# Expansion and Rehabilitation of the North West Secondary School Practical Instruction Department in Region 1.

Site ID: ICB No. GSDEP/2020/W1

The Project is Financed by the Caribbean Development Bank and the Government of Guyana.

The Project is being Implemented by the Guyana Skills Development and Employability Project (GSDEP) through the Ministry of Education the Telephone# 592-227-3533. or Email Address: gsdep.coordinator@moe.gov.gy

The Design Document was prepared by:
Caribbean Engineering and Management Consultants Inc. (CEMCO Inc.)

## 1.4 Methodology

**The methodology applied for this project may be loosely categorized as follows.**

- **Site Reconnaissance Visit- March 04, 2019.**
- **Discussions with various stakeholders (, officials, and other groups). The project team commenced stakeholders consultation with the following persons:**

– The Regional Chairman- Mr. Bretnol Ashley
– The Regional Executive Officer Mr. Andre Bazilo
– The Regional Educational Officer- Mr. Nigel Richard
– The Assistant Regional Education Officer- Marti De Souza
– The Head teacher- Ms. Caretta
– The Reginal Health Superintendent.- Dr. Lall

- **Review of Secondary sources of information**
- **Observation of Land Use in the project area of influence.**
- **Assessment of Environmental problems and recommended actions associated with projects of similar nature.**

## 2.0 Geographical Location

The project site is located in Region 1 (see Figure 1) where the main economic activity of the area is predominantly farming, fishing and small scale mining in outlying areas. Many residents from Mabaruma are engaged in mining in the neighbouring Port Kaituma. Commercial activities centers among retail shops and service business located within central Kumaka.

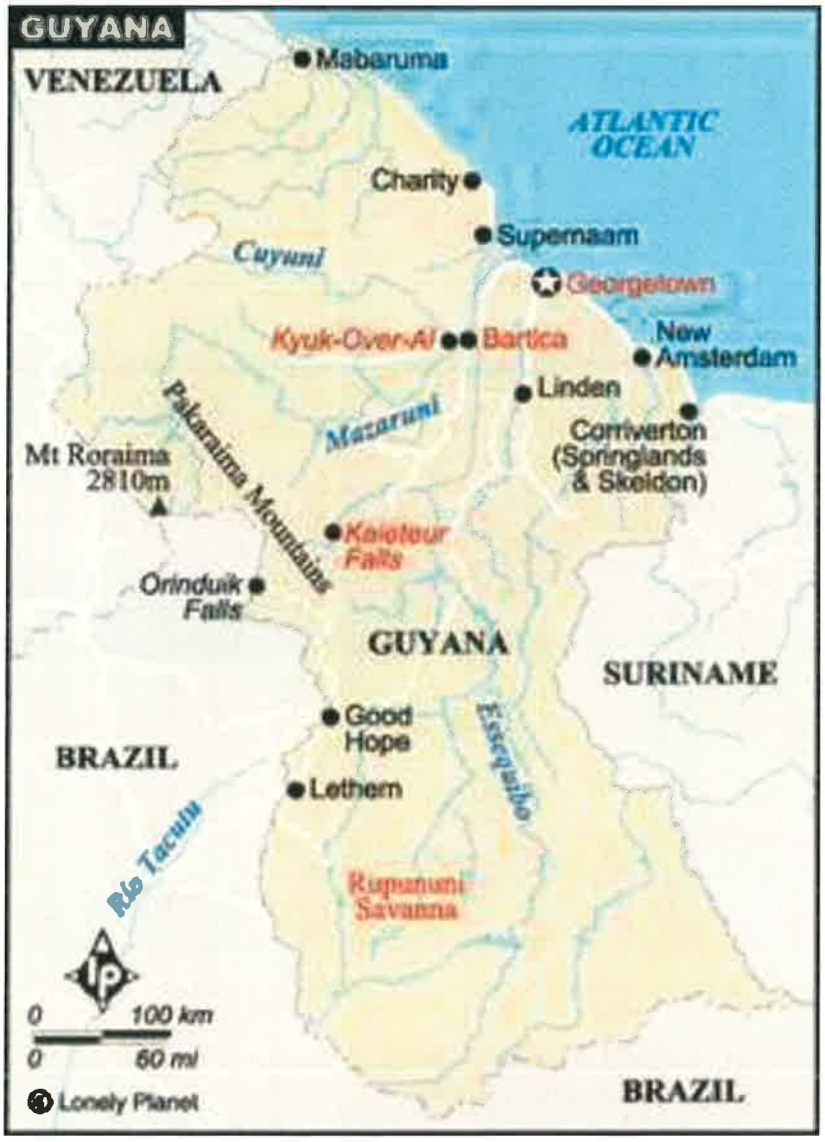


Figure 1: Map of Guyana showing Mabaruma.


Figure 2: Depicting the site in relation to the surrounding areas.

A shown in Figure 2, the Mabaruma secondary School is located in an area with undulating terrain, the school itself is located on a hill. The surrounding areas comprise forest type vegetation. Within the school compound itself many small shrubs are present. The school is located on a turnoff uphill off the main carriageway.

A review of secondary information has revealed that no threatened or endangered species are located within the demarcated school area. The wider Mabaruma however, is home to a myriad of flora and fauna. Construction will be undertaken off the main carriageway hence traffic management should minimal.The main carriageway should only be used by the project to transport materials and equipment periodically.

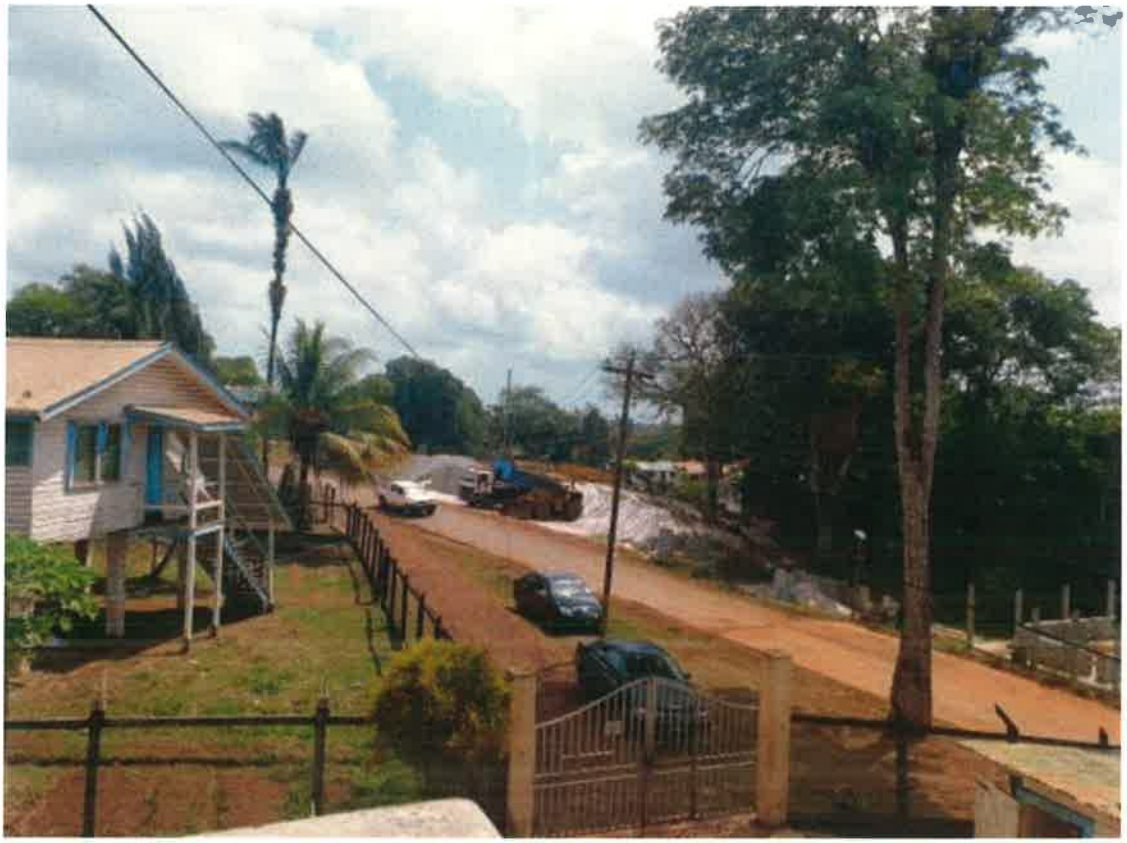

Figure 3: Access to the Mabaruma School compound.

### 3.0 Description of Proposed Works

The proposed interventions are stated in Table 1 of the Terms of Reference as follows:

- Construction of a single story 265 m2 (2,850 ft2) building to house 2 workshops for Commercial Food Preparation and Home Economics.
- Construction of a single storey 195 m2 (2,100 ft2) building to house a workshop for Electrical Installation;
- Construction of a single storey 33m2 (360 ft2) Toilet Block (comprising males' washroom, females' washroom and persons-with-physical-disabilities washroom);
- Expansion of an existing single storey 106 m2 (1,136 ft2) building [Home Economics] to 157 m2 (1,692 ft2) and conversion to house a Workshop for Garment Production (Leather Craft);
- Expansion of an existing single storey 106 m2 (1,136 ft2) building [Technology] to 157m2 (1,692 ft2) and conversion to house a Workshop for Furniture Making; and
- Expansion of an existing 108m2 (1,159 ft2) building [Library] to 132 m2 (1,417 ft2) and conversion to a Learning Resource Centre (LRC).

## *4.0 IMPACTS (ENVIRONMENTAL AND SOCIAL)*

This section describes the anticipated impacts and significance on the physical and biological environment, community and socio-economic environment. The existing secondary school have a number of surrounding buildings including Dorms, IT Centre, Staff quarters and Kitchen.

The general impact of The Guyana Skills Development and Employability Project (GSDEP) is deemed positive. The Project aims to increase enrolment and promote participation of both men and women in non-traditional areas of Technical and Vocational Education and Training (TEVET), and to facilitate more efficient matching of skills with job requirements.

Under the proposed interventions, considerations must given to proper environmental management throughout the construction phase of the project. Preparation of environmental and other plans also ensure that the construction phase of the project is controlled in a manner that minimizes negative environmental externalities.

The majority of Negative impacts are likely to occur during construction phase and is temporary. The most important impact should be dust and noise pollution within the site, this is likely to affect teacher and students since works might be conducted simultaneously with school activities. Traffic congestion during construction is not anticipated as the site is located off the main thoroughfare. The school is accessed through the main road which will only be temporarily impeded when materials are transported to site. Also, given that the school is located on a turn, appropriate traffic control measures will be required when materials are transported to site.

The other inconveniences created during the construction works consists basically of atmospheric pollution due to dust, noise from machinery and equipment, garbage and waste production increase, soil erosion and sedimentation and minor inconveniences due to the presence of workers and machinery. These inconveniences can be mitigated through the application of standard measures in engineering, construction and operation plans.

### 4.1 Potential Impacts during Construction Phase

#### *4.1.1 Vegetation & Biodiversity*

The project area is almost completely dominated by man; the site houses the secondary school and ancillary facilities which has already altered the existing flora and fauna. The entire site comprises small shrubs, grasses and a few scattered large trees. Behind the school kitchen the vegetation comprise a bamboo forest stand with other large trees. (See figure 4 and 5). In terms of fauna, very little animal species were observed with the exception of small birds, insects and scavengers including vultures as depicted in Figure 6. Thus present land-use patterns should not be greatly altered by this project. This impact should be short term and limited to the construction phase and is not deemed significant.

Figure 4: Flora observed on the site.

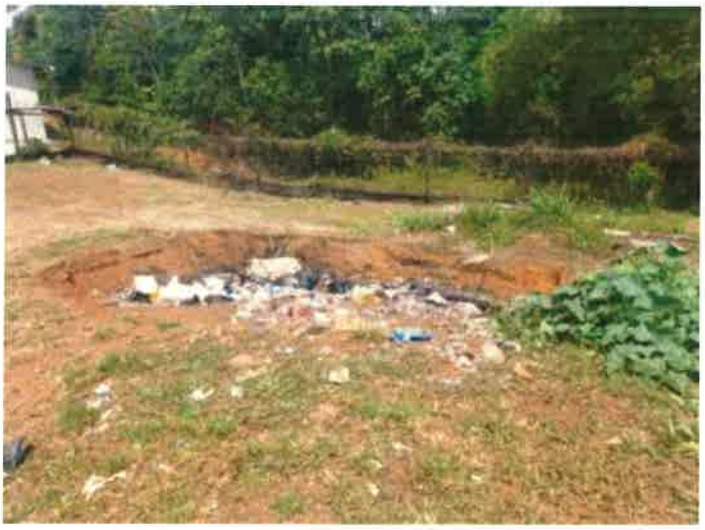

Figure 5: Flora observed on the site.

Figure 6: Fauna observed on the site.

***Mitigation Measures***

The CONTRACTOR should:

- not destroy, remove or clear trees and shrubs, or disturb or destroy farm areas or watercourses to any extent greater than is absolutely necessary for the performance of the work, or to any greater extent than has been authorized;
- ensure that machine operators take extra care when backing up or swinging around to avoid damaging overhanging limbs and nearby trees when working close to the boundary of the work zone;
- Retain existing vegetation where feasible by limiting the size of the disturbed area.

### *4.1.2 Wildlife & Impact on Threatened or Endangered Species*

As explained above, biodiversity has been greatly reduced in the terrestrial ecosystems in project area and surrounding. A few patches of vegetation and wildlife habitat should be lost due to this project. However, this vegetation, and the associated wildlife, is well represented outside of project area. It is of such small size that it is deemed non-significant.

***Mitigation Measures***

For the protection of wildlife and wildlife habitat, the CONTRACTOR should:

- minimize disturbance to wildlife, particularly along areas with remaining vegetative stands and main drainage channels where they exist;
- Dispose of garbage in secure bins and ensure that the construction site and yard is clean and free of food items to deter nuisance pests.

### *4.1.3 Water Quality*

Water Quality in most occupied areas are already compromised by agrochemicals, pollution and improper waste disposal practices. This project is not expected to affect water quality in any way as they are no waterways in close proximity to the site. The existing drainage system consist of reinforced concrete drains which empties into a soak away located within the boundaries of the school. Due to the relief of the land, storm water is also conveyed to the valley contiguous to the property boundary.

***Mitigation Measures***

### *4.1.4 Watercourses and Water Quality*

In order to protect water courses, the CONTRACTOR should:

- Ensure that waste storage stockpiles or stockpiled material are not be placed in close proximity to waterways, surface drains etc., in cases where this is unavoidable, appropriate berms should be constructed to prevent erosion of material.

### *4.1.5 Traffic Congestion*

Impacts to traffic is not expected during the construction phase. The Project activities should not impact day to day traffic flows. Minor traffic congestion is only expected during transportation of equipment and materials to the site. In addition, truck transporting equipment can result in slow moving traffic. There is also the possibility of traffic accidents.

***Mitigation Measures***

In order to manage traffic effectively, the CONTRACTOR should:

- The Contractor should provide flagmen with "STOP" and "GO" signs to guide trucks transporting equipment and materials to the site
- The Contractor should, as a priority in all activities, undertakings and endeavours, ensure the continued and continuous safety of the public and all persons directly or indirectly associated with the Works
- The Contractor should keep roads and sidewalks affected by his operations free from soil and material spillage and ensure that construction areas can accommodate traffic safely at all times.
- The Contractor should take care at all times to ensure the convenience and safety of teachers, students and other stakeholders within the project area.

### *4.1.6 Construction and Domestic Waste*

A fair amount of waste should be generated during construction, this includes construction as well as domestic waste. Fuels and lubricants used by vehicles and equipment should generate used oil filters, waste oils etc.
Construction sites can generate significant amounts of domestic waste, including food boxes, water bottles and other types of waste.

***Mitigation Measures***

See section 5 for detailed waste management plan

### *4.1.7 Dust and Noise*

Dust pollution should be a short term impact during the construction phase. The soil type within the project area generate a significant amount of dust increased vehicular activity should exacerbate dust nuisance. Vehicle emissions should also increase the level of atmospheric pollution. Dust nuisance is likely to affect residents located downhill of school compound due to the difference in elevation and prevailing wind conditions. Dust nuisance is also likely to affect occupants of the dorms and staff quarters as they are all located within the school compound.
Noise pollution should be short term and limited to the construction phase. The use of heavy equipment and machinery during construction should increase noise levels.

Figure 7: Houses located downhill of the Mabaruma School.

***Mitigation Measures***

**Fugitive Dust**

In order to prevent wind erosion of stockpiled aggregate and cleared areas resulting in fugitive dust, particularly during the dry months, the CONTRACTOR should:

- use water trucks to dampen unpaved access routes and staging areas at regular intervals;
- Use plastic to cordon areas producing high levels of dust within the school compound;
- Ensure that trucks transporting material to site are covered with tarps to prevent fugitive dust.

***Noise***

During the construction phase, Contractor should mitigate the potential impacts from noise by;

- avoiding the creation of unnecessary or intrusive noise at the construction site;
- Scheduling construction activities so the noisiest activities are conducted, to the extent possible, outside of school hours, this can be arranged with the School's head teacher.

### *4.18 Erosion and Sediment Control*

The movement of equipment within the site can result in erosion and sedimentation, the undulating terrain and dry conditions should result in top soil eroding and depositing in other areas. Clearance of the vegetation to facilitate construction of new buildings can potentially exacerbate erosion.

**Mitigation Measures.**

The following measures should be implemented to reduce the impact of erosion and sedimentation activities:

- To mitigate this impact the Contractor should avoid as far as practical to avoid construction in areas of relatively steep gradients.
- The Contractor shall monitor areas of exposed soil during periods of heavy rainfall to prevent slippages.
- The Contractor shall use appropriate machines for all earth works.
- If ponding is observed due to compaction, it may be necessary to scarify the topsoil.
- The Contractor should cconsider the weather pattern before initiating major earthworks. Earthworks should be avoided during periods of heavy rainfall.

The mitigation measures should result in minor residual impacts which are of medium severity and which should have a low likelihood of occurrence

## 4.2 Social Impacts

Both positive and negative social impacts should result from this project. Positive impacts includes the creation of employment for the surrounding community, improved infrastructure for educational/vocational services. In terms of negative impacts, this should be limited to the minor inconveniences created from construction. Negative social impacts should include disruption to traffic, dust nuisance, poor waste management the presence of workers and equipment in the school area.

Student dorms are located within the project area and concerns were raised by stakeholders regarding interface between female students and construction workers. The following measures are recommended prevent interaction of students and workers.

**Mitigation Measures.**

- Contractor's staff to be housed away from school premises.
- Strict policy with measures to be implemented by Contractor to prevent interface of students and workers.
- Contractor to conduct toolbox talk with special emphasis on sex education, senior member of staff to be designated with the responsibility of monitoring the activities of staff.
- Contractors staff to strictly desist from catcalling or any inappropriate contact with students of the school.

### *4.2.1 Potential Impacts during Post Construction Phase*

Direct Environmental Impacts generally lessen during the post construction phase, however a few impacts may occur.

- Construction debris may not be cleared from the site
- Building may not be dismantled and utilities disconnected
- Construction waste stockpiles may not be removed and any ditches created are not graded.
- Construction site may not to be restored to its original state.

***Mitigation Measures***

- The Contractor should ensure that construction debris is removed from site after construction is complete
- The site should be restored to its original or acceptable state following construction.

### 4.3 Positive Impacts of the Project

Apart from the major positive impact of the project resulting into the creation of employment during the construction phase, there are other positive impacts as follows:

- Improved Infrastructure
- Increased access to vocational training and possible employment creation following completion of courses.
- Spin off economic benefits.

## *5.0 SPECIFIC MANAGEMENT PLANS*

## 5.1 CONSTRUCTION PHASE (GENERAL CONSTRUCTION)

### *5.1.1 General Measures that shall be implemented*

The CONTRACTOR should be committed to implementing the recommendation stated in the Project Environmental Management Plan and should be required to:

- dispose of sewage, refuse in a manner approved by all authorities having jurisdiction;
- conduct all operations in such a manner that there are no unauthorized discharges of any sort (liquid or solid) into waterways;
- ensure that habitat areas that are not within the work site are protected from disturbance; and
- ensure that appropriate spill kits are available.
- ensure that construction sites are watered twice daily to reduce dust nuisance. The Contractor should ensure that water is readily available on site to wet the entire area.
- ensure that waste stockpiles have a perimeter berm and be located as far as practicable possible to waterways. They should be removed within 30 days of initial placement.
- When night work is authorised by the Consulting Engineer, the Contractor shall provide adequate lighting as required by the Consultant in order to gain access or to supervise the works and carry out testing or examination of material.
- The Contractor shall acquaint himself with the position of all existing services such as surface water drains, cables for electricity and telephone and lighting poles, water mains and the likes before commencing excavation or other work likely to affect the utilities.
- The Contractor should maintain good relationships with the all affected stakeholders.

## 5.2 Waste Management Plan

### *5.2.1 Purpose and Scope*

This plan should ensure that waste generated during construction is handled in a way that protects the environment and complies with applicable regulations. The following are some of the materials that should be generated during construction:

- Vegetation stripping
- Packing materials
- Containers for various construction materials
- Plastics

- Concrete
- Food
- Sewage

### *1.2.2 Waste Management Practices*

#### *5.2.2.1 General Waste*

All organic and inorganic materials should be placed and/or disposed of so as not to directly or indirectly impact any watercourse or groundwater. The placement and disposal of all such products and materials should be done in an environmentally acceptable manner.

The REO indicated that waste disposal services are available through the regional office. Waste disposal arrangements should be made with contractor and Regional Officials to ensure proper disposal technique are employed Construction debris and other waste should not be allowed to accumulate on the construction site but should be collected promptly and regularly removed from the site by the Contractor. Construction debris should not be stockpiled longer than 30 days after initial placement.

The Contractor shall implement all measures possible to ensure that all waste generated is reused and recycled where applicable.

#### *5.2.2.2 Waste Oils and Special Wastes*

Waste oils, special wastes, and refuse generated during the servicing of equipment (e.g., air and oil filters, hydraulic fluids, and petroleum products) should be stored, transported and disposed of in accordance with recommendation of the RDC Office.

- All waste oil and petroleum products shall be collected in sealed five gallon containers. A special area at the contractor site office/storage facility should be designated to stored waste oil.
- Where possible, waste oil, lubricants and other waste materials generated during the servicing of equipment and machinery should be recycled.

#### *5.2.2.3 Domestic and Other Waste*

The Contractor is required to provide adequate numbers of waste collection receptacles on site. Receptacles should be strategically placed on site to ensure that waste is not haphazardly dumped on site. Waste should be disposed at an area approved by the local RDC. All food wastes should be collected and stored in containers and be regularly transported to the adjacent dumpsite.

Construction waste such as formwork and lumber should be reused where possible. Wooden materials that cannot be reused should be transported to the adjacent dumpsite.

Cement bags and other packaging material should be disposed at the dumpsite as well.

Steel end pieces and other waste that cannot be burned should be temporarily stockpiled and subsequently disposed.

In terms of sewage management, the contractor should explore the option of construction of a temporary facility, this should be discussed with the M&TC for formal approval.

***5.2.2.5 Disassembly of Construction Site.***

After completion of construction works at all sites the contractor should demolish and remove all temporary site offices, storage facilities and camps. Demolished material should be donated to the M&TC and nearby residents. Materials that cannot be reused should be burned or dumped at the local approved landfill site.

## 5.3 Emergency Response Plan

### 5.3.1 Spill Contingency and Response Plan

#### 5.3.1.1 Purpose and Scope

This document describes spill contingency measures and response plan for the project. The plan is designed to reduce impacts to the environment in the event of a spill through ensuring materials are available and established procedures are followed.

The purpose of the spill contingency plan is to provide a course of action, which should be implemented to allow a prompt and orderly response to spills that may occur during construction. A spill of any liquid, solid or gaseous substance, which could impair the usefulness of the land, water or air where it is released should be responded to by the procedures outlined in the contingency plan. The main objectives of the Spill Contingency Plan are:

- To reduce the risk of harmful exposure to individuals and the surrounding environment;
- To clearly outline the action to take if a spill should occur; and,
- To ensure that project staff is aware of the correct response required.

***5.3.1.2 Reporting of Spills***

All spills major or minor should be report to the consultant environmental office and procedures outlined in the Social and Environmental Report should be followed.

***5.3.1.3 Spill Response Equipment/Kit***

The Contractor should provide a spill kit on the project Site. The spill kit should be stored at the Contractors site office to be used in the event of a Spill.

The kit should comprise the following materials

- Skimmers
- Fire extinguishers
- Absorbent foam
- Gloves, safety goggles and respirators.
- 5 Gallon sealable containers

- Caution Tape
- Bags containing saw dust
- Bags Containing white sand
- Plastic Spade
- Heavy Duty Garbage Bags
- Empty Five Gallon Containers with lids to store spilled materials.

## 5.4 Spill Conditions

***The Contractor should initiate the following response for spills***

### *5.4.1 Solid Material Spill in a Dry Area*

- Clean up and recover material with protective gear.
- The material should be Stored/transported to an area recommended by the local authorities.

### *5.4.2 Liquid Material Spill in a Dry Area*

- The spill should be contained using earthen berms.
- Material should be recovered with protective gear. Material recovery may utilize pumps or absorbents as appropriate for type of spill.
- In cases where liquid is absorbed, the material that the liquid is spilled on should be removed.
- Area should be detoxified.
- Material should be Stored/transported to a recommended area of disposal.

### *5.4.3 Solid Material Spill in an Area Wet from Rain*

- Spill material should be covered with plastic.
- Any drainage should be isolated from the spill area, if possible, using earthen berms.
- Clean up and recover material using protective gear.
- Store/transport recovered material.

### *5.4.4 Liquid Material Spill in an Area Wet from Rain*

- The spill should be contained using earth berms.
- Drainage should be isolated, if possible, using earth berms
- Material should be cleaned up and recovered using protective gear. Material recovery may utilize pumps or absorbents as appropriate for the type of spill.
- Material should be Stored/transported to an approved area.

### *5.4.5 Solid or Liquid spill in a Drainage Ditch*

- Spill should be contained by placing an earth berm across the ditch as far downstream of the spill as possible;

- Isolate drainage, if possible using berm.
- Spilled material should be recovered and Stored/transported to approved area.

## 5.5 Specific Materials on Construction Projects

The following response actions are outlined for specific spills that, however unlikely, could occur during road construction.

### *5.5.1 Petrol/Gasoline*

***The initial response to petrol/gasoline spill should be:***

- Stop the flow at the source if possible;
- Eliminate all possible sources of ignition (e.g., extinguish cigarettes, shut off motors);
- Evacuate danger area
- Carefully consider the hazards and merits of trying to contain the spill. Contain only if it is safe to do so and obvious benefit of containment is apparent (e.g., contain if flowing towards a water course). Otherwise leave gasoline to spread and evaporate.
- Notify the Environmental Officer/Monitor/ or the Supervisor's Representative.

***5.5.2 In the event of a fire, the response should be:***

- Use $CO^2$, dry chemical, foam or water spray (fog);
- Use jet streams to wash away burning gasoline;
- Divert the gasoline to an open area and let it burn off under control;
- Use water to cool tank surfaces;
- Be aware of re-ignition if the fire is put out before all the gasoline is consumed.

Petrol/gasoline can be recovered in the following manner:

- Unburned gasoline can be soaked up by sand and wood shavings or by commercial sorbents;
- If necessary, contaminated soil should be excavated;
- Gasoline entering the ground can be recovered by digging sumps or trenches and pumping from below the water table

***5.5.3 Petrol/ gasoline can be disposed of in the following manner:***

Evaporation or incineration under controlled circumstances.

### *5.5.4 Other Fuels and Petroleum Products*

Fuel and petroleum products spills should be contained using local earth materials and/or sandbags. Spill clean-up equipment specifically designed for petroleum products should be located at the Contractors site office.

***5.5.5 Spills or leaks of all light and medium oils, including fuel oil at storage facilities, should be responded to by following these steps:***

- Identify the source of the leak or spill;
- Stop flow if possible
- Eliminate open flame ignition processes
- Contain the spill
- Notify the Supervisor's Representative
- Spilled diesel fuel should be recovered by using sand, sawdust or straw. If necessary, contaminated soil should be excavated.

***5.5.6 Fuel spills on land should be responded to by the following procedures:***

- Construct a earth berm down slope of the running or seeping fluid;
- Plastic tarps may be placed at the base of the berm to allow the fuel to pool on the plastic for easy capture with absorbent pads;
- Pads may be squeezed into empty drums and re-used;
- Larger pools can be pumped back into drums;
- Special care should be taken to prevent the fuel from entering a body of water where it should; have greater negative impact;
- Contaminated soil and vegetation may have to be removed and disposed at an appropriate area.

***5.5.7 Fire response methods for diesel fuel include:***

- $CO^2$, dry chemical, foam, or water spray;
- Water to cool tank surfaces;
- Diversion of the diesel to an open area and let it burn off under control;
- Awareness of re-ignition if the fire is put before all the diesel fuel is consumed.

***5.5.8 Fuel spills on water must be contained immediately to restrict the extent of the floating fuel. The methods, which may be used to contain fuel oil, include:***

- Absorbent pads used to capture small spills on water;
- A skimmer to recover oil contained by the boom and then pump the recovered fuel into empty fuel drums; and
- Culverts (plastic) to permit water flow while capturing and collecting fuel. The culvert should be surrounded with absorbent material to capture any fuel on the water surface.

### *5.5.9 Acid Spills*

- Spills of acid should be contained using sandbags and neutralization can be accomplished using either soda ash or lime. Both the sandbags and lime should be stored at the maintenance yard. Following neutralization, the area must be carefully flushed with water.
- Note: Prior to using water in any cleanup, consult the guidelines for the specific chemical, as appropriate use of water may be severely hazardous.
- Any water used for flushing a spill should be contained, recovered and disposed of in an approved manner.

## 5.6 Health and Safety/Accident Emergency Response

The Contractor should be committed to ensuring the safety of the general public, students, teachers and all construction workers and sub-contractors associated with the project area. The Contractor should set up the construction site in such a manner with all signs and barricades in place to ensure the safety of all stakeholders

All practical safety measures should be taken to prevent accidents involving construction workers and students and teacher. The Contractor should ensure that no material is stockpiled in a manner that should endanger the general public.

### 5.6.1 General Health and Safety Measures that should be implemented by the Contractor.

The Contractor is required to:

- Ensure measures are in place to protect employees health and safety
- Ensure the provision and maintenance of construction sites that are lit, safe and without risks to health. When night work is done on the construction site, the contractor should provide adequate lighting to ensure the safety of workers and the general public.
- The execution of suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage, transport and disposal of articles and substances. Spill response protocol should be communicated with all members of staff to ensure appropriate response during an emergency situation.
- Ensure the provision and maintenance of access to all places on the site are in a condition that is safe and without risk of injury. All access areas should be maintained as necessary.
- Ensure the provision of protective clothing and safety gear (hard hats, hearing protection, goggles and other devices for activities).The Contractor should procure all necessary safety gears for employees. All employees should be inspected on a daily basis to ensure that they are properly attired.
- First Aids Kits containing materials to treat minor injuries should be present on all active construction sites.
- Arrangements should be made with nearby hospital and health centers to deal with emergencies.

- The Contractor should provide and maintain adequate sanitation, refuse collection and waste disposal (as specified in the Site Environmental Management Plan). Provide continuous supply of fresh water on site.
- Designate as safety officer one of the contractor's senior staff who should have specific experience and knowledge of safety regulations on similar projects.
- Provide a suitable number of sanitary facilities on site.

**5.6.2 Cement Works**

Cement work/concrete manufacture can pose a risk to employees on site. Potential hazards for workers in concrete manufacturing:

- Eye, skin and respiratory tract irritation from exposure to cement dust;
- Inadequate safety guards on equipment;
- Inadequate lockout/tag out systems on machinery;
- Overexertion and awkward postures;
- Slips, trips and falls; and
- Chemical burns from wet concrete.

The following recommendations are outlined for the protection of staff.

***5.6.2.1* Cement *Dust***

**Hazard:** Exposure to cement dust can irritate eyes, nose, throat and the upper respiratory system. Skin contact may result in moderate irritation to thickening/cracking of skin to severe skin damage from chemical burns. Silica exposure can lead to lung injuries including silicosis and lung cancer.

**Mitigation Measures:**

- Rinse eyes with water if they come into contact with cement dust and consult a physician.
- Use soap and water to wash off the dust to avoid skin damage.
- Wear a P-, N- or R-95 respirator to minimize inhalation of cement dust.
- Eat and drink only in dust-free areas to avoid ingesting cement dust.

**5.6.2.2 Wet Concrete**

**Hazard:** Exposure to wet concrete can result in skin irritation or even first-, second- or third-degree chemical burns. Compounds such as hexavalent chromium may also be harmful.

**Mitigation Measures:**

- Wear alkali-resistant gloves, coveralls with long sleeves and full-length pants, waterproof boots and eye protection.
- Wash contaminated skin areas with cold, running water as soon as possible.
- Rinse eyes splashed with wet concrete with water for at least 15 minutes and then go to the hospital for further treatment.

#### 5.6.2.3 Falling Objects

**Hazard:** Workers may be hit by falling objects from conveyor belt systems, elevators or concrete block stacking equipment.

**Mitigation Measures:**

- Avoid working beneath cuber elevators, conveyor belts and stacker/de-stacker machinery.
- Stack and store materials properly to limit the risk of falling objects.
- Wear eye protection when chipping and cleaning forms, products or mixers.

#### 5.6.2.4 Poor Ergonomics

**Hazard:** Improper lifting, awkward postures and repetitive motions can lead to sprains, strains and other musculoskeletal disorders.

**Mitigation Measures:**

- Use hand trucks or forklifts when possible.
- Lift properly and get a coworker to help if a product is too heavy.
- Avoid twisting while carrying a load. Shift your feet and take small steps in the direction you want to turn.
- Keep floors clear to avoid slipping and tripping hazards.
- Avoid working in awkward postures.

#### 5.6.2.5 Confined Spaces

**Hazard:** Mixers and ready-mix trucks have confined spaces that pose safety risks for workers.

**Mitigation Measures:**

- Follow established procedures for confined space entry and work to assure safety.
- Guard against heat stress when cleaning truck mixer drums.

- Wear appropriate protective equipment to avoid silica exposure when removing concrete residues from inside truck mixer drums.

#### 5.6.2.6 Vehicles

**Hazard:** Poorly maintained or improperly handled vehicles can lead to crushing injuries at the plant site or other injuries for truck drivers.

**Mitigation Measures:**

- Make sure back-up alarms on all vehicles are functioning.
- Avoid overloading cranes and hoists.
- Use care with the load out chute on concrete mixers to avoid injuries to hands and fingers.
- Beware of hot surfaces on equipment and truck components.
- Guard eyes against splashes of aggregate materials during loading and unloading.
- Use hearing protection if needed to guard against excessive noise exposure during cement loading/unloading and while using pneumatic chippers inside truck mixer drums.

#### 5.6.2.7 Other Hazards

- Welding operations can lead to flash burns.
- Makeshift ladders, platforms and stairs with improper or no guardrails make falls more likely.
- Workers can also be injured by falling concrete forms if the forms are improperly chocked, braced or cribbed.

### 5.7 Criteria for Appointment of Key Staff.

All key personnel responsible for health and safety should be screened by the contractor before they are hired. The Contractor should assess their previous experience in projects of a similar nature.

### 5.8 Health and Safety and Sub-Contractors.

All sub-contractors working on the construction site should be briefed by the engineer and safety control personnel before commencing works on site. The sub-contractor should be briefed on the requirement of the health and safety plan. Copies of the EMP should be given to all sub-contractors. He/she should be required to adhere to all mitigation measures specified in this EMP. All sub-contractors should be monitored by the Safety Officer to ensure compliance with the EMP. All sub-contractors should be required to attend a meeting between the site engineer and safety control personnel when construction commences.