

7. Recommendations

The site conditions should be favorable for the construction and operation of proposed Taikabu Sanitary Landfill Facilities from technical, socioeconomic, environmental and organizational points of views with or without mitigation measures of project's negative or positive environmental impacts. The proposed site could be recommended for development, if the proposed mitigation measures either enhancement or reduction are honestly and correctly adopted and applied, after drawing up a good Environmental Management Plan (EMP). Following environmental recommendations are to be made for the effective and best use of the proposed site besides others for its sustainability.

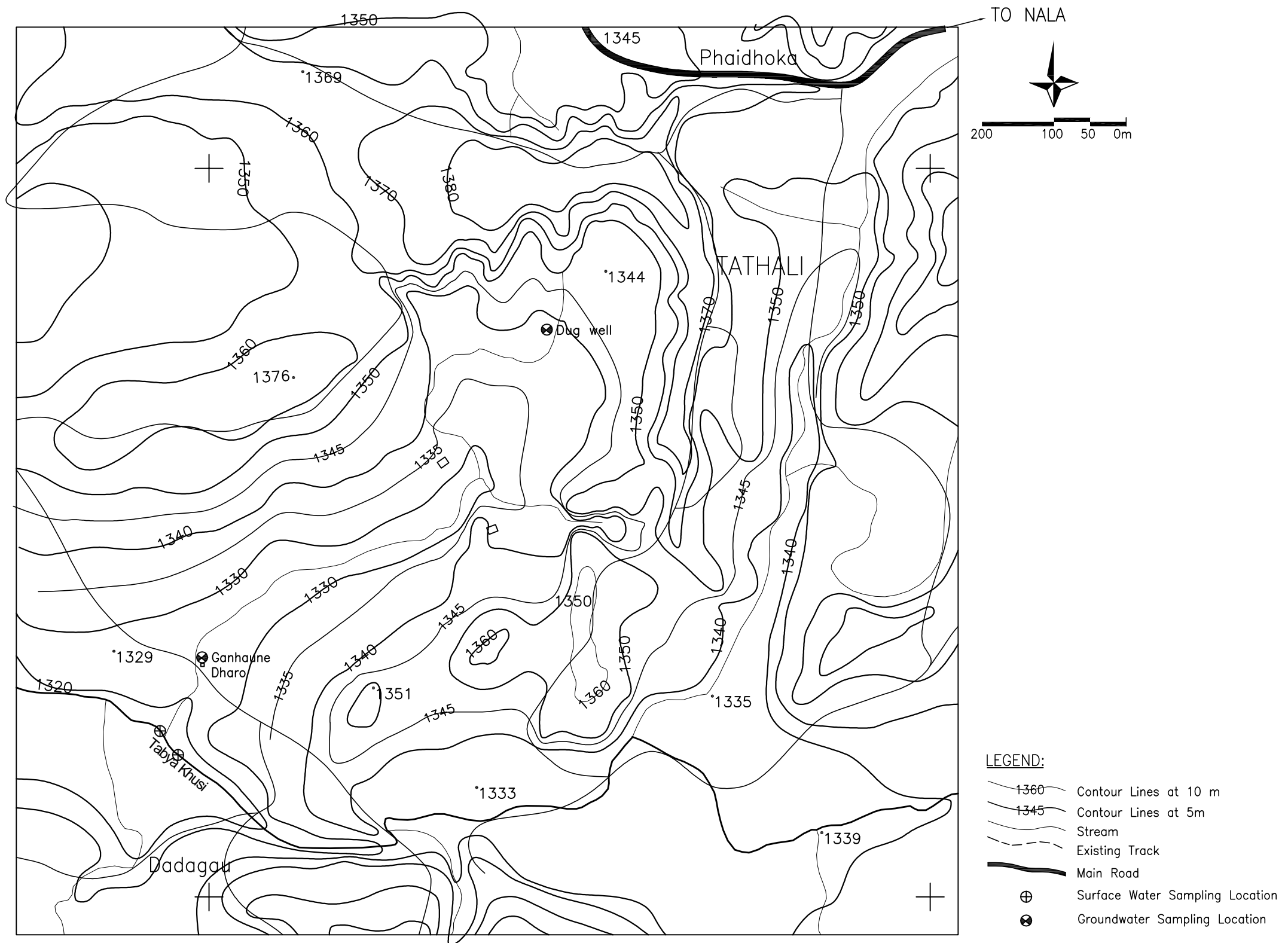
- A public interaction should be organized before starting the implementation of the project in the Taikabu LFS.
- Knowledgeable, interested, anxiously concerned leaders of the society should be convincingly told how every step would be taken.
- Public participation should insured in the decision making process of the project right from the beginning to the operation and maintenance of the projects. Public participation should also include project-affected families.
- The EIA report has to come up with other alternatives also and should not just stick to the proponent's selection of the landfill site.
- Prompt collection and disposal management system for solid waste should be developed so as to ensure safe delivery of solid waste as it is generated.

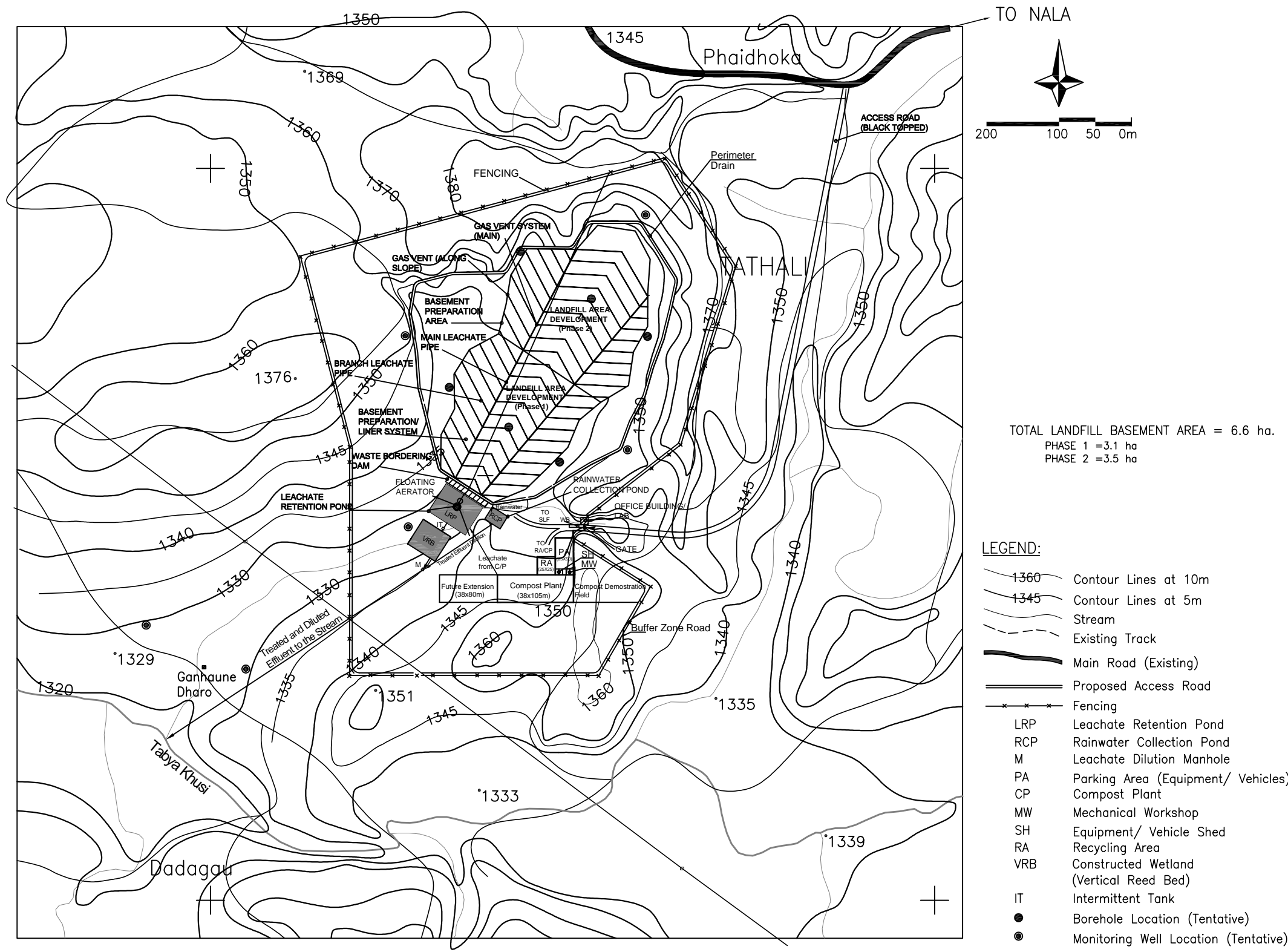
- As environmental enhancement programs some community development programs should be implemented with community involvement from project designing to implementation phase.

II. CONCEPT DESIGN

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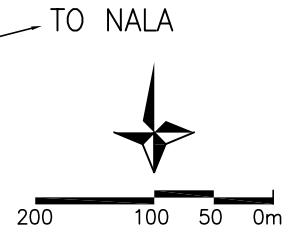
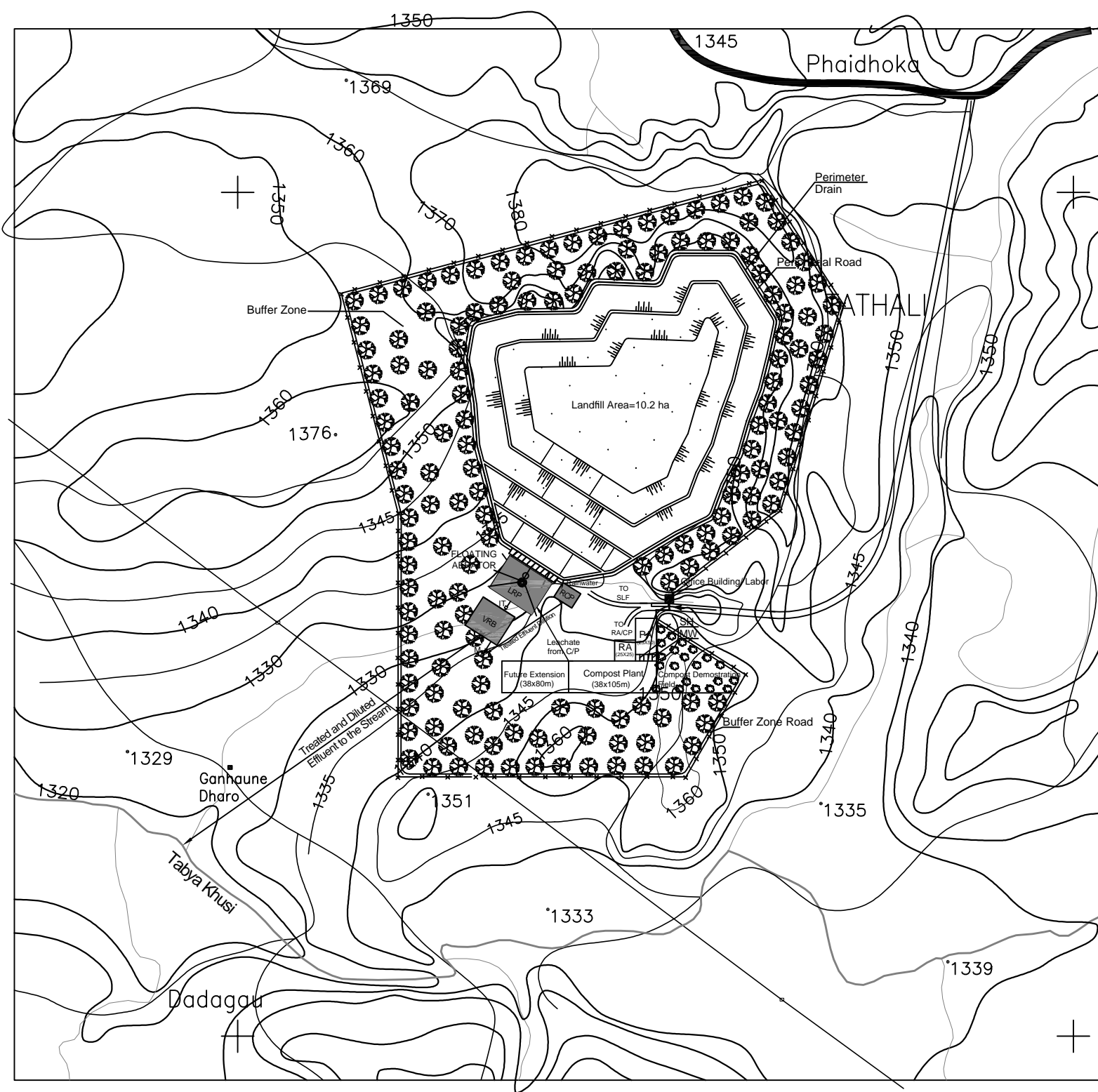




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Figure C.4-2
Layout Plan of Landfill Development



TOTAL SITE AREA	=29.9 ha.
LANDFILL AREA	=10.2 ha.
GREENERY/ BUFFER ZONE	=15.1 ha.
WM & OTHER INFRASTRUCTURE FACILITIES	= 4.6 ha.

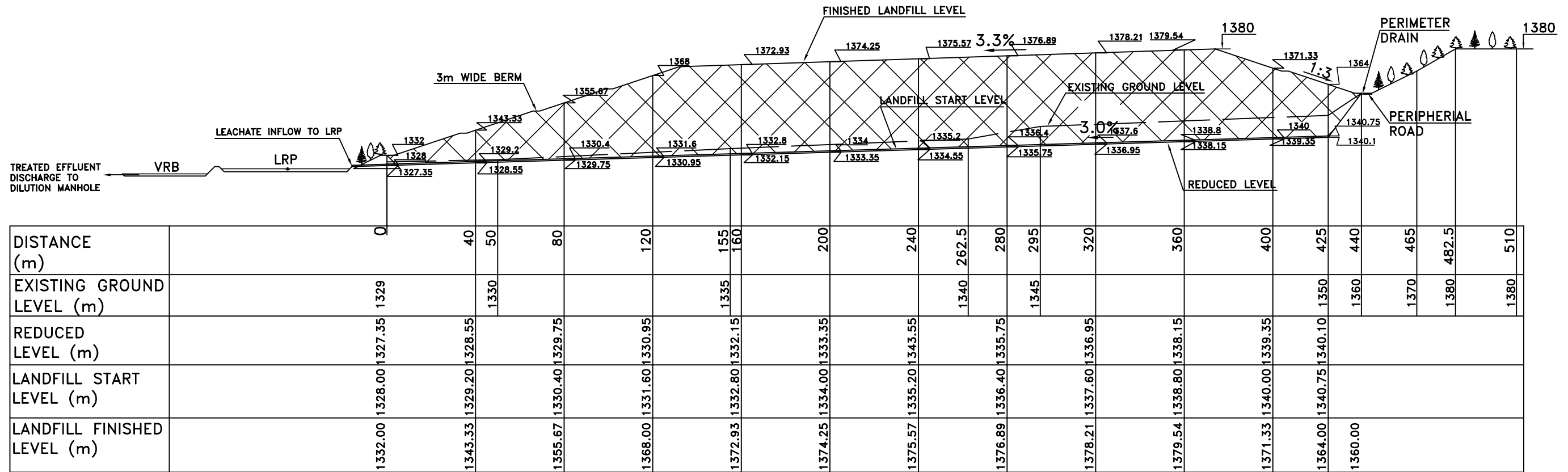
LEGEND:

	1360 Contour Lines at 10m
	1345 Contour Lines at 5m
	Stream
	Existing Track
	Main Road (Existing)
	Proposed Access Road
	Fencing
	LRP Leachate Retention Pond
	RCP Rainwater Collection Pond
	M Leachate Dilution Manhole
	PA Parking Area (Equipment/ Vehicles)
	CP Compost Plant
	MW Mechanical Workshop
	SH Equipment/ Vehicle Shed
	RA Recycling Area
	VRB Constructed Wetland (Vertical Reed Bed)
	IT Intermittent Tank

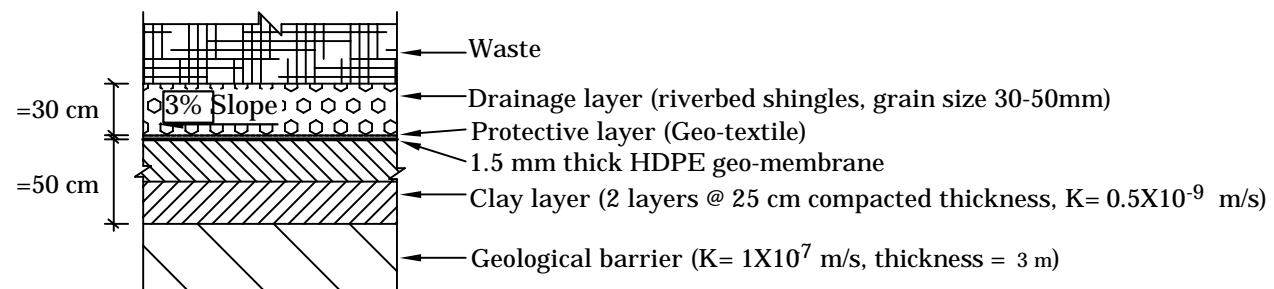


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Figure C.4-3
Layout Plan of Landfill Completion



LONGITUDINAL SECTION (Through the Landfill Area)



RECOMMENDED LINER SYSTEM (Basement Sealing)

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Figure C.4-4
Longitudinal Section (Through The Landfill
Area) & Recommended Liner System

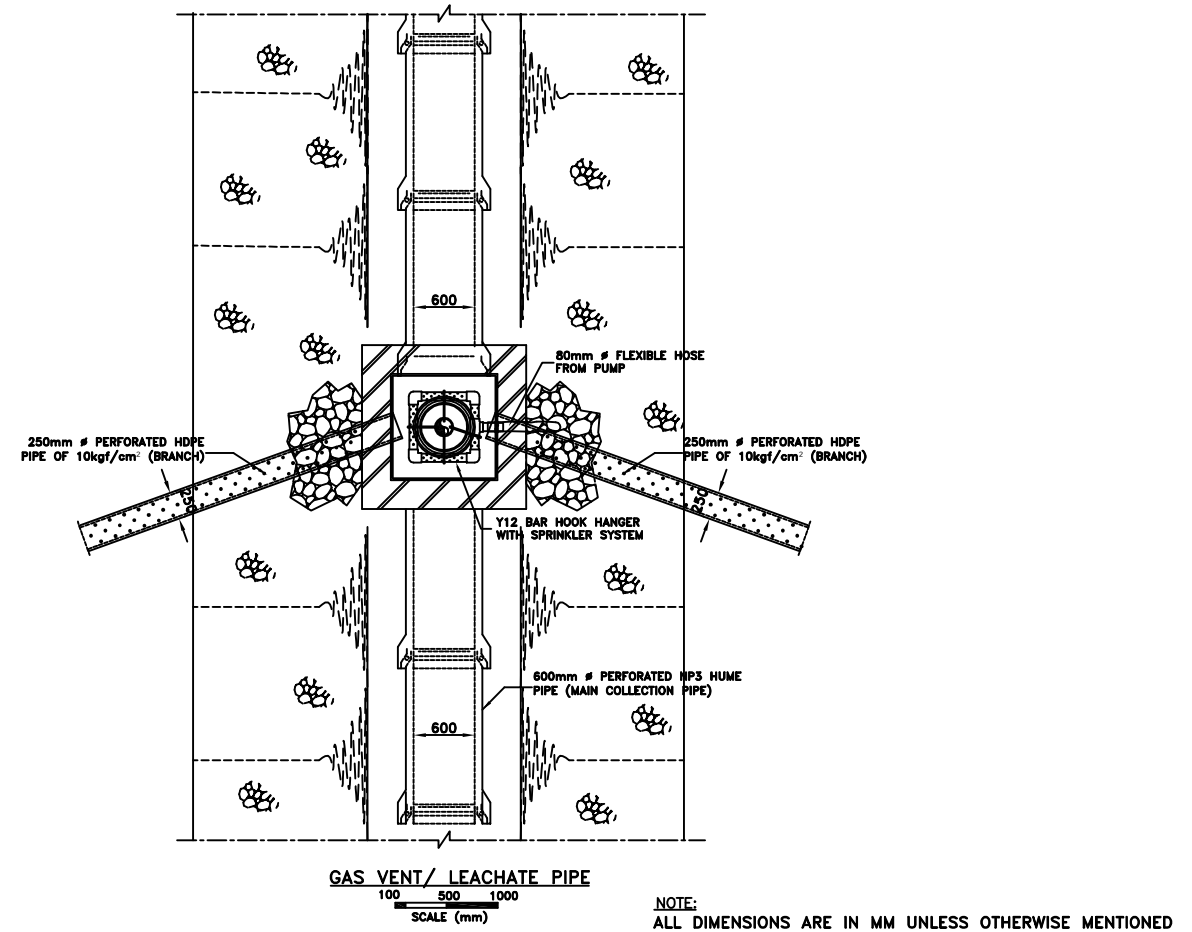
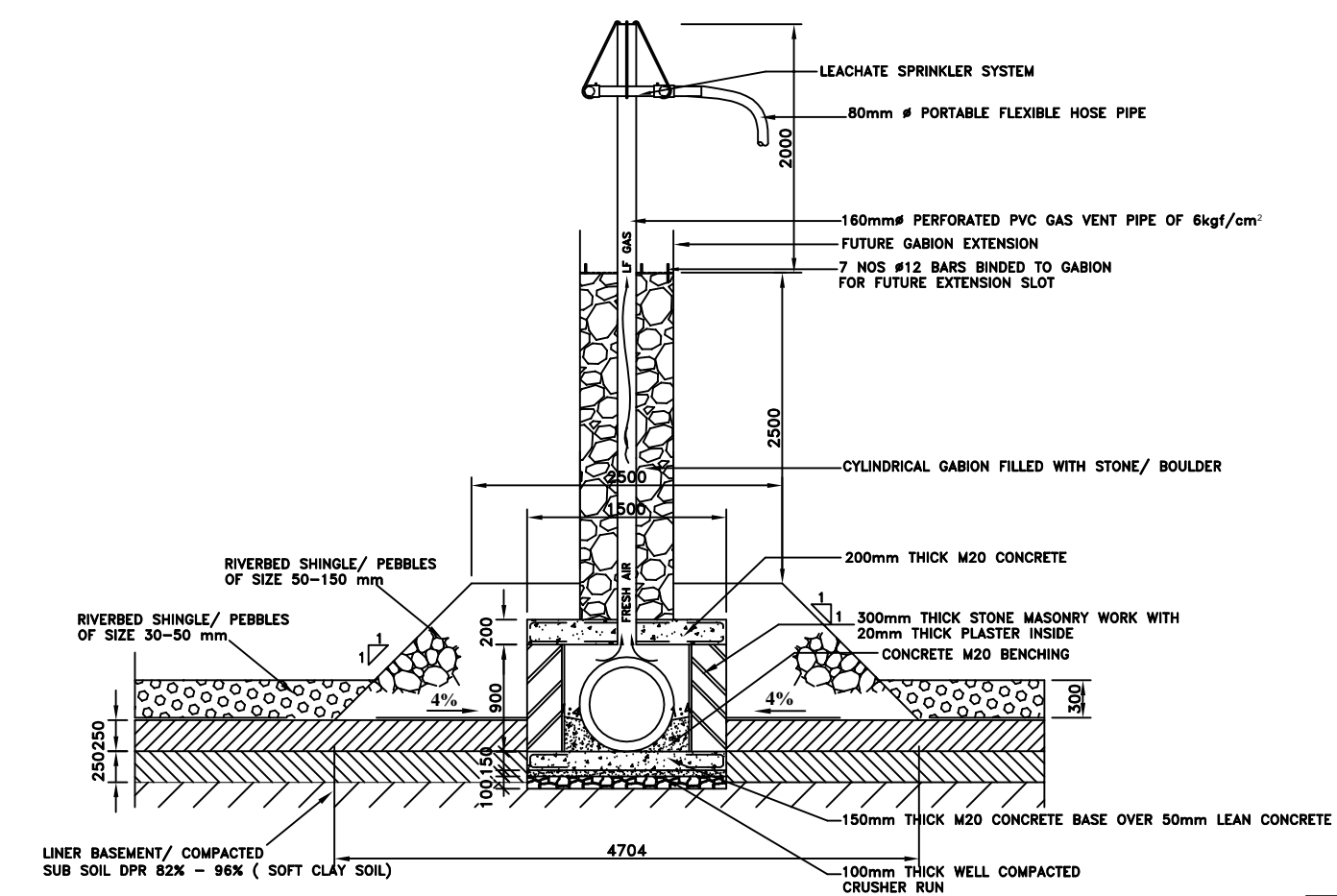
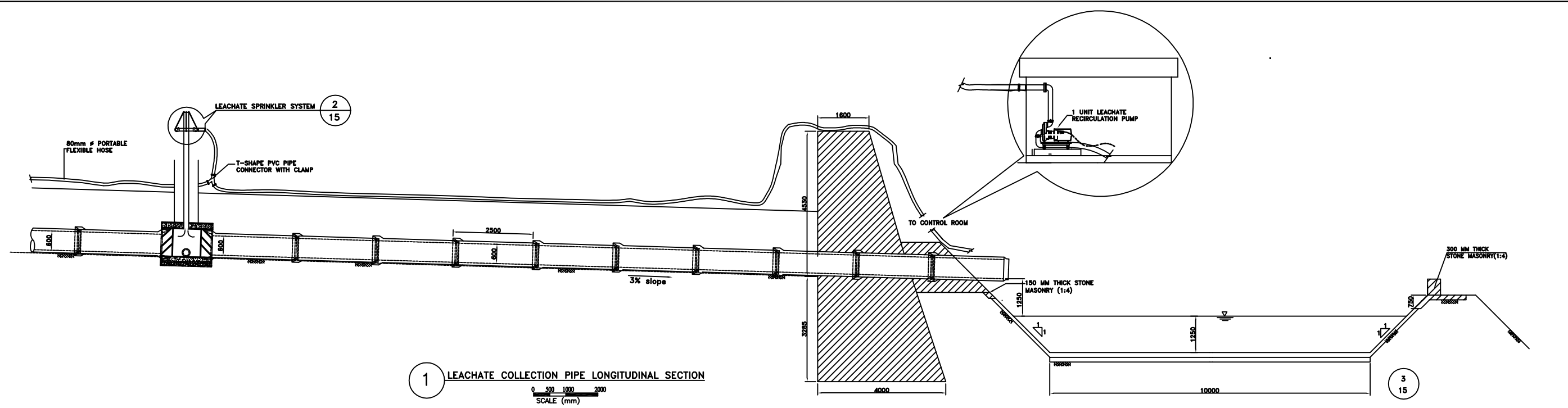


Figure C.4-5
Typical Leachate Collection and
Gas Vent System