Environmental Guidelines for Housing

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1.0 Background

This section of the *Manual* outlines the main environmental management issues relating to the establishment and construction of low-cost housing units, and presents guidelines to minimize the negative environmental impacts of decisions and activities related to the establishment and construction of low-cost housing units. These guidelines are presented in a user-friendly format, for use by housing programme managers and homeowners.

In attempting to obtain documentation on the subject of environmental management in relation to low-income housing, it was found that such documentation was sparse. Further, few local regulations and technical guidelines relating to environmental management exist, and those which do exist, are of little relevance to low-income housing. Consequently, this material is based primarily on the knowledge and experience of the author.

2.0 Introduction

Funding provided under the housing programme by the NRDF largely relates to the construction or expansion of wooden houses and the expansion of masonry houses. The houses are, for the most part, located outside of the larger urban areas, usually on family lands, or on rented "house spots", and not within planned residential developments. The houses are usually located on relatively flat or moderately sloping lands, away from public paved roads and they are often serviced by footpaths or narrow unpaved roads. In the majority of cases, formal planning approval is not sought for the construction or location of the houses. It should be noted however that formal planning approval is not required in St. Lucia for expansion of residential developments when the area of the expansion amounts to less than one-third of the area of the original development.

It is commonly thought that because of the relatively small scale of the activities involved in low-income housing, particularly when undertaken on one house at a time, the environmental problems associated with an individual low-income housing venture are generally insignificant and of limited impact. However, within any given area, a series of minor environmental problems can combine to produce significant negative impacts. For example, the indiscriminate disposal of waste into a ravine or river course by several households will cumulatively lead to the pollution of that watercourse. Also, an improper practice associated with one household can over time lead to a major environmental problem with impacts on an entire community. For example, the improper construction of drains on one house lot on a hillside may over time lead to the formation of a gully, which can cause the loss of large amounts of soil or inundation of properties located downhill. Therefore, as simple or insignificant as activities related to low-income housing may appear to be, they may contribute to significant environmental problems unless certain measures are adhered to. Some of these measures may be quite simple and relatively cheap. However some low-income homeowners may be unable to afford to implement some of these measures, at least not at the same time as they are seeking to address expenses directly related to the main housing unit.

The typical environmental problems associated with low-income housing ventures in St. Lucia are for the most part related to the Location and Placement of houses, Site Preparation, Drainage and Waste Disposal. Descriptions of these problems, and the guidelines on the measures which should be implemented to address these problems, are provided in the following sections.

3.0 The Location and Placement of Houses

3.1 Problems associated with the Location and Placement of Houses

Indiscriminate and uniformed placement of houses creates both environmental hazards and danger to the occupants of these houses.

A large number of the houses established through low-income housing programmes are located within unplanned developments. The houses funded through the NRDF housing programme are, in most cases, located on family lands which have not been formally partitioned, or on rented "house spots" which have not been surveyed. In such cases, the houses are often located away from public roads and the houses are not directly serviced by paved roads, although tracks and pathways may be found, and infrastructure such as water supply pipelines and electricity poles are not laid out in an organized manner. In such instances, there are no rules to govern the placement or location of houses, and homeowners and builders often determine the placement and location of houses based on their own judgments and preferences. Very often, no consideration is given to the future development of the surrounding lands, and, as such, the orderly future development of the area may be compromised. Invariably, after some time, the landowners would seek to rationalise and formalize the development and this process may become quite complicated because of the absence of any kind of planning during the time when houses were being located or placed. Houses are often placed so close together that it may be difficult to establish a proper road network. Plot sizes may be so small that it may be impossible for individual houses to be attached to septic tanks, even if they are upgraded and the homeowners are able to afford septic tanks.

In considering the placement and location of houses, attention should also be paid to flood risk. Houses may be located in watercourses or gullies, causing flooding of the house or nearby areas. Whereas flooding may not be a consequence of any activities undertaken by the builder or homeowner, the improper placement and location of houses in flood prone areas may result in considerable discomfort, loss of property, injury and even loss of life.

Since St. Lucia is a small island, issues related to the establishment of developments within or near coastal areas are often encountered. Among the most significant of these issues in relation to housing developments are the risks associated with property damage and injury to residents, as a result of storm surges. Storm surges are essentially walls of water created by a tropical cyclone (topical wave, tropical storm or hurricane) out at sea. They can reach the shore at destructive, well above normal sea levels. When storm surges hit the shoreline and coastal areas, they can cause significant damage to property located within these areas, and of course they can result in the injury of residents and even death.

There are a number other important environmental management issues associated with housing developments in St. Lucia's coastal areas. These relate to public access to beaches, the natural erosion and accretion of beaches, pollution of nearshore waters as a result of land-based activities, and aesthetics. Public access is a sensitive issue, and several public statements have been made about the commitment of Government to ensuring that the public has free access to St. Lucia's beaches. In addition, beaches undergo natural processes of erosion and accretion, and it is desirable that these processes be allowed to take place as freely as possible, in order to maintain the natural balance of coastal ecosystems. Further, whenever waste is generated through land-based activities close to the shore, there are pollution risks associated with the disposal of such wastes into the nearshore waters, and particular measures need to be put in place to minimize or eliminate these risks. The visual impact of developments in coastal areas are also important as the attractive coastal views are important to St. Lucia's overall image as a tourist destination.

3.2 Guidelines on the Placement and Location of Houses

3.2.1Placement and Location of Houses in Unplanned Developments

In deciding upon the location of houses, particularly within large parcels of land for which subdivision plans have not been prepared or implemented, consideration must be given to the future development of the area. The main issues to be considered are:

Lot sizes: lots should not be less than 3000 square feet in area. Control of lot sizes and proper layout (sub-division) is paramount. This is the minimum lot size approved by the Development Control Authority in residential developments. It should also be borne in mind that the Ministry of Health does not normally approve septic tanks on lots below 3000 square feet. Even if septic tanks are not an immediate priority of the homeowner, consideration should be given to the possible future upgrading of the house to include a septic tank. This not only allows proper disposal of sewage on site using septic tanks, but also proper access to individual sites by cesspool trucks for removal of sewage.

Roads or footpaths: provision should be made for the future construction of roads. The minimum road width normally required in residential developments is 20 feet. At any rate, whenever plans are made to construct roads, a provision of 10 feet should be made for footpaths. Apart from the provision of adequate width for future roads and footpaths, consideration should be given to the appropriate alignment of these in a manner that will optimize the use of the available land area, as well as the provision of adequate linkages to established public roadways. In addition, any established rights-of-way through the property to adjacent parcels of land must be recognized and maintained.

3.2.2 Soil stability and land slippage

In areas with unstable soils or steep slopes, the improper placement of houses can add to soil instability and contribute to land slippage. In instances where a sections of a hillside is to be levelled off to accommodate a house, placement of the house too close to a slope break can cause land slippage, if the increased load on the soil exceeds its capacity. This would most likely occur during rainfall events when the weight of water in the soil would be added to the loading created by the house to cause land slippage. It should be borne in mind also that slope failure or land slippage caused by placement or location of a house too close to the slope break may lead to loss of the house, and even the loss of life. The house should therefore be placed well away from the slope break so as not to contribute to slope failure. The required distance between the house and the slope break may vary according to the soil types, slope, size and type of house. However, as a general rule, the foundation of the house should not be located less than 20 feet from the top or bottom of a slope break (Figure 46).

In instances where houses are to be constructed at the foot of a slope, there is a risk that the slope may fail and move towards the house to partially or completely cover it. Such a scenario has been experienced on several occasions, in certain cases resulting in damage to or complete the loss of the house, and even loss of life of the occupants of the house. Slope failure and land slippage in such cases often occur during or after heavy rainfall. In order to avoid or minimize the risks associated with the location or placement of houses at the foot of a slope, efforts should be made to stabilize the slope by applying the techniques and methods described in Section 4.2 below. In addition, the house should be placed well away from the foot of the slope. The distance from the slope would vary depending on the height of the slope, the soil type, the types of activities undertaken on or above the slope, the level of protection given to the slope (vegetation, retaining wall) and the height of the house. However as a general rule, a minimum clearance of 30 feet from the foot of the slope should be maintained in situations where the slope height exceeds the height of the house. This distance can be reduced according to the height of the slope relative to the height of the house.

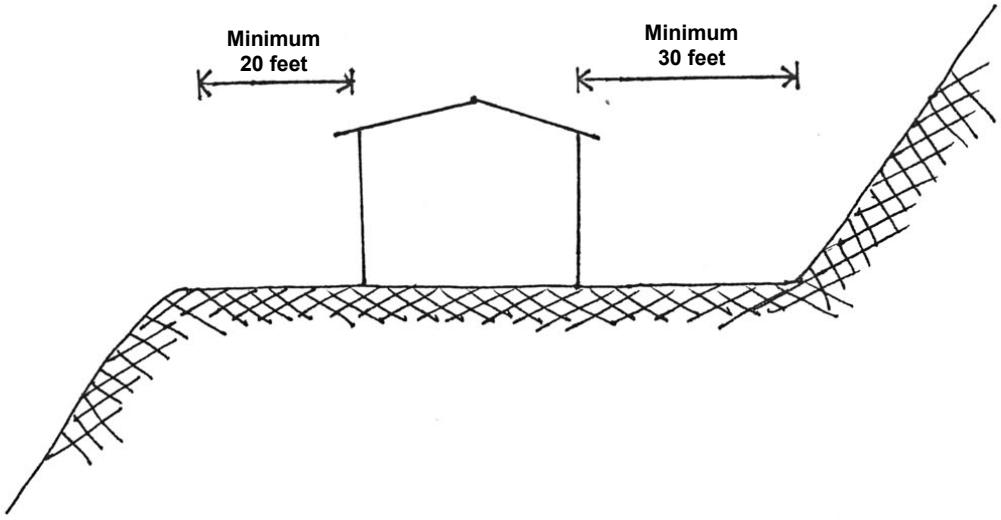

Figure 46 Location of Houses on Slope

3.2.3 Flood Risks

Homeowners planning to move into an area with which they are not familiar should seek to obtain information on the risks of flooding in the area, particularly if the area is relatively flat or near a large ravine or a river. Scientifically developed flood risk information is not immediately available in St. Lucia and so homeowners should seek to obtain information on such matters as the frequency of flooding and the flooding patterns. Such information can be obtained by speaking to persons living in or familiar with the area. On the basis of information received, appropriate measures could be taken in relation to the placement and location of the house. In particular, the location selected for the house should be at a safe elevation above standard flood heights, and/or the construction of appropriately sized drains around the house (Section 5).

3.2.4 Setbacks for Coastal Developments

In general, most of the negative environmental impacts associated with developments in coastal areas can be addressed through the application of appropriate setbacks.

Coastal development setbacks have several functions:

- They provide buffer zones between the ocean and coastal infrastructure, within which the beach zone may expand or contract naturally, without the need for seawalls and other structures, which may imperil an entire beach system. Thus in this sense, they may actually reduce beach erosion.
- They reduce damage to beachfront properties during high wave events and storm surges.
- They provide improved vistas and access along the beach.
- They provide privacy for the occupiers of coastal property and also for persons enjoying the beach as a recreational resource.

The Development Control Authority (DCA) has developed guidelines for developments within coastal areas, which are laid out in the *Manual For Developers—Volume 1* of February 1988. The manual states, "Any subdivision along the coast of St. Lucia, which is not specifically designated as a harbour or industrial site, must be set back from the high water mark. The distance required for setback will depend on the slope/gradient of the area, the nature of the sub-strata, and prevailing

oceanographic conditions". Figure 47, which illustrates the guidelines for setbacks in coastal areas, is adapted from diagrams provided in the *Manual For Developers—Volume 1*.

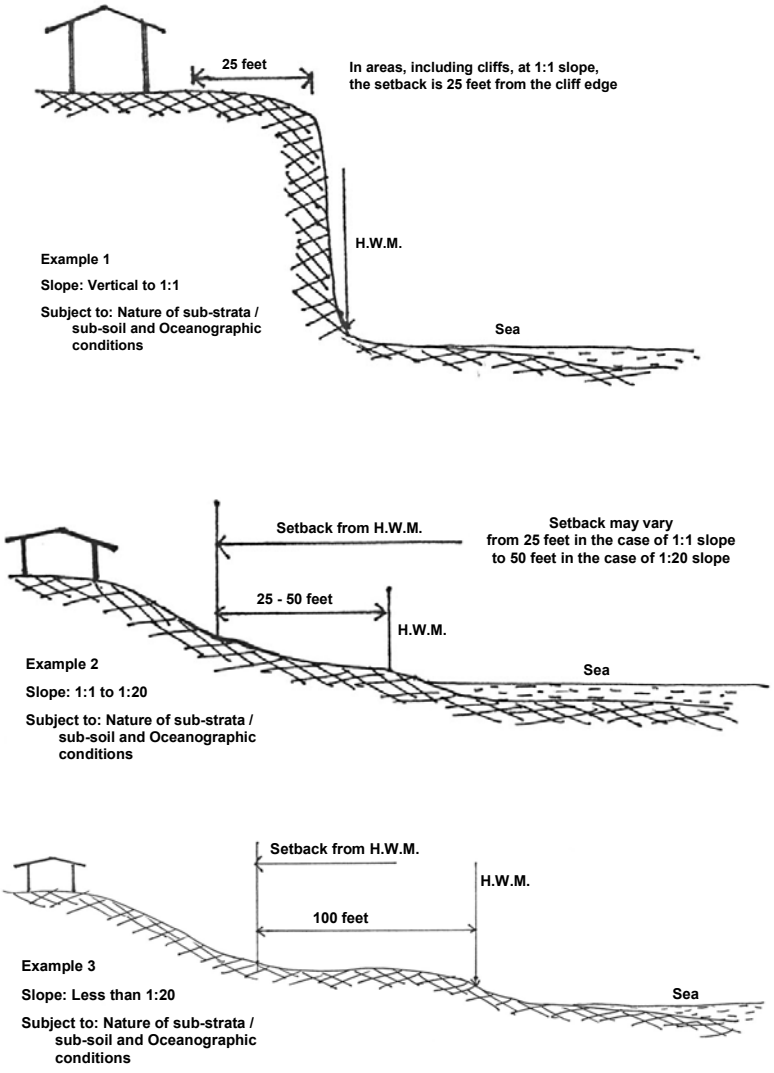

Figure 47 Setback Requirements for Developments in Coastal Areas
(Adopted from DCA Manual for Developers)

In considering developments within coastal areas, it should be noted that St. Lucia is in a unique position, since the land adjacent to the beach (within 186 feet of the high water mark) is known as the "Queen's Chain". The Queens Chain is owned by the Government and it generally extends around the coast except along the waterfront areas of the cities, towns and villages. Land within the Queen's Chain cannot be purchased, only leased, and the persons wishing to develop land within the Queen's Chain would normally have to own the land behind (landward of) the Queen's Chain. The *Manual For Developers—Volume 1* lays out guidelines for developments within the Queen's Chain. The first guideline listed states that "Development shall be of low density with a minimum plot size of 10,000 square feet". The minimum plot size stipulated in this guideline suggests immediately that low-income housing developments are not to be encouraged within Queen's Chain.

4.0 Site Preparation

4.1 Problems associated with Site Preparation

The preparation of the site is one of the more important preliminary activities in the process of construction or establishment of the house. At this stage of the process, certain basic procedures and guidelines should be adhered to, in order to avoid complications and difficulties in the future stages. Some of these difficulties may be associated with environmental problems such as soil erosion and land slippage. These problems are often in turn related to the clearing of vegetation, the removal of soil and the cutting of slopes.

4.1.1 Clearing of Vegetation

It has been well established that vegetation plays a significant role in maintaining soil stability and reducing soil erosion. Generally, the root systems of vegetation serve to bind the soil and decrease its susceptibility to erosion and slippage. Also, vegetative cover protects the soil from the direct impact of rainfall, thereby reducing the extent of soil erosion. The clearing of vegetation, particularly when widespread, renders the soil unstable and facilitates soil erosion which lead to sedimentation of rivers, increased flood risks in low lying areas, and pollution of rivers and coastal areas. Vegetation, therefore, should only be removed in from areas where the actual building will be erected. Trees should only be removed if they obstruct the construction process or are likely to be a danger to the house. After completion of construction, vegetation must be replanted to help prevent soil erosion and to improve soil stability.

4.1.2 Removal of Soil and Cutting of Slopes

In the preparation of a site for construction or establishment of a house on a hillside, it is often necessary to remove soil or to cut into the hillside to obtain the required conditions to establish the footing or to construct the foundation. Topsoil may have to be removed to expose the more compact and stable underlying soil layers or bedrock, which are required for the construction of strong footings or foundations. If the removal of soil or the cutting of slopes are not properly undertaken, the area can be rendered unstable and this can in turn lead to excessive erosion or land slippage. It is therefore necessary to pay special attention to these matters to avoid future difficulties.

4.2 Guidelines on Site Preparation

Excessive excavation should be avoided. The depth and width of such excavations should only be the minimum required. This reduces the possible instability of earthworks and the need for backfilling and consolidation.

The removal of soil should be limited to only those areas where it is necessary for the proper construction of the footing or foundation of the house. Also, it should be limited only to the necessary depth. Further, the soil that is removed should be safely placed in another location. If the amount of soil is not substantial, it can be spread over surrounding areas if they are relatively flat and if the chances of washout by rainfall are minimal. Also, some topsoil may be retained for use in the potting of plants.

In instances where it may not be convenient to the use the soil on the same site, the soil should be disposed of at another location. In that case, the builder and homeowner should ensure that disposal is undertaken in a responsible manner, either at an approved site for backfilling or disposal of soil or at another location but with the approval of the land-owners or their agents, and in a manner which reduces the risks of the deposited soil being easily washed away.

When the cutting of slopes is undertaken to accommodate a house, attention should be paid to the stabilization of the cut slopes to prevent soil erosion and land slippage. Steep slopes are one of the principal conditions favouring landslides and soil instability and so care should be taken to ensure that

any slopes created in preparation for the construction or establishment of houses are at least at the most stable angle for the particular type of soil, the angle of repose. The table below provides guidelines on the recommended slopes for the most common soil types.

Recommended Slopes for Common Soil Types

Soil Type	Recommended Slope
Clays and Loams	1:2; 65^{o} or 200%
Silts	1:1; 45^{o} or 100%
Sands	2:1; 30^{o} or 50%

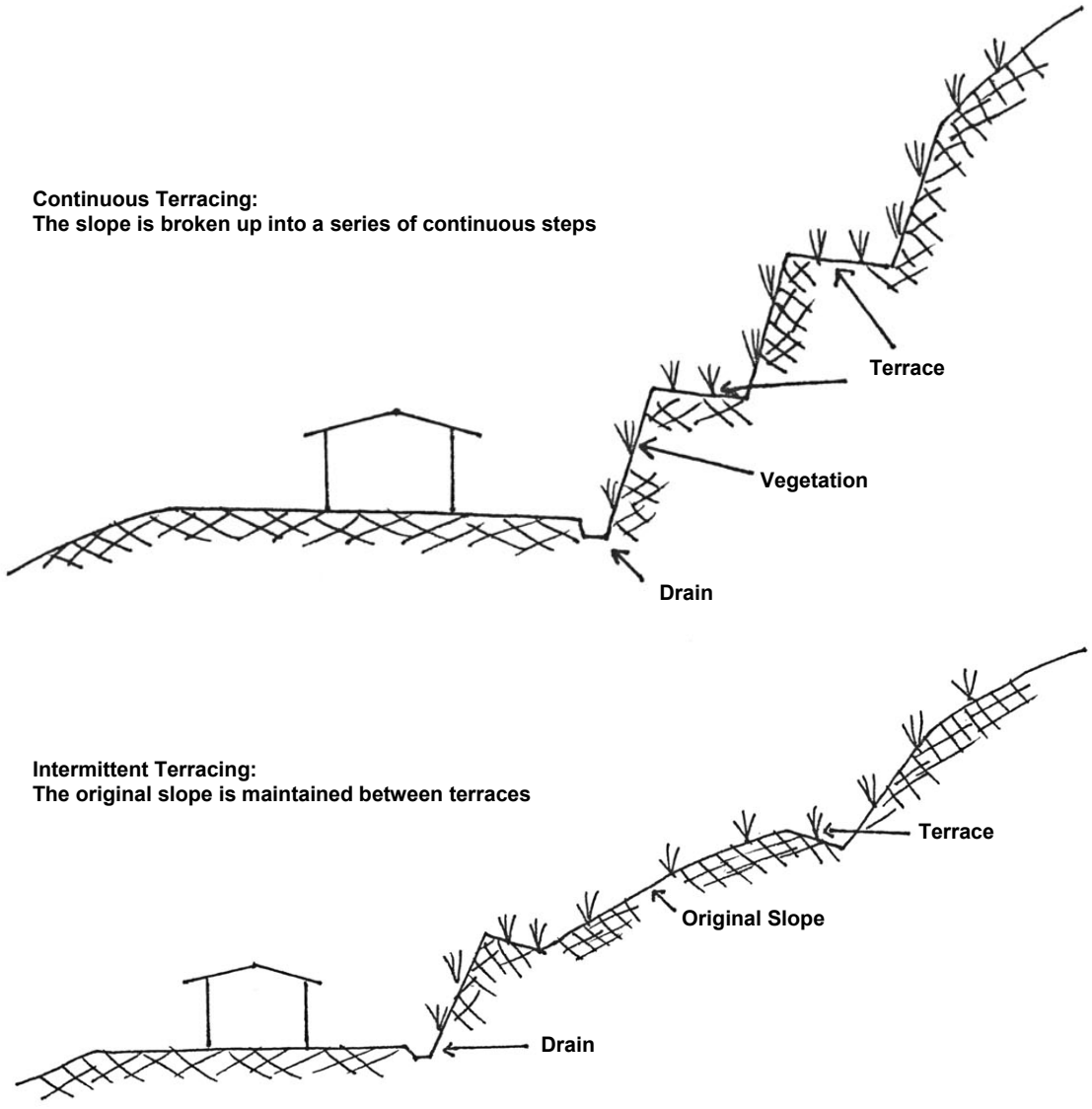

Figure 48 Reduction of Slope Height through Terracing

In addition to ensuring that slopes are cut at the right angle, it is also advisable to establish vegetation on the cut slopes to further reduce the risks of soil erosion and land slippage. Vegetation influences slope conditions in two main ways. Hydrologically, it influences the rate and volume of water entering the soil by promoting infiltration and thereby reducing overland flow which contributes to soil erosion; and mechanically, it binds soil particles together, thereby increasing the strength of the soil and contributing to its overall stability.

Vegetation increases the resistance of the soil to shear, that is the tendency for adjacent soil layers to shift in relation to each other, because the roots of he vegetation serve to bind the soil layers together. Vegetation also protects the surface of the soil from erosion by overland flow and traps soil particles that may be moving down slope. Vegetation, which is selected for the particular condition of the site, well established and to a sufficient density, can provide effective surface slope protection. One of the most common grass species associated with slope stabilization in St. Lucia is Vetiver Grass, also called Khus Khus Grass *(Vetiveri zizaniodes).*

It should be noted that, in addition to steep slopes, the other main physical factors that contribute to landslides are weak underlying bedrock and heavy rainfall conditions. These factors in combination are almost certain to result in landslides. Additionally attention should be paid to the overall height of the slope. It is advisable to limit slope heights. Where the slope height exceeds 6 feet, the slope should be cut into terraces, each 6 feet or less in height. See Figure 48.

5.0 Drainage

5.1 Problems associated with Inadequate Drainage

Uncontrolled drainage may undermine housing foundations and alter water courses, leading to flooding and generally affecting the quality of the environment. Such conditions may include ponding of water, which may lead to mosquito breeding, and indiscriminate flow of runoff, which may contribute to soil erosion and the formation of gullies or land slippage. In addition, the movement of vehicular and pedestrian traffic may be made difficult as a result of poor ground conditions due to inadequate drainage, particularly during the rainy season. It is therefore important that adequate attention be paid to drainage when considering the construction or placement of houses.

5.2 Guidelines on Drainage

Ideally, drainage associated with residential developments should be considered within the context of an overall system. That is, an overall drainage plan should be developed for a residential area, with such a plan taking into consideration the layout of the lots, the existence of established natural drainage channels and the drainage inflows and outflows of relevance to the development. However, in the context of low-income housing in St. Lucia, since houses are more often constructed or established on an individual basis, the consideration of drainage issues and the work to be undertaken by the homeowner is limited in scope.

The drainage considerations related to a single house may be generally classified into two main aspects: (i) the handling of runoff from the roof; and (ii) the handling of surface runoff.

Ideally, runoff from the roof of the house should be collected through a system of guttering, and safely conveyed through a down-pipe to a stable drain. However, in most low-income housing ventures, the installation of guttering is not undertaken because of the expense involved. At any rate, the absence of guttering contributes to indiscriminate flow of runoff around the house which may lead to poor ground conditions and soil erosion, and which may even adversely affect the stability of the footing or foundation of the house. It is therefore highly advisable that efforts be made to install a guttering system at least along sections of the roof where it would be most desirable.

Uncontrolled upland runoff onto the site is a significant problem that must be addressed. Where this is a problem, cutoff drains should be constructed to intercept and divert overland flows. The

construction of surface drains in an appropriate manner around the house is also highly desirable. Such drains facilitate the orderly and efficient removal of runoff from areas around the house, thereby improving ground conditions after rainfall events and controlling overland flow in a manner that minimises soil erosion. These drains may also allow footpaths and roadways to remain firm and stable during the rainy season.

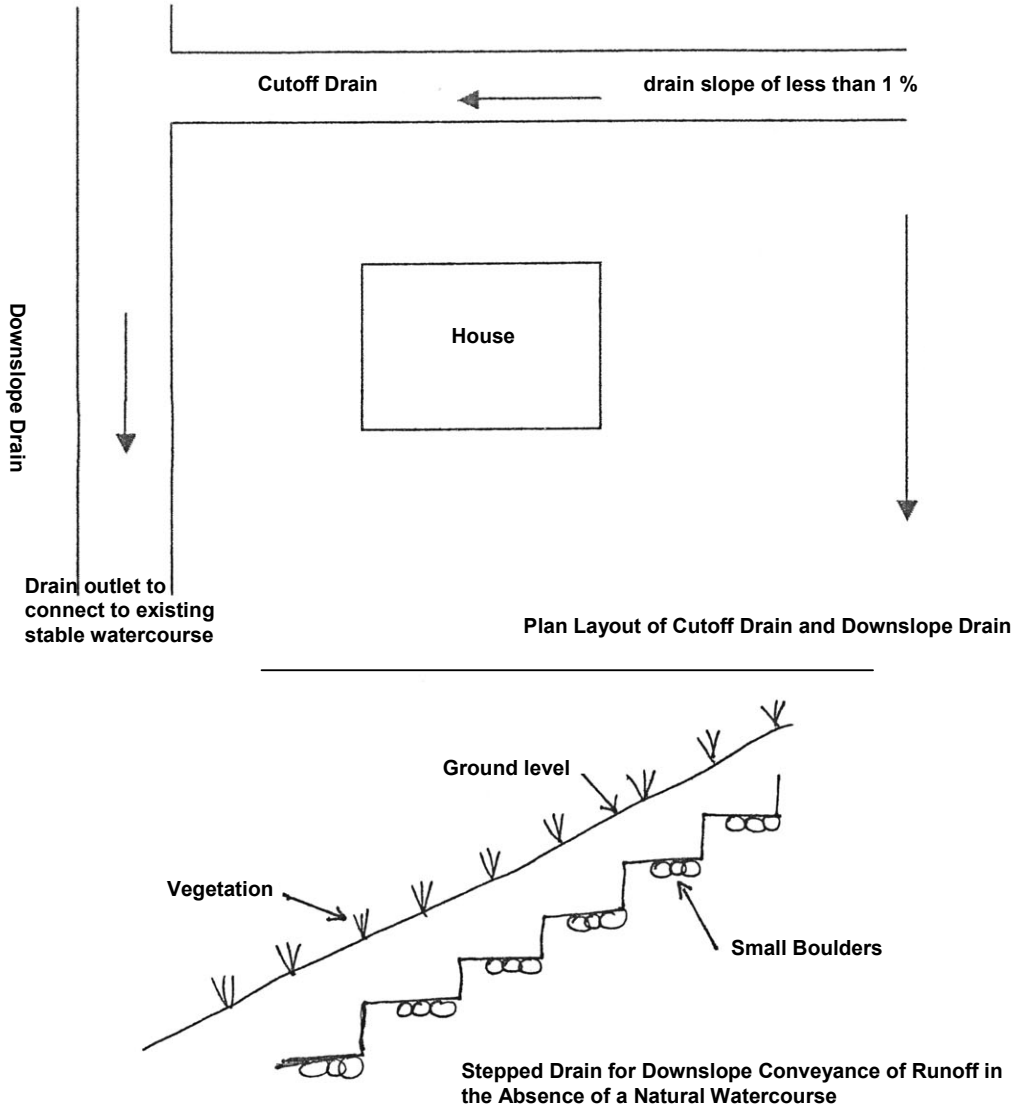

Figure 49 Cutoff Drain and Downslope Drain

Surface drains in residential areas should ideally be constructed of concrete, as they are generally easier to maintain. Because of the costs associated with construction of such drains, they are often not used in low-income housing areas, and earthen drain are used instead.

The factors to be considered in the construction of drains around the house are:

Layout of drains: Layout and sizing of drains is important if drainage is to be successful. Run-off from houses and adjacent areas must flow freely to drains. This may necessitate the filling in of localized low spots on the lot to facilitate free flow to the drains and to prevent the ponding of water. Ponding not only prevents free flow, but also tends to undermine the stability of drain cuttings and embankments.

Consideration should also be given to conveyance of runoff from the roof. In cases where guttering is used, the down-pipe should be directed into a drain around the house. Consideration must also be given to the slope along the bottom of the drain. This slope should facilitate steady flow at a velocity which is not excessive. Excessive flow velocities can lead to erosion in the drain which can enlarge the drain and eventually create gullies. Generally, in order to avoid excessive velocities, the slope of the drain should not exceed 1%. See Figure 49.

The construction of open drains on hillsides can be a major issue. Cutoff or interceptor drains are required to intercept runoff originating from lands at higher elevations. These should be constructed along the contour, to a stable watercourse that can safely convey runoff downhill. Where such watercourses are not immediately accessible, a drain must be constructed to convey runoff downslope. Special measures must be undertaken to ensure that drains constructed to convey runoff downslope remain stable. Typical configurations of these drains are provided in Figure 49.

Finally, the layout should allow for safe conveyance of the runoff to an appropriate outlet such as an existing roadside drain, ravine or river. Homeowners should take responsibility for the safe disposal of runoff from drains that they have constructed, and in instances where they do not have direct access to outlets indicated above, they should seek agreement with persons in the surrounding areas to arrange for the safe conveyance and disposal of runoff from the drains around their house.

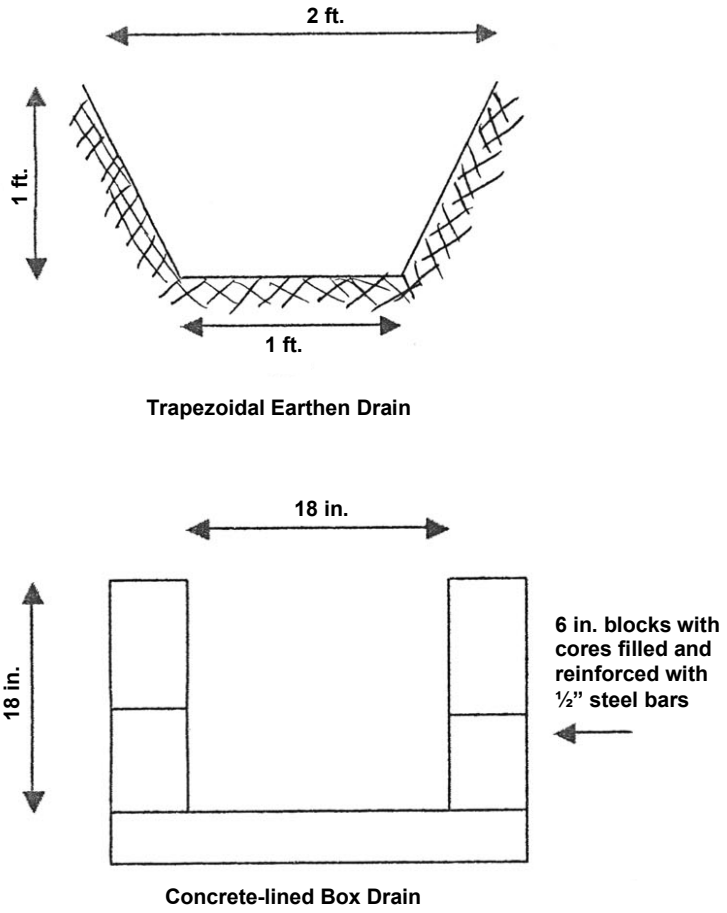

Figure 50 Typical Drains Outside of the House

Sizing of drains: The sizes of drain constructed in residential areas are normally a function of the volume of runoff to be conveyed by the drain. However, in most cases the drains constructed around houses are usually relatively small in size, unless they are required to intercept runoff from surrounding areas.

The smaller drains constructed around houses should be constructed with a side slope. Straight-sided earthen drains are not desirable as the sides of such drains are not as stable as those that are sloped, and there is an increased risk that soil may fall into the drain and create blockages that impede free flow. The typical cross sections and dimensions of drains constructed around houses are provided in Figure 50.

Drain sizing must increase from narrow to large in the direction of water flow and must be properly sized to accommodate flows.

6.0 Waste Disposal

6.1 Problems associated with Improper Waste Disposal

The disposal of solid and liquid waste has generally received little attention in the consideration of issues related to low-income housing. However, improper waste disposal at the household and community level can lead to problems such as fly and rodent infestation, pollution and obstruction of watercourses and offensive odours which affect human health, the environment and the overall quality of life.

6.1.1 Solid Waste Disposal

The proper disposal of solid waste generated during the construction or relocation of a house is a matter that is often overlooked. However, in certain instances, such as when the demolition of an old structure is part of the overall activity, solid waste disposal can be a significant matter which requires particular attention. Generally however, in the context of low-income housing, only small amounts of waste are generated during the construction or establishment of houses, principally because of the small-scale nature of the activity. At any rate the basic guidelines provided in Section 6.2 should be adhered to.

6.1.2 Liquid Waste Disposal

In the context of low-income housing, liquid waste disposal is generally related to wastewater generated from household activities such as dishwashing, laundering, bathing and cleaning as well as to sanitary wastewater associated with human waste.

Most residential areas are not served by municipal sewerage systems and so each household is required to be responsible for disposal and treatment of its sanitary wastewater.

In low-income housing, pit latrines are commonly used for disposal of human waste. This practice is still accepted by health authorities in St. Lucia. The use of septic tanks is encouraged, wherever these can be afforded. However, most persons in the low-income bracket are unable to afford a septic tank system and therefore the preference in relation to disposal of sanitary waste is for a pit latrine. At any rate, even when pit latrines are used, it is often the case that limited attention is paid to proper construction methods, resulting in foul odours and fly infestation problems.

6.2 Guidelines on Waste Disposal

6.2.1 Solid Waste Disposal

The following measures should be adhered to during construction or relocation of houses:

- Waste should be stored in containers and should not be allowed to accumulate on-site for extended periods of time;
- Only small amounts of waste should be placed at the roadside for collection under the regular household waste collection service;
- Large amounts of waste and bulky items should be transported to the landfill for disposal;
- Waste being transported must be covered to prevent dispersion or littering during transportation;
- The burning of waste on-site should be avoided;
- Waste should not be disposed of in drains, ravines, or rivers.

During normal occupation of a house, all households are required to properly store their solid waste and to place them in the designated storage containers in their neighbourhood or along the route of the garbage collection vehicles on the designated collection days. The St. Lucia Solid Waste Management authority had developed some basic guidelines which could be applied to households and which would contribute to the smooth running of the solid waste management system and the improvement of environmental conditions. The main guidelines that apply to households are as follows:

- Waste should be stored in containers with tight fitting lids;
- All household waste should be put out for collection in bags which are securely tied;
- Waste should be placed at the roadside along the collection route, only on the designated collection days;
- In areas where community bins are provided these used be used and waste should not be placed at the roadside;
- Waste should be protected from dogs, cats rats and other animals;
- Bulky waste such as discarded refrigerators and stoves should be put out for collection only on the days designated for bulky waste;
- Materials such as plastic bags, jars, packaging, and bottles should be reused as much as possible;
- Whenever possible, items should be purchased in reusable containers;
- Waste should not be disposed of in drains, ravines, or rivers.

6.2.2 Liquid Waste Disposal

It is currently a common practice for wastewater from common household activities to be disposed of into open drains, which are invariably also used for conveyance of surface runoff around the house. Such a practice may be continued in the absence of municipal sewage systems. The guidelines relating to these drains are presented in Section 5.2. Care should be taken not to use these drains to dispose of any hazardous chemicals. Such chemicals should be disposed of in accordance with guidelines provided by the manufactures or suppliers, and in instances where the homeowner is unable to undertake disposal, the assistance of the Environmental Health Department should be sought.

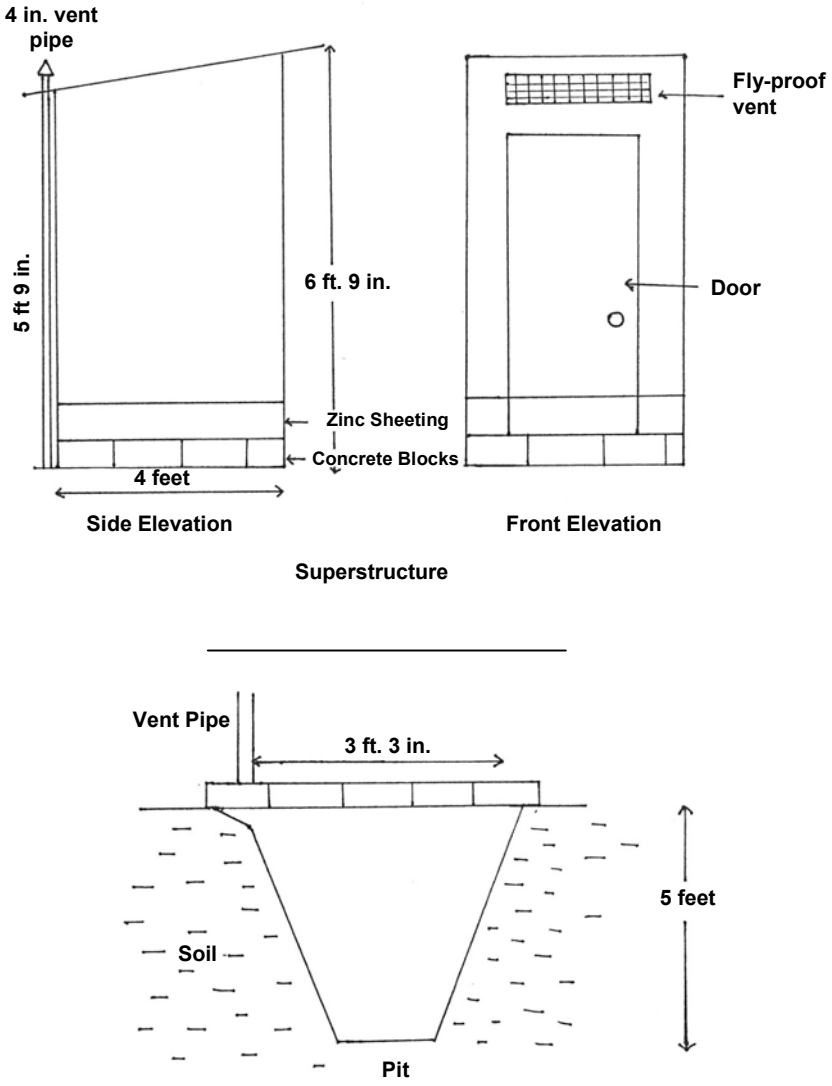

Figure 51 Ventilated Improved Pit Latrine

Over the past several years, the Ministry of Health, through its Environmental Health department, has encouraged the construction and use of Ventilated Improved Pits (VIP) Latrines by low-income households. VIP Latrines are pit latrines that incorporate use of a vent pipe to channel gases and odours into the air in such a manner as to prevent the odour nuisance normally associated with latrines. The VIP also makes provisions for the prevention of fly infestation by the use of screens or fly traps. The VIP is constructed in nearly the same way as the conventional pit latrine except that provision is made for additional features involving a vent pipe and fly screens. The advantages of such latrines are:

1. They minimize the nuisances of foul odour and fly infestation
2. They are relatively easy to construct and maintain;
3. They can be constructed at relatively low cost
4. Their have the potential to be upgraded to pour flush toilets
5. They involve minimal requirements for water
6. The superstructure is portable and reusable
7. They are no major health risks associated with their use

Contrary to popular belief that the latrine must be located well away from the house, the VIP latrine can be constructed close to the house, provided that the vent pipe can receive plenty of sunlight so that it can be heated to release offensive odours and gases into the atmosphere. These odours and gases are effectively released if the VIP latrines are properly constructed and sited, and so the nuisances that they pose are minimized.

The VIP is constructed in nearly the same way as the conventional type of pit latrine except that provision is made for certain additional features. Drawings of the VIP are provided in Figure 51. The main guidelines relating to construction of the VIP latrine are:

- The pit should be about 5 to 6 feet in depth, and approximately 3 feet in length and width.
- The pit must be dug to make allowance for the vent pipe on the side which will receive sunlight for most of the day (usually the south-west side).
- The slab must be placed on at least one row of blocks and not on the ground.
- The slab should be at least one foot longer and wider than the opening of the pit.
- The blocks can be placed by constructing a trench approximately 2-3 inches from the edge of the pit. The trench should be 4 inches wide and 2-3 inches deep. Some mortar should be placed in the trench and the blocks laid on the mortar.
- The slab should fit exactly on the blocks with only the allowance for the vent pipe being left exposed.
- All cracks and crevices within and between the blocks and the slab should be securely sealed.
- The superstructure should be of the same length and width as the slab.
- Before placing the superstructure over the slab, the bottom of the superstructure should be treated to repel ants and termites.
- The vent pipe must be placed outside of the superstructure and painted black so that it will heat the gases to promote their expulsion into the atmosphere.
- The vent pipe must be provided with a screen or fly trap at the top to prevent the escape of flies which may enter the pit.
- The superstructure should be protected for the first 2 feet off the ground with tin or zinc sheeting. This serves as a rodent guard as well as for protection from rain-splash, to prevent early rotting

7.0 Concluding Remarks

As simple or insignificant as activities related to low-income housing may appear to be, they may contribute to significant environmental problems unless certain measures are adhered to. Some of these measures may be quite simple and relatively cheap. However some low-income homeowners may be unable to afford to implement some of these measures.

In seeking to assist persons in the low-income bracket to own their own homes, development agencies and funding agencies should give consideration to the environmental impacts of their housing programmes and provision should be made within these programmes for assistance to be given to homeowners and relevant national agencies to enable them to address any negative impacts. Such assistance will contribute to the improvement of the overall quality of life of the beneficiaries of the low-income housing programme, and in turn, to the overall sustainable development of the nation.

There are very few policy and legal instruments or technical guidelines addressing matters relating to low-income housing. This is somewhat surprising, as over the past several years, low-income housing and the related programme area of poverty reduction have been identified as key components of Government's development agenda. Therefore, there appears to be a need to develop policies and relevant supporting legislation, regulations and guidelines, which provide the framework for effective and sustainable development of the low-income housing sector. In that regard, the Department of Housing should undertake the development of a National Housing Policy which will, among other things, address the underdeveloped framework for the promotion of low-income housing.

Further, the planning approval process in relation to low-income housing needs to be addressed. The current process does not account for the peculiar circumstances of low-income persons, with the

result that a significant proportion of these persons who pursue establishment or construction of their homes do not seek planning approval. The process is generally too complex and expensive for these persons, and the technical requirements of the Development Control Authority (DCA) may further add to the construction costs, thereby making it more difficult to construct a house which satisfies the requirements of the Authority. Further, some funding agencies, including the NRDF, do not require planning approval as a pre-condition for lending. This is cause for concern, as they appear to be facilitating the establishment of developments without the approval of the DCA. The NRDF and other financing agencies involved in low-income housing should therefore be encouraged to enter into dialogue with the DCA and its technical arm, the Physical Planning Section of the Ministry of Physical Planning, Environment and Housing, with a view to implementing appropriate mechanisms and procedures to facilitate and promote the legal establishment of low-income housing developments.

References—Environmental Siting Guidelines

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Gumbs, F.A. *Soil and Water Conservation Methods for the Caribbean*. 1987. University of the West Indies, St. Augustine, Trinidad.

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List of Principal Agencies to be Contacted on Matters Relating to Environmental Management and Low-Income Housing in St. Lucia

Agency	Address	Telephone/Fax/E-mail
Department of Housing Ministry of Physical Development, Environment and Housing	Greene's Building Sans Soucis Castries	Tel: (758)-468-4400 Fax: (758)-458-2330
Sustainable Development and Environment Unit Ministry of Physical Development, Environment and Housing	Greaham Louisy Administrative Bldg Waterfront Castries	Tel: (758)-468-4460 Fax: (758)-452-2506 sdestaff@planning.gov.lc
Physical Planning Section Ministry of Physical Development, Environment and Housing	Greaham Louisy Administrative Bldg Waterfront Castries	Tel: (758)-468-4438 Fax: (758)-452-2506 gisunit@hotmail.com
Environmental Health Department Ministry of Health, Human Services and Family Affairs	Chaussee Road Castries	Tel: (758)-452-2859 Fax: (758)-452-5655 e-mail: health@candw.lc