4th April 2016 – Introduction to Training

Day one of the environmental training course commenced at the Richmond library facility venue with an opening address by Mr. Tshiamo Moncho, LANDCARE, Kimberley, NC. He introduced the speaker/course presenter to the attendees during the morning session and outlined the purpose and intention of the training. A power point presentation on the various environmental & bio-engineering techniques of addressing soil erosion was made to the attendees and LANDCARE Extension Officers staff engaged in the rehabilitation of eroded areas for the Richmond Soil Conservation Project (NC/DAL/EPWP/00080).

The presentation covered the following erosion control techniques that would be implemented & considered for the Richmond environmental restoration project:

- Introduction & overview to Erosion Control & Donga rehabilitation techniques for the Richmond project
- General shaping and trimming of side slopes
- Introduction to the A-Frame levelling technique for setting out contours
- Placing & installation of Sand Bags, Rock berms, Silt fencing and Bio-Jute netting
- Use of fertilisers & organic mixes for plants and vegetation
- Preparation & planting of vetiver grass for soil conservation applications
- Soil preparation for hand seeding applications
- Rescuing & transplanting of Native plants
- Maintenance procedures to erosion control structures & vegetated areas

The silt fencing, bio-jute netting & sand bags together with all steel & wooden stakes, including baling and tying wire for the structures were supplied by HYDROMULCH as part of the training package.
Established potted vetiver plants were delivered to site and stored in Richmond for distribution during the 4 day training session and for use during the Hydromulch supervision period.

Course materials as well as specific loose tools were likewise made available by HYDROMULCH in order to successfully complete the required training schedules.

A site visit with the team leaders was made to the operational area of the Richmond soil conservation project following the morning session. No afternoon on-site work was possible due to continuous rain.

A suitable location below the southernmost weir on for the proposed in-field training was jointly decided & agreed to where the setting out of contours using the A-frame, installation of rock berms and silt fences together with the placing of sand bags, bio-jute and vetiver planting could be demonstrated.

5th April 2016 – In Field Training

Day one of the in-field training commenced with a safety & environmental briefing on the potential risks that could be encountered during the course of training. The trainees were introduced and briefed on:

- **General shaping & trimming of donga & gully side slopes.**
  Trimming of the river embankments to facilitate rows of vetiver planting, bio-jute netting, hand seeding and transplanted native grass tufts. The technique of shaping and filling in the smaller gullies & rills were demonstrated and the teams proceeded thereafter with finishing off and levelling the river embankment slopes where rehabilitation work was to be implemented.
• **A-frame levelling technique**
The A-frame technique for setting out contour lines was demonstrated to the teams who then proceeded to set out the shoulder breakpoint contour line of the river embankments, in addition to setting out contour lines for effective packing of rock berm structures, silt fences and vetiver grass hedge rows (VGHR’s). It was explained & demonstrated to all that the A-frame technique was an effective method of ensuring that rock structures or rock berms constructed inside the river channel of riparian areas were level.

• **Sand Bag Installation & Placing**
Packing of sand bags to reinforce the toe of the river embankment into which vetiver grass would be planted. The bags are placed in continuous rows with the second row above offset to provide a “step” where the vetiver plants are inserted into the sand bag. Two (2) to three (3) plants per bag or as determined at the time of planting.

Careful shaping and levelling off of the river embankment side slopes carried out after the placing of the sand bags in order to “tie-in” the slope with the sand bags.
• **Rock Berm Installation & Placing**

Packing of Rock Berms on contour to disperse & divert surface water runoff. The packing of the rock berms was done to lessor eroded areas where backfilling and shaping was carried out prior to rock packing, whereas the larger gullies were filled by packing the rocks and the berms extended horizontally to act as a dissipater to address surface water runoff. The function and objective of the rock berm structures to trap silt, reduce surface water runoff velocity, create a microclimate for native water & wind borne seed establishment was explained to the trainees.

The dimensions of the structure set out with a base width of 500 mm to 1000 mm and a vertical height depending on anticipated water flow of between 300 mm & 600 mm.

Diagram of rock berm structure

Some loose rocks were moved from central location on site and the teams proceeded by carrying them to the respective locations where the berms had been set out.

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**Rock berms**

Rock berms were marked and set out using the A-frame technique in order to accurately determine the contour level. Loose rock collected by surrounding areas and thereafter packed and installed by trainees.

Caution was exercised in removing stones/rocks on the slope such that exposed areas would not cause erosion.

The use of large rocks ranging from 3 to 10 kg or greater for the berm packing were collected and placed, starting at the base with decreasing sizes as the structure was built.
The set out contour lines were excavated slightly to recess the rock structures.

The berms were extended along the contour and through the eroded rills and gullies, with the objective of evenly dispersing surface water runoff. Three to five lines of rocks were placed along the contours with additional lines of rocks placed in the gullies such that the completed structure was uniform in height.

The dimensions of the structures are based on the anticipated annual precipitation of around 265 mm and that intense and severe downpours were not likely to occur.

- **Rescuing and transplanting native vegetation** – Grass tufts
  The technique of rescuing and transplanting native vegetation (grass tufts) was demonstrated to the trainees. The native plant was removed physically using a flat spade and trimmed. A suitable sized hole was constructed using the hand auger to remove soil and to limit evapotranspiration.

The rescued plant is then placed in the excavated hole. 500ml water is added to the plant hole to kick start the regrowth of the plant.

Bio-Jute or grass mulch can be placed over the hole of the replanted rescued plant to provide shade and a microclimate environment for the re-establishment of the native plant.
It was found that growth was evident within 5 days where bio-jute had been placed over the transplanted native vegetation and hand seeded areas.

**6th April 2016 – In Field Training**

Day two of the in-field training commenced with a safety talk on the hazards and risks associated with the work to be carried out. Additional training given on trimming of side slopes and eroded gullies/rills together with placing of sand bags. Training in the placing of silt fences together with the surface preparation and planting of vetiver grass was also provided.

- **Silt Fences**
  The silt fences were set out to (a) dissipate surface water runoff, (b) to trap silt and (c) to vector surface water runoff away from the river embankment basin and into the surrounding areas. Straight lines were marked and a trench excavated to insert approximately 100mm of the fabric which was then backfilled and lightly compacted. Resized Y standard steel poles were placed and hammered into the ground at either side of the fence to secure the galvanised 3mm wire strands onto which the silt fence fabric was secured.
Planting of Vetiver Grass Hedge Rows (VGHR's)
The trainees participated in the procedures and techniques for the planting of vetiver grass hedge rows (VGHR’s) on contour and to the trimmed side slopes of the river embankments. The contour lines for the rows of vetiver grass were set out using the A-frame. Excavation of the plant holes was carried out using the modified hand auger, inserting 10 grams of “Gromor”, an organic supplement, into the prepared plant holes, into which the established plant was placed. The distance between the plants varied between 150 mm and 200 mm.

The technique of rescuing and transplanting native vegetation was demonstrated using the supplied hand auger.
The native plant was removed physically and placed in the excavated hole. 500ml water was added to the plant hole to kick start the regrowth of the plant.

Bio-Jute was placed over the excavated hole to provide shade and a microclimate environment for the re-establishment of the native plant.

The successful re-establishment of the plant was doubtful from the outset due to the adverse weather conditions at the time of transplanting but was carried out in order to demonstrate the process and the effective use of the planting auger.

7th April 2016 – In Field Training

Day three of the in-field training commenced with a safety talk on the hazards and risks associated with the work to be carried out. Further training given on trimming of side slopes and eroded gullies/rills together with placing of silt fences, sand bags and vetiver planting. Training in collection of native seed from surrounding grassland areas was given en route to site where an area was selected where native grass seed could be harvested. The method for placing of silt fences together with the surface preparation and planting of vetiver grass was also provided. Furthermore, the maintenance procedures for silt fence, sand bags and planting of vetiver areas was also covered.

The training was cut short at 2 pm due to adverse weather conditions.
8th April 2016 – In Field Training

HYDROMULCH included the morning of 8th April to provide for the bio-jute installation training as a result of downtime due to the adverse weather conditions of the past 4 days. Training commenced with a safety talk on the hazards and risks associated with the work to be carried out. The teams did however continue with side slope trimming, rock berm pack, silt fence installation, vetiver planting and maintenance of planted areas by hand watering.

Bio-Jute Installation

The area selected for the Bio-Jute installation training was trimmed and thereafter scarified horizontally and on contour, forming drills 25mm to 35mm wide and 30mm to 50mm deep. Organics (10 grams per metre squared) together with the harvested native grass seed and commercially supplied grass seed was spread manually and raked into the prepared surface bed. The bio-jute was laid over the seeded area in sections of 1.2 metre widths and hand stitched in order to create a continuous cover.

The bio-jute cover will provide an ideal microclimate which will promote the establishment of both the native seed and the commercially supplied grass seed. The bio-jute can be expected to last for a period of approximately 8 months if not damaged by veld fires or domestic animals. Germination of the sown grass seed may occur soon but will in all probability only show signs of growth in the coming Spring.

A vetiver grass hedge row was planted at the shoulder break point of the river embankment side slope and will, once established, facilitate surface water runoff. Watering of the vegetated side slope and seeded areas is continuing and will be ongoing for the month of April.
Work completed during training period:

- Setting out of contours using A-Frame \(366 \text{ m}^1\)
- Trimming of side slopes \(825 \text{ m}^2\)
- Placing & Installation of rock berms \(100 \text{ m}^1\)
- Placing & Installation of Silt Fences \(26 \text{ m}^1\)
- Placing of Bio-Jute biodegradable netting \(80 \text{ m}^2\)
- Hand seeding \(80 \text{ m}^2\)
- Collection of native grass seed \(3 \text{ kg}\)
- Rescuing & transplanting of native vegetation \(10 \text{ plants}\)
- Planting of vetiver grass plants \(1016 \text{ plants}\)

**Observations and On-Site evaluation**

The collection and transportation of rocks from the surrounding areas appears to be time consuming and rather expensive but is in essence important in the rehabilitation objectives of the Richmond environmental project. Silt fences can, however, be a viable substitute for rock berms when placed along contours. The fences offer an ideal microclimate environment for water and wind borne seed establishment, retention of silt, dissipate surface water runoff and can be relocated at any time (in the short or long term) once the areas have stabilised and vegetation growth is evident.

In conclusion, the contracting teams and EWP trainees embarked on an intense 5 day training program that was interrupted by rain. It did however demonstrate techniques not previously undertaken by them. Two A-Frames as well as two planting auger will be donated to the Richmond project by HYDROMULCH.

**Suggestions for consideration for additional or new training modules**

The supply of the correct training systems, together with all supporting materials and loose tools are essential for the implementation of effective training course modules. We would like to offer the following suggestions for future training modules such that all environmental systems/techniques under discussion with all their supporting material items as well as specific loose tools can be provided by the training entity, thus avoiding misinterpretation and understanding of selected environmental product lines and specification requirements.

Likewise, the training course is to provide for minimum material quantities which will give the trainees a sound background and understanding of what the erosion and sediment control system procedures for soil conservation applications entails.

LANDCARE will be able to decide on what erosion control system techniques would be best suited for rehabilitation work in the respective national parks and then be able to order materials accordingly. Purchasing can be done directly with recognised suppliers or through Hydromulch (Pty) Ltd.

All training classes are to be limited to either 30 or 60 participants such that sufficient training material is made available for all to participate and be proactive.

Participants are likewise to be forewarned to equip themselves with the necessary PPE and that the course will comprise a basic theoretical introduction (power point presentation) and an intensive two and a half days of in-field training which will be physical and at times difficult.
Certificates of attendance to be issued to all trainees on the successful completion of the training course.

![Certificate Image]

Typical example of certificate format with reference to Richmond training

All training courses are to cover registration, a basic introduction presentation followed by two and a half days of in-field training. Non active participants will not be issued with a training certification.

The below schedule of quantities provides for the material requirements and excludes provision for trainee travel & accommodation and actual training costs per person.

**Schedule of proposed topic descriptions & quantities for consideration**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description of Erosion Control Structures &amp; Techniques for Soil Conservation Training to be provided for by Training Entity</th>
<th>Unit</th>
<th>Quantity per 30 Trainees</th>
<th>Quantity per 60 Trainees</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Shaping &amp; Trimming of donga and river embankment (riparian area) side slopes including all incidentals necessary to carry out training effectively.</td>
<td>m²</td>
<td>50</td>
<td>100</td>
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<td>2</td>
<td>Supply &amp; Installation of 250 gram Bio-Jute netting including all wooden stakes, agricultural bag stitching needles, sisal string for stitching sections in situ, 2 kg hammers, wooden stakes and all incidentals necessary to carry out training effectively.</td>
<td>m²</td>
<td>50</td>
<td>100</td>
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<tr>
<td>3</td>
<td>Setting out of contour lines for various applications including a levelling device or A-frame structure and all incidentals necessary to carry out training effectively.</td>
<td>m¹</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Placing of Brushwood, including sufficient hand axes for processing material and all incidentals necessary to carry out training effectively.</td>
<td>m²</td>
<td>50</td>
<td>100</td>
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<tr>
<td>5</td>
<td>Supply &amp; Installation of Sand bags including providing empty 50 kg polypropylene bags, spades to fill bags and wire or string to stitch closed filled bags, fencing pliers and all incidentals necessary to carry out training effectively.</td>
<td>No</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>
Supply & Installation of approved 700 mm Silt fences manufactured from nonwoven, polypropylene stable fibre geotextile combined with polyester reinforcing mesh including all steel Y standard stakes of 1 meter in height, placed at 5 metre intervals; with 3.0 mm straining wire to span across steel support poles/stakes and 1.6 mm binding wire to secure fence to straining wires and poles. 1 x 7 kg fencing hammer for hammering in of steel poles and supporting wooden or steel stakes; fencing pliers and all incidentals necessary to carry out training effectively.

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<thead>
<tr>
<th></th>
<th>Supply &amp; Installation of approved 700 mm Silt fences</th>
<th>100</th>
<th>200</th>
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Placing and Installation of Rock berms placed on contour and all incidentals necessary to carry out training effectively. Rocks to be collected from surrounding areas on site or supplied by LANDCARE in close proximity to work area.

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<thead>
<tr>
<th></th>
<th>Placing and Installation of Rock berms placed on contour</th>
<th>30</th>
<th>60</th>
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Supply and planting of 3 month old established ‘potted’ vetiver plants (Chrysopogon zizanioides) including supplying organics (20 grams/plant) and NPK fertiliser (5 grams/plant) and all loose tools & incidentals necessary to carry out training effectively.

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<thead>
<tr>
<th></th>
<th>Supply and planting of 3 month old established ‘potted’ vetiver plants</th>
<th>600</th>
<th>1200</th>
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Rescuing and transplanting of native vegetation including all loose tools and all incidentals necessary to carry out training effectively.

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<th>Rescuing and transplanting of native vegetation</th>
<th>50</th>
<th>100</th>
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50mm portable centrifugal water pump with 5 metre suction and 30 metre delivery hoses for watering of all plants and necessary maintenance of vegetated areas.

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<th>50mm portable centrifugal water pump</th>
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Supply necessary safety equipment for trainees – gloves, reflective vests, sunshade hats, glasses & dust masks.

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<tr>
<th></th>
<th>Supply necessary safety equipment for trainees</th>
<th>50</th>
<th>100</th>
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Supply loose tools per site:
(i) Spades flat
(ii) Spades – round (Shovels)
(iii) Rakes
(iv) Bush picks
(v) Twine for setting out contours lines etc- 2 kg rolls
(vi) 10 litre buckets for watering plants
(vii) 20 litre plastic containers for drinking water
(viii) Lasher Hand trowels for plant holes

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<th>Supply loose tools per site</th>
<th>30</th>
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<td>20</td>
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The department is to provide for transportation of the trainees to and from site on a daily basis as well as a trailer for transporting the loose tools and training materials.

We trust that the above information will be of value to you and confirm our availability should you require any additional information in respect to erosion and sediment control training.

Thanking you

Yours faithfully

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