# Report On Georgian Animal Migration Route


Carried Out By

Edward Hamer LTD

Specialist Consultants To Agriculture & Meat Industry



October, 2014

The Report was Commissioned by SDC Funded Mercy Corps Georgia Implemented Alliances Lesser Caucasus Programme

ALCP Alliances Lesser Caucasus Programme

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# 1. RATIONALE

The SDC project the Mercy Corps Georgia Alliances Lesser Caucasus Programme have commissioned Edward Hamer of Edward Hamer Ltd a livestock consultant with a lifetime experience in livestock matters to undertake a report looking at the twice annual transhumance stock migration route from a practical farming view on the improvements and maintenance needed.

It is our understanding that The Georgian Ministry of Agriculture wish to begin improving the agricultural sector in readiness for closer integration with The EU. We shall look at the industry with this in mind and make recommendations where we see improvements needed.

# 2. Georgian Sheep Industry Overview

It is impossible to gauge the total numbers of sheep in Georgia as there is no formal statistics but the current estimate is from 600,000 to 1,000,000 head. In the main these are of the indigenous Tushuri breed a fat tailed breed, other breeds have become more or less extinct. Possibly up to 85% of sheep are farmed using the "nomadic system" that is spending the winter months in low altitude pastures in Kakheti areas in the main and moving to summer pastures some 300 km away in the southern Caucuses in spring making twice a year migration of almost 2,000,000 animals to include cattle along a time honoured stock route – Animal Movement Route (AMR)- from summer to winter grazing areas through four provinces of Southern Georgia.

We are not looking at the North Caucuses route as it is outside our remit.

The Tushuri sheep have been developed through the millennia to withstand long migrations, lack of food and water, they are also suited to the main live export market from Georgia to Muslim countries as they prefer the fat tailed sheep that closely resemble the indigenous Awassi sheep of these countries.

The only income from sheep farming in Georgia is that of selling sheep as the wool produced has little or no market at present. The quality and handling of the wool is very poor, perhaps if there was a better market shepherds would take more care in handling.
The total number of sheep has reduced in Georgia over the last years ,this is attributed to two factors, firstly the loss of winter grazing in Dagestan/Russia which is no longer accessible to Georgian shepherds and secondly the introduction of the area land tax in 2011 which has made pastoral sheep farming considerably less profitable.

# 3. Animal Movement Route (South) (AMR)


This route of approximately 300 km in total length starts in Kakheti moving through 4 southern provinces to finish in the Kvemo-Kartli region, with branches joining the route at various places en-route. This is a time honoured "Drovers Way" that has been used throughout the millennia During former communist times the route was maintained and watering and resting areas were kept in good state of repair Sadly today the AMR is literally falling apart, 50% of watering points do not work, drinking troughs ,dams and other water supplies are completely out of use, of these 20% have no water in the form of dams or bore holes, in former times water was trucked in to watering points, today this would be uneconomical as then fuel was $0,05 per litre. In many places water courses and culverts are not working so that after rain large lakes of mud and water lie across the route making it difficult to drive livestock through them. As a result watering points can be as much as two days apart in terms of herding livestock which is inconceivable in animal welfare terms. Since the Georgian Government sold land to private land owners along the route no attention was paid to animal movements so that now there is severe conflict between Shephard's and land owners over land use and the AMR. Many rest areas have been lost to the Shepherd's as they were sold by the state so there is further conflict between landowners and Shepherd's along the route when it comes to resting and feeding of livestock.

There are further problems in some villages and larger industrial towns where old tradition has met 21$^{st}$ centaury industrialisation. Namely in Rustavi and in Tsintskaro although the latter has achieved an AMR diversion thanks to Alliances programme.

The bio-security of almost 2,000,000 animals using this route has no facilities what so ever, therefore any disease of one flock/herd of animals can easily be transmitted to all the others.

Bio-security to the human population is not considered with massive numbers of livestock passing close to the human habitations causing, dust in dry times, mud in wet times and leaving animal excrement along roads. Given that there are deadly diseases such as anthrax prevalent in the animal population of Georgia this continued system is just waiting for a major infection. Further to this there are considerable animal deaths en-route which at present are left where they fall ,to be scavenged by wildlife and dogs, this again is a major human health risk with parasitic infections such a tape worm, hydadit etc (see Annex 8).
In many areas the fabric of the AMR is deteriorating as the geological make up of much of Georgia is very unstable hills and mountains that are prone to landslides.

The pastoral grazing of livestock both cattle and sheep has a huge socio-economic benefit to Georgia ,not only does it provide 1000' s of direct jobs, the export of live cattle and sheep is worth an estimated $100,000 per annum. The land tax paid by pastoralists varies from $2.85 to $11.50 per hectare the total income of which to the state is $60,000,000. It is estimated that 70% of this comes from pastoralists. At present the Government of Georgia is receiving this tax and contributing nothing to the industry.

If this route is lost in the future then the vast marginal land areas will have no further economic value as the winter grazing pastures of Kakheti cannot support grazing after May as they become semi dessert and are too hot and dry for livestock. The summer grazing areas of the high southern Caucuses cannot be grazed after October due to harsh winter conditions and heavy snow fall. Therefor without the AMR in place 90 % of livestock in Georgia will disappear.

# 4. Animal Movement Route Restructuring Details

**Action Point 1:** National & local Government redefine the land ownership along the route

**Action Point 2:** The lost rest areas need to be re-instated or new ones designated

**Action Point 3:** Water Points must be renovated or reconstructed and damns built or solar bore holes installed and fenced to provide water to those without water.

## Boundaries and Resting Areas

The first and most important step in restructuring the AMR is to have, National & Local Government redefine the land ownership along the route so that shepherds can move along the route unhindered by ownership conflicts. The lost rest areas need to be re-instated or new ones designated. **Without this in place there is little point in carrying out the later needs.**

## Watering Points

Typical Water Point Surrounded in Sea of Mud

All water point along the route are in a serious state of disrepair. At least 50% need to be restructured to provide adequate efficient points where large flocks/herds of stock can drink. The other 50% need completely rebuilding (drawing attached Annex 1) of these, half have no water supply . New supply needs to be found in the form of bore holes with solar pumps and storage tanks or with dams to conserve water in the winter period. These dams or solar bore holes will have to be fenced to prevent the equipment being damaged by cattle and sheep (drawings 109/02,03 and attached Annex 1&2).

## Conflict Points along Route

**Action Point 4:** Underpass or overpass constructed for AMR on new Tbilisi Rustavi Highway.

**Action Point 5:** Traffic lights or under or over pass on Tbilisi Marneuli crossing.

**Action Point 6**: Rehabilitate secondary Tsalka Bridge

## Tsintskaro


Tsinskaro was the worst hotspot on the route passing entirely through the village. This has been re-routed to avoid livestock going through the village center. Alliances Lesser Caucuses Programme (Mercy Corps) has facilitated this by-pass route and instigated and managed by the local Disaster Risk Reduction Working Group of Tetritskaro Municipality who coordinated with local, regional and national stakeholders to design and realize the bypass.

## Rustavi

In this large industrial city we have a major conflict where time honoured tradition has come head on into 21 st century industrial expansion. The AMR has already had to be unofficially diverted as industrial development has expanded across the route. The main highway Rustavi – Tbilisi is now being expanded to a multi-lane highway, this is already a very fast road and will become more so with the expansion. At present no provision has been made for a livestock underpass or bridge. We cannot believe why any provision for the ancient

stock route has not been made . **This is a very dangerous crossing and loss of life of animal and human will be inevitable if no provision is made.**

The route skirts the city having to negotiate a rubble tip placed across the route and a dangerous road highway bridge the has to be crossed buy all livestock and shepherds.

## Marneuli

The AMR crosses the Marnueli to Tbilisi road, this is not as busy as the Rustavi road but there is still a significant danger crossing as Georgian drivers are unwilling to give way to livestock At this crossing needs either a livestock bridge or underpass but in the very least manually operated traffic lights should be employed to avoid loss of human or animal life.

## Tsalka


Here we have stock using the busy road bridge over the river, again this is a conflict point with stock drovers and vehicle drivers. There is however a broken bridge alongside the road bridge that could be refurbished as the stone bridge piers are still intact and new or second hand girders could be utilised with a wooden top decking making an ideal bypass of the main road bridge.

## Fencing

**Action Point 7:** Where route crops are grown such as vines, maize, wheat etc where this is the case the AMR needs fencing to avoid possible conflict

In many areas along the route crops are grown such as vines, maize, wheat etc where this is the case the AMR needs fencing to avoid possible conflict . It should be borne in mind that large mobs of stock do not drive well down narrow roadways and a minimum 70 to 100 meter width needs to be maintained.

## Bio Security on AMR

**Action Point 8:** Biosecurity points need to be constructed at strategic points on the AMR. See Annex 0, Map1.

With almost 2 million head of livestock using the AMR on an annual basis the transfer of disease will be inevitable Bio security points are needed to be constructed along the route in strategic places. We have used local expert knowledge to suggest the most advantageous points for these. These are position where all stock using the route will have to pass through even on closer points to summer grazing areas.

We attach a typical design for bio-security livestock yards Drawing **109/04** and cost (annex 3) We have included in design provision for 2000 head of sheep with a dipping bath design (Drawing **109/05** and costing Annex 4) in addition we include a sheep "race" for any administrations that are needed. We show yards for 150 head of cattle with walk in shower (Drawing **109/06** and cost Annex 5) facility and cattle crush for administrations.

An isolation pen should be provided shown on drawing to contain any sick or injured animal. This pen should have solid impervious walls for ease of sanitising and separate positive drainage. Care should be taken in the design to ensure the waste dip and associated chemicals to not enter any water course or sub strata. Dirty surface water from holding yards needs to be dealt with to avoid contamination of water courses and ground water.

Given the large number of dogs that accompany the mobs of stock and the fact they are eating/scavenging on fallen stock attention needs to be given to worming the canine population as they undoubtedly carrying tapeworms that are infections to both humans and livestock e.g. Taenia Hydatigena, Cystercus Tenuicollis, Cystercus Ovis (see Annex 8)

## Suggested Points

Points that have been highlighted on attached map (annex 0) are point 23 and point 28 and point 35/36 By this positioning Stock starting the route in Kakheti would be dipped/showered and used foot bath at the next point these stock would only need to walk the foot bath but new entrants would have to shower and dip as joining the route and similar for 3$^{rd}$ or 4$^{th}$ points. See map attachment (Annex 0)

## Fallen Stock

**Action Point 9:** Have strategically located mobile incinerators on route.

Given the relatively high mortality rate during the AMR and the high incidence of anthrax fallen stock needs to incinerated to stop cross contamination. To think that horse mounted drovers will carry fallen stock to incineration points, we do not think is feasible or will happen. We suggest 2/3 mobile incinerators that can be towed by tractor and pick up fallen stock and incinerate when they have enough for a burn. We suggest locally made incinerators using wood or LPG on a low cost design (Drawing **109/07** & annex 6). As an alternative we give details of bespoke incinerators and costs (Annex 7).

## Refurbishment of existing AMR

**Action Point 10:** Full list of infrastructure finalized

As there has been no maintenance of the route since the end of Soviet rule the AMR is now in a sad state ,in many places the water courses and culverts are not working ,this results in wet conditions of large pools of water and mud. All these areas need addressing. These points are too numerous to list and we have not had time to cover the entire route. But local expert knowledge can pin point these. In some areas we have witnessed, new water diversion ditches need to be excavated to avoid possible landslides.

## Administration

**Action Point 11:** Determine the management structure for the AMR

There needs to some type of formal management put in place. In the past Soviet era it was administered by local government, today this does not exist. On speaking to a former manager of the AMR Mr. Guguli we learn that under communist administration there were a full time employed work force of 19 people. We suggest that the “Georgian Shepherd’s Association” take control of the management during the periods on the AMR use in tandem with special working groups from the local municipalities, or the Ministry of Agriculture sets up a management structure. All flocks/herds will need to register at point of joining the route and be issued with a certificate of proof of dipping/shower and foot bath. How many heads of stock horses, donkeys, dogs. At the next point they will only have to foot bath stock. In this way disease transmission can be vastly reduced or in most eliminated.

Maintenance of water points, bio-security points and general maintenance should come under the same management structure.

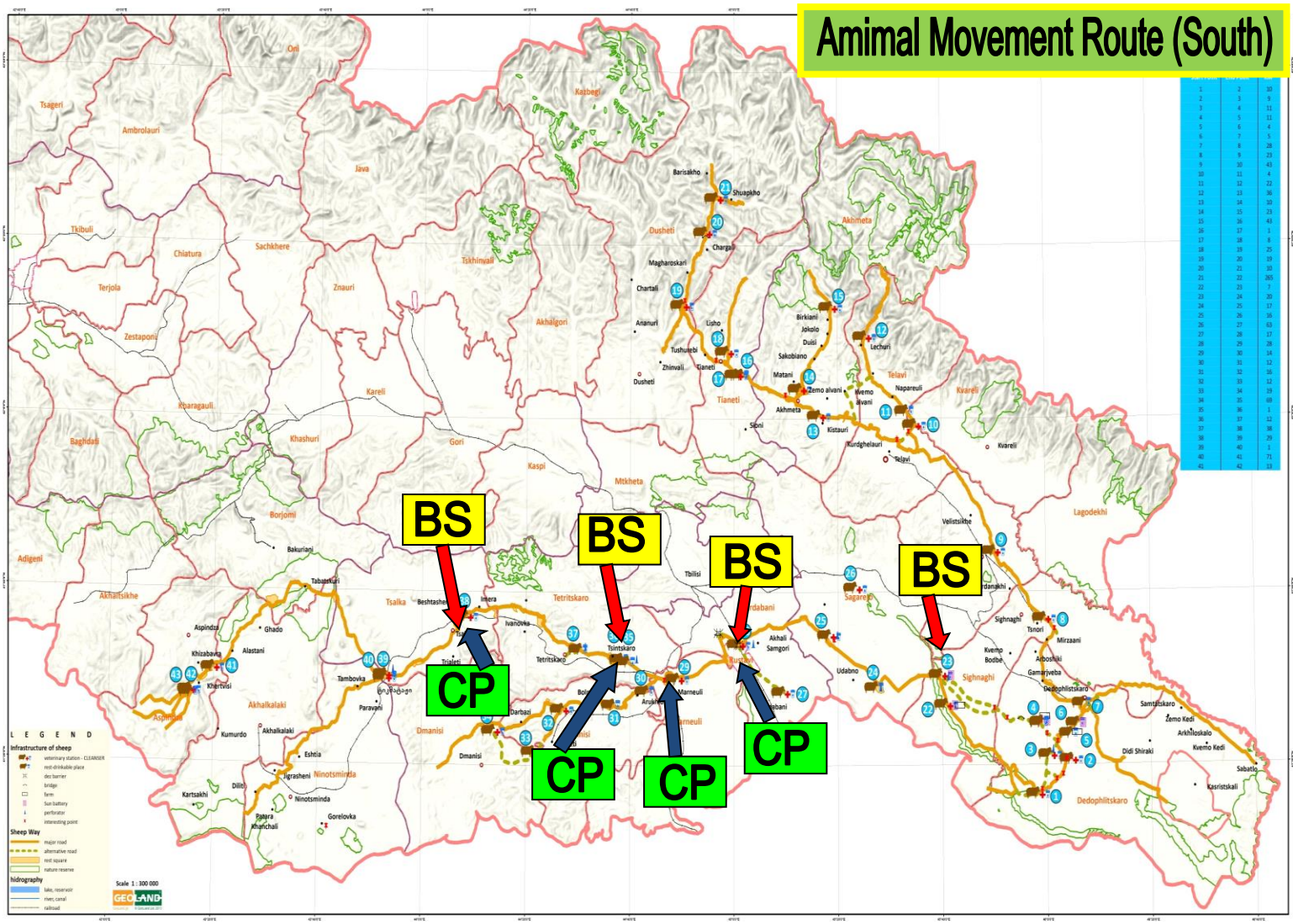
How the management costs are delivered, we think this should be sorted out at local level as we feel having experience of farmers throughout the world, ”they will not want to pay”.

# 5. Conclusions

If the Georgian Government and Agricultural Ministry wish to get closer proximity with the EU a great amount of investment is needed in the AMR. Currently the disease control situation can only be described as “a ticking time bomb” given that there are regular out breaks of both foot & mouth disease and anthrax the recommendations of this report should be seriously considered from both a livestock and human health point. Animal welfare is virtually non – existent.

Given that the pastoral livestock sector has a massive socio -economic benefit to the population of Georgia it cannot be let to continue with the inherent risks that have been highlighted.

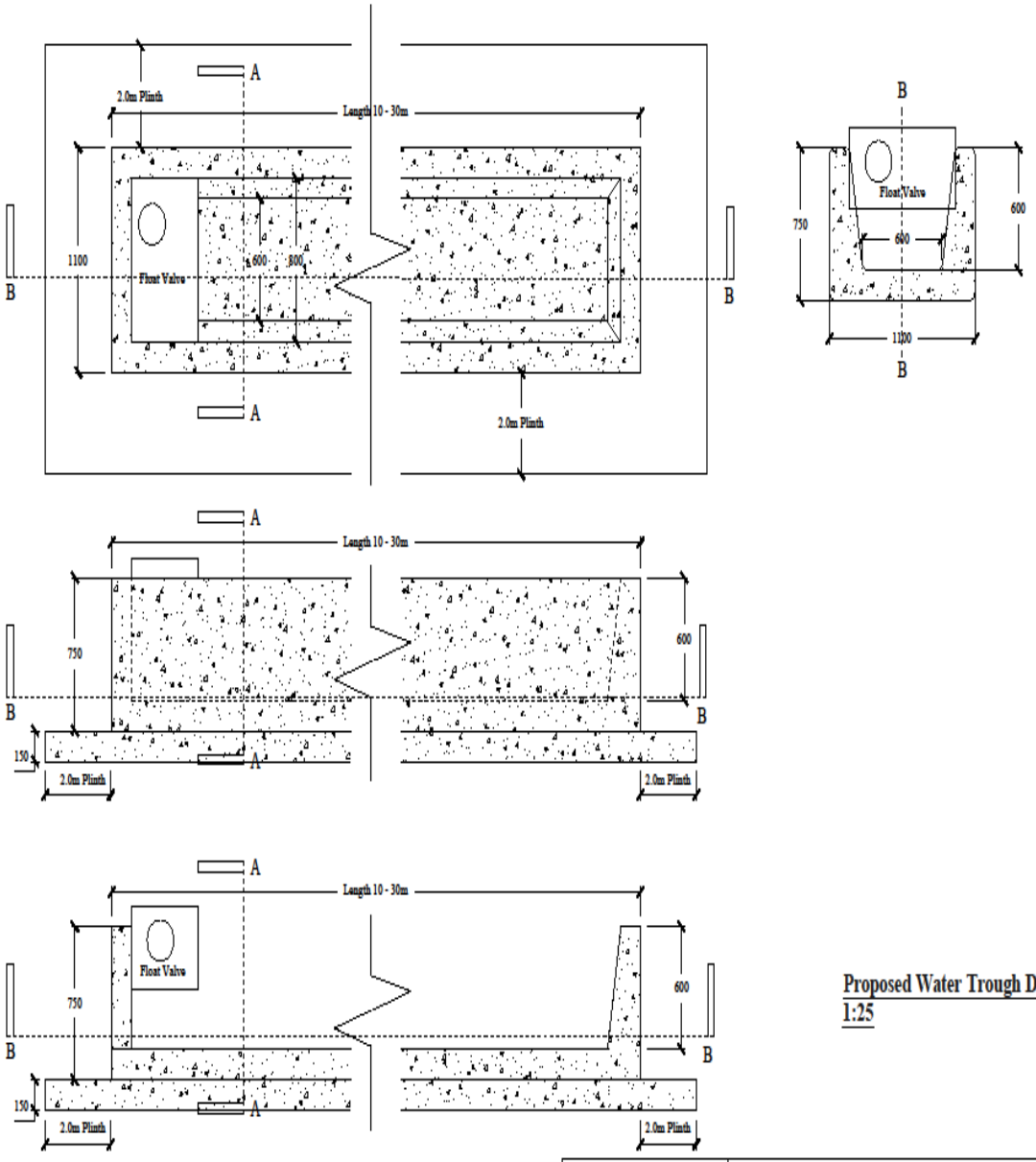
# Annex 0 Map 1 of AMR Showing Suggested Bio Security Yards & Conflict Points




**BS** = Dip/Shower Bio Security Yards

**CP** = Conflict Points

# Drawing 109/02 Typical Water Trough Design

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| Edward Hamer Ltd. Specialist Consultant to Agriculture and Meat Industry | Job | Stock Route Study - Market in Marneuli, Georgia | | |
| | Subject | Typical Water Trough Design | | |
| | Drn MEH | Date Oct 14 | Scale As Shown | Drg.No 0109 / 02 |
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# Annex 1.

## Livestock Water Trough Provision

All costs are based on UK prices for material and labour and the exchange rate used
£1 = $1.60 US.

To construct reinforced concrete water troughs for provision of stock water along the AMR drawing 109/02

Construct in 40 newton concrete @ $152 pcm  add labour and shutters and steel @$380 pcm total $532 per M3

10meter long trough 18 M3 @ $532  $9596

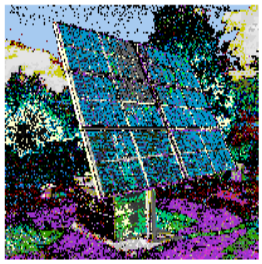
20meter long trough 36 M3  @ $532  $19,152

30 meter long trough 54 M3 @ $532  $ 28,728

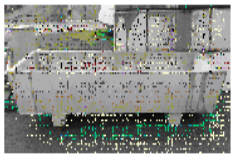
The above quantities include a 2 mt wide plinth around troughs to prevent livestock erosion.

# Drawing 109/03 Typical Water Provision Drawing

Proposed storage tank of approx. 20,000 liters served by solar borehole pump with associated float valve.



Proposed solar paneled water borehole pump system, piped to storage tank at elevated position.



Proposed concrete water troughs, see drawing 0109/02 for further details

Water Storage

Water storage at high level, demand triggered by float valve

Solar PV Panels

Stock troughs at low level, demand triggered by float valve

Borehole & Pump

**Proposed Illustration of Solar Borehole & Water Troughs nts**

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| Job | Stock Route Study - Market in Marneuli, Georgia | | |
| Subject | Typical Water Provision Drawing | | |
| Drn MEH | Date Oct 14 | Scale NTS | Drg.No 0109 / 03 |

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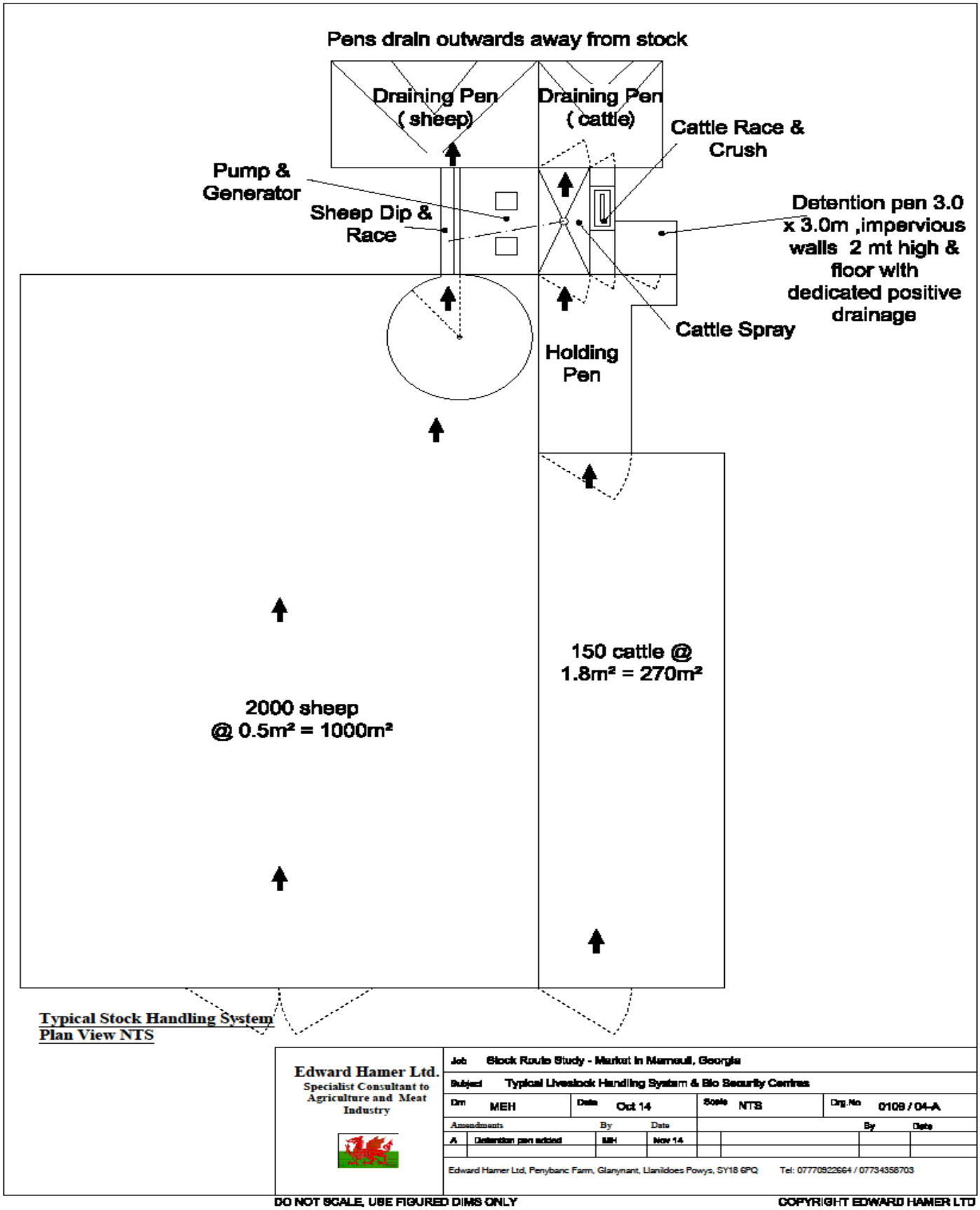
# Drawing 109/04 Livestock Handling and Bio Security Centers



# Annex 2.

# Provision of water and storage at AMR water points

All costs are based on UK prices for material and labour and the exchange rate used £1 = $1.60 US.

Drawing 109/3 is a typical installation envisaged for provision of stock water using boreholes, solar pumps , storage tanks and concrete water troughs (see Dwg 109/02)

**BOREHOLE**

As the ground water level is a total unknown we can only estimate a cost to drill and line boreholes as a PC sum.

$ 2500 per borehole

**SOLAR PUMPS**

This technology has been used in Australia for many years  Solar pumps are not large capacity pumps and only pump during sunlight hours so therefore necessary to have adequate storage of water

The size and type of pump can only be gained once the depth of borehole is known Prices for pumps and solar panels also associated control gear vary from

$500 for the smallest and most shallow to $10,000  for a large capacity deep borehole See attachment of Solar pump capacity & prices

# Small submersible solar powered water pumping systems.

*Ideal for water transfer from boreholes or surface water applications where low daily flow rates are required. Powered by the 2 x 85 watt solar panels. Performance data in table below:*

| TDH in metres | Pump model | Litres per day | Bore casing dia. | System cost |
|---|---|---|---|---|
| 10 | SDS-Q-135 | 6516 | 125mm | $3060.00 |
| 20 | SDS-Q-135 | 6012 | 125mm | $3060.00 |
| 30 | SDS-Q-130 | 5112 | 125mm | $3060.00 |
| 10 | SDS-T-135 | 4104 | 100mm | $2510.00 |
| 20 | SDS-T-135 | 3960 | 100mm | $2510.00 |
| 30 | SDS-T-135 | 3780 | 100mm | $2510.00 |
| 40 | SDS-T-128 | 2700 | 100mm | $2510.00 |
| 50 | SDS-T-128 | 2628 | 100mm | $2510.00 |
| 60 | SDS-T-128 | 2520 | 100mm | $2510.00 |
| 70 | SDS-T-128 | 2448 | 100mm | $2510.00 |

Notes:

1. *Voltage rating is 30VDC with 2 x 85W panels & PCA30-M1D pump controller*
2. *Daily flow rates are based on 6 peak sun hours. Subject to seasonal conditions.*
3. *System cost includes panel, pole frame, pump & pump controller. Downhole cables are extra, subject to the length required.(electrical & stainless steel safety cable)*
4. *Maximum pump submergence below SWL is 15 metres. Maximum water temp. is 40 C*
5. *Prices do NOT include installation & travel. Subject to quotation.*
6. *USA made pump & pump controller.*
7. *TDH is total dynamic head.*

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**TANK STORAGE**

We are basing the stock water requirements on the following tables

Daily Stock Water Recommendations

Litres x Volume per day of Stock

Cows 75 x _____ = _____

Cows, Dry 50 x _____ = _____

Calves 50 x _____ = _____

Beef Cattle 50 x _____ = _____

Horses, Active 60 x _____ = _____

Horses, Grazing 40 x _____ = _____

Sheep, Dry Pasture 10 x _____ = _____

Lambs, Dry Pasture 3 x _____ = _____

Sheep, Green Pasture 4 x _____ = _____

Lambs, Green Pasture 2 x _____ = _____

We suggest that at each water point along the AMR for points without free flow water tanks of 36,000 litres be constructed

Costs of the above 36,000 lt tank is $2880  add shipping from UK and concrete base, erection plus associated pipe work  In total costs are $5000 per tank .

**Surface Water Collection**

Where it is geographically possible a cheaper alternative is to construct dams to feed watering points as shown on Dwg 109/03

The dams should be adequately stock fences to prevent stock erosion of the dams

Cost of earth dams IRO $ 1000 per dam

# Annex 3.

## Livestock handling yards / Bio- security centres

All costs are based on UK prices for material and labour and the exchange rate used
£1 = $1.60 US.

To build as per drawing 109/04 livestock handling yards for bio-security purposes

Total yard area of concrete at 150mm thick 1461 M2  219 M3  of 35 newton concrete @ $128 pcm  add land preparation and labour $56 pcm  All draining yards to laid to falls of min. 1:20

219 M3 @ $184 pcm  $40,296

Sheep Dip (annex 4)  $800

To provide steel section pens and associated gates  at 1.2 mt high for sheep and 2 mt high for cattle

**Costs  $4 600**

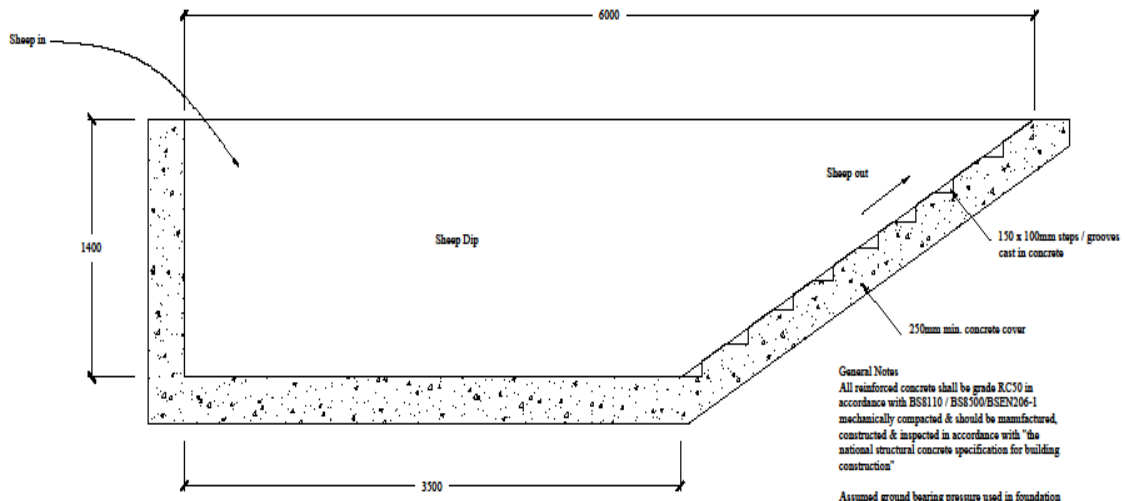
Petrol/Diesel pump for cattle shower  $ 1000

To construct cattle shower and associated pipe work with spray nozzles  $3200

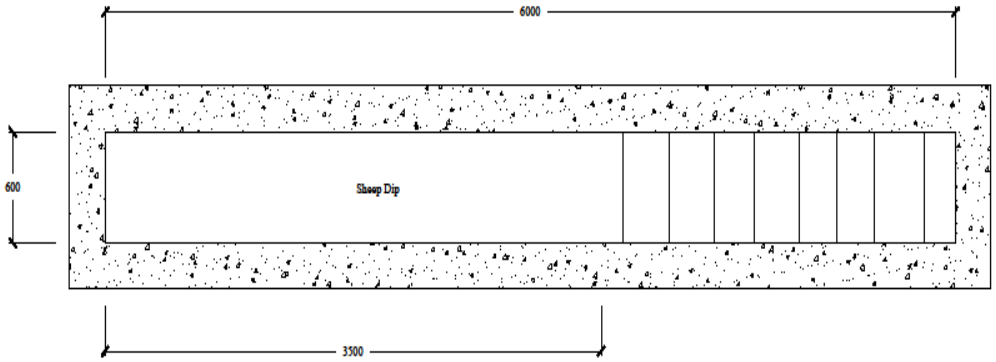
Provision of basic cattle crush  $2880 plus transport costs

Provision of water at bio security sites  PC sum used as per AMR watering points

# Drawing 109/05 Sheep Dipping Bath




**Proposed Sheep Dip**
**Section View 1:25**




**Proposed Sheep Dip**
**Plan View 1:25**

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| Job | Stock Route Study - Market in Marneuli, Georgia | | |
| Subject | Sheep Dipping Bath | | |
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## Annex 4.

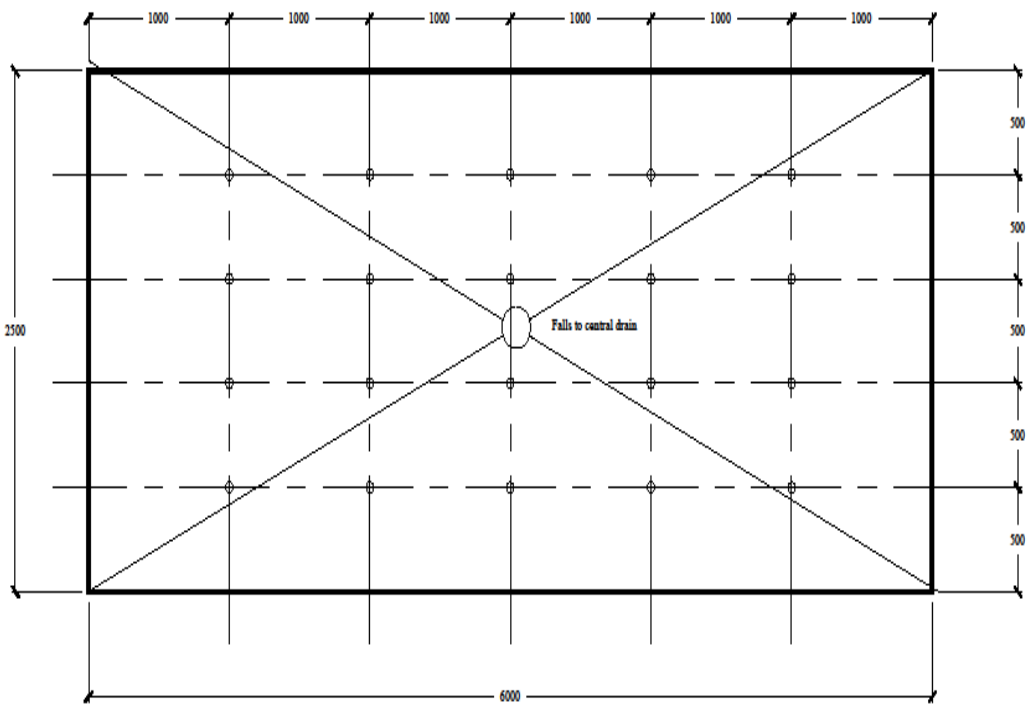
## SHEEP DIP CONSTRUCTION & COST

All costs are based on UK prices for material and labour and the exchange rate used £1 = $1.60 US.

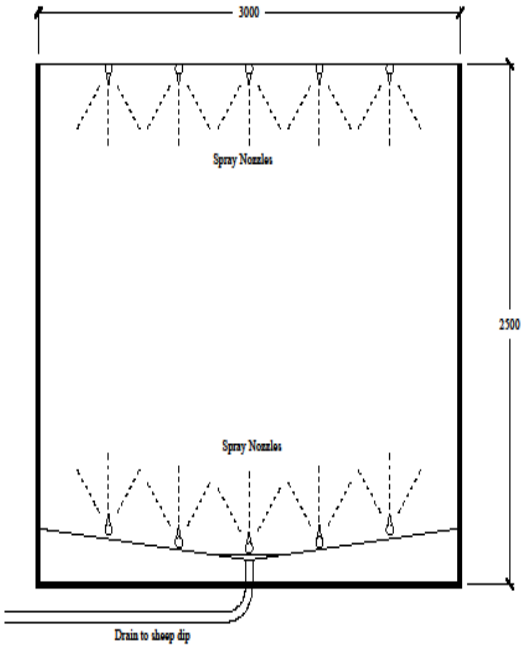
Drawing 109/5 shows details of a typical well proven, sheep dip swim bath constructed from mass shuttered concrete walls of 250mm thickness with cast in sheep steps for exit ramp .

4 M3 of 35 newton concrete plus excavation and construction labour $1000

# Drawing 109/06 Cattle Shower Drawing




**Proposed Cattle Spray Booth**
**Plan View 1:25**




**Proposed Cattle Spray Booth**
**Section View 1:25**

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| Job | Stock Route Study - Market in Marneuli, Georgia | | |
| Subject | Cattle Spray Shower Drawing | | |
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## Annex 5.

## Cattle Shower Costs

All costs are based on UK prices for material and labour and the exchange rate used £1 = $1.60 US.

Drawing 109/06 depicts a typical cattle shower 6 m x 2.5m  a 15 M2 area enough for 8 cattle at 1.8 M2 per head (UK Size )  but Caucuses type cattle  12 head

A simple steel frame covered with galvanized sheet sheets with entry/ exit  door each end built over a dished concrete floor with a drain point back to holding bath (sheep dip)  On the floor galvanised 25 mm pipes with approx 20 No. Course jet/nozzles spraying upwards and the same configuration on the open roof section .

The pipe work connected to a petrol/ diesel 2 " (50mm) pressure pump taking mixed chemical water from the sheep dip bath and all excess drained and piped back to the holding bath

Concrete costs have been calculated in Annex 3

Cost of walls, gates and pipe work & nozzles $ 3200

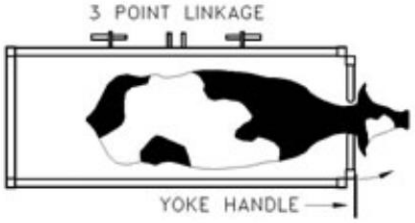
Pressure pump $ 1280

# ECONOMY CRUSH

A very basic crush incorporating a yoke within the front gate with variable width settings from 165 to 220mm.

Features include:

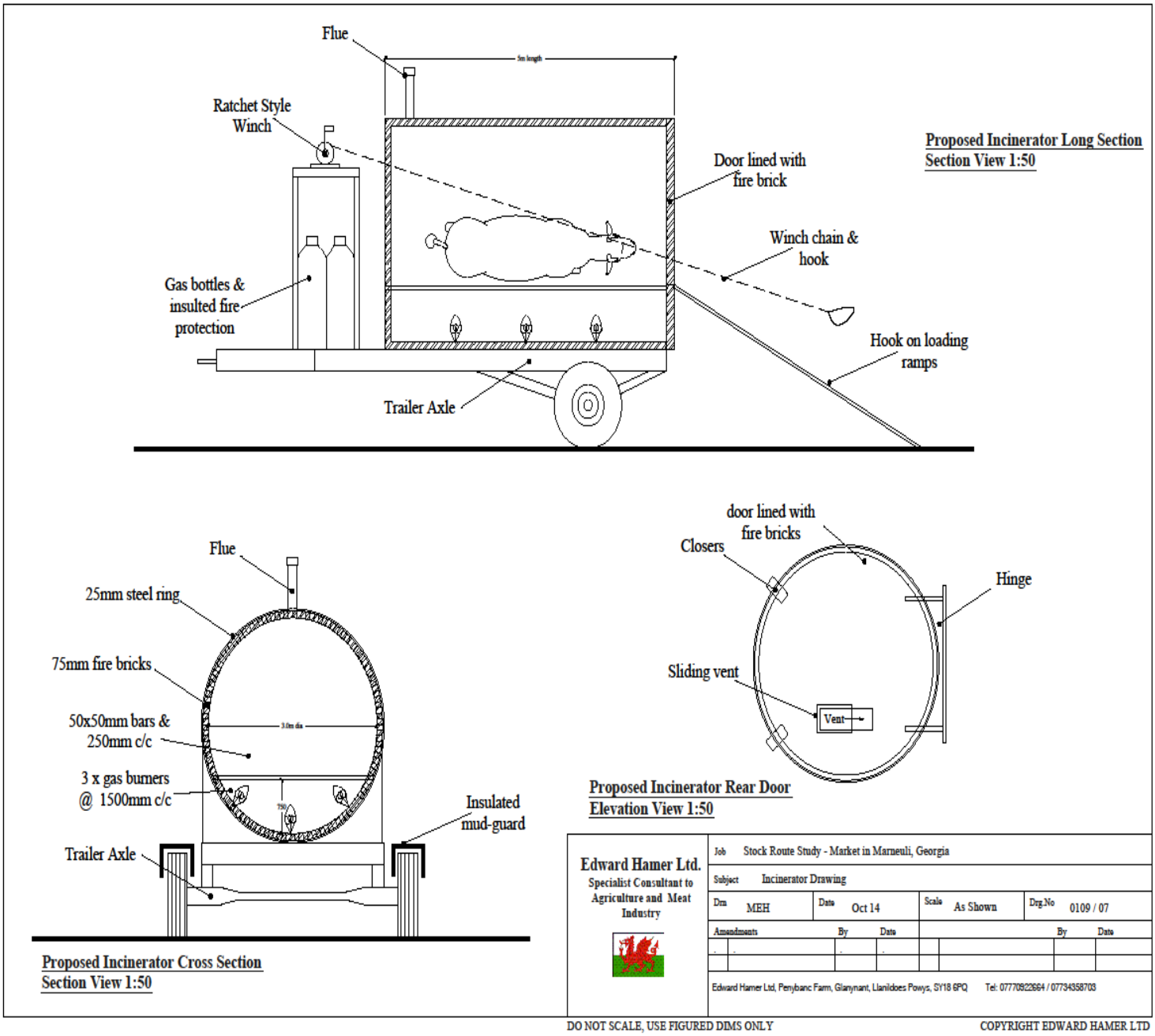
- Bolted construction timber floor
- Backing up bar
- 3 point linkage




| Product code | Length | Width | Internal width | Height |
|---|---|---|---|---|
| F045 2000 01 | 1980 | 788 | 688 | 1850 |

**Cattle Crush Option Table - click here**

# Drawing 109/07 Incinerator Drawing



# Annex 6.

# Incinerator for Disposal of Fallen Stock on AMR

All costs are based on UK prices for material and labour and the exchange rate used £1 = $1.60 US.

**DESIGN AND COST FOR A LOCALLY CONSTRUCTED INCINERATOR**

Drawing 109/7 is a concept drawing and this should not be constructed without a full engineering design on the burners. Exhaust chimney and air intake.

Second hand steel tank 3 mt in diameter with minimum wall thickness of 10 mm

Steel plates for end and doors, used truck axel and wheels and girder RSJ for carriage abd tow beam Costs $1500

Approx 3600 75 mm fire bricks for lining $9000

Burners and controls $ 5000

Labour $ 3200

Additional items ,winch change

Over gas switches etc $1200

Total $19,900

# Annex 7

## Details and costs of professionally built Incinerators

All prices converted from UK £ @ 1.60 US$

Seen below quotes for two professionally build incinerators

H150 this can incinerate 150 kg per hour and mounted on trailer I have reservations if a large cow will fit into the burn chamber .

Cost FOB UK $61,787

H1000 this can incinerate 1000 kg per hour and mounted on trailer. It is very large and heavy and would in my opinion be difficult to transport on rough country

Cost FOB UK $288,740

# COMMERCIAL OFFER

**HAMER CO**

**HURIKAN 150E**
**MOBILE**
**INCINERATOR**

**QW2763**

**1 off**

**November 10th, 2014**

# Introduction

1. Further to recent communications, Waste Spectrum Environmental are pleased to offer one x Hurikan 150E Mobile Incinerator to deal with the disposal of infected animal carcass waste generated on a twice-annual migration route to/from the Northern Cauceses region.
2. As this machine is required to accept a range of animal carcases it does not require the highest specification of Refractory Concrete as the temperature requirements to deal with animal carcases (infected or otherwise) are in the range of 400-700C.
3. The machine would be supplied on a European Highways Specification trailer assembly with full suspension, lighting, indication and air braking systems. The machine is fitted as standard with a female electrical connector and a Height Adjustable Hitch.
4. The maximum hourly Burn Rate capacity for animal carcases is 150Kgs/hr and each load of 75Kgs can be placed into a cantilever driven load 'hopper' unit. The burn rate can vary (up or down) depending on the calorific waste of each load. Freshly slaughtered carcases have the highest calorific value- if waste is left in storage for a day or more, the calorific value drops markedly resulting in a lower burn rate.
5. The Machine can typically be loaded with 75Kgs of waste every 30 minutes if required.
6. The machine will be supplied with a 2.5Kva Generator.
7. The machine is set up to operate on 220V at 50Hz and Single Phase.
   Electrical power consumption is extremely small as it is necessary only to power the Control Panel and the Igniter Mechanisms on the Burners.
8. The machine can operate on Diesel with typical hourly fuel consumption of only 15 Litres – the Burners are equipped with temperature sensors and switch themselves off once a particular waste load is 'self-combusting'.
9. The diesel fuel supply is from a fuel tank equipped with a forced pump – the fuel supply should be situated at least 10M from the machine.
10. Please note the section in this Quotation which refers to 'Consumables'. There are a number of components in this machine (and others in the range) which are classified as Consumables because it is known that they will fail after periods of time under normal use. These items are consequently outside the company Warranty Scheme and it is recommended that Support Kits be purchased with the machine as a precaution against a failure on-site and to minimise the resulting down time.
11. The design, manufacture and materials used in this machine result in a mode of operation that conforms to the European Union ABPR (Animal By-Products) regulation EC1069/2009. **There are no emissions limits stated in the EC1069/2009 regulation**. The resulting expected emissions from the Hurikan 1000 during **closed** operation are minimal, and no additional air abatement equipment is required with respect to the incineration of animal carcases. More severe (Waste Industry Directive – WID) emissions regulations, if operated in Georgia, will result in additional equipment being required to comply with a specific limit, although the operation of this incinerator at a WID standard for animal carcases is not an industry requirement.
12. Availability - 4 week production lead time to completion from date of receipt of order/deposit payment
13. Delivery: Seafreight option through Black Sea to Port of Bat'umi or by Roadfreight through Turkey. Freight quotes can be obtained at the appropriate time on request.

**Commercial Offering**

| | |
|---|---|
| Prepared for | Edward Hamer |
| Company | Edward Hamer Co Ltd |
| Quote Reference | QW2763 |
| Date | 10/11/2014 |

| Quantity | Description | Unit Price | Line Price | Comment |
|---|---|---|---|---|
| 1 | Hurikan 150 Incinerator<br>EU Standard, Diesel, Static<br>7-Burner Gas Operation Kits | £20,054 | £20,054 | |
| 1 | Mobile Facility | £10,396 | £10,396 | |
| Options | | | | |
| | Single 40Ft Skids | £4,545 | | |
| | Transportable<br>Professional | | | (Free). For trailer mounting by Custome |
| Extras | | | | |
| | Stack Extension (Ask for Details) | £570 | | |
| 1 | De-Ash tool | £118 | £118 | |
| | Heat Exchanger | £157 | | |
| 1 | Safety Ladder | £648 | £648 | |
| 1 | Diesel Fuel Tank | £2,065 | £2,065 | |
| Maintenance | | | | |
| | Comprehensive Support Kit - Diesel | £1,871 | | |
| 1 | Standard Spares Support Kit | £1,138 | £1,138 | |
| 1 | Major Service Kit | £720 | £720 | |
| 1 | Minor Service Kit | £483 | £483 | |
| | TOTAL EQUIPMENT COST | | £35,622 | |
| | Delivery Cost | TBA | TBA | |
| | Documentation Cost | £125 | £125 | |
| | Commissioning Cost | £2,870 | £2,870 | |
| | TOTAL QUOTATION PRICE | | £38,617 | |

Payment terms 50% deposit - balance prior to collection
Quotes are valid for 30 days. Prices exclude VAT, Duty and Local Taxes.


## STANDARD WARRANTY

The whole plant and associated equipment supplied as part of the overall installation will be covered by a fully inclusive parts warranty for a period of twelve months commencing from the completion of the commissioning period, with the exception of any consumable item as listed below and provided that:

a) Each defect has materialised under normal operating conditions and not due to misuse, abuse, or operational errors.
b) an effective maintenance regime is operated which includes a Service Contract being taken up at the time of handover. This Service Contract should be provided by Waste Spectrum Environmental Limited or trained and authorised agents.
c) The contract price, as detailed within the quotation or as amended by agreement of both parties, has been paid in full.

### Consumable Parts (Items not covered under Warranty)

1. Primary Chamber thermocouples
2. Secondary Chamber thermocouples
3. Access Door seals
4. Control Panel indicator bulbs or LEDs
5. Burner electrodes and leads
6. Burner probes and leads
7. Burner Blast Tubes (Diesel Burners only)
8. Burner Diffuser Assemblies (Diesel burners only)
9. Refractory patching material

# WASTE SPECTRUM METHODOLOGIES

### Procurement

Products used to manufacture Waste Spectrum incinerators are sourced from companies providing the highest quality product with the best engineering. Any incineration equipment that is recommended by Waste Spectrum will comply with your specified requirements.

### Works Testing

All electrical and fuel installations on the incinerator are thoroughly tested at the factory before despatch; initial checks are carried out on the control system and each operation of the system is individually initiated and checked.

### On-Site Testing and Commissioning

Following the site installation of the electrical and fuel supply by you or your contractor, Waste Spectrum will attend site to commission the incinerator.

1) Once the control system is checked, each operation of the system is individually initiated and all mechanical devices are checked for full operational compliance safety interlocking and sequenced operation. The individually packaged burners are ignited and if required, adjusted for maximum efficiency combustion.

2) The refractory lining of the chambers is cured using recognised methods where controlled incremental temperature rises and soaking periods are used to ensure best curing.

3) The system is then brought to eventual operating conditions using the burners and waste is then introduced into the incinerator, progressively up to approximately 50% of capacity. During these tests the system parameters are fine tuned to ensure suitable machine performance.

4) Once commissioned, the machine is then run to capacity to prove its full operational capabilities.

Training is carried out during this full capacity run.

### Testing and Commissioning Procedure

- Software Checks
- Individual component tests, motor rotations, mechanical device testing
- Safety interlocking systems operational

- Burner operations, combustion qualities
- Refractory curing
- Bring whole system to temperature in stages
- Initiate trial burns to establish preliminary system parameters
- Progressively increase waste quantities to fine tune system parameters
- Give instruction to operating personnel via lectures and plant inspection
- Train operating personnel during normal operational regimes
- Prove operational capabilities satisfy specified criteria

## Quality Control Procedure

1. **Initial Design Work**
   Waste Spectrum incinerators are engineered through many years of experience. All drawings are verified and tested before fabrication commences.
2. **Fabrication**
   All fabrications are checked by a quality engineer.
3. **Refractories**
   The refractory process is monitored and checked regularly by a quality engineer.
4. **Fitting**
   Ancillary equipment such as burners is fitted by experienced fitters in accordance with the design.
5. **Pipe Work**
   All fuel pipe work is pressurised and verified by a qualified engineer.
6. **Electrics**
   Electrical installations are tested and verified by a qualified electrical engineer:

   Supply to the Control Panel Isolator – 230VAC 60Hz, 1ph – Incinerator only
   Supply to the Optional Lift and De-Ashing Unit – 415VAC 60Hz, 3ph Neutral and Earth, 40A.

**Additional Information**

1. The maximum single load capacity will vary due to potential variations in the waste stream. Correct loading and operating practice will need to be followed.
2. Estimated burn rates will vary dependent upon the calorific value of the waste.
3. The volume of residual ash is likely to be reduced to approximately 5% in weight although this may vary dependant on the waste stream.
4. All other specific information about this machine is to be found in the Technical Specification.

**Mark Comerford**

**International Business Development Manager**

# COMMERCIAL OFFER

**HAMER CO**

**HURIKAN 1000E Mobile Incinerator**

**1 OFF**

**QW2764**

**10th November 2014**

# Introduction

1. Further to recent communications this offer is being made to provide a solution for the provision of mobile incineration equipment to dispose of livestock carcases affected by a variety of diseases during twice-annual migration.

2. The Hurikan 1000E Mobile is fitted with a fully automated loading door operation which is operator controlled using a remote pad linked by cable to the machine's Control Panel

3. The loading door mechanism is electrically-actuator driven and involves the door being "Lifted/Traversed/Lowered into its 'Open' position by a single button press on the part of the operator.

4. Waste can be loaded into the machine through the top of the primary chamber using a Dumper/Tipper truck. Larger items if applicable, can be lifted and dropped into the primary chamber by the use of an industrial 'Grabber' unit if a dumper truck is not a practical option.

5. Once the loading is finished the operator, by the use of the keypad, can reverse the door movement process with the actuator mechanism effectively 'locking' the door down onto the top concrete lip of the primary chamber walls, thus eliminating any smoke or odour emissions once the machine is in full burn mode.

6. A single load can be up to 5000Kgs this will be dependent on the type of waste being loaded into the machine and the hourly burn rate can reach up to 1000Kgs but this is totally dependant on the calorific value of individual waste loads and the correct loading intervals and a waste calorific value of 8Mj/kg,

7. The Hurikan 1000E Static is fitted with a series of ash doors positioned near the base of the chamber which does allow for the continuous removal of ash (hot or cold) which will not affect the main burn operation of the machine. This is particularly relevant in high volume situations where the speedy disposal of waste in the shortest possible time is the main requirement. An optional 'Hot Ash Vacuum' is also available at an additional cost. The machine can, if required, operate continuously 24/7.

8. The Hurikan 1000E Mobile is fitted in total with 7 Burners, 5 in the Main Chamber, and 2 in the Secondary Chamber where a minimum temperature of 850C is maintained in accordance with European ABPR legislation compliance. The average hourly fuel consumption across all 7 burners is 30 Litres but this can vary (up or down) considerably dependant on the calorific values of individual waste loads. This figure is an average and takes no regard of 'Top Up Loading' procedures which can greatly reduce fuel consumption. – see Point 9.

9. Hurikan 1000E Mobile burners are fitted with temperature sensors and constantly switch off once a pre-set temperature in the primary chamber has been arrived at due to the natural combusting of the waste.

10. The Hurikan 1000 Mobile is mounted onto a standard 40FT European Union Highways Standard Goosenecked trailer which can be easily connected behind an articulated truck or

large tractor unit. The trailer has fully functional airbraking, suspension, indication and lighting systems and is manufactured (in Sweden) to the highest and strictest road standards – it is designed tio be pulled along rough roads and is fitted with "A" Class suspension systems to avoid damage to the Incinerator while moving.

11. Waste Spectrum offer a variety of Spares kits to support the machine should a failure occur of a specific item. It is strongly recommended that the machine be purchased with a Standard Spares Support Kit.

12. Service Kits sufficient for the maintenance of the machine are available from nearest Waste Spectrum Distributor (to be advised) on an ongoing basis as and when required – it is recommended that the machine has two services per year. (One 'Major' and one 'Minor') and that the machine should be supplied with two Service Kits, sufficient for maintenance over the first 12 month period of use.

13. Please note the section in this Quotation which refers to 'Consumables'. There are a number of components in this machine (and others in the range) which are classified as Consumables because it is known that they will fail after periods of time under normal use. These items are consequently outside the company Warranty Scheme and it is recommended that a Support Kit be purchased with the machine as a precaution against a failure on-site and to minimise the resulting down time.

14. The design, manufacture and materials used in this machine result in a mode of operation that conforms to the European Union regulation EC1069/2009. **There are no emissions limits stated in the EC1069/2009 regulation**. The resulting expected emissions from the Hurikan 1000 Mobile during **closed** operation are minimal,

15. The commissioning of the machine will be carried out by a trained Waste Spectrum Engineer – time on site is expected to be 6 days – the specific procedure of drying out the concrete will be done on site following the arrival of the machine – this procedure ensures that the concrete is fully dried out and hardened to a 'Kiln State' and guarantees that all remaining moisture is removed from the High Grade Monolithic Refractory Concrete used in the construction of the Primary (Combustion) chamber. The Commissioning phase will also include full operator and engineer training on site.

16. **Payment Terms:**
    **50% with order; 50% balance to be covered by an Irrevocable Confirmed Letter of Credit.**

17. **Availability : 4 weeks to manufacturing completion given receipt of order and deposit payment**

18. Delivery : 10 days seafreight time to Bat'umi Port. incl: of Marine insurance – cost of seafreight can be obtained on request. An alternative Roadferight route via Turkey is also available.

19. Local Customs fees (if applicable) are excluded from this quotation

20. Waste Spectrum offer a 1-year (13 month) warranty with the machine quoted for – this excludes specific components that are classified as Consumables which are known to fail within certain periods given wear and tear.

**Service Package**

During the 1-year Warranty period, Waste Spectrum offer a fully comprehensive Service & Support package for the machine. Servicing (only) will be performed by a local engineer from the nearest Waste Spectrum Distributor to site . (Bentley Merkim, of Izmir, Turkey)

Each Major Service will include a replacement set of Spares sufficient to carry out a full Service, plus the labour and travel time involved.

**Commissioning Charge**

The inclusive price quoted includes a trained engineer travelling locally to site – 3 days to cover the "Concrete Dry-Out" procedure, followed by a further 3 days commissioning the machine; return travel time/cost and accommodation costs.

**Commercial Offering**

| | |
|---|---|
| Prepared for | Edward Hamer |
| Company | Edward Hamer Co Ltd |
| Quote Reference | QW2764 |
| Date | 10/11/2014 |

| Quantity | Description | Unit Price | Line Price | Comment |
|---|---|---|---|---|
| 1 | Hurikan 1000 Diesel Incinerators | £132,415 | £132,415 | |
| | EU Standard, Diesel, Static | | | |
| | 7-Burner Gas Operation Kits | | | |
| 1 | Mobile Facility | £35,330 | £35,330 | |
| Options | | | | |
| | Single 40Ft Skids | £4,545 | | |
| | Transportable | £8,665 | | (Free). For trailer mounting by Custome |
| 1 | New Trailer, not pre-owned | | Incl: in M/C price | |
| | Professional | £8,193 | | |
| 1 | Diesel Fuel Tank (inc in Mobile & Tra | £2,016 | | included in Emergency standard |
| 1 | Storage Container (inc in Mobile) | £3,301 | | included in Emergency standard |
| Extras | | | | |
| | Stack Extension (Middle Section) Sta | £570 | | |
| | Stack Extension (Middle Section) Mo | £107 | | |
| 1 | De-Ash tool | £157 | | Included In Incinerator Price |
| 1 | Safety Ladder | £648 | £648 | |
| 1 | Diesel Fuel Tank | £2,065 | | Included In Incinerator Price |
| 1 | Electrical Generator | £1,050 | £1,050 | |
| 1 | Pressure Washer | £358 | £358 | |
| Maintenance | | | | |
| | Comprehensive Support Kit - Diesel | £6,866 | | |
| 1 | Standard Spares Support Kit | £3,284 | £3,284 | |
| 1 | Major Service Kit | £2,089 | £2,089 | |
| 1 | Minor Service Kit | £1,504 | £1,504 | |
| | TOTAL EQUIPMENT COST | | £176,678 | |
| | Delivery Cost | FCA Worcester | FCA Worcester | |
| | Documentation Cost | £125 | £125 | |
| | Commissioning Cost | £3,660 | £3,660 | |
| | TOTAL QUOTATION PRICE | | £180,463 | |

Payment terms 50% deposit - balance prior to collection
Quotes are valid for 30 days. Prices exclude VAT, Duty and Local Taxes.

## WASTE SPECTRUM METHODOLOGIES

### Procurement

Products used to manufacture Waste Spectrum incinerators are sourced from companies providing the highest quality product with the best engineering. Any incineration equipment that is recommended by Waste Spectrum will comply with your specified requirements.

### Works Testing

All electrical and fuel installations on the incinerator are thoroughly tested at the factory before despatch; initial checks are carried out on the control system and each operation of the system is individually initiated and checked.

### On-Site Testing and Commissioning

Following the site installation of the electrical and fuel supply by you or your contractor, Waste Spectrum will attend site to commission the incinerator.

1) Once the control system is checked, each operation of the system is individually initiated and all mechanical devices are checked for full operational compliance safety interlocking and sequenced operation. The individually packaged burners are ignited and if required, adjusted for maximum efficiency combustion.

2) The refractory lining of the chambers is cured using recognised methods where controlled incremental temperature rises and soaking periods are used to ensure best curing.

3) The system is then brought to eventual operating conditions using the burners and waste is then introduced into the incinerator, progressively up to approximately 50% of capacity. During these tests the system parameters are fine tuned to ensure suitable machine performance.

4) Once commissioned, the machine is then run to capacity to prove its full operational capabilities.

Training is carried out during this full capacity run.

### Testing and Commissioning Procedure

- Software Checks
- Individual component tests, motor rotations, mechanical device testing
- Safety interlocking systems operational
- Burner operations, combustion qualities
- Refractory curing
- Bring whole system to temperature in stages
- Initiate trial burns to establish preliminary system parameters
- Progressively increase waste quantities to fine tune system parameters
- Give instruction to operating personnel via lectures and plant inspection
- Train operating personnel during normal operational regimes
- Prove operational capabilities satisfy specified criteria

## Quality Control Procedure

1. **Initial Design Work**
   Waste Spectrum incinerators are engineered through many years of experience. All drawings are verified and tested before fabrication commences.
2. **Fabrication**
   All fabrications are checked by a quality engineer.
3. **Refractories**
   The refractory process is monitored and checked regularly by a quality engineer.
4. **Fitting**
   Ancillary equipment such as burners is fitted by experienced fitters in accordance with the design.
5. **Pipe Work**
   All fuel pipe work is pressurised and verified by a qualified engineer.
6. **Electrics**
   Electrical installations are tested and verified by a qualified electrical engineer:
   Supply to the Control Panel Isolator – 230VAC 60Hz, 1ph – Incinerator only
   Supply to the Optional Lift and De-Ashing Unit – 415VAC 60Hz, 3ph Neutral and Earth, 40A.

## Additional Information

1. The maximum single load capacity will vary due to potential variations in the waste stream. Correct loading and operating practice will need to be followed.
2. Estimated burn rates will vary dependent upon the calorific value of the waste.
3. The volume of residual ash is likely to be reduced to approximately 5% in weight or less although this may vary dependant on the waste stream.
4. All other specific information about this machine is to be found in the Technical Specification.
5. Waste Spectrum Environmental incineration systems are specifically designed to be fully compliant with EU Animal By-Products Regulation (EC) No, 1069/2009, to meet the European Waste Incineration Directive for incinerating any other types of waste (including clinical and municipal solid waste) further abatement equipment will be required and will need to be purchased.
6. During loading and de-ashing of the machine some smoke may be visible when the doors are open.

# Annex 9 Details of Canine Worm Problem in Human and Livestock

The Risk to Sheep from Dog Tapeworms
Dr. Paula Menzies.

Dogs and sheep naturally go together. Dogs are used to herd the sheep or guard them from predators and many flocks own at least one of these useful animals. Other canids such as coyotes, wolves and foxes commonly leave near sheep pastures. But without proper precautions, any of these canids can be a source of a parasitic disease that can rob your sheep enterprise of all its profits. Canids can be a host to may different intestinal parasites, some of which can cause them illness. However, one of these parasites – tapeworms – do not generally make the dog sick, but the intermediate stage of these worms cycles through sheep and unfortunately, the damage that these tapeworms do the sheep carcass can cause them to be condemned at slaughter.

To understand how this happens, we need to understand the life cycle of the dog tapeworm. Adult tapeworms reside in the small intestine of the dog or other canid and use a scolex or head to grasp onto the wall of the gut. The tapeworms reproduce by shedding segments of their body each one of which contains thousands of eggs. These segments are not only found in the dog's stool but can be seen "crawling" on its coat before finally dropping off. They look like a strange white, flat worm. When dried, these segments look like a grain of rice. The eggs are spilled out of the segment and can survive in the environment for up to a year - waiting for an opportunity to infect its next host - the sheep.

If these segments contaminate the pasture or forages that sheep are eating, the eggs will hatch in the sheep's gut and the tiny larvae will burrow through the wall of the intestine to travel to its "target" tissue, where it turns into a small bladder-like structure called a cyst. Each one of these cysts contains an embryonic "baby" form of the tapeworm. If a dog or coyote gets an opportunity to eat the tissues that contain these cysts, this larval tapeworm will turn into an adult in the dog's intestine and the cycle will continue. Here in Ontario, there are two main types of dog tapeworms to worry about and they have different target organs in the sheep.

1. Taenia hydatigenia is the name of the most common tapeworm in the dog and Cysticercus tenuicollis also called the bladder worm of sheep, is the name of the intermediate "cyst"stage in the sheep. The larval parasite prefers migrating through the liver and then developing into cysts within the liver tissue. After several weeks, the cysts may die. At slaughter, the liver may show long, wiggly migration tracts caused by a recent infection, moderately large cysts containing an embryonic tapeworm, or small round scars from an old infection. Or if re-infection is ongoing – the liver may contain all three. Regardless of which stage is found, the liver is condemned as unfit for human consumption.

2. The next tapeworm is less common but reports of the parasite are increasing in Canada – often with great economic cost.

Taenia ovis in the dog, it is called Cysticercus ovis in the sheep, sometimes also called the sheep measles worm. Its preferred tissues are the muscles of the body, including heart, diaphragm and skeletal muscle or meat of the sheep. At slaughter, small white cysts can be seen through the muscle. If found, the entire carcass will be condemned as unfit for human consumption. So how common are these infections? In Ontario, an audit of condemnations found that 5% of lamb livers are condemned because of evidence of tapeworm cysts. In other parts of Canada, there have been cases where up to 30 lambs from one farm have been condemned because of C. ovis cysts in the muscle. This is an economically important disease to the sheep industry. While these two tapeworms are not infectious to humans (unlike the cattle tapeworm), there is a dog tape in Ontario Echinococcus granulosus, which can harm people. It more commonly has a wolf-moose cycle in northern Ontario – but can also cycle through the dog and sheep. It is the cyst form that infects humans. Fortunately control of T. hydatigenia and T. ovis, will also control echinococcus infection in dogs.

What should be done?

Once the lamb is infected, there is no treatment so it is very important that all farm dogs be routinely treated for tapeworms every 3 months, and as frequently as every month if cysts have been found in sheep. A special de-worming medicine is required to kill the adult tapes, and can only be purchased from a licensed veterinarian. The wormers sold in pet stores or feed stores will not kill tapeworms. At the same time, make sure that all dead stock is buried at least 2 ft deep or is appropriately composted so that no scavenging can occur by dogs or wild canids such as coyotes, wolves or foxes. If the tapeworms infect the wild canid population there is little chance of eliminating it. Unfortunately the cyst stage of the infection can also occur in deer. Once the wild canid - deer cycle is established in your geographic region, control in pastured sheep becomes very, very difficult. If you have any questions at all whether your dogs are infected, contact your local veterinarian right away. In summary to prevent infection of your sheep with dog tapeworms:

1. Do not feed any of your dogs (working, guard or pet) any part of a dead sheep.
2. Do not dispose of dead sheep where dogs or coyotes or foxes might have access to it.
3. Talk to your flock veterinarian to get your dogs on a regular tapeworm treatment program.
4. Any new dogs coming to your farm must be treated and held in isolation for at least 3 days before exposing to the sheep farm.
5. Try to prevent your dog from defecating where it might contaminate sheep feed, pastures or water sources.
6. Make yourself aware of causes of condemnation of lambs that are sent for slaughter.