

2.0 DESCRIPTION OF THE WORKS

2.1 Scope of Works

2.1.1 The full scope of the works to be covered by this Specifications and CQA Plan will comprise the following main components:

- Re-profiling and confirmation of the final waste level surface following any remediation works required by the Employer or Works Supervisor;
- Crushing and grading of free issue material to be used for the regulating layer;
- Placement of the regulating layer;
- GCL acceptance, handling and storage;
- GCL installation, including fixing, seaming, sealing and tie-in;
- Confirmation of material source and placement of the restoration material;
- Quality control procedures on all of the above;
- Production of the Final Report

2.2 Works to be performed by the Contractor

2.2.1 The works to be performed by the Contractor shall comprise (but not be limited to):

- All surveying and setting out necessary for the works;
- Removal of temporary site infrastructure within the capping footprint;
- Re-profiling works to the required final Target Profile;
- Any remediation works to the final waste level surface where requested by the Employer or Works Supervisor;
- Crushing and grading of the free issue material (to be used for the regulating layer);
- The transportation and deployment of the regulating layer, including the preparation of the surface to accommodate the GCL;
- The construction of associated permanent and temporary access roads and surface water drainage;
- The supply, delivery, handling and storage of the GCL;
- The placement of the GCL, including fixing, seaming, sealing, tie-in and defect remediation;
- The preparation of the final panel layout sketches (including records of rolls used);
- Supply (provisional), transportation and deployment of the restoration material;
- Any other works deemed necessary by the Works Supervisor or Employer.

2.2.2 The Contractor shall ensure that all works carried out and all materials used for the construction of the Intermediate Capping Works comply with this Specification and CQA Plan. It is the Contractor's responsibility to demonstrate this compliance (by providing evidence) at any time, if required by the Works Supervisor.

2.3 Duties to be performed by the Works Supervisor

2.3.1 The duties to be performed by the Works Supervisor shall comprise (but not be limited to):

- Supervision of all works carried out by the Contractor;
- Construction Quality Assurance (CQA) by way of verification that the works have been carried out in accordance with the Specification and CQA Plan.
- Maintaining records of progress, manufacturer's certificates received and any changes to the CQA Plan.

- Liaison with the Malta Environment and Planning Authority (MEPA) representative during the works, if required to do so by the Employer.
- The production of a Final Report.

2.4 Construction Stages – Work Method Statements

- 2.4.1 Prior to commencement of the works detailed within this document the Contractor shall submit full detailed method statements for the acceptance of the Works Supervisor showing compliance with the Specification & CQA Plan clearly demonstrating that all work will be carried out to the highest quality.
- 2.4.2 Commencement of any work stage is subject to acceptance of the method statement by the Works Supervisor. Any works commenced by the Contractor prior to discussion of the proposed methods and acceptance of the method statement will be at the Contractor's own risk and any material placed may be subject to removal/remediation to the satisfaction of the Works Supervisor.

2.5 Site Surveys/Inspection Pits

- 2.5.1 On completion of the re-profiling works and prior to commencing works associated with the Capping Works and throughout the Construction Quality Assurance programme, a survey shall be undertaken by the Contractor to confirm that the final waste profile is as shown on drawing D117657/TZ/M/03RevB ("Top of Pre-settled Waste Target Profile and Construction Details")
- 2.5.2 On completion of the placement of regulating layer, a survey shall be undertaken by the Contractor to confirm that the layer has been placed to its required thickness.
- 2.5.3 On completion of the placement of restoration material, a survey shall be undertaken by the Contractor to confirm that the layer has been placed to its required thickness.
- 2.5.4 All drawings shall be referenced to Maltese Principal Datum.
- 2.5.5 Throughout the Works associated with the placement of the regulating layer and restoration material, the Works Supervisor can instruct the Contractor to open inspection pits at any time to verify the thickness of the layers.

2.6 "Hot areas"

- 2.6.1 Some localised areas of burning exist on the site. These shall be identified at the commencement of the Works by the Contractor and the Works Supervisor. The Contractor and the Works Supervisor shall agree with the Employer the modification to the capping system required to be adopted in these areas before work commences.

3.0 REGULATING LAYER

3.1 General

- 3.1.1 A regulating layer shall be constructed directly on the final waste level surface (Target Profile) to provide suitable protection to the geosynthetic clay liner from the underlying waste and to provide a firm, even surface for installation.
- 3.1.2 The area to receive the regulating layer is the entire area of the re-profiled landfill as shown on Drawing No. D117657/TZ/M/03/RevB ("Top of Pre-settled Waste Target Profile and Construction Details")

3.2 Final Waste Level Surface

- 3.2.1 Final waste levels shall be achieved by re-profiling by the Contractor. Final waste levels are shown on drawing D117657/TZ/M/03/RevB. Sequence of works and methodology must be agreed with the Works Supervisor. A survey of the final waste level surface shall be carried out by the Contractor prior to placement of the regulating layer.
- 3.2.2 The final waste level surface will be inspected by the Works Supervisor before placement of the regulating layer may commence to ensure the area is:
- Well compacted;
 - Capable of providing sufficient bearing capacity to support construction plant and the regulating layer and capping materials
 - Free from excessive ponded liquid;
 - Free from any item of waste with the potential to protrude through the regulating layer;
 - Free from excessive voids;
 - Free from excessive changes in gradient over short areas;
- 3.2.3 The Works Supervisor may request the Contractor to carry out remediation works to the final waste level surface should the surface be deemed unsuitable for the placement of the regulating layer. This may include trimming of the waste and additional plant trafficking to facilitate final compaction.
- 3.2.4 A record of acceptance of the final waste level surface shall be kept by the Works Supervisor.

3.3 Regulating Layer Material

- 3.3.1 Material to be used for the regulating layer is limestone material produced by the ongoing excavations on site and will be free-issued by the Employer from source, adjacent to the site.
- 3.3.2 The free issue material shall be crushed and graded by the Contractor. Grading shall meet the requirements of the table below. The Contractor shall carry out testing, to BS1377: part 2 to demonstrate that the graded material complies with these requirements, as instructed by the Works Supervisor. Testing results shall be submitted to the Works Supervisor.

Size	125mm	37.5mm	6.3mm	3.35mm	2mm	600µm
% Passing	100	0-100	0-100	0-35	0-10	0-2

3.4 Regulating Layer Placement

- 3.4.1 The regulating layer shall be placed and compacted over the whole area in which capping works take place over waste. The regulating layer shall comprise a minimum 250mm thick layer. The regulating layer shall be placed in a single lift and compacted in accordance with the methods proposed in the Contractor method statement. The Works Supervisor may require that a placement trial (trial pad) be carried out by the Contractor to demonstrate that the plant to be used for the placement and compaction is adequate.
- 3.4.2 The final profile of the regulating layer on which the GCL is laid shall be smooth and flat and free from any materials or substances that would threaten the physical or chemical properties of the GCL. The surface shall be free of organics or other deleterious materials, sharp-edged/angular rocks, stones, sticks, construction debris, and other foreign material that could contact and potentially damage the GCL. Any unevenness shall be avoided since such point loading may cause stress on the GCL that may result in the potential for damage and a resultant increase in permeability.
- 3.4.3 The regulating layer surface shall be rolled with a smooth-drum compactor (or other approved plant to the satisfaction of the Works Supervisor) to remove any wheel ruts or other abrupt grade changes. Furthermore, all protrusions extending more than 10 mm from the regulating layer surface and particles greater than 37.5mm present on the finished surface shall either be removed (with the indentation filled and compacted with suitable material to the satisfaction of the Works Supervisor), crushed, or pushed into the surface with a smooth-drum compactor. The Works Supervisor shall accept the method for treatment of surface protrusions in the method statement. The finished surface shall be firm and unyielding, without abrupt elevation changes.
- 3.4.4 Placement of the regulating layer shall be continually supervised by the Works Supervisor. The final surface shall be inspected and certified that it is:
- Free from organic and deleterious material;
 - Free from loose debris;
 - Free from soft spots and excessive voids or cracks;
 - Free from ponded water;
 - Capable of providing sufficient bearing capacity to support the capping system;
 - Free from protrusions extending more than 10mm from the regulating layer surface.
- 3.4.5 Any areas of unsuitable material identified by the Works Supervisor shall be marked up for discussion with the Contractor. Unsuitable material shall be removed with additional suitable regulating layer material placed and compacted to the satisfaction of the Works Supervisor prior to acceptance of the regulating layer surface.
- 3.4.6 Acceptance of the regulating layer surface shall be obtained from the Works Supervisor prior to installation of the GCL. Particular attention shall be paid to the tie-in to existing capping and lining systems and any other areas that exhibit abrupt changes of gradient. Remedial work to “soften” the angle may be requested by the Works Supervisor prior to acceptance of the regulating layer surface. Acceptance of the regulating layer surface by the Works Supervisor shall in no way absolve the Contractor of his responsibility to produce a regulating layer surface for GCL installation to the standard specified in the Specification & CQA Plan.
- 3.4.7 A visual inspection will also be carried out by the Works Supervisor during placement to assess uniformity of thickness. Hand dug inspection pits may be excavated by the Contractor

to physically measure the thickness of the layer and demonstrate to the Works Supervisor that the minimum thickness has been achieved. The location shall be determined by the Works Supervisor.

- 3.4.8 The Contractor may propose an alternative method for demonstrating the physical thickness of the regulating layer, subject to acceptance of the Works Supervisor. Any void produced shall be remediated in accordance with Section 3.3.4.
- 3.4.9 Exposed areas of regulating layer not covered by GCL placement prior to the end of the working day shall be smooth rolled to seal the surface against the ingress of water. The surface shall be subject to acceptance by the Works Supervisor prior to installation of the GCL.
- 3.4.10 The Works Supervisor may instruct the Contractor to undertake hand stone picking should concentrated areas of angular stone or other particles be identified by the Works Supervisor and deemed unacceptable regarding the potential for puncturing of the GCL during construction.

3.5 Existing Leachate Extraction and Monitoring Infrastructure

The existing landfill leachate extraction and monitoring system is operational. The Contractor shall ensure that the capping works do not adversely interfere with the operation of the existing systems. Any damage caused by the capping construction works shall be reported to the Works Supervisor immediately.

4.0 TRANSPORTATION, STORAGE AND HANDLING OF GEOSYNTHETIC CLAY LINER (GCL)

4.1 Transportation and Delivery of GCL

- 4.1.1 To ensure the optimum performance of the GCL, it shall be transported, handled and stored prior to and during installation in a manner that does not impair the physical or chemical properties of any component of the material. All personnel involved in handling shall be made aware of the types of activities that may result in damage.
- 4.1.2 Procurement of the GCL for use in the works shall be the responsibility of the Contractor. Delivery of the GCL to the site and handling of the material on actual delivery to the site shall be the responsibility of the Contractor. The Works Supervisor will not accept rolls of material that cannot be unloaded from the delivery vehicle in a manner that precludes causing damage. GCL shall be delivered to site in packaging that will protect the rolls from UV degradation and the Contractor shall ensure that the rolls are kept in the packaging provided by the manufacturer until required for use in the works. The specification of the GCL is included in Appendix B.
- 4.1.3 The Works Supervisor shall supervise the delivery and unloading of the rolls. Typically, rolls will be labelled with an individual roll number by the supplier.
- 4.1.4 During unloading of GCL, rolls shall be lifted from the delivery vehicle by suitable equipment (e.g. slings). They shall not be dragged, pushed or allowed to fall onto the ground or vehicle from any height. All precautions shall be taken to avoid stressing or tearing the GCL. Any tears in the packaging shall be repaired and recorded.
- 4.1.5 During unloading, the Works Supervisor will complete a visual inspection to identify any damage or suspected damage on delivery. Rolls that are delivered without the full labelling shall be suspected of damage. Any damaged rolls shall be labelled and segregated for further investigation. The roll numbers and the condition of delivered rolls shall be recorded by the Works Supervisor using a Quality Control Sheet as shown in Appendix A.

4.2 Storage of GCL

- 4.2.1 Before taking delivery of the GCL rolls, the Contractor and Works Supervisor shall agree the location of the storage facility before the preparation of an area suitable for both the reception and storage of the material.
- 4.2.2 The storage facility shall be located where the material will not be affected by site activities (e.g. site traffic). The area shall be situated away from vegetation and be rolled to provide a firm, flat and horizontal surface that shall be prepared to avoid puncturing or other damage. It shall be of a sufficient size to enable the required number of rolls to be stored lying horizontal on a surface that provides continuous support along the length of each roll
- 4.2.3 Rolls of GCL shall be stacked no more than 3 rolls high and shall not be stored standing on one end. No other materials shall be stacked on top of the GCL. The area for storage shall provide support along the entire length of each roll. Rolls shall not be stored on blocks since localised contact points could cause stresses on the product.
- 4.2.4 To protect the GCL rolls, the base of the storage area shall be dry, well drained and stable. The storage area shall protect the material from the following:

- Precipitation;
- Standing water;
- Chemicals;
- Excessive heat (>70°C) and sparks; (dependant upon manufacturers recommendations);
- Vandalism, animal and plant infestation;
- Puncture;
- Any other environmental condition that could impact on its physical properties.

4.2.5 Correct storage of the GCL lies with the Contractor. Any damage occurring to rolls shall be recorded by the Works Supervisor who may request isolation of individual rolls to allow further inspection.

4.3 Handling of GCL

4.3.1 Responsibility for correct handling of the GCL on site lies with the Contractor and shall be carried out so as not to damage the material and in accordance with good health and safety practice.

4.3.2 All lifting of GCL rolls will be performed using either appropriately located slings (in accordance with the manufacturers requirements or marked with the Safe Working Load), a core pipe with a spreader bar (to ensure the lifting chains or straps do not rub against the end of the roll), or a stinger bar (a bar protruding from the front of a forklift or other equipment). Under no circumstances should the GCL be handled with the forks of a forklift, the bucket of an excavator or other similar equipment.

4.3.3 Lifting the GCL rolls with a core pipe and spreader bar or a stinger bar is likely to require removal of the core plug. This plug shall be replaced once the roll has been handled. To prevent damage to the roll due to stresses caused by bending, the core pipe or stinger must limit deflection to that agreed with the Works Supervisor, when a full GCL roll is lifted.

4.3.4 Any damage caused during handling of the GCL shall be recorded by the Works Supervisor and rectified. If this is not possible, the roll shall be rejected and not used in the capping works.

5.0 INSTALLATION OF GEOSYNTHETIC CLAY LINER (GCL)

5.1 GCL Placement Methodology

- 5.1.1 GCL shall be placed directly on the final regulating layer surface.
- 5.1.2 The proposed layout of the GCL panels should be provided by the Contractor and agreed in advance with the Works Supervisor and a provisional GCL panel layout plan submitted to the Works Supervisor at least ten working days prior to capping.
- 5.1.3 The layout of GCL panels should minimise the number of joints in the GCL and ensure that sufficient overlaps are allowed for seams and other obstacles. Where the slope length (plus tie-in) is less than the length of a roll no horizontal seams shall be permitted. Where a horizontal seam is essential, due to the slope being longer than a complete roll, this shall be located towards the base of the slope. The Contractor shall produce the final panel layout sketch and this shall be agreed with the Works Supervisor.
- 5.1.4 A field panel is defined as a unit of GCL that is to be seamed in the field i.e. a field panel is a roll or a portion of roll cut in the field.
- 5.1.5 It shall be the responsibility of the Contractor to ensure that each field panel is given an identification (alpha numeric) that can be referenced to the layout plan. This identification system shall be agreed with the Works Supervisor. This field panel identification code shall be as simple and logical as possible. The Contractor shall establish a table or chart showing correspondence between roll numbers and field panel identification codes. The field panel identification code shall be used for all quality assurance records.
- 5.1.6 The Works Supervisor shall verify that field panels are installed at the locations indicated on the layout plan.

5.2 GCL Installation

- 5.2.1 GCL installation will not proceed until the Works Supervisor has given acceptance.
- 5.2.2 GCL rolls shall be taken to the working area of the site in their original packaging. Immediately prior to their deployment, the packaging shall be carefully removed without damaging the GCL. The GCL shall be placed with the woven side towards the sub-grade. The GCL shall be kept free from folds or wrinkles. At no time during the installation of the GCL and other layers, shall any plant or equipment be permitted to travel directly on the unprotected surface of the GCL.
- 5.2.3 If the installation equipment causes rutting of the subgrade, the subgrade must be restored to the originally accepted condition before placement continues. Care must be taken to eliminate the extent to which the GCL is dragged across the subgrade in order to avoid damage to the bottom surface of the GCL.
- 5.2.4 Only as much GCL as can be covered by the end of the working day with restoration material or a temporary waterproof tarpaulin shall be deployed. The GCL shall not be left uncovered overnight. If the GCL is hydrated when no confining stress is present, it shall be necessary to remove and replace the hydrated material. If adverse weather conditions occur during GCL laying, sufficient plastic sheeting or tarpaulin shall be available to provide cover for this material, to prevent premature hydration.

- 5.2.5 The Works Supervisor shall inspect the GCL during placing and any damage shall be repaired, covered with a new sheet or removed and replaced. The Works Supervisor shall visually inspect the whole surface of the GCL checking for variations in colour, thickness, needle punching and sewing density or any variations in appearance that may suggest material or installation problems. The results of the GCL inspection shall be recorded by the Works Supervisor. Any damaged areas shall be marked and given records kept of its location. The record shall include the location, size and repair details of any damage.

5.3 GCL Joints and Overlaps

- 5.3.1 The joints between consecutive panels shall be formed by overlapping the panels by a minimum of 400mm. Bentonite powder shall be added to the seam at a rate of 0.5kg per linear metre, unless there is additional bentonite powder impregnated into the overlapping area of the GCL product. Care shall be taken to ensure that the joints are free from soil and other debris.
- 5.3.2 End-of-roll overlapped seams shall be constructed in a similar manner but shall overlap by at least 1m. A full roll length shall extend the whole length of the slope. Where this is not possible due to the length of the slope the larger section shall be pinned with steel pins to the top and the shorter length placed on the lower slope. The GCL field panel on the upper section of any slope shall overlay that being applied to the lower slopes. The lower field panel shall also be pinned beneath the overlap.
- 5.3.3 The GCL may only be slit in exceptional circumstances, such as awkward corners to permanent protrusions, where the GCL should be overlapped and then overlain with a covering panel of GCL which itself shall overlap the slit by at least 400mm. All such details should be agreed with the Works Supervisor in advance.
- 5.3.4 The Contractor shall ensure that all GCL overlaps and seams are flat to ensure a good seal.
- 5.3.5 The Toe Tie-In detail (see Drawing No. D117657/TZ/CAP/01) is that the new GCL shall overlap the existing capping by at least 1m. The existing GCL and geomembrane sidewall liners shall be exposed by at least 1500mm from the anchor trench and the surface cleaned prior to joining and then additional bentonite powder shall be added to the seam at a rate of 0.5kg per linear metre. All details shall be agreed with the Works Supervisor.

5.4 Repairing Damaged GCL

- 5.4.1 If damage to the GCL is identified an assessment shall be made of whether the damage threatens the integrity of the material and the lining system into which it will be integrated. The Works Supervisor shall undertake a technical assessment of the damage and the findings and solutions shall be recorded in writing on, for inclusion in the final report. The technical assessment will include a consideration of the magnitude and direction of any stresses and the consequences of material failure.
- 5.4.2 If the assessment by the Works Supervisor identifies the possibility that the damage could affect the integrity of the panel then the panel will be removed and not used in the lining system, or as otherwise. A full replacement panel will then be installed in accordance with the procedures detailed in this chapter.
- 5.4.3 If the Works Supervisor has determined that the damage will not significantly affect the integrity of the liner then the damage will be patched under the direct supervision of the

Works Supervisor. The damaged area will be overlain with a sheet of GCL, which is at least 400mm larger than the damaged area in all directions.

- 5.4.4 The “damaged area” shall include any area of bentonite that appears thinner as a consequence of the tear. The tear should be filled with bentonite granules or powder and overlain with the patch, which is held in place with bentonite powder or paste. The perimeter of the patch should be edged with at least 0.5kg per metre run of bentonite powder. Any damage repair must be recorded and accepted by the Works Supervisor before works continue.

5.5 Hydration of the GCL

- 5.5.1 Pre-hydration of the GCL is required, especially if this is to be placed during dry weather. Pre-hydration can be achieved by spraying each panel with water, after it is laid. Restoration material shall be placed immediately after hydration, before the GCL dries.

6.0 GEOSYNTHETIC CLAY LINER (GCL) PINNING AND TIE-INS

6.1 General

6.1.1 The installation of the GCL requires a number of pinning and tie-in systems to be constructed within the capping area. These are:

- Tie-in to the existing permanent sidewall lining system.
- Pinning to support the GCL on the slopes.
- Tie-in to the existing landfill gas and leachate extraction and monitoring infrastructure.

6.1.2 As-built construction surveys for the existing lining systems shall be used to locate each tie-in, in order to minimise mechanical excavation and the potential for damage. These surveys will be provided by the Employer.

6.1.3 Tie-in details are shown on Drawing No. D117657/TZ/CAP/01 and D117657/TZ/M/03RevB.

6.2 Tie-in to Existing Leachate Extraction and Monitoring Infrastructure

6.2.1 Penetrations through the capping system by pipes and other structures should be avoided whenever possible, when they are absolutely necessary, they should be carried out in accordance with both the specific manufacturers installation guidance and this Specification and CQA & Plan

6.2.2 Installation designs for the connection of the GCL to existing monitoring wells are shown on Drawing No. D117657/TZ/CAP/02.

6.2.3 Existing Leachate chambers pose a potential hazard and could allow significant air ingress into the waste mass. All such chambers shall be effectively sealed as shown on Drawing No. D117657/TZ/CAP/02.

6.2.4 In general the GCL shall be sealed around penetrations and structures with a combination of granular bentonite or bentonite paste used liberally (approximately 3 kg/m) to surround the penetration beneath the GCL and between the parent GCL and a secondary collar of GCL. The Works Supervisor shall check and record that the agreed requirements have been met.

6.2.5 Construction of the GCL connection shall not commence until the Works Supervisor approves the subgrade.

6.3 Pinning

6.3.1 Steel pins shall be used to secure the GCL to the slopes. Pins shall be a minimum of 10mm diameter and either 'L' shaped or 'U' shaped and shall penetrate a minimum depth of 500mm.

6.3.2 Pins shall be located to the GCL manufacturer's recommendations. As a minimum pins shall be spaced a minimum of 2.5m apart across the slope and within 1m of the slope crest. Where a roll starts part way down a slope pins shall be placed 750mm from the top of the panel.

7.0 RESTORATION MATERIAL

7.1 Material

- 7.1.1 Restoration material shall be placed over the GCL. This shall be placed in a single 350mm lift to avoid trafficking directly on the capping system and placed utilising low ground pressure plant. The material shall not be compacted.
- 7.1.2 Restoration material shall be deployed from the toe of the slope upwards and in a manner that will not lead to the development of wrinkles and folds in the capping system or separation of the GCL seams. The Works Supervisor may request localised placement of the material by excavator over GCL seams running normal to the slope.
- 7.1.3 Restoration material shall comprise suitable inert, organic and uncontaminated material with no elements deleterious to the capping system and with particles no greater than 25mm.
- 7.1.4 The Contractor shall devise methodologies for the selection of materials, mixing and placement of material. These methodologies shall be submitted to the Works Supervisor a minimum of 2 weeks before this element of the works is to commence. The Works Supervisor will review and comment on these methodologies prior to commencement. Where such methodologies are considered by the Works Supervisor to be inappropriate or unsuitable, alternatives shall be proposed to the acceptance of the Works Supervisor. These methodologies shall be revised as works progress.
- 7.1.5 The Works Supervisor shall inspect that the materials and placement methods contained in the method statement meets the above requirements.
- 7.1.6 Restoration material shall not be placed if inclement weather conditions dictate that the quality of the restoration material final landscape would be affected.

7.2 Restoration Grassland

- 7.2.1 Immediately after placing the restoration material (within 48 hours) the whole area shall be cultivated and seeded to develop grass sward and limit erosion. Watering shall be undertaken as necessary. The grass seed mix shall be subject to acceptance of the Works Supervisor.

7.3 Benches

- 7.3.1 The benches shall have a 350mm thick layer of fine crushed limestone (with particles no greater than 25mm) placed above the GCL to act as a protection layer. This shall be lightly compacted to ensure that the GCL is not damaged.
- 7.3.2 A 400mm thick layer of compacted crushed limestone (with particles no greater than 125mm) shall be placed above the GCL protection layer. See details on drawings D117657/TZ/M/03RevB and D117657/TZ/CAP/01.
- 7.3.3 Material to be placed on the benches is limestone produced by the ongoing excavations on site and will be free-issued by the Employer, at source. The Contractor shall crush the material to the required maximum sizes.

8.0 DOCUMENTATION

8.1 Records to be Produced/Completed by the Contractor

- 8.1.1 Records shall be kept at all times when work is in progress at the site. The following records shall be produced and signed by the Principal Contractor:
- Level surveys agreed with the Works Supervisor to record the ground levels before placement of the regulating layer (also indicating the location of the edges of any existing capping and lining system);
 - Level surveys agreed with the Works Supervisor to record the ground levels after placement of the regulating layer;
 - Level surveys agreed with the Works Supervisor to record the ground levels after placement of the restoration material;
 - Records of any “hot areas” identified during the works;
 - Daily records detailing the extent and type of any earthworks including details on the types of plant used and a record of the weather on each day of the works;
 - Records of the GCL rolls delivered and used in the works and the corresponding MQC (Manufacturer’s Quality Control) Certificates;
 - A drawing of the final panel layout for the GCL, including the identification numbers of the rolls used and also detailing the extent of the capping system placed and the tie-in details with the existing lining systems;
 - Daily records of the extent of the GCL placed and associated works including the location and identification numbers of all rolls of material used, identification numbers of seams, joints and patches;
 - A record of any repairs or remedial works to the GCL;
- 8.1.2 Completed records shall be submitted, together with relevant supporting documents and drawings, to the Works Supervisor. If there are any discrepancies, omissions or other areas of non-compliance the Works Supervisor shall give the Contractor notice of items requiring attention.

8.2 Records to be Produced/Completed by the Works Supervisor

- 8.2.1 The Works Supervisor will keep records of the following information, where deemed necessary by the Works Supervisor:
- Remediation where required and approval of the final waste level surface;
 - Preparation and approval of the regulating layer;
 - Records of delivery, handling and storage of GCL;
 - MQC (Manufacturer’s Quality Control) Certificates of the GCL delivered and used on site, provided by the Manufacturer;
 - Preparation and approval of the restoration material;
 - Types of equipment used;
 - Weather conditions and whether the works are being undertaken within the specified conditions;
 - Personnel on site;
 - Any remedial action on final waste level surface, regulating layer, GCL, and restoration material;
 - Photographic evidence of the above works;
 - Any other relevant matters detailed in the Specification & CQA Plan.

8.2.2 The Works Supervisor shall complete record sheets, and inform the Contractor on a daily basis of any areas of non-compliance and indicate the required remedial action to rectify any problems.

8.2.3 The Works Supervisor shall record the required data on paper copies and electronically.

9.0 PROCEDURES FOR LIAISON WITH THE EMPLOYER

- 9.1 Where conditions on site dictate a significant change is needed to the Specification & CQA Plan, the Works Supervisor will discuss and agree these with the Employer beforehand and shall then advise the Contractor.
- 9.2 The Works Supervisor will keep a copy of records of work carried out on site which will be available for inspection by the Employer.

10.0 FINAL REPORT

- 10.1 On completion of the works and any testing, the Works Supervisor shall produce a Final Report. The report will form a permanent, well-documented record of the work carried out, the materials and construction methods used and the testing undertaken. A copy of the Works Supervisors records shall be included within an Appendix to the Report. Photographs of the various stages and elements of the work shall also be included.
- 10.2 Typical sections for the report would include:
- Introduction
 - Description of works
 - Materials used in construction
 - Installation details
 - Failures / Non-Compliance Problems, including remedial action taken
 - Drawings/sketches
 - Photographs
 - Works Supervisor Site Records (in typed up electronic format)
- 10.3 The GCL panel layout sketches and supporting documentation should contain the following information:
- Layout of individual panels
 - Defects/Repairs

11.0 WORKS SUPERVISION

- 11.1 Quality Control Procedures for works supervision shall be in accordance with those specified within this document. The Works Supervisor shall be on site at all times during the works carried out in accordance with the Specification & CQA Plan. If any regulating layer, GCL or restoration material is installed and/or tested when the Works Supervisor is not on site, the Works Supervisor may require that any section of the works is uncovered and proper installation demonstrated. The Works Supervisor may request that any such installed material is removed and replaced in conformation with these procedures.

APPENDIX A

WORKS SUPERVISOR DAILY RECORD SHEETS

APPENDIX B

MATERIAL SPECIFICATION

NAUE – BENTOFIX NSP 4900

DRAWINGS

D117657/TZ/CAP/01: CAPPING SYSTEM INSTALLATION DESIGN.

D117657/TZ/CAP/02: CAPPING SYSTEM TIE-IN DESIGN - EXISTING LEACHATE AND
LANDFILL GAS MANAGEMENT INFRASTRUCTURE

D117657/TZ/M/03RevB: TOP OF PRE-SETTLED WASTE TARGET PROFILE AND
CONSTRUCTION ARRANGEMENTS

- compact and be placed
benches, above the GCL.

[illegible]

Decorative powder to be applied between GCL cells

1.2m of clean Stone Linings (top exposed)

Regulating Layer-250mm

Proposed GCL

Restorative Soils-350mm

12.5%

Existing Mineral Stewall

Existing GCL Stewall Liner

Waste

1m rib-rim overlap between existing and proposed GCL

The diagram illustrates the layout of a Waste Cell, showing the relationship between various layers and structures. Key components and labels include:

- WASTE**: The central area representing the waste material.
- Existing Mineral Sidewall**: The boundary on the left side of the cell.
- Proposed GCL**: Geosynthetic Clay Liner, shown as a green line.
- Regulating Layer 250mm**: A layer above the GCL, shown as a light orange hatched area.
- Minimum overlap**: Indicated by a dimension line showing the required overlap of the GCL and Regulating Layer.
- 12.5**: A dimension indicating the width of the Regulating Layer.
- Restoration Seal- 300mm**: A seal at the bottom right corner.
- Existing GCL Seewall Line**: The boundary at the bottom left.
- Decorative panels to be applied between GCL cells**: Indicated by a dimension line at the top.
- Min. 100mm overlap**: A dimension indicating the required overlap of the Existing Mineral Sidewall and the Existing GCL Seewall Line.

Debris and powder to be applied over new GCL roll

1.5m of clean Base Layer as required

Proposed GCL

Regulating Layer 250mm

Reinforcing Strip 150mm

12.5

Existing Mineral Stewall

Existing Geomembrane Stewall Liner

Existing Geotextile

Existing Geomembrane and Geotextile to be neatly cut back to expose underlying GCL

Waste

1m minimum overlap between existing GCL and new GCL rolls

400mm of crushed compacted limestone

300mm fine crushed limestone

Seam to be sealed 1:1.25m

Minimum 1m overlap

Bentonite powder to be applied between GCL rolls

GCL overlap in direction of slope

grout/surface water flow

Minimum 1m overlap

Where GCL roll finishes on slope underlying roll to be pinned to slope

WASTE

Proposed GCL

Regulating Layer - 250mm

Reinforcing Strips - 50mm

FINAL

Job Title

AND GAS MANAGEMENT SYSTEMS

INSTALLATION

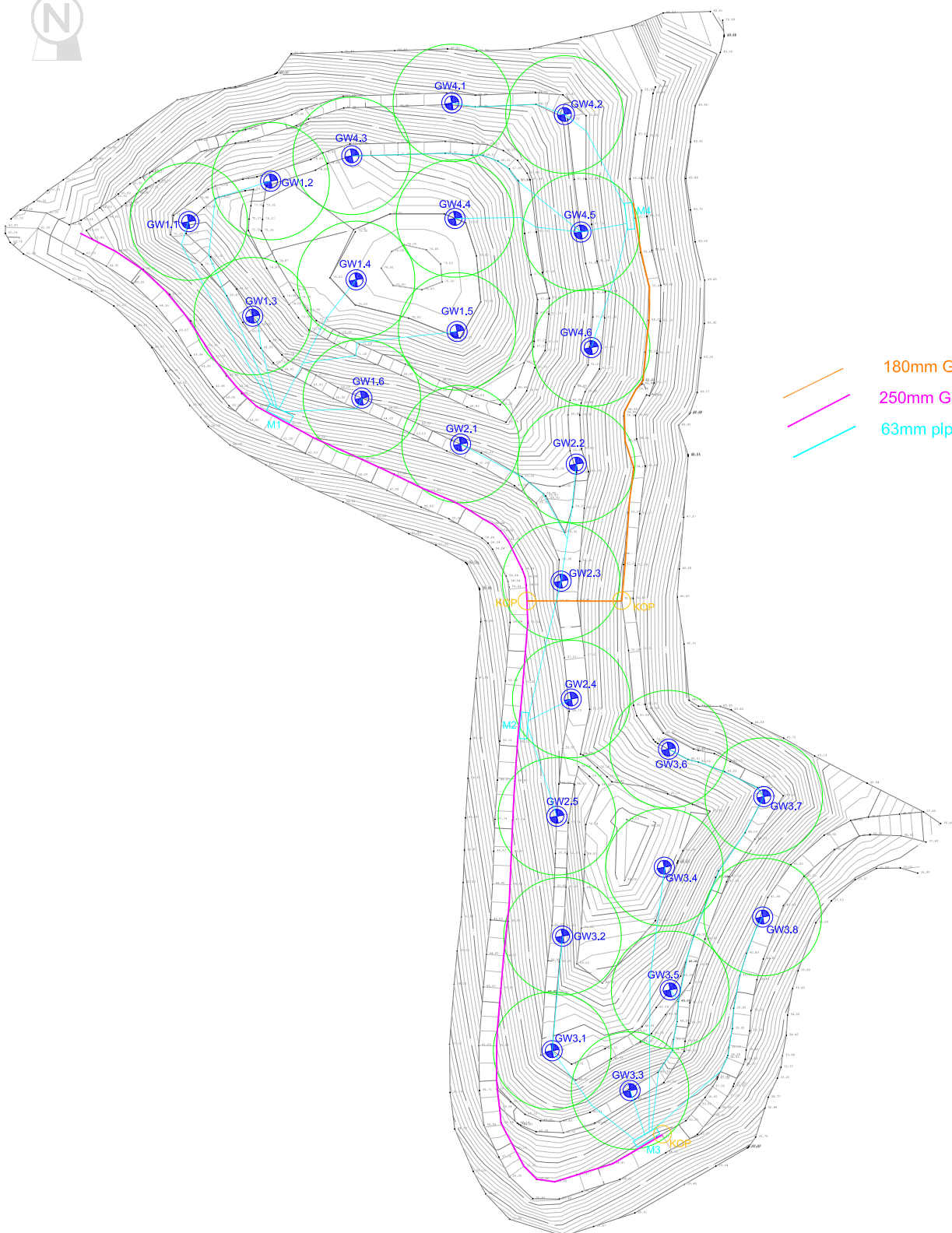
BCG	BCG	CH-W/M	07/09
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Bowl Court

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Drawing Number



- 180mm Gas Main
- 250mm Gas Main
- 63mm pipework

NOTES

1. The gas management system is designed to ensure that the gas is safely managed and that the system is safe to operate.

GAS MANAGEMENT SYSTEM LAYOUT

CONSULTANTS SERVICES FOR THE
INTEGRATED GAS MANAGEMENT SYSTEM

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DATE: 10/10/2023

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