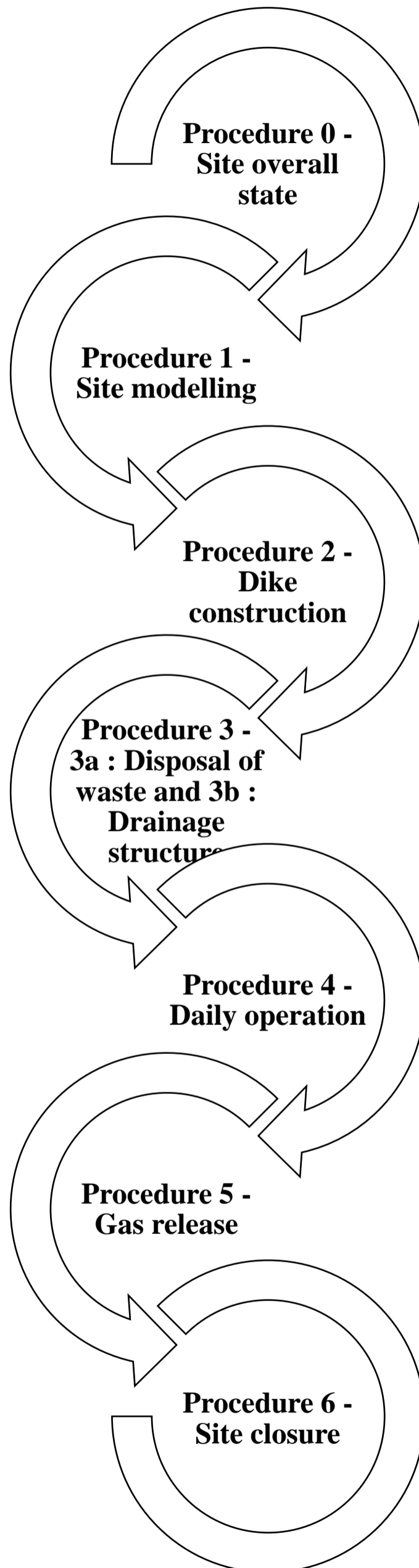


*Operational procedure for site maintenance and operation – Dibra*



# USEFUL DEFINITIONS

## MATERIALS

Different materials are requested to improve Dibre site. As not all the materials are available, this list explains the characteristics of the materials to be used in the procedure, depending on the aim of part we are building.

### Drainage material:

The material used to build the “drainage lines” within the landfill limits shall be constituted of gravel or stones or selected construction materials (bricks, stones, broken concrete, etc.). The diameter shall be between 3 mm and 15 mm.

Important: No materials with a diameter less than 3 mm shall be used.

Plastic or paper sheets shall be discarded when checking the materials.

These two factors would cause clogging of the system and failure of the drainage. To implement it : sieve the materials with a normal “chicken net”.

### Cover material:

- Daily cover: the aim of daily cover is to avoid to attract animals and to have waste blown by the wind. Any excavation or construction material can be used. Important: avoid presence of organic materials or light elements (plastic, paper, etc.).
- Layer cover: the aim of the layer cover is to create a homogenous surface where the machines can drive. It has the same composition as the daily cover. The layer cover should be at least 20 cm thick.
- Final cover: the aim of final cover is to make the waste unavailable to the population, to avoid erosion and to integrate the landscape. The final cover is composed by at least 80 cm of construction waste and 30 centimeters of soil.

Is to be noticed that in winter / rainy season, the thickness of the daily and layer cover can be bigger, to allow machines to drive safely on the wet surface.

### Dike material:

Dikes are used to limit the landfill boundaries and stabilize the waste within it. The materials used to build the dikes can be construction materials (bricks, stones, broken concrete, etc.), covered by soil (20 centimeters) on their external side.

Important: the stability can vary depending on the material type. Slope shall not be steeper than 2:3.

### Chimney material:

The chimneys aim at evacuating the gases produced by the landfill. The material used shall be coarse materials, as for the drainage. No plastic or paper sheets shall be present, because they would avoid the gas flowing into the tube.

Important: In these materials, and in particular in the last 50 centimeters of the tube, no flammable material should be present (paper, car tires, etc.).

## CELLS

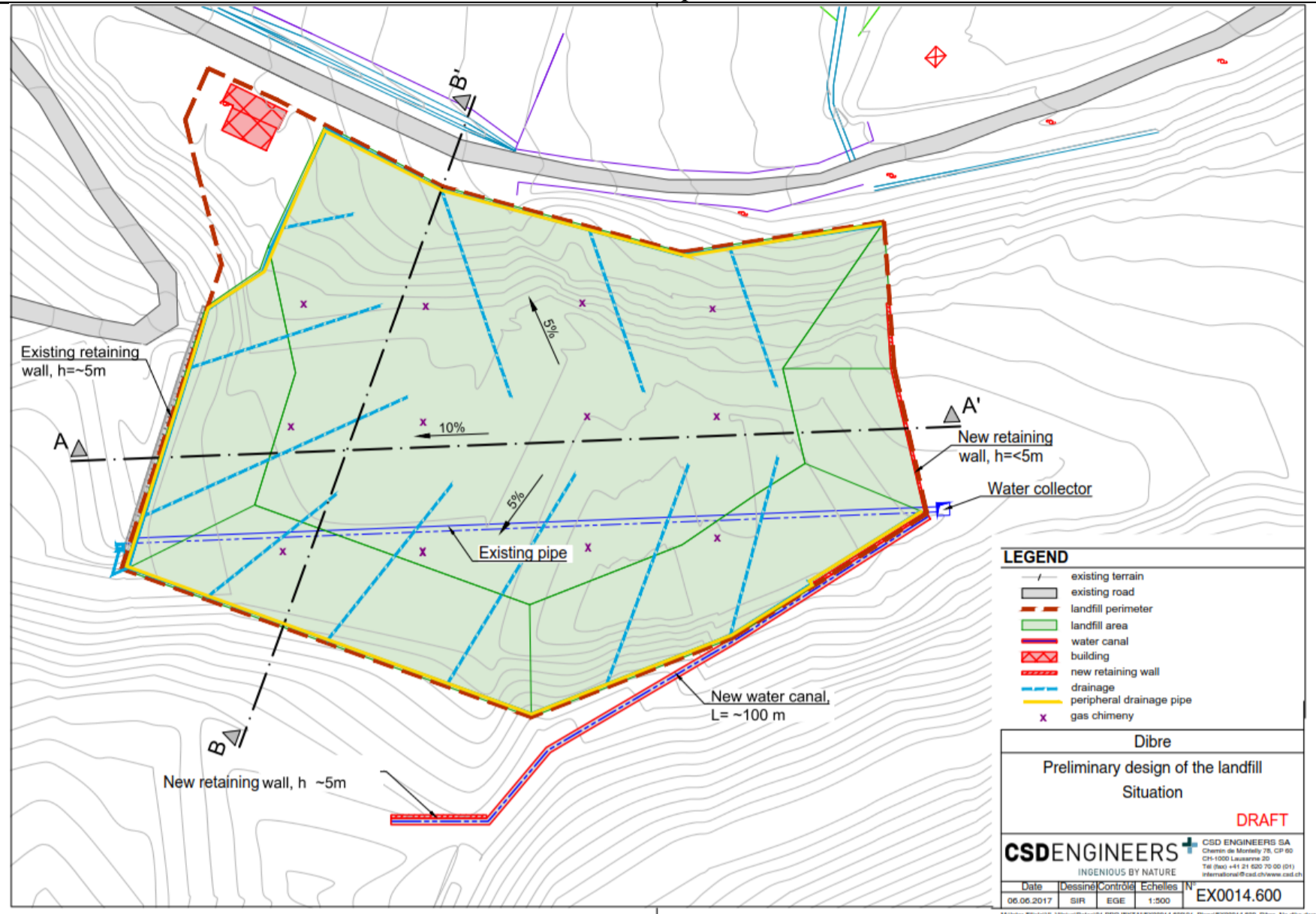
A cell is a place in the landfill where the waste has to be disposed. It is part of the landfill management to plan in advance the sequence of the cells to be filled, so that the open surface of waste is limited and the trucks know where the waste has to be disposed.

## MARKERS

The markers are wooden sticks that indicate the level of the layer, i.e. the height of the waste at that point, to obtain the slopes indicated in the plans. They indicate the maximum level of the layer and help respect the slopes (10% and 5%, depending on the direction).

# Procedure 0 - Site overall state monitoring

Procedure map or sketch



## WHEN?

Once a week

## WHAT TO DO?

- Monitor the overall state of the site
- Monitor the main dike status
- Monitor the retention wall status
- Monitor the in and out water flow the site pipe
- Monitor the fencing status
- Monitor the drainage system
- Monitor the gas release system
- Monitor the compliance with the layering model agreed for the site
- Monitor overall slopes of the waste surface have to be respected (10%). Refer to the segment in the map direction A' to A.
- Monitor slope on northern and southern part of the intersection A'-A is 5% on both sides
- 

## WHAT NOT TO DO?

- Change or adjust the adopted operation model
- Create depressions on the surface of the landfill

## RELATED RISK

- Site collapse internally
- Site collapse, dam-burst
- Site flooded, or creations of "ponds" at the surface
- Site burning
- Site closure due to no more space

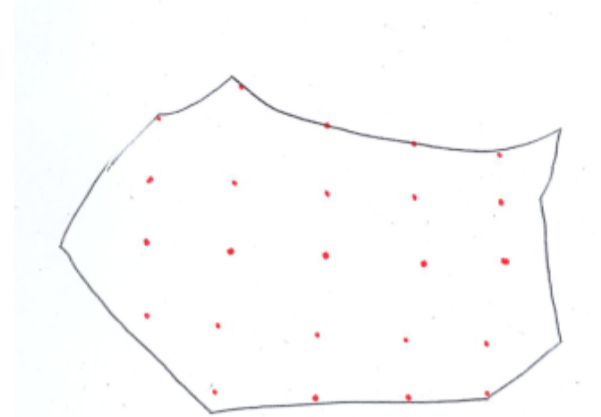
## REMARKS

# Procedure 1 - Site modelling

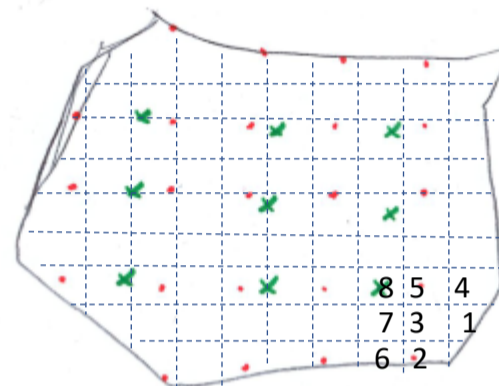
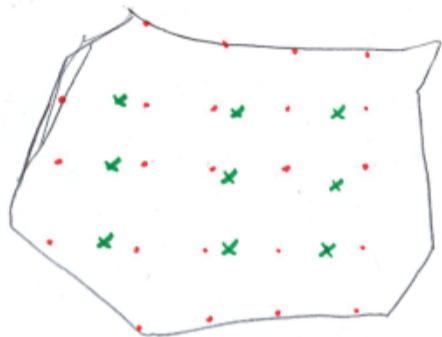
*Procedure map or sketch*

1. Establish a plan for the order of cells to be filled, starting from the furthest point.

2. Place the height markers for the layer



3. Place the chimneys for the layer



**WHEN?**

**Planning stage**

**WHAT TO DO?**

The existing waste surface should be compacted as much as possible before the building works start. This will enhance the stability and diminish further compaction of waste. The compaction is done by repeated passages of the available heavy equipment on site (backhoe or similar heavy machines).

Due to safety reasons (stability), the compaction of waste near the western wall is not advised.

The stapes at this stage are the following :

1. Plan the disposal sequence of the incoming waste
2. Place the markers to indicate the final slopes of the layer.
3. Place the chimneys (see [procedure X](#))

These steps have been illustrated to be implemented to all the landfill surface, but it can be decided that the operation of the landfill is done in only on part of the current landfill.

**WHAT NOT TO DO?**

- Spread the waste
- Work in many cells at the same time to limit the surface that is not covered.
- Exceed or not reach the marker level. This will induce the non-respect of the slopes and will deny water evacuation

**RELATED RISK**

- Site collapse internally
- Site collapse, dam-burst
- Site flooded
- Site burning
- Site closure due to no more space

**MATERIALS USED**

Markers : wood / metallic poles  
Chimneys : metallic barrels / tubes

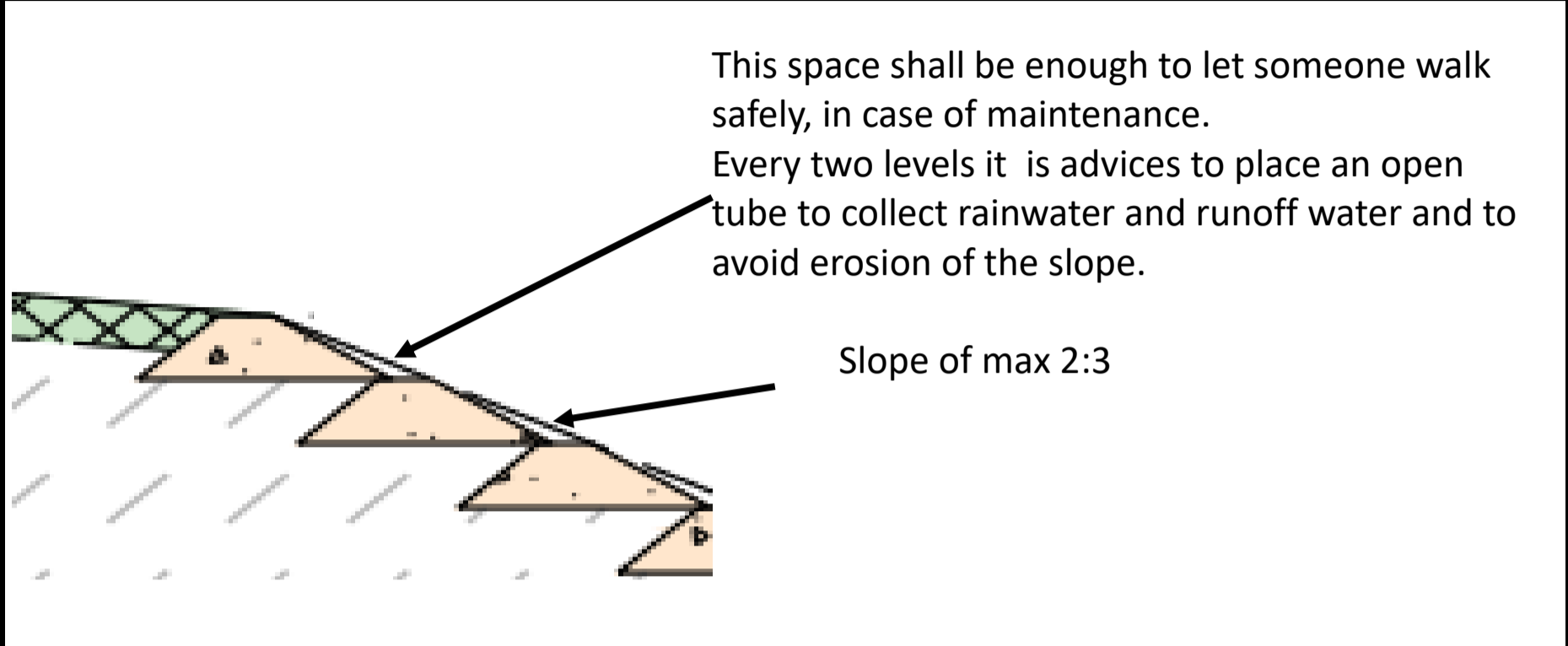
**REMARKS**

The markers are wooden sticks that indicate the level of the layer, i.e. the height of the waste at that point, to obtain the slopes indicated in the plans.

A clear plan and markers on the field are necessary to guarantee the stability of the waste by implementing adequate slopes and insure the water runoff.

# Procedure 2 : Dike construction

*Procedure map or sketch*



| WHEN? | WHAT TO DO? | WHAT NOT TO DO? |
|-------|-------------|-----------------|
|-------|-------------|-----------------|

**When needed – before starting a new layer**

The dikes are fixed-size mounts of material that define the perimeter and the height and the slope of each layer.

It is not necessary to build a dike if a wall is present (or natural relief). When the level of the wall/natural relief is reached, a dike shall be placed above.

Their slope should be maximum 2:3 and with a maximum height of 2.5 m, to guarantee the stability.

The dikes should be placed to contain the waste.

After the construction of the dike, a layer of soil of at least 0.2 m thickness has to be used to cover the outside part of the dikes, to avoid their erosion and integrate the structure in the landscape.

Do not exceed 2:3 slope

| RELATED RISK | MATERIALS USED | REMARKS |
|--------------|----------------|---------|
|--------------|----------------|---------|

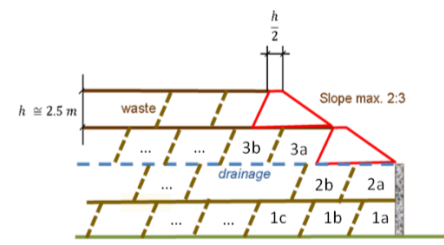
If the slopes are too steep, the materials are not stable and undergo increased erosion.

The materials used to build the dikes can be construction materials (bricks, stones, broken concrete, etc.), covered by soil (20 centimeters) on their external side.

Important: the stability can vary depending on the material type. Slope shall not be steeper than 2:3.

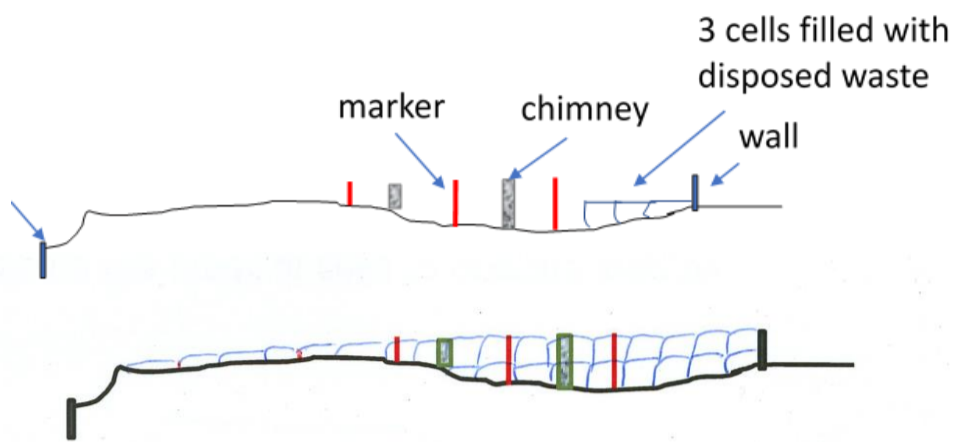
In case the dike material is not able to drain the water, an open drain (half a tube) can be placed on the base of each dike to direct the runoff water towards the lowest point (river).

Ensure that the site is closing in a form of a pyramid, enforced by inert material slopes to prevent collapse and dam-bursts.



# Procedure 3a – Disposal of waste – site layering (first layers)

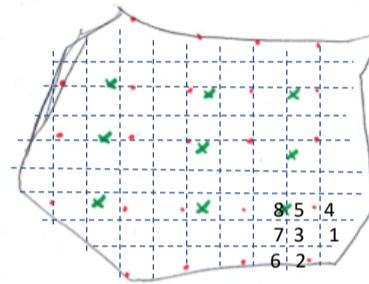
## Procedure map or sketch



Layer 1 : Disposal of waste in cells, according to the planning (in the figure : sketch of the profile of disposal for cells 1, 3, 7).

Layer 2 : Disposal of waste in cells, according to the planning. Completion of the first layers.

Before filling the level above the wall, the construction of the dikes will also include a dike above the wall, to contain the waste.



### WHEN?

**When operating the first layers (daily operation)**

### WHAT TO DO?

1. Once the markers, chimneys and dikes are built, the waste can start be disposed.
2. Disposal of waste in cells, according to the planning (cell order)
3. At the end of each day, compact the waste by passing 3-4 times with the machine and place a daily cover (see definition) on the disposed waste.
4. Dispose waste as indicated in the specific procedure maintaining the overall slope (east-west) of 10% and overall slope north and south of 5% creating a east-west ridge along intersection A'-A as indicate din the main map.
5. Once the layer is complete, raise the barrels of the gas release chimneys as explained in the procedure for gas release and replace the markers for the new layer.
6. Create the new layer by repeating steps 1 to 4.

Attention : when the layer reaches the level the northern retaining wall, a dike shall be built.

When the surface of the landfill allows having a direct slope of 10% to the lower point of the landfill, implement the drainage structure (see procedure 3b)

### WHAT NOT TO DO?

- Have a flat surface or places were water could accumulate.

### RELATED RISK

- Site collapse internally
- Site collapse, dam-burst
- Site flooded
- Site burning
- Site closure due to no more space

### MATERIALS USED

Daily cover: Any excavation or construction material can be used. Important: avoid presence of organic materials or light elements (plastic, paper, etc.).

### REMARKS

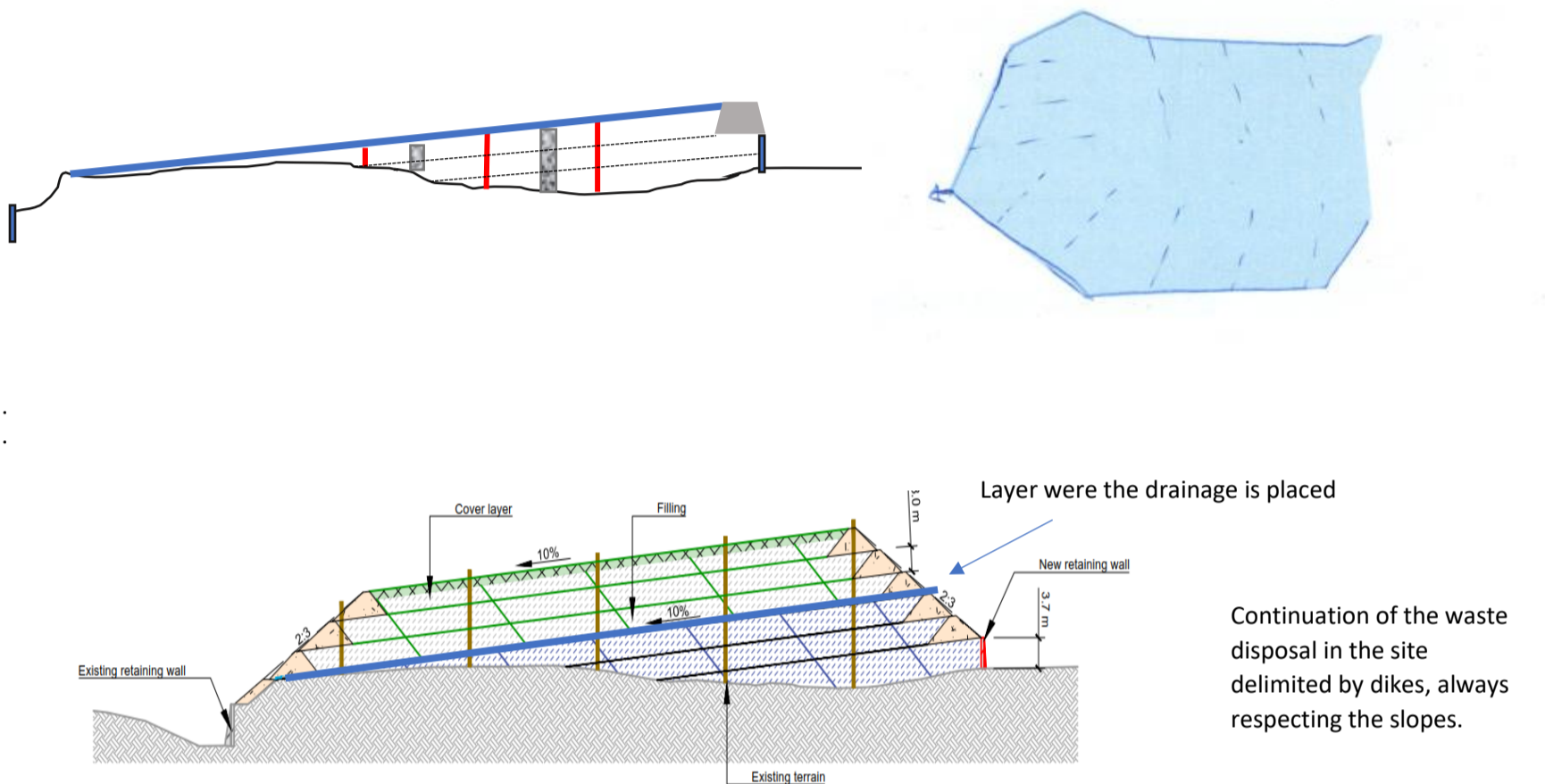
The construction of the dikes can be anticipated and implemented while filling the last cells of the layer. In this way, the continuous arrival and disposal of waste can be managed without interruptions.

# Procedure 3b –drainage structure

Procedure map or sketch

Figure 1 : Drainage structure : internal drains (gravel) and peripheral drains (perforated tubes)

Dark blu = drainage internal (see first page : materials, for composition) and peripheral (draining tube, with an outlet in the river). The peripheral drainage has to be implemented on the three sides of the site (down the slope) and converge to the lowest point (river)



## WHEN?

When the level of the wall is reached

## WHAT TO DO?

Once the surface of the landfill allows having a direct 10 % slope to the lower point of the landfill :

1. Install a drainage structure (lines), to move the waters from the central ridge to all directions towards the peripheral water drainage.  
The drainage is constituted of 2 types of elements:
  - Lines of gravel or inert material within the dumpsite area, the volume of the line is 1m<sup>3</sup> of material per linear meter
  - Peripheral drainage pipe (internal diameter between about 15 cm) at the borders of the dumpsite, which collect the leachate drained by the lines of gravel. The outlet (lowest point) of the peripheral drainage is connected to the canal chamber, at the base of the existing western wall.
2. Cover the peripheral drainage with 1 m<sup>3</sup> or draining material (see definition in the first page) for m1 of tube.
3. Start the next layer from building the new dikes (4 sides of the site) and continue as per daily operation.
4. Fill the space between the gravel drainage lines with the incoming waste. This operation has to be carried out carefully, in order not to damage the draining capacity of the system.

## WHAT NOT TO DO?

- Drive with trucks on the drainage tubes
- Move the internal drainage material when disposing the waste

## RELATED RISK

- Site flooded if the drains are clogged / damaged
- Site instability if water accumulates

## MATERIALS USED

The material used to build the "drainage lines" within the landfill limits shall be constituted of gravel or stones or selected construction materials (bricks, stones, broken concrete, etc.). The diameter shall be between 3 mm and 15 mm.

## REMARKS

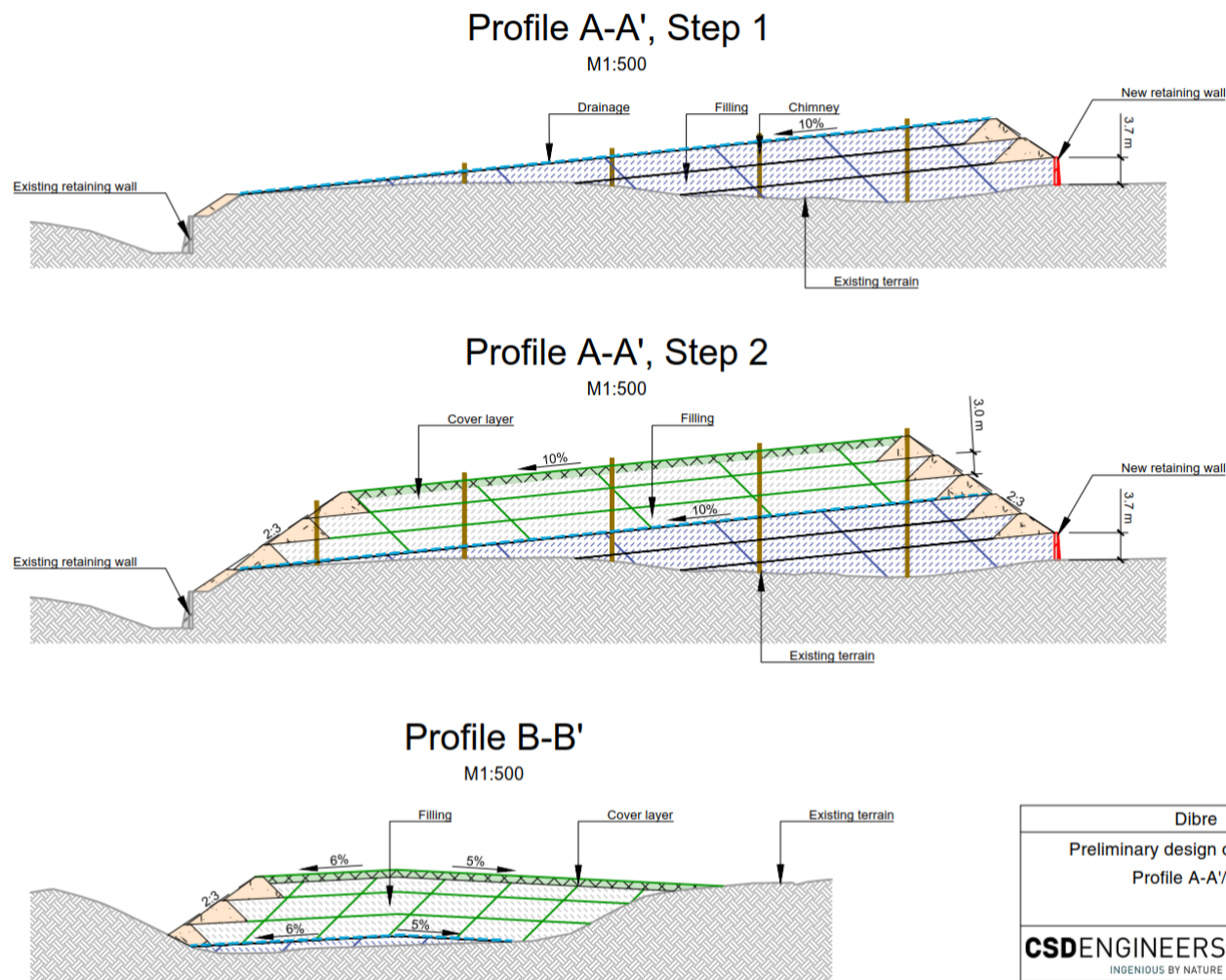
Between the lines of draining materials, waste can be disposed, until completing the layer. The operators should pay attention not to destroy the draining lines, when disposing the waste

|  |  |  |
|--|--|--|
|  | <p>Important: No materials with a diameter less than 3 mm shall be used. Plastic or paper sheets shall be discarded when checking the materials.</p> <p>These two factors would cause clogging of the system and failure of the drainage. To implement it : sieve the materials with a normal "chicken net".</p> | <p>The exact number of required drains shall be calculated according to local rainfall data.</p> |
|  |  |  |



# Procedure 4 : daily operation (above drainage structure)

Procedure map or sketch



## WHEN?

Daily

## WHAT TO DO?

1. Once the markers, chimneys and dikes are built, the waste can start be disposed again.
2. Disposal of waste in cells, according to the planning (cell order)
3. At the end of each day, compact the waste by passing 3-4 times with the machine and place a daily cover (see definition) on the disposed waste,
4. Dispose waste as indicated in the specific procedure maintaining the overall slope (east-west) of 10% and overall slope north and south of 5% creating a east-west ridge along intersection A'-A as indicate din the main map.
5. Once the layer is complete, raise the barrels of the gas release chimneys as explained in the procedure for gas release and replace the markers for the new layer.
6. Create the new layer by repeating steps 1 to 6.

The overall structure shall look like a pyramid. Every layer is smaller than the one before.

## WHAT NOT TO DO?

- Spread the waste
- Dispose the waste in cells other than the one indicated

## RELATED RISK

- Site collapse internally
- Site collapse, dam-burst
- Site flooded
- Site burning

## REMARKS

|  |  |  |
|--|--|--|
|  |  |  |
|--|--|--|

# Procedure 5 : Gas chimney

*Procedure map or sketch*



## WHEN?

## Preparation of the layer

## WHAT TO DO?

The gas evacuation system shall be planned to have a chimney every 20 meters, approximatively, constructed with metallic tubes filled with inert material (high permeability, see "materials" indications).

- The metallic structure with handles is installed previously to waste disposal.
- When the waste level reaches the upper part of the metallic tube, use a retro excavator to pull the metallic tube up, as shown in the picture.
- The inert materials will remain in the waste layer, creating a preferential way of circulation for the gas. The raised tube needs to be filled by coarse material, before disposing the waste around it.
- The chimney should have a fixed "reverse funnel" to concentrate the gas in one point that has to be ignited to burn the gas produced by the disposed waste.

## WHAT NOT TO DO?

- Dispose the waste before having filled the metallic structure with inert material

## RELATED RISK

## REMARKS

These chimneys can be constructed using barrels (eventually welded barrels to reach the layer height).

# Procedure 6 : Final cover

*Procedure map or sketch*



| WHEN?                          | WHAT TO DO?  | WHAT NOT TO DO?  |
|--------------------------------|--|--|
| <p><b>End of operation</b></p> | <p>Final cover guarantees the safe end of operation and the integration in the landscape.</p> <p>The landfill needs to be entirely covered by 80 centimeters of materials and 30 centimeters of soil (see first page for definition).</p> <p>The gas chimneys have to reach above the ground and pass through the cover layer, to allow the gas to be released.</p> <ul style="list-style-type: none"> <li>• The chimney has to be perforated in the cover layer, to capture the gas that could be present in this zone.</li> <li>• The chimney should have a fixed “reverse funnel” to concentrate the gas in one point that has to be ignited to burn the gas produced by the disposed waste.</li> </ul> | <ul style="list-style-type: none"> <li>• Close permanently the gas chimneys</li> </ul> |

| RELATED RISK   | MATERIALS NEEDED   | REMARKS   |
|--|--|---|
| <ul style="list-style-type: none"> <li>• Gas accumulation if the gas is not allowed to exit</li> </ul> | <p>Final cover: the aim of final cover is to make the waste unavailable to the population, to avoid erosion and to integrate the landscape. The final cover is composed by at least 80 cm of construction waste and 30 centimeters of soil.</p> <p>Is to be noticed that in winter / rainy season, the thickness of the daily and layer cover can be bigger, to allow machines to drive safely on the wet surface.</p> | <ul style="list-style-type: none"> <li>• Reduces as much as possible rainfall infiltration with the impermeable layer.</li> <li>• Provides surface drainage systems to make sure that the infiltrating water doesn't accumulate,</li> <li>• Reduces surface erosion: Growth of vegetation should be facilitated by using fertile soil and irrigation.</li> <li>• Control migration of gas and leachate</li> </ul> |