



CALCULATION SHEET

No. 1 of 1

Prepared By: P McShane

Date: 19.07.04

Checked By: J Keohane

Date: 19.07.04

PROJECT: NEWGRANGE MEATS, NAVAN, CO MEATH

SUBJECT: PROPOSED CONSTRUCTED WETLANDS – DESIGN CALCULATIONS – REV 1.0

References

- 1) Feasibility Study Prepared by Aila Harrington, Environmental Consultant
- 2) Newgrange Meats Correspondence
- 3) Treatment Wetlands, Kadlec & Knight (CRC Press 1996)

Introduction

IE Consulting Engineers were requested by Aila Harrington, Environmental Consultant, on behalf of Newgrange Meats Ltd to assess the design of a constructed wetland system to treat wash-waters from the existing Newgrange Meats facility.

These calculations are provided to compliment and prove the wetland sizing and design detailed in the Feasibility Study produced by Aila Harrington, Environmental Consultant.

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Remarks

File Number
IE235

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1) <u>Effluent Characterisation</u>	Remarks
a) <u>Volume</u>	
Typical current maximum daily volume ⁽¹⁾ = 50 M ³	
Proposed maximum design daily volume ⁽²⁾ = 100 M ³	
b) <u>Effluent Strength</u>	
Typical maximum strength of influent discharging to constructed wetland system from the existing HDPE lined lagoon :-	
BOD = 5420 mg/l ⁽³⁾	
SS = 940 mg/l ⁽³⁾	
Ammonia = 230 mg/l ⁽³⁾	
Phosphorus = 107 mg/l ⁽³⁾	
Nitrogen = 109.3 mg/l ⁽³⁾	
c) <u>Other Factors</u>	
The average temperature of the coldest month is 4.5 ⁰ C ⁽⁴⁾	
(1) Figure provided by Newgrange Meats Ltd and Contained in Feasibility Study Report	
(2) Requirement of Newgrange Meats Ltd to Allow for Possible Future Expansion	
(3) Laboratory results of effluent samples taken from the existing lagoon and after passing through a 250 micron sieve.	
(4) From Agroclimatic Atlas of Ireland	

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1) Desired Final Effluent Quality

Remarks

The desired final effluent quality from the proposed constructed wetlands system is listed below:-

BOD₅ < 10 mg/l⁽⁵⁾

Suspended Solids < 10 mg/l⁽⁵⁾

Ammonia < 1.0 mg/l

Total Phosphorus < 0.1 mg/l⁽⁵⁾

Total Nitrogen < 2.0 mg/l

4) Wetland Modelling and Design

a) Preliminary Information

The wetland system is designed as a series of ponds as shown on the accompanying drawings. For this particular application 9 treatment ponds are proposed, with approximate areas as listed below:

<u>Pond No.</u>	<u>Pond Area</u>	<u>Pond No.</u>	<u>Pond Area</u>
1	2335 M ²	6	3175 M ²
2	2430 M ²	7	3975 M ²
3	2827 M ²	8	3400 M ²
4	1482 M ²	9	661 M ²
5	2270 M ²		

A typical wetland depth of 0.30-0.35 metres is assumed throughout the system. This depth can be increased from time to time without adversely affecting system performance.

b) Design Formulae

Most of the design approaches for constructed wetland systems use the same basic formula, which is based on the design formula for a plug flow reactor model ⁽⁶⁾

$$A = \frac{Q}{K_v \cdot h} \ln \left(\frac{C_{in} - C^*}{C_{out} - C^*} \right)$$

- Where
- A is the required surface area (m²)
 - Q is the average or design flow rate (m³/day)
 - H is the water depth
 - C_{in} is the input parameter concentration mg/l
 - C_{out} is the desired output concentration mg/l
 - C* is the estimated background concentration
 - K_v is the rate constant

(5) As contained in Feasibility Study prepared by A Harrington
(6) From Kadlec and Knight 1996 and O'Sullivan 1998

PROJECT: NEWGRANGE MEATS, NAVAN, CO MEATH

SUBJECT: PROPOSED CONSTRUCTED WETLANDS – DESIGN CALCULATIONS – REV 1.0

Remarks

For particular climatic conditions the rate constant and background concentration need to be adjusted for temperature as follows

$$\text{Where } K_{v,t} = K_{v,20} \theta^{t-20}$$

$$C^* = C^* \theta^{t-20}$$

c) Site specific Parameter Values

Average temperature of coldest month 4.5 ° C
 Typical design average daily rainfall 3.0 mm/day⁽⁷⁾
 Average depth of constructed wetland 0.30m

d) General Design Parameters

Using conservative values, the general design parameters⁽⁸⁾ are given in Table 1 below :-

	<u>Units</u>	<u>SS</u>	<u>BOD</u>	<u>TN</u>	<u>TP</u>	<u>Ammonia</u>
Kv <i>(volumetric rate constant)</i>	Day ⁻¹	0.25	0.5	0.2	0.12	0.17
θ (temp. coeff for Kv)		1.00	1.06	1.05	1.00	1.04
C*20 Background conc.	Mg/l	5 + 0.15C _{in}	3.5 + 0.053C _{in}	1.5	0.02	0
θ temp. coeff for C		1.065	1.00	1.00	1.00	1.00

Table 1 : General Surface Flow Wetland Design Parameters

(7) From Agroclimatic Atlas of Ireland

(8) From Kadlec and Knight 1996 and O'Sullivan 1998



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The proposed constructed wetlands system will comprise a total of 9 No. treatment ponds of different areas. An initial settling lagoon, of pond area 1995M² is proposed prior to pond no. 1. Following pond no. 9 an emergency divert pond is proposed, with volume capacity for storage of approximately 500M³.

Remarks

The plug flow reactor model was run for ponds 1-9 in series and the reductions in BOD, Suspended Solids, Ammonia, Phosphorous and Nitrogen were calculated. The results of the plug flow reactor model run are summarised in Table 2 below :-

Pond No.	Pond Area (M ²)	BOD _{in} (mg/l)	BOD _{out} (mg/l)	SS _{in} (mg/l)	SS _{out} (mg/l)	TN _{in} (mg/l)	TN _{out} (mg/l)	TP _{in} (mg/l)	TP _{out} (mg/l)	AN _{in} (mg/l)	AN _{out} (mg/l)
1	2335	5420	1531.1	940	283.8	109.3	57.35	107	46.18	230	120.26
2	2430	1531.1	414.84	283.8	85.75	57.35	29.67	46.18	19.27	120.26	61.24
3	2827	414.84	95.30	85.75	26.01	29.67	14.22	19.27	6.98	61.24	27.93
4	1482	95.30	43.79	26.01	14.53	14.21	9.87	6.98	4.10	27.93	18.51
5	2270	43.79	15.37	14.53	8.52	9.87	5.92	4.10	1.82	18.51	9.85
6	3175	15.37	5.92	8.52	6.49	5.92	3.31	1.82	0.59	9.85	4.08
7	3975	5.92	4.00	6.49	6.00	3.31	2.09	0.59	0.16	4.08	1.35
8	3400	4.00	3.75	6.00	5.91	2.09	1.73	0.16	0.06	1.35	0.53
9	661	3.75	3.73	5.91	5.90	1.73	1.69	0.06	0.05	1.35	0.44
Total	22,555		3.73		5.90		1.69		0.05		0.44

Table 2 – Predicted Performance of a 9 Pond Constructed Wetland System

Total area (inc. settling lagoon) = 24,550M²

Residence Time

Considering an operational maximum water depth of 0.35M, the total volume available in the constructed wetlands system is approximately 8593 M³.

The average residence time for a 50 M³/day flow will be approximately 172 days.
The average residence time for a 100 M³/day flow will be approximately 86 days.

The above predicted treatment levels assume full operational efficiency of the wetland system and full growth establishment of wetland pond vegetation.

File Number

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Our Ref HP/PMS/IE235

Your Ref

Date 24th June, 2004

INNOVATION CENTRE
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CARLOW

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Newgrange Meats Ltd
Painestown
Navan
Co Meats

Dear Sirs

Re: Constructed Wetlands Scheme – Engineers Interim Inspection Report 1

The site of the constructed wetlands scheme was visited and inspected on Wednesday 23rd June, 2004.

At this stage part construction of the initial settling lagoon, pond 1, pond 2 and pond 4 have been completed.

The bases of the ponds were inspected to ascertain the constructed permeability. We are satisfied with the base construction of the initial settling lagoon, pond 1 and pond 2. We have informed the contractor to proceed placing the topsoil for ponds 1 and 2 to facilitate the planting of the wetland plants.

On inspection of pond 4 it is evident that a layer of well-broken gravelly shale has been encountered towards the western end of the base. This layer of material is not ideal for the base of a constructed wetland system unless sealed with a minimum of 300mm of low permeability material. We have therefore instructed the contractor to shift pond 4 in an easterly direction where more suitable subsoils are evident. This will not result in any loss of overall total constructed wetland area, just an alteration to the original planning layout. When completed the base of pond 4 will again be inspected before any placement of topsoil and planting is undertaken.

A topographical survey of the earthworks has been arranged for Wednesday 30th June or Thursday 1st July, when it is envisaged that approximately 50% of the earthworks shall be completed. From the topographical survey information we can ascertain the actual area of the ponds constructed and check the invert levels of associated pipework. A certificate for contractors payment will then be issued based pro-rata on the works completed to our satisfaction and the total agreed contract price.

In relation to health and safety and environmental awareness issues we are satisfied with the working and method of earthworks and the type of machinery employed.

We have raised concerns with the contractor in relation to working with machinery under live power lines. This point was specifically highlighted in the pre-tender health and safety plan produced as part of the contract documentation. The contractor has agreed to place bunting and warning signs under and adjacent to all power lines immediately.

It was also noted that a diesel-refueling tank has been placed on site. This tank is neither double skinned or internally banded, and poses a risk to surface waters and ground water if leakage occurs. The contractor has agreed to place this tank within a temporary bund constructed from the low permeability subsoil material found on site.

Yours Sincerely



Paul McShane
Project Engineer
For IE Consulting Engineers

cc John Collins
Austin Weir
Denver Willis

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Our Ref HP/PMS/IE235

Your Ref

Date 30th June, 2004

INNOVATION CENTRE
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Newgrange Meats Ltd
Painestown
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Co Meats

Dear Sirs

Re: Constructed Wetlands Scheme – Engineers Interim Inspection Report 2

The site of the constructed wetlands scheme was visited and inspected on Wednesday 30th June, 2004.

At this stage the earthworks for the initial settling lagoon, pond 1, pond 2, pond 3 and pond 4 have been completed. The earthworks for pond 5 are part completed.

The bases of the ponds 1 and 2 were inspected on the previous visit to ascertain the constructed permeability, which we were satisfied with, and we requested the contractor to proceed placing the topsoil for ponds 1 and 2 to facilitate the planting of the wetland plants. Ponds 1 and 2 have had the topsoil placed and have been part planted with wetland plants. We are satisfied with the base construction of ponds 3 and 4 and have informed the contractor to proceed with placing topsoil for these ponds.

The placing of all drainage and interconnecting pond pipework was also inspected. Constructed pipework levels cannot be accurately checked until the topographical survey has been undertaken.

However, from inspection, it is evident that the outlet pipe from the initial settling lagoon to the first wetland pond may have been constructed at too high a level. EPA and local authority requirements stipulate a minimum freeboard of 1 metre between the top water level of a lagoon and the surrounding embankment crest level. In this case there only appears to be an approximate 500mm freeboard. The contractor has therefore agreed to raise the crest level of the initial settling lagoon to ensure a minimum 1metre freeboard.

There should be a minimum of 300mm clearance between the invert of the pond inlet pipes and the base level of each pond. From a visual inspection the inlet pipes to ponds 2 and 4 appear to have less than this clearance. The reason for this is that the contractor was forced to shift pond 4 in an easterly direction due to the presence of a rock and shale subsoil layer that was encountered. This reduced the scope for level settings in ponds 2 and 4. We have therefore informed the contractor to lower the base levels of ponds 2 and 4 at the inlet locations to ensure a 300mm minimum clearance to the incoming pipe invert level.


A topographical survey of the works has also been undertaken on 30th June. The survey information will enable us to determine the area of wetland ponds constructed to date and to check the levels of any constructed pipework. An engineer's interim certificate for contractors payment will then be issued based pro-rata on the works completed to our satisfaction less the pro-rata retention amount.

In relation to health and safety and environmental awareness issues we are satisfied with the working and method of earthwork construction and the type of machinery employed.

We raised concerns in the previous report in relation to machinery working under live power lines without any bunting or warning signs being in place. The contractor has now placed warning poles and bunting under all power lines where works are being undertaken.

The contractor has also placed the diesel storage tank within a temporary bund, which is constructed from the low permeability subsoil material found on site.

Yours Sincerely



Paul McShane
Project Engineer
For IE Consulting Engineers

cc John Collins
Austin Weir
Denver Willis
Joy McFarland

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Our Ref HP/PMS/IE235

Your Ref

Date 13th July, 2004

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Newgrange Meats Ltd
Painestown
Navan
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Dear Sirs

Re: Constructed Wetlands Scheme – Engineers Interim Inspection Report 3

The site of the constructed wetlands scheme was visited and inspected on Tuesday 13th July, 2004.

At this stage the earthworks for the initial settling lagoon, pond 1, pond 2, pond 3 pond 4, pond 5 and pond 6 have been completed. The earthworks for ponds 7, 8 and the emergency divert pond are part completed.

The base construction of ponds 5, 6, 7 and 8 were inspected to ascertain the constructed permeability. We are satisfied with the base construction of these ponds and have instructed the contractor to place topsoil in ponds 5, 6, 7 and the upper ledge of pond 8. The deeper area of pond 8 does not require planting. The base of the emergency divert pond has yet to be completed to our satisfaction.

A topographical survey of the works was undertaken on 30th June. From this survey information we were able to determine the extent of pond earthworks constructed to date, check level differences between adjacent ponds and check inlet and outlet pipe levels.

The main findings of the initial survey were as follows: -

- *the initial settling lagoon was constructed to a volume of approximately 900m³ less than required*
- *additional inlet pipes are required to pond 2*
- *as of 30th June approximately 35% of the earthworks have been completed*

The contractor has since increased the volume of the initial settling lagoon as required and has agreed to place additional inlet pipes to pond 2. These items will be confirmed when the information from the next topographical survey is compiled.

The second interim topographical survey was undertaken on 13th July. The results of this survey shall be compiled within 2-3 days.

The main findings of the site inspection undertaken on 13th July are as follows: -

- *the cover levels of the polypropylene chambers which connect the inlet and outlet pipework for ponds 4 and 6 are too low and require raising*
- *an extra inlet pipe is required at the southern inlet end of pond 1*
- *an additional inlet pipe is required at the northern inlet end of pond 2*
- *part of the southern and western embankments of pond 5 are too steep and require re-grading to an angle of approximately 45°*
- *a number of inlet pipes to pond 6 appear to be set at the incorrect level*

These points have been discussed with the contractor and he has agreed to rectify these issues as soon as possible.

At this stage the contractor is currently completing the earthworks construction and has still to complete the inlet and outlet pipework for ponds 6, 7, 8 and emergency divert pond. The final discharge sewer from pond 8 and associated valves and manholes are yet to be completed. The contractor envisages completing these works on 16th or 19th July 2004.

A final topographical survey of the works shall be undertaken after the contractor has completed his works. After the final topographical survey we shall draw up a snag and defects list of the total works. The contractor shall be obliged to rectify any snags or defects before any retention monies are paid.

It is also recommended the total wetlands area is fed with water or effluent as soon as possible. Each pond should initially be impounded with a water depth of at least 300mm. Although we can check constructed areas and pipe levels using the topographical survey details the actual flow through the system from first inlet to final outlet cannot be checked until all ponds are submerged. A check for pond embankment leakage and pipe leakage can also not be undertaken until this time.

In relation to health and safety and environmental awareness issues we are satisfied with the working and method of earthwork construction and the type of machinery currently being employed.

Yours Sincerely



Paul McShane
Project Engineer
For IE Consulting Engineers

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cc John Collins
Austin Weir
Denver Willis
Joy McFarland

IE235 – Newgrange Meats Constructed Wetlands Scheme

Snagging List -1

Following an inspection of the constructed wetlands scheme on 27th July and 4th August 2004, the items listed below require attention to ensure the satisfactory completion of the constructed wetlands scheme. This list does not include any planting snags.

Note: A check on the total hydraulic flow from initial settling lagoon to final discharge cannot be assessed until adequate effluent volumes and levels are present within all ponds and lagoons.

1) Initial Settling Lagoon

- The north west corner of the embankment is too low in comparison with the other embankment levels of this lagoon. This area of embankment needs to be raised. As stated in previous correspondence it is recommended that a minimum 1-metre freeboard be maintained above final top water level (if required by Newgrange Meats Ltd). This may require crest level raising in certain areas.
- The inlet pumping main to this lagoon has not been fixed in position
- The outlet dip-pipe has not been fixed

2) Wetland Pond 1

- No visual defects within this pond system

3) Wetland Pond 2

- No visual defects within this pond system

4) Wetland Pond 3

- No visual defects within this pond system

5) Wetland Pond 4

- An additional section of 150mm diameter inlet pipe is required at the southern most inlet area of this pond
- The incoming invert level of the northern most inlet pipe is approximately 40mm above the pipe outlet invert level within pond 3. This will cause a backflow from pond 4 to pond 3. The invert level of this pipe needs to be adjusted.

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6) *Wetland Pond 5*

- No visual defects within this pond system

7) *Wetland Pond 6*

- The incoming invert level of the southern most inlet pipe is approximately 110mm above the pipe outlet invert level within pond 5. This will cause a backflow from pond 6 to pond 5. The invert level of this pipe needs to be adjusted.
- The cover level of the central inspection chamber at the outlet end is too low and could be inundated by a high water level within pond 6. The cover level of this manhole needs to be raised by at least 350mm.

8) *Wetland Pond 7*

- The invert level of two of the inlet pipes is too high. These pipes need to be adjusted to the same invert levels of adjacent inlet pipes.

9) *Wetland Pond 8*

- The downstream face of the southern embankment is too steep. This face needs to be re-graded to a maximum angle of 45 degrees.

10) *Wetland Pond 9*

- The downstream face of the southern embankment is too steep. This face needs to be re-graded to a maximum angle of 45 degrees.

11) *Emergency Divert Pond*

- No visual defects within this pond system

Signed
Paul McShane



For IE Consulting Engineers

cc Dermot Boyle
Aila Harrington
John Collins
Austin Weir
Denver Willis
Joy McFarlan

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IE235 – Newgrange Meats Constructed Wetlands Scheme

Snagging List -2

Following an inspection of the constructed wetlands scheme on 8th December 2004, the items from the previous snagging list, as detailed below, were inspected. Items satisfactory completed are shown in **BLUE**. Items not satisfactory completed or requiring attention are shown in **RED**.

1) *Initial Settling Lagoon*

- The north west corner of the embankment is too low in comparison with the other embankment levels of this lagoon. This area of embankment needs to be raised. As stated in previous correspondence it is recommended that a minimum 1-metre freeboard be maintained above final top water level (if required by Newgrange Meats Ltd). This may require crest level raising in certain areas. **Satisfactorily completed.**

2) *Wetland Pond 1*

- No visual defects within this pond system

3) *Wetland Pond 2*

- No visual defects within this pond system

4) *Wetland Pond 3*

- No visual defects within this pond system

5) *Wetland Pond 4*

- An additional section of 150mm diameter inlet pipe is required at the southern most inlet area of this pond. **Satisfactorily completed.**
- The incoming invert level of the northern most inlet pipe is approximately 40mm above the pipe outlet invert level within pond 3. This will cause a backflow from pond 4 to pond 3. The invert level of this pipe needs to be adjusted. **Satisfactorily completed.**

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6) *Wetland Pond 5*

- No visual defects within this pond system

7) *Wetland Pond 6*

- The incoming invert level of the southern most inlet pipe is approximately 110mm above the pipe outlet invert level within pond 5. This will cause a backflow from pond 6 to pond 5. The invert level of this pipe needs to be adjusted. **Satisfactorily completed.**
- The cover level of the central inspection chamber at the outlet end is too low and could be inundated by a high water level within pond 6. The cover level of this manhole needs to be raised by at least 350mm. **Satisfactorily completed.**

8) *Wetland Pond 7*

- The invert level of two of the inlet pipes is too high. These pipes need to be adjusted to the same invert levels of adjacent inlet pipes. **Satisfactorily completed.**

9) *Wetland Pond 8*

- The downstream face of the southern embankment is too steep. This face needs to be re-graded to a maximum angle of 45 degrees. **Satisfactorily completed.**

10) *Wetland Pond 9*

- The downstream face of the southern embankment is too steep. This face needs to be re-graded to a maximum angle of 45 degrees. **Satisfactorily completed.**

11) *Emergency Divert Pond*

- No visual defects within this pond system

Signed
Paul McShane



For IE Consulting Engineers

cc Dermot Boyle
Aila Harrington
John Collins
Austin Weir
Denver Willis
Joy McFarland

Slane Water Readings Jan 06 - Feb 07

More than 1 days effluent

Date	Reading (m ³)	Daily Usage (m ³) Max 100m3 per Day	Weekly Usage (m ³) Max 700m3 per Week
02/01/2006	No Kill		
03/01/2006	34186	109	
04/01/2006	34295	85	
05/01/2006	34380	161	
06/01/2006	No Kill		
07/01/2006			
08/01/2006			355
09/01/2006	No Kill		
10/01/2006	34541	77	
11/01/2006	34618	81	
12/01/2006	34699	86	
13/01/2006	34785	113	
14/01/2006			
15/01/2006			357
16/01/2006	No Kill		
17/01/2006	34898	85	
18/01/2006	34983	90	
19/01/2006	35073	79	
20/01/2006	35152	158	
21/01/2006			
22/01/2006			412
23/01/2006	No Kill		
24/01/2006	35310	97	
25/01/2006	35407	109	
26/01/2006	35516	91	
27/01/2006	35607	142	
28/01/2006			
29/01/2006			439
30/01/2006	No Kill		
31/01/2006	35749	118	
01/02/2006	35867	95	
02/02/2006	35962	90	
03/02/2006	36052	92	
04/02/2006			
05/02/2006			395
06/02/2006	36144	86	
07/02/2006	36230	76	
08/02/2006	36306	81	
09/02/2006	36387	88	
10/02/2006	36475	96	
11/02/2006			
12/02/2006			427
13/02/2006	36571	89	
14/02/2006	36660	79	
15/02/2006	36739	83	
16/02/2006	36822	77	
17/02/2006	36899	116	
18/02/2006			
19/02/2006			444
20/02/2006	37015	79	
21/02/2006	37094	70	
22/02/2006	37164	47	
23/02/2006	37211	74	
24/02/2006	37285	119	

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Date	Reading (m ³)	Daily Usage (m ³) Max 100m ³ per Day	Weekly Usage (m ³) Max 700m ³ per Week
25/02/2006			
26/02/2006			389
27/02/2006	37404	15	
28/02/2006	37419	70	
01/03/2006	37489	79	
02/03/2006	37568	14	
03/03/2006	37582	103	
04/03/2006			
05/03/2006			281
06/03/2006	37685	17	
07/03/2006	37702	78	
08/03/2006	37780	71	
09/03/2006	37851	75	
10/03/2006	37926	105	
11/03/2006			
12/03/2006			346
13/03/2006	38031	45	
14/03/2006	38076	64	
15/03/2006	38140	118	
16/03/2006	38258	89	
17/03/2006	Holiday		
18/03/2006			
19/03/2006			316
20/03/2006	38347	20	
21/03/2006	38367	86	
22/03/2006	38453	60	
23/03/2006	38513	82	
24/03/2006	38595	108	
25/03/2006			
26/03/2006			356
27/03/2006	38703	51	
28/03/2006	38754	106	
29/03/2006	38860	60	
30/03/2006	38920	134	
31/03/2006	39054	121	
01/04/2006			
02/04/2006			472
03/04/2006	39175	23	
04/04/2006	39198	89	
05/04/2006	39287	103	
06/04/2006	39390	86	
07/04/2006	39476	104	
08/04/2006			
09/04/2006			405
10/04/2006	39580	86	
11/04/2006	39666	88	
12/04/2006	39754	74	
13/04/2006	39828	89	
14/04/2006	39917	38	
15/04/2006			
16/04/2006			375
17/04/2006	Holiday		
18/04/2006	39955	22	
19/04/2006	39977	64	
20/04/2006	40041	142	
21/04/2006	40183	143	
22/04/2006			
23/04/2006			371
24/04/2006	40326	18	

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Date	Reading (m ³)	Daily Usage (m ³) Max 100m ³ per Day	Weekly Usage (m ³) Max 700m ³ per Week
25/04/2006	40344	105	
26/04/2006	40449	79	
27/04/2006	40528	148	
28/04/2006	No Kill		
29/04/2006			
30/04/2006			350
01/05/2006	Holiday		
02/05/2006	40676	101	
03/05/2006	40777	75	
04/05/2006	40852	78	
05/05/2006	40930	139	
06/05/2006			
07/05/2006			393
08/05/2006	No Kill		
09/05/2006	41069	81	
10/05/2006	41150	87	
11/05/2006	41237	118	
12/05/2006	41355	111	
13/05/2006			
14/05/2006			397
15/05/2006	41466	74	
16/05/2006	41540	93	
17/05/2006	41633	88	
18/05/2006	41721	22	
19/05/2006	41743	60	
20/05/2006			
21/05/2006			337
22/05/2006	41803	92	
23/05/2006	41895	27	
24/05/2006	41922	96	
25/05/2006	42018	93	
26/05/2006	42111	38	
27/05/2006			
28/05/2006			346
29/05/2006	42149	14	
30/05/2006	42163	101	
31/05/2006	42264	106	
01/06/2006	42370	138	
02/06/2006	?		
03/06/2006			
04/06/2006			359
05/06/2006	No Kill		
06/06/2006	42508	94	
07/06/2006	42602	93	
08/06/2006	No Kill		
09/06/2006	42695	100	
10/06/2006			
11/06/2006			287
12/06/2006	42795	46	
13/06/2006	42841	87	
14/06/2006	42928	108	
15/06/2006	43036	98	
16/06/2006	43134	15	
17/06/2006			
18/06/2006			354
19/06/2006	No Kill		
20/06/2006	43149	114	
21/06/2006	43263	126	
22/06/2006	43389	144	

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Date	Reading (m ³)	Daily Usage (m ³) Max 100m3 per Day	Weekly Usage (m ³) Max 700m3 per Week
23/06/2006	No Reading		
24/06/2006			
25/06/2006			384
26/06/2006	No Kill		
27/06/2006	43533	83	
28/06/2006	43616	94	
29/06/2006	43710	84	
30/06/2006	43794	91	
01/07/2006			
02/07/2006			352
03/07/2006	No Kill		
04/07/2006	43885	94	
05/07/2006	43979	99	
06/07/2006	44078	97	
07/07/2006	44175	20	
08/07/2006			
09/07/2006			310
10/07/2006	44195	45	
11/07/2006	44240	98	
12/07/2006	44338	72	
13/07/2006	44410	111	
14/07/2006	44521	118	
15/07/2006			
16/07/2006			444
17/07/2006	44639	12	
18/07/2006	44651	109	
19/07/2006	44760	93	
20/07/2006	44853	105	
21/07/2006	44958	19	
22/07/2006			
23/07/2006			338
24/07/2006	44977	40	
25/07/2006	45017	64	
26/07/2006	45081	95	
27/07/2006	45176	97	
28/07/2006	45273	37	
29/07/2006			
30/07/2006			333
31/07/2006	45310	22	
01/08/2006	45332	76	
02/08/2006	45408	69	
03/08/2006	45477	75	
04/08/2006	45552	20	
05/08/2006			
06/08/2006			262
07/08/2006	45572	20	
08/08/2006	45592	30	
09/08/2006	45622	75	
10/08/2006	45697	71	
11/08/2006	45768	109	
12/08/2006			
13/08/2006			305
14/08/2006	45877	17	
15/08/2006	45894	62	
16/08/2006	45956	88	
17/08/2006	46044	84	
18/08/2006	46128	121	
19/08/2006			
20/08/2006			372

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Date	Reading (m ³)	Daily Usage (m ³) Max 100m ³ per Day	Weekly Usage (m ³) Max 700m ³ per Week
21/08/2006	46249	21	
22/08/2006	46270	89	
23/08/2006	46359	100	
24/08/2006	46459	125	
25/08/2006	46584	76	
26/08/2006			
27/08/2006			411
28/08/2006	46660	28	
29/08/2006	46688	111	
30/08/2006	46799	87	
31/08/2006	46886	90	
01/09/2006	46976	109	
02/09/2006			
03/09/2006			425
04/09/2006	47085	19	
05/09/2006	47104	96	
06/09/2006	47200	101	
07/09/2006	47301	95	
08/09/2006	47396	120	
09/09/2006			
10/09/2006			431
11/09/2006	47516	79	
12/09/2006	47595	94	
13/09/2006	47689	96	
14/09/2006	47785	85	
15/09/2006	47870	82	
16/09/2006			
17/09/2006			436
18/09/2006	47952	18	
19/09/2006	47970	88	
20/09/2006	48058	79	
21/09/2006	48137	62	
22/09/2006	48199	113	
23/09/2006			
24/09/2006			360
25/09/2006	48312	20	
26/09/2006	48332	89	
27/09/2006	48421	75	
28/09/2006	48496	107	
29/09/2006	48603	114	
30/09/2006			
01/10/2006			405
02/10/2006	48717	20	
03/10/2006	48737	98	
04/10/2006	48835	95	
05/10/2006	48930	94	
06/10/2006	49024	126	
07/10/2006			
08/10/2006			433
09/10/2006	49150	17	
10/10/2006	49167	96	
11/10/2006	49263	89	
12/10/2006	49352	105	
13/10/2006	49457	138	
14/10/2006			
15/10/2006			445
16/10/2006	49595	96	
17/10/2006	49691	94	
18/10/2006	49785	112	

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Date	Reading (m ³)	Daily Usage (m ³) Max 100m ³ per Day	Weekly Usage (m ³) Max 700m ³ per Week
19/10/2006	49897	100	
20/10/2006	49997	52	
21/10/2006			
22/10/2006			454
23/10/2006	50049	25	
24/10/2006	50074	118	
25/10/2006	50192	113	
26/10/2006	50305	100	
27/10/2006	50405	157	
28/10/2006			
29/10/2006			513
30/10/2006	Holiday		
31/10/2006	50562	105	
01/11/2006	50667	93	
02/11/2006	50760	85	
03/11/2006	50845	140	
04/11/2006			
05/11/2006			423
06/11/2006	50985	40	
07/11/2006	51025	90	
08/11/2006	51115	96	
09/11/2006	51211	88	
10/11/2006	51299	138	
11/11/2006			
12/11/2006			452
13/11/2006	51437	98	
14/11/2006	51535	97	
15/11/2006	51632	113	
16/11/2006	51745	102	
17/11/2006	51847	157	
18/11/2006			
19/11/2006			567
20/11/2006	52004	94	
21/11/2006	52098	115	
22/11/2006	52213	103	
23/11/2006	52316	109	
24/11/2006	52425	237	
25/11/2006			
26/11/2006			658
27/11/2006	52662	98	
28/11/2006	52760	93	
29/11/2006	52853	93	
30/11/2006	52946	97	
01/12/2006	53043	133	
02/12/2006			
03/12/2006			514
04/12/2006	53176	85	
05/12/2006	53261	106	
06/12/2006	53367	92	
07/12/2006	53459	84	
08/12/2006	53543	127	
09/12/2006			
10/12/2006			494
11/12/2006	53670	27	
12/12/2006	53697	94	
13/12/2006	53791	78	
14/12/2006	53869	70	
15/12/2006	53939	116	
16/12/2006			

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Date	Reading (m ³)	Daily Usage (m ³) Max 100m ³ per Day	Weekly Usage (m ³) Max 700m ³ per Week
17/12/2006			385
18/12/2006	54055	16	
19/12/2006	54071	80	
20/12/2006	54151	78	
21/12/2006	54229	19	
22/12/2006	54248	136	
23/12/2006			
24/12/2006			329
25/12/2006	No Kill		
26/12/2006	No Kill		
27/12/2006	No Kill		
28/12/2006	54384	63	
29/12/2006	54447	90	
30/12/2006	54537	89	
31/12/2006			242
01/01/2007	Holiday		
02/01/2007	Holiday		
03/01/2007	54626	101	
04/01/2007	54727	95	
05/01/2007	54822	114	
06/01/2007			
07/01/2007			310
08/01/2007	54936	67	
09/01/2007	55003	62	
10/01/2007	55065	49	
11/01/2007	55114	84	
12/01/2007	55198	88	
13/01/2007			
14/01/2007			350
15/01/2007	55286	55	
16/01/2007	55341	80	
17/01/2007	55421	80	
18/01/2007	55501	83	
19/01/2007	55584	121	
20/01/2007			
21/01/2007			419
22/01/2007	55705	68	
23/01/2007	55773	101	
24/01/2007	55874	77	
25/01/2007	55951	107	
26/01/2007	56058	96	
27/01/2007			
28/01/2007			449
29/01/2007	56154	25	
30/01/2007	56179	79	
31/01/2007	56258	77	
01/02/2007	56335	82	
02/02/2007	56417		
03/02/2007			
04/02/2007			263

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Dunbia (Slane) Monitoring Results

Date Sample Taken	Time Sample Taken	Sample Location	Ammonia mg/L as N	BOD mg/L	COD mg/L	Nitrate mg/L as N	Nitrite mg/l as N	pH	Phosphate (Ortho) mg/L as P	Phosphate (Total) mg/L as P	SS (Total) mg/L	Chloride mg/L	Fats, Oils & Greases mg/L	Total Coliforms mg/L	Lab Ref
29/09/2006	11.3	Inlet to ICWs	452.18	264	2510	<9.96	<0.4	7.75	43.9	34.07	1196	240			15992
29/09/2006	11.12	Pond 2	96.76	<120	4690	<9.96	<0.4	7.87	44.5	32.58	3308	157			15989
29/09/2006	11.24	Pond 4	41.55	36	1150	<9.96	0.48	7.85	26.8	17.88	88	119			15990
29/09/2006	10.52	Pond 6	49.9	28	1250	<9.96	0.99	7.79	26.2	17.58	100	131			15991
29/09/2006	10.30	Inlet to Discharge Pond	28.07	23	1030	<9.96	0.75	7.7	14.9	15.75	76	128			15995
29/09/2006	11.20	Lysimeter 1 (Upper)	<2.00	18	1120	<9.96	-	7.33	<4.0	<2	282	-			15993
29/09/2006	10.40	Lysimeter 2 (Lower)	13.31	<30	1650	<9.96	<0.4	7.34	<4.0	<2	144	170			15994
27/04/2006		Pond 1	410.69	375	1143	<0.09	0.014	7.7	47.619	47.665	272	198		210	6260/007/03
27/04/2006		Pond 3	170.38	350	690	<0.09	0.012	7.9	36.829	41.18	94	166		30	6260/007/04
27/04/2006		Pond 5	91.14	350	559	<0.09	0.011	7.6	28.274	28.699	85	143		30	6260/007/05
27/04/2006		Pond 7	19.33	33	290	4.21	0.1	7.3	15.026	15.243	102	109		70	6260/007/06
27/04/2006		Pond 9	34.37	23	112	7.04	0.984	7.3	9.852	10.638	51	99		60	6260/007/07
17/11/2005		Pond 9	129.12	160	485	<0.09		7.3	16.392	21.738	105	199	11	70	6260/001/07
17/11/2005		Lysimeter 2	44.2			<0.09		6.4	<0.006	0.181		140	<5	40	6270/001/06
17/11/2005		Lysimeter 1	0.43			<0.09		6.5	<0.006	<0.005		167	34	0	6270/001/01
17/11/2005		Pond1	363.33	400	2035	<0.09		7.4	43.462	43.779	544	227	32	300	6270/001/02
17/11/2005		Pond 3	386.55	88	745	<0.09		7.9	33.754	34.228	169	192	22	200	6270/001/03
17/11/2005		Pond 5	260.21	250	575	<0.09		7.9	29.625	30.292	152	184	31	300	6270/001/04
17/11/2005		Pond 7	182.19	90	435	<0.09		7.8	23.023	23.264	107	127	<5	300	6270/001/05
17/11/2005		Pond 9	57.08	122	680	<0.09		7.2	13.042	14.403	173	153	<5	300	6270/001/07
28/07/2005		Lysimeter 1	0.33	442	470	<0.09			<0.006	0.062	114	173			

Date Sample	Time Sample	Sample Location	Ammonia mg/L as N	BOD mg/L	COD mg/L	Nitrate mg/L as N	Nitrite mg/l as N	pH	Phosphate (Ortho) mg/L as P	Phosphate (Total) mg/L as P	SS (Total) mg/L	Chloride mg/L	Lab Ref
29/09/2006	10.35	Discharge Pond	26.36	25	1230	<9.96	2.65	7.99	15.8	15.68	48	142	15996
27/04/2006		Discharge Pond	34.37	23	112	7.04	0.984	7.3	9.852	10.638	51	99	6260/007/07

Date Sample	Time Sample	Sample Location	Ammonia mg/L as N	BOD mg/L	COD mg/L	Nitrate mg/L as N	Nitrite mg/l as N	pH	Phosphate (Ortho) mg/L as P	Phosphate (Total) mg/L as P	SS (Total) mg/L	Chloride mg/L	Coliforms (Total) mg/L	Lab Ref
29/09/2006	11.5	Proposed Receiving Water	10.24	109	48	<1.98	0.05	7.72	<0.5	<100	44	174		15997
27/04/2006		Proposed Receiving Water	<0.021	2	28	5.79	0.958	7.6	1.84	1.947	31	127	4	6260/007/02
10/02/2005		Proposed Receiving Water	0.27		9	3.41	0.064			0.207	5	111		4880/001/03
10/02/2005		Proposed Receiving Water	1.42		8	2.62	0.099			0.03	<5	153		4880/001/02
10/02/2005		Proposed Receiving Water	0.44		10	2.68	0.134			0.037	5	168		4880/001/01

Date Sample Taken	Time Sample Taken	Sample Location	Ammonia mg/L as N	BOD mg/L	COD mg/L	Nitrate mg/L as N	Nitrite mg/L as N	pH	Phosphate (Ortho) mg/L as P	Phosphate (Total) mg/L as P	SS (Total) mg/L	Chloride mg/L	Coliforms (Total) No/100ml	Faecal Coliforms cfu/100ml	Faecal Streptococci cfu/100ml	Total Organic Carbon mg/l	Conductivity U/cm at 20°C	Lab Ref
29/09/2006	10.09	Borewell	0.3	<2	15	<1.98	<0.02	7.28	<0.5	<100	2	34.48	48	14	2	2.5	914	15988
27/04/2006		Borewell	<0.021	2	<3	<0.09	0.011	7.5	<0.006	0.027	5	20	6					6260/007/01

Dunbia (Slane) Daily Sampling for Inlet and Outlet of ICW

Date	Sample Results mg/l Inlet to Pond 1			Sample Results mg/l Inlet to Discharge Pond							
	BOD	COD	Ammonia	BOD	COD	Ammonia	Total Nitrate	Total Phosphorous	Suspended Solids	Fats, Oils, Greases	pH
Limits	4351	7021	720.3	10	40	1	50	0.5	10	5	6-9
31/07/2006	240	2100	301								
01/08/2006											
02/08/2006											
03/08/2006											
04/08/2006											
05/08/2006											
06/08/2006											
07/08/2006											
08/08/2006	191	1555	310								
09/08/2006											
10/08/2006											
11/08/2006											
12/08/2006											
13/08/2006											
14/08/2006											
15/08/2006	386	1835	222								
16/08/2006											
17/08/2006											
18/08/2006											
19/08/2006											
20/08/2006											
21/08/2006											
22/08/2006	177	1140	84.9								
23/08/2006											
24/08/2006											
25/08/2006											
26/08/2006											
27/08/2006											
28/08/2006											
29/08/2006	246	1680	127								
30/08/2006											
31/08/2006											
01/09/2006											
02/09/2006											
03/09/2006											
04/09/2006											
05/09/2006	377	4810	132								

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Date	Sample Results mg/l Inlet to Pond 1			Sample Results mg/l Inlet to Discharge Pond							
	BOD	COD	Ammonia	BOD	COD	Ammonia	Total Nitrate	Total Phosphorous	Suspended Solids	Fats, Oils, Greases	pH
06/09/2006											
07/09/2006											
08/09/2006											
09/09/2006											
10/09/2006											
11/09/2006	390	1280	102								
12/09/2006											
13/09/2006											
14/09/2006											
15/09/2006											
16/09/2006											
17/09/2006											
18/09/2006	188	1480	327	50	540	29.9					
19/09/2006											
20/09/2006											
21/09/2006											
22/09/2006											
23/09/2006											
24/09/2006											
25/09/2006	862	13100	246	24	316	48					
26/09/2006											
27/09/2006											
28/09/2006											
29/09/2006											
30/09/2006											
01/10/2006											
02/10/2006	3140	1560	391	22	254	29.5					
03/10/2006											
04/10/2006											
05/10/2006											
06/10/2006											
07/10/2006											
08/10/2006											
09/10/2006	403	1500	371	18	252	19.2					
10/10/2006											
11/10/2006											
12/10/2006											
13/10/2006											
14/10/2006											
15/10/2006											
16/10/2006	517	1700	415	30	314	23.6					
17/10/2006											

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Date	Sample Results mg/l Inlet to Pond 1			Sample Results mg/l Inlet to Discharge Pond							
	BOD	COD	Ammonia	BOD	COD	Ammonia	Total Nitrate	Total Phosphorous	Suspended Solids	Fats, Oils, Greases	pH
18/10/2006											
19/10/2006											
20/10/2006											
21/10/2006											
22/10/2006											
23/10/2006	479	1730	300	10	206	9.1					
24/10/2006											
25/10/2006											
26/10/2006											
27/10/2006											
28/10/2006											
29/10/2006											
30/10/2006											
31/10/2006	432	1200	341	28	200	9.6					
01/11/2006											
02/11/2006											
03/11/2006											
04/11/2006											
05/11/2006											
06/11/2006	506	2130	412	4	180	12.4					
07/11/2006											
08/11/2006											
09/11/2006											
10/11/2006											
11/11/2006											
12/11/2006											
13/11/2006	474	1640	354	8	245	12.1					
14/11/2006											
15/11/2006											
16/11/2006											
17/11/2006											
18/11/2006											
19/11/2006											
20/11/2006	781	1680	371	13	189	33.2					
21/11/2006											
22/11/2006											
23/11/2006											
24/11/2006											
25/11/2006											
26/11/2006											
27/11/2006	992	2040	361	17	234	84.3					
28/11/2006											

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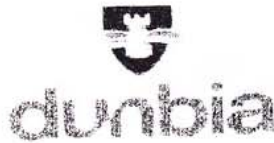
Date	Sample Results mg/l Inlet to Pond 1			Sample Results mg/l Inlet to Discharge Pond							
	BOD	COD	Ammonia	BOD	COD	Ammonia	Total Nitrate	Total Phosphorous	Suspended Solids	Fats, Oils, Greases	pH
29/11/2006											
30/11/2006											
01/12/2006											
02/12/2006											
03/12/2006											
04/12/2006	1190	2550	255	-	560	127					
05/12/2006											
06/12/2006											
07/12/2006											
08/12/2006											
09/12/2006											
10/12/2006											
11/12/2006	715	1410	252	17	172	69.7					
12/12/2006											
13/12/2006											
14/12/2006											
15/12/2006											
16/12/2006											
17/12/2006											
18/12/2006	714	1550	388	13	136	86.9					
19/12/2006											
20/12/2006											
21/12/2006											
22/12/2006											
23/12/2006											
24/12/2006											
25/12/2006											
26/12/2006											
27/12/2006											
28/12/2006											

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Date	Sample Results mg/l Inlet to Pond 1			Sample Results mg/l Inlet to Discharge Pond							
	BOD	COD	Ammonia	BOD	COD	Ammonia	Total Nitrate	Total Phosphorous	Suspended Solids	Fats, Oils, Greases	pH
29/12/2006											
30/12/2006											
31/12/2006											
01/01/2007											
02/01/2007											
03/01/2007	6	143	74.9	-	1650	150	<0.3	37.2	476	37.3	7.7
04/01/2007											
05/01/2007											
06/01/2007											
07/01/2007											
08/01/2007	347	1390	217	6	131	57.7	1.9	13.7	32	<4	8.1
09/01/2007											
10/01/2007											
11/01/2007											
12/01/2007											
13/01/2007											
14/01/2007											
15/01/2007	418	1250	263	6	106	75	4.6	14.2	28	<4	8.3
16/01/2007											
17/01/2007											
18/01/2007											
19/01/2007											
20/01/2007											
21/01/2007											
22/01/2007	411	1340	246	-	126	68.6	4.9	12.6	28	<100	7.7
23/01/2007											
24/01/2007											
25/01/2007											
26/01/2007											
27/01/2007											
28/01/2007											
29/01/2007	382	1360	275	4	129	69.9	7.2	13.3	20	<4	7.8
30/01/2007											
31/01/2007											
01/02/2007											
02/02/2007											
03/02/2007											
04/02/2007											
Maximum	3140	13100	415	50	1650	150	7.2	37.2	476	37.3	8.3
Minimum	6	143	74.9	4	106	9.1	1.9	12.6	20	37.3	7.7
Average	576	2121	275	17	313	53	5	18	117	37	8

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Results from Discharge Pond



Service and Maintenance Agreement (Aila Carty: Environmental Consultant)

I, Aila Carty (Aila Carty) of 1 Beechwood Avenue, Newtown, Cobh, Co. Cork, warrant that all services of Environmental Consulting provided for Dunbia (Slane) are in accordance with the following and subject to conditions within Discharge License: 05/09 from Meath County Council, and in conjunction with relevant legislation.

Service Agreement:

Monthly site inspections will be carried out by Aila Carty to cover:

1. Review of Records
Review of the daily and weekly monitoring checks carried out by site personnel as part of the wetlands maintenance and management plan, to ensure effectiveness of the treatment system. These records are listed below:
 - a) Water levels of the ponds
Monitoring of the ponds will occur daily with on-site personnel but will be checked monthly to ensure the depth remains correct relevant to flow and external circumstances.
 - b) Volumes into the Wetlands system
Volumes discharged into the Wetlands will be monitored daily by site personnel to ensure the system is not being overloaded. The current system design for flow to the wetlands is 100m³ per day maximum. This will be reviewed on a monthly basis by Aila Carty.
 - c) Volumes discharging from the wetlands
Volumes discharging from the wetlands to be recorded daily by site personnel, with a maximum licenced discharge of 50m³ in any 24 hour period, and reviewed on a monthly basis by Aila Carty.
 - d) Monitoring of Lysimeters
Volumes of effluent from Lysimeter 1 and 2 are to be recorded on a weekly basis to monitor infiltration rates and reviewed on a monthly basis by Aila Carty.
 - e) Monitoring of weather conditions
Weather conditions are recorded daily by site personnel, including rainfall and reviewed by Aila Carty on a monthly basis.
 - f) Effluent Quality Sampling.
Periodic sampling of various ponds in the wetlands will be carried out to monitor the performance of the Wetlands system.
2. Review of on-going operational management for efficiencies of the Wetlands system.

Monthly monitoring and inspection visits take place, with recommendations issued to ensure that operational efficiencies are maximised.

3. Wetlands vegetation conditions and health (Biomonitoring)
Monthly monitoring and inspection of the wetlands vegetation is also carried out to assess and record changes to the vigour and growth of all plants. Particularly in the event of any incidents i.e. high pond levels, low pond levels, high ammonia levels etc, and to suggest remedial measures. Recommendations are to be reviewed with on-site personnel.
4. Operational activities providing the wetlands system.
Checks are made with site personnel during the monthly visit to ensure that there are no significant changes within operational activities that may adversely affect the Wetlands efficiency, and recommendations recorded should any such adverse changes be noted.
5. Provision of operational advice where required and in relation to but not limited to the following:
 - a) Abnormal operating conditions; Climatic conditions, emergency conditions, accidental releases including spillages etc.
 - b) Abnormal sample results: Ponds, Lysimeters, Borewells etc.
 - c) Need for additional planting, and details about the type of plants or method to use.
 - d) Provision of any information relating to any new technology or methods that may improve effluent quality or operation of the wetlands.
6. A site report will be provided after each visit outlining any recommendations provided to site by Aila Carty relating to any of the above points.

This Service Agreement will cover a proposed 12 month period however, Dunbia (Slane). reserve the right to review or terminate this agreement with the recipient to receive one weeks notice.

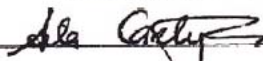
Signed on behalf of Dunbia (Slane) Ltd.:



Print Name: BRIAN TORNEY

Date: 5 JAN 2007

Signed by Aila Carty:



Print Name: AILA CARTY

Date: 5 Jan 2007 (Contract Start Date)

Location:	Newgrange Meats
Date of visit:	18 May 2005
Site contact name:	John Collins

Purpose of visit:	Proposed Participants
<ul style="list-style-type: none"> - To go through the monitoring regime intended for the wetlands at Newgrange with Aila Harrington and Vincent Murray. - Site visit report for Aila to be agreed along with subsequent dates - Meet Jer Keohane regarding pumping for wetlands discharge consent - Also to discuss with Liz Quinn events from last week and the proposed lab etc. to be used for testing requirements 	John Collins Aila Harrington Vincent Murray Jer Keohane Liz Quinn Victoria Kerr

Summary of visit:
<ul style="list-style-type: none"> - Assessment of ICW at Newgrange - Met with Denver and Victoria Kerr, discussion of both sites - Met Vincent Collins from Meath Co. Co at Newgrange Meats - Viewed Newgrange Monitoring – incomplete - Assessment of plants, reasonably good growth, expect growth to increase in the next few weeks.

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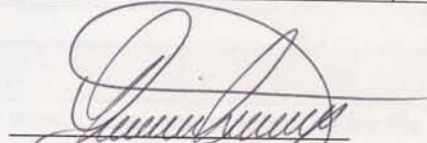
Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Maintenance programme for Newgrange Meats	Must be carried out daily and weekly for lysimeter readings	Vincent Murray	Now
2.	Newgrange Who is responsible for maintenance and management?	There needs to be someone on site daily to assess wetland	Vincent or?	Now
3.	Water Levels.	Water levels to be maintained as they are	Vincent Murraray	For next four weeks
4.	Meter reading	A copy of the daily water usage on site required	?	Now
5.	Maintenance of embankments	The tops of the banks should be mowed/maintained for access		Over the next four weeks
6.	Water levels in last pond at Newgrange	If the water level is kept below the outlet pipe, this can be stored and recycled to lower end of system during dry months	Vincent Murray	July -August

	Discussion Point	Action	Responsible	Due date
7.	Next site visit	Next visit 21 June	A. Harrington and D. Willis	21/06/05

Site sign-off

Signed:



Name:

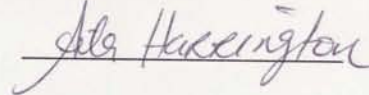
Gilmar Jesus

Date:

18-05-2005

Group Employee Sign-off

Signed:



Name:

Aila Harrington

Date:

18-5-2005

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Location:	Newgrange Meats
Date of visit:	28-6-05
Site contact name:	John Collins

Purpose of visit:	Proposed Participants
Assessment of constructed wetland systems at Newgrange.	Aila Carty Denver Willis

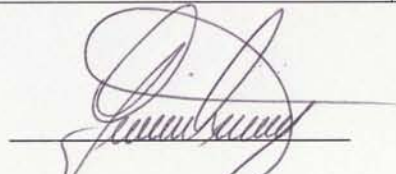
Summary of visit:
<p>Newgrange Meats</p> <ul style="list-style-type: none"> - The outlet point of settling pond to be cleaned up - Plant growth very good in most ponds, still limited in pond 3 - Effluent discharging only from first 3 ponds - Solids entering and building up in first pond - Top of banks to be maintained and cut also at inlet and outlet points. - No discharge from wetland - Water levels close to outlet point (approx. 5cm below pipe) - Checklist incomplete - Samples taken from lysimeters

Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Water levels	Pipes to be kept down	Vincent Murray	Over the next four weeks
2.	Lysimeter 1	The barrel should be changed and the top to be sealed	V. Murray	Immediately
3.	Water level in last pond and emergency pond	Water to be kept in the ponds in case it is needed later if wetting ponds if drying out occurs	V. Murray	
4.	Water meter readings	Who is responsible for monitoring	?	Immediately
5.	Monitoring checklist	Check list to be filled in daily and weekly as outlined	V. Murray	Immediately
6.	Appoint person responsible when V. Murray is absent	Who is responsible	J. Collins	Immediately

Site sign-off

Signed:



 Name: Gilmar Jesus

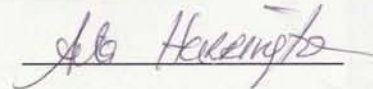
Name:

Date:

28-06-05

Group Employee Sign-off

Signed:



Name:

Aila Harrington

Date:

28-6-05

For inspection purposes only. Consent of copyright owner required for any other use.

Location:	Newgrange Meats
Date of visit:	28 July 2005
Site contact name:	Denver Willis

Purpose of visit:	Proposed Participants
Assessment of constructed wetland systems at Newgrange Meats.	Aila Harrington Denver Willis

Summary of visit:
<p>Meeting with John Collins and Denver Willis to review progress of wetland systems Excellent growth in Newgrange except pond 3 – replanting being carried out today.</p> <p style="color: red; transform: rotate(-45deg); font-weight: bold;">For inspection purposes only. Consent of copyright owner required for any other use.</p>

Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Planting	Plant growth in all ponds good. Planting of carex sedge today in pond 3	Dermot Boyle	Done 28-7-05
2.	Lysimeters	Results from lysimeters – show good treatment Replacement of containers on lysimeters and seal	V. Murray	Next week
3.	Final pond	Water to be kept in pond and used for wetting lower ponds if necessary	V. Murray	Over the next 6-8 weeks
4.	Water level	Water levels to be maintained at max. levels to reduce levels entering into replanted pond 3 6 inch pipe to be placed on balancing pond if necessary	V. Murray	Over the next 4 weeks

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Site sign-off

Signed:



Name:

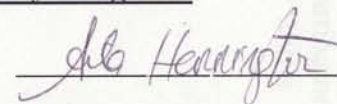
Gilmar Jesus

Date:

28-07-05

Group Employee Sign-off

Signed:



Name:

Aila Harrington

Date:

28-7-05

Location:	Newgrange Meats
Date of visit:	31.8.05
Site contact name:	Denver Willis

Purpose of visit:	Proposed Participants
Assessment of the integrated constructed wetlands to review performance and progress	Aila Harrington Denver Willis Vincent Murray


Summary of visit:
<p>Overall assessment of constructed wetland</p> <ul style="list-style-type: none"> - Plant growth - Water levels - Performance - Volumes <p style="color: red; text-align: center; transform: rotate(-45deg); font-weight: bold;">For inspection purposes only. Consent of copyright owner required for any other use.</p>

Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Pond 3 Water levels	New pipe to be placed at the outlet from pond 3 to lower water levels	Dermot Boyle	Before 9-9-5
2.	Pond 3 Water levels	Channels to be dug in pond 3 3-5m to the outlet pipes, to help lower water level	Dermot Boyle	9-9-05
3.	Lysimeters in P 1 and 6	New containers to be placed on both lysimeters	V. Murray	9-9-05
4.	Plant growth	Plant growth in all ponds v. good. Die back beginning to occur in pond 1 (normal) Plants beginning to take in pond 3		
5.	Effluent to be discharged to pond 2 and 3	The effluent to be discharged to P 2 and 3, once the new pipe has been placed	V. Murray	9-9-05
6.	Pond 4 outlet pipe	Pond 4 – new outlet pipe to be placed to drop the water level	Dermot Boyle	9-9-05
7.	Water samples	Samples taken last month, show expected performance at this stage Samples to be taken again at the end of October	Denver	

Site sign-off

Signed:



Name:

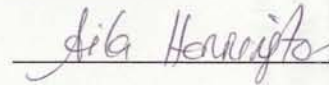
Gilmar Jesus

Date:

31.08.2005

Group Employee Sign-off

Signed:



Name:

Aila Harrington

Date:

31.8.2005

Location:	Newgrange Meats
Date of visit:	15 November 2005
Site contact name:	Denver Willis

Purpose of visit:	Proposed Participants
Assessment of integrated constructed wetland systems	Denver Willis Aila Harrington

Summary of visit:
<p>Assessment of general performance of ICWs and sampling of effluent quality.</p> <p>Overall satisfactory performance</p> <p style="color: red; transform: rotate(-45deg); font-weight: bold;">For inspection purposes only. Consent of copyright owner required for any other use.</p>

Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Water levels	Pipes to be turned up in pond 3, 4, and 5 to increase water depth by 5cm	V. Murray	22-11-05
2.	Water samples taken from inlet, outlet, lysimeters and odd numbered ponds 3, 5, 7	Water samples to be taken and analysed for parameters on a bi-annual basis.	D. Willis	15-11-05
3.	Checklist	Continuous daily and weekly checklists to be completed	V. Murray	15-11-05
4.	Discharge licence	Discharge licence has not been granted yet therefore no discharge is to occur		

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Site sign-off

Signed:



Name:

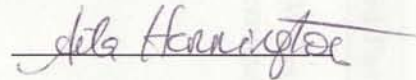
Gilmar Jesus

Date:

15-11-05

Group Employee Sign-off

Signed:



Name:

Aila Harrington

Date:

15-11-05

Location:	Newgrange Meats
Date of visit:	19-12-05
Site contact name:	Denver Willis

Purpose of visit:	Proposed Participants
Assessment of integrated constructed wetland systems at Newgrange Meats.	Denver Willis Victoria Kerr Aila Harrington Vincent Murray

Summary of visit:
<p>An assessment of the integrated constructed wetland systems was carried out to assess the performance, and to identify any issues that need attention.</p> <ul style="list-style-type: none"> -Water levels - Plant growth - Discharges , volumetric and quality - Pumps - Lysimeter performance

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Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Discharge from wetland	The effluent from the last pond is not satisfactory and no discharge is recommended at present.		
2.	Progress of pond 3	Plants have established well in pond 3 and water levels were increased slightly on day of site visit		
3.	Outlet pipes adjusted	The levels within pond 2, 3, 4, 5, 6 and 7 were adjusted slightly to increase water levels and retain effluent.	A. Harrington D. Willis V. Murray	19-12-05
4.	Level in balancing pond to be increased	The level within the balancing pond/lagoon is to be increased to provide further retention	V. Murray	19-12-05

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Site sign-off

Signed:



Name:

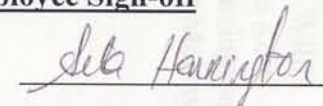
Gilmar Jesus

Date:

20-12-05

Group Employee Sign-off

Signed:



Name:

Aila Harrington 19-12-05

Date:

20-12-05

Location:	Newgrange Meats
Date of visit:	18-01-06
Site contact name:	Denver Willis

Purpose of visit:	Proposed Participants
Assessment of the integrated constructed wetland systems at Newgrange Meats.	Denver Willis Vincent Murray Aila Harrington

Summary of visit:
<p>Newgrange Meats ICW, good performance of wetland overall, but effluent concentration still to high to discharge to drain.</p> <p>Management agreement signed on site for the next 12 months.</p> <p>Flow meter not up and running yet.</p>

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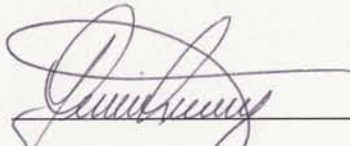
Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Outlet and inlet pipes between all ponds	Pipes to be cleaned of debris and vegetation to avoid blockages	Vincent Murray	18-02-06
2.	Pond 3 water levels	The water level in pond 3 is to be lowered to avoid damage to plants.	Vincent Murray	18-01-06
3.	Discharge	No effluent is allowed to discharge from the wetland system – quality not acceptable	Vincent Murray	18-02-06
4.	Discharge licence – outlet sampling point	Location of sampling point at the outlet from the wetland to be established. Location should ideally be prior to other waters connecting to the wetland discharge to provide accurate reading of the wetlands performance.	Denver Willis o contact Paul McShane	25-01-06
5.	Outlet sampling point location	The location of the outlet sampling point to be agreed with Meath Co. Co.	Denver Willis	18-02-06

	Discussion Point	Action	Responsible	Due date
6.	Water meter reading 33676 (19-12-05) 34999 (18-01-06)	1323m ³ last month On average 63m ³ /day Water meter to be installed at inlet and outlet of wetland.	Niall Tormey	18-02-06
7.	Yard areas discharging to wetland	The areas that are discharging to the wetland are to be highlighted	Denver Willis	18-02-06

Site sign-off

Signed:



Name:

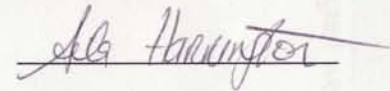
Gilmar Jesus

Date:

18-01-06

Group Employee Sign-off

Signed:



Name:

Aila Harrington

Date:

18-01-06

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Location:	NEWGRANGE MEATS
Date of visit:	28 April 2006
Site contact name:	Victoria Kerr

Purpose of visit:	Proposed Participants
Assessment of integrated constructed wetlands at Newgrange Meats.	Victoria Kerr Aila Carty Gilmar Jesus Alan O'Dwyer

Summary of visit:
<p>Newgrange Meats</p> <p>A walk around the wetlands at Newgrange with V. Kerr, A. Carty, G. Jesus and A. O'Dwyer to assess and discuss the wetland. Overall the wetland is performing satisfactorily with water depths at appropriate levels and good plant growth in all ponds. There was no discharge from the wetland. I went through the monitoring procedures that need to be carried out daily and weekly – responsible: Gilmar Jesus.</p>

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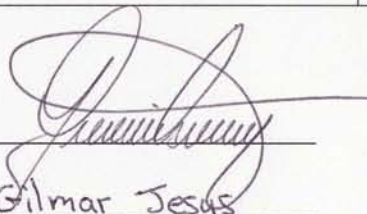
Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Settling lagoon	The level in the settling lagoon can be dropped slightly over the next 4 weeks, this must be done very gradually and no greater than 10cm over the next 4 weeks.	G. Jesus	28-05-06
2.	Lysimeter 2	The area where the effluent is collected from lysimeter 2 in pond 8 to be tidied up, to allow for the proper collection of effluent in the chamber.	G. Jesus	28-05-06
3.	Water levels	Water levels in all ponds to be maintained as they are	G. Jesus	28-05-06
4.	Maintenance of water in last ponds	The water in the last pond and emergency pond to be maintained – for recycling later through the wetland during the summer.	G. Jesus	
5.	Flow meters	Flow meters to be installed at the inlet and outlet of the wetland.	Alan O'Dwyer	28-05-06

	Discussion Point	Action	Responsible	Due date
6.	Monitoring checklist	Updated monitoring checklist to be sent to Gilmar for daily and weekly checks	A. Carty	5-05-06
7.	Sampling	Water samples were taken from ponds 1, 3, 5, 7 and 9.	V. Kerr	28-04-06

Site sign-off

Signed:



Name:

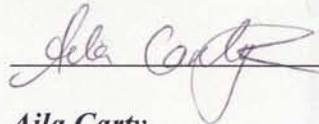
Gilmar Jesus

Date:

28-4-2006

Group Employee Sign-off

Signed:



Name:

Aila Carty

Date:

28-4-2006

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Consent of copyright owner required for any other use.

Location:	Newgrange Meats
Date of visit:	30 May 2006
Site contact name:	Gilmar Jesus

Purpose of visit:	Proposed Participants
Assessment of integrated constructed wetlands at Newgrange.	Victoria Kerr Aila Carty Gilmar Jesus

Summary of visit:
<p>NEWGRANGE</p> <p>A walk around the wetlands at Newgrange with Victoria Kerr, followed by a discussion with Gilmar on the procedures that need to be carried out over the next month on the wetland.</p> <p>Water levels in ponds 1-4 had dropped (10cm), due to no kill for several days. Water levels high in ponds 5-10, especially in the last two ponds. To drop the level in the last two ponds and to ensure that the effluent increase the levels to such a point that there is a risk of the pond spilling over, the level in pond 9 is to be dropped by 60cm and land spread. Any effluent land spread is to be recorded. All other pipe level to be maintained. The level in the settling lagoon has been dropped and is to be reduced by a further 10cm over the next month. There was no discharge from ponds 1-5.</p> <p>It is recommended that the embankments are cut enough to provide easy access around the wetland for monitoring.</p> <p>The lysimeters have not been checked for volumes since the last site visit. It is important to check them every week to provide a proper record. Other checks and monitoring to be filled in the daily and weekly. Gilmar said that he is expecting the flow meters to be installed next week at both the inlet and outlet of the wetland, by Alan O'Dwyer and Austin Weir.</p> <p>Good plant growth in most pond. 50% of the <i>Glyceria</i> in pond 1 has not come back after the winter. Gilmar is expecting some one else on site to assist him in the monitoring and maintenance of the ICW.</p>

Discussion points and actions arising

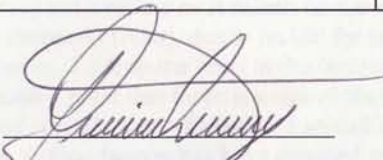
	Discussion Point	Action	Responsible	Due date
1.	Settling lagoon	Level in settling lagoon to be dropped 10cm over the next month	Gilmar Jesus	30/6/06
2.	Embankments	The grass on top of the embankments should be cut enough so to provide access around the wetland.	Gilmar Jesus	15/06/06
3.	Monitoring	Monitoring checklist to be filled in daily and weekly as required	Gilmar Jesus	30/05/06
4.	Lysimeter	Lysimeters are to be checked weekly	Gilmar Jesus	
5.	Lysimeter 2 collection container	The area for collecting the effluent from the lysimeter in pond 8 should be tidied up to ensure proper monitoring	Gilmar Jesus	
6.	Flow meters	Flow meters to be installed at inlet and outlet	Alan O'dwyer and Austin Weir	30/06/06
7.	Pond 9	Water level in pond 9 is to be dropped by 60cm and land spread. Volume of effluent spread and location of spread land to be recorded	Gilmar Jesus	9/06/06

Site sign-off

Signed:

Name:

Date:


GILMAR

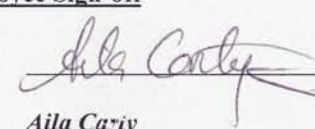
30 May 2006

Group Employee Sign-off

Signed:

Name:

Date:


Aila Cariy

30 May 2006

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Location:	Newgrange Meats
Date of visit:	27 June 2006
Site contact name:	John Collins

Purpose of visit:	Proposed Participants
Assessment of integrated constructed wetlands	Aila Carty Victoria Kerr John Collins Gilmar Jesus

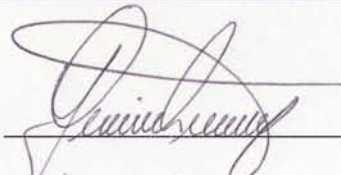
Summary of visit:
<p>Newgrange Meats</p> <p>A walk around the wetlands was undertaken to assess the performance and state of the ICW. There has been good plant growth in ponds 2-8; with pond 1 having some die off of plants. Water levels have dropped considerably in all ponds, including the settling lagoon. The level in the settling lagoon is to be dropped a further 5cm. Water levels to be maintained as they are in all ponds. The final ponds can have the effluent re-circulated to the upper section of the ponds.</p> <p>Monitoring is being carried out.</p> <p>The flow meters are in the process of being installed and should be completed next week.</p> <p>Overall there appears to be good performance.</p>

Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Flow meters	Installation of flow meters to be completed next week	Alan O'Dwyer	3-7-06
2.	Water levels in ponds	Water levels to be maintained in all ponds	Gilmar Jesus	27-6-06
3.	Settling lagoon level	The effluent is to be dropped a final 5cm in the settling lagoon. This will bring the effluent level in the lagoon to a minimum.	Gilmar Jesus	27-7-06
4.	Re-circulating effluent	Re-circulating effluent is to continue from the deep ponds to the upper section during dry weather only.	Gilmar Jesus	27-7-06
5.	Embankments	The tops of the banks should be mowed or grazed just enough to allow easy access around the site.	Gilmar Jesus/John Collins	27-7-06

Site sign-off

Signed:



Name:

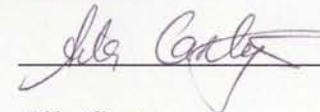
Gilmar Jesus

Date:

27 June 2006

Group Employee Sign-off

Signed:



Name:

Aila Carty

Date:

27 June 2006

For inspection purposes only:
Consent of copyright owner required for any other use

Site Visit Report

Dungannon Meats Group

Location:	Dunbia Slane
Date of visit:	10 August 2006
Site contact name:	Gilmar Jesus

Purpose of visit:	Proposed Participants
Assessment of constructed wetland system	Gilmar Jesus Victoria Kerr Aila Carty

Summary of visit:
<p>Lagoon – effluent level at its lowest. The floc has formed over the entire lagoon. No smells on the day.</p> <p>Pond 1 – Discharge from pond 1. Plant growth has been knocked back considerably, likely caused by high concentration in pond 1. Low water level in pond. A channel is evident at the upper end of the pond, where plants are not established and there is no dispersion of flow, also due to low water level. Plant growth is ok where there is no effluent (higher ground).</p> <p>Pond 2 – No discharge, very low water level. Good plant growth at the upper end of the pond, with greater open areas at the lower end.</p> <p>Pond 3 – Deep water level (300mm). Relatively good plant growth, but still some open areas remaining, especially at the upper end of the pond. Main plant species <i>Carex riparia</i>. Water level was dropped to reduce the level in the pond. Discharge</p> <p>Pond 4 – Good plant growth, but still some open areas remain, approx. 20%. Water depth 50-200mm. No discharge.</p> <p>Pond 5 – No discharge. Main species in the pond are <i>Carex</i>, <i>Iris</i>, <i>Eleocharis</i>, <i>Glyceria</i>, and <i>Cyperus</i>. Good growth, but some areas where plants have not established grass has grown, especially on higher ground. Water depth 50-200mm.</p> <p>Pond 6 – No discharge. Good plant growth of <i>Carex</i>. There are some open areas toward the south bank, where water depth is deeper 200-300mm. main species in the pond are <i>Carex</i>, <i>Scirpus maritimus</i>, <i>Glyceria</i> and <i>Phalaris</i>. Pipe was adjusted to allow water to pond 7 and lower water level in pond 6. 15% of open area.</p> <p>Pond 7 – No discharge. Very low water level. Water in the pond appeared dirty. Good plant growth, with some open areas where plant establishment has failed. Replanting would be suitable now while water levels are low. Main species in the pond area <i>Sagittaria</i>, <i>Carex</i>, <i>Butomus</i>, <i>Scirpus</i>, <i>Phalaris</i> and <i>Iris</i>.</p> <p>Pond 8 – Good plant growth. Discharge. Pipe turned down to reduce water level.</p> <p>Pond 9 – Water level 400mm from outlet pipe. Very low water level. Water appeared dirty.</p> <p>Monitoring checklist has not been filled in since 20-6-06</p> <p>Flow meters have been installed, the outlet meter requires a ladder to be installed to check the meter reading.</p> <p>Recirculation of effluent from the lower section to the upper section to be carried out over the next month.</p>

Discussion points and actions arising

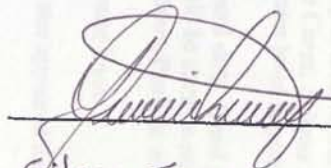
	Discussion Point	Action	Responsible	Due date
1.	BOD, COD and Ammonia concentrations	The BOD, COD and Ammonia concentrations of the influent to pond 1 are being monitored weekly	Victoria Kerr	
2.	Flow meters	Inlet and outlet flow meters have been installed	Alan O'Dwyer	10-8-06
3.	Flow meter reading	Some one to be appointed responsible for taking flow meter reading (daily)	Gilmar Jesus	17-8-06
4.	Monitoring checklist for wetland to be filled in on a continuous basis	The monitoring checklist must be filled in daily and weekly as indicated on the checklists.	Gilmar Jesus	10-8-06
5.	Effluent re-circulation	The effluent is to be re-circulated to the settling lagoon at the upper end of the system to empty the effluent from the final and emergency ponds.	Gilmar Jesus	17-8-06

6.	Discussion Point	Action	Responsible	Due date
	Replanting recommended in areas where plants have not established	Replanting would be easily carried out now in areas where water levels are low		
7.				
8.				
9.				

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Site sign-off

Signed:



Name:

Gilmar Jesus

Date:

16/08/06

Group Employee Sign-off

Signed:

Aila Carty

Name:



Date:

15 August 2006

Location:	Dunbia Slane
Date of visit:	31 October 2006
Site contact name:	Victoria Kerr

Purpose of visit:	Proposed Participants
Assessment of constructed wetlands at Exel and Newgrange	Victoria Kerr Aila Carty John Collins Gilmar Jesus

Summary of visit:

Slane

A walk over of the wetlands. Sheep have been grazing the embankments. All ponds were discharging, with greater flows from the lower ponds 6-8.

Outlet pipe in ponds 1-3 were raised slightly to increase water depth to ensure that the entire pond area is covered and to decrease preferential flows from inlet to outlet.

The last pond and emergency ponds are full. There is pipe and pump next to the final pond to pump effluent up to the upper ponds.

The manhole in which the outlet flow meter has been installed in full of water.

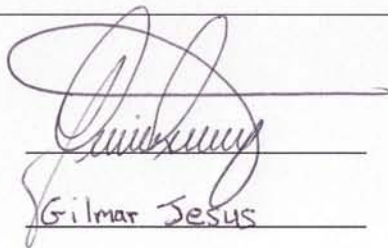
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Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Outlet pipes raised in ponds 1, 2 and 3	The outlet pipes were raised to increase water depth in the ponds to allow for increased residence.	Aila Carty	
2.	Flow meter manhole	The water filling the flow meter manhole needs to be looked at.	Gilmar Jesus	30-11-06
3.	Monitoring checklist to be forwarded to Aila.	Daily and weekly checks to be forwarded to ailacec@gamil.com including effluent quality data and flow readings	Gilmar Jesus and Victoria Kerr	6-11-06

Site sign-off

Signed:



Name:

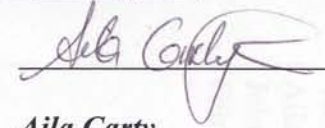
Gilmar Jesus

Date:

2 November 2006

Group Employee Sign-off

Signed:



Name:

Aila Carty

Date:

2 November 2006

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Location:	Dunbia Slane
Date of visit:	7 December 2006
Site contact name:	Victoria Kerr

Purpose of visit:	Proposed Participants
Site visit to assess the constructed wetlands and review performance.	Victoria Kerr Aila Carty Gilmar Jesus

Summary of visit:
<p>Slane</p> <p>Water levels within all ponds including the settlement lagoon are very high; this is due to the prolonged wet weather. In order for continued containment of the effluent within the wetland, outlet pipes can be adjusted temporarily to increase capacity. The last set of results from the outlet of the wetland were BOD 77mg/l and ammonia 84.3mg/l, this is well in excess of the limit set out in the discharge licence BOD 10mg/l and ammonia 1mg/l.</p> <p>Once the effluent reaches the limit set out in the discharge licence it can be discharged to the watercourse.</p> <p>It is recommended to re-circulate the effluent from the last pond to pond 1 rather than pond 4.</p> <p>Monitoring has been carried out over the past two months, including daily checks, lysimeter readings and flow meter readings. Flow meter readings recording volumes to the wetland show regular over loading.</p>

Discussion points and actions arising

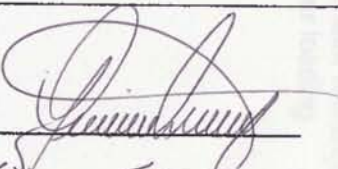
	Discussion Point	Action	Responsible	Due date
1.	Slane Re-circulation of effluent from last pond	The effluent from the final pond is to be re-circulated and discharged to pond 1.	Gilmar Jesus	8 Dec 06
2.	Adjust outlet pipes	The outlet pipes in pond 1 are to be lowered to reduce water depth in the first pond	Gilmar Jesus	8 Dec 06
3.	Information to be compiled for EPA IPC licence as per letter dated 28 th November	Information on the lysimeters – construction and installation Details on how and when the emissions from ICW will achieve predicted effluent concentration	Aila	January 07
4.	Site visit reports	Site visit reports prepared as part of the maintenance of the ICW to be included in the response to the EPA letter	Aila Victoria	Jan 07
5.	Lysimeter results	Reading from the lysimeters will be calculated and graphed to demonstrate permeability rates	Aila	Jan 05

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	Discussion Point	Action	Responsible	Due date
6.	Volumetric loading to the wetland	Readings from the meter recording the volumes discharging to the wetland indicate over loading. The cause of the overloading needs to be assessed and measures to reduce volumes need to be deployed.		
7.	Outlet meter	The well installed for the meter reading outflow volumes from the wetland needs to be re-installed and re-sealed to prevent water entering.	Gilmar	

Site sign-off

Signed:



Name:

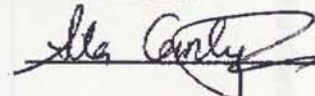
Gilmar Jesus

Date:

11/12/06

Group Employee Sign-off

Signed:



Name:

Aila H. Carty

Date:

8 December 2006

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Location:	Newgrange Meats
Date of visit:	31 January 2007
Site contact name:	Victoria Kerr

Purpose of visit:	Proposed Participants
<p>Assessment of constructed wetland performance Meet with Victorai Kerr and Alan O'Dwyer to discuss actions to be taken for the next four weeks and O & M manual.</p>	<p>Victoria Kerr Alan O'Dwyer Aila Carty</p>

Summary of visit:
<p>A walk round the wetland to view the present situation and highlight issues where action is required.</p> <p>Discussion with V. Kerr and A. O'Dwyer on management and progress since previous site visit</p> <p>Water levels in all ponds remain very high, water depths between 300-750mm (ponds 1-8).</p> <p>There was no discharge from the ponds, except from pond 7. The water depth in pond 1 has been raised by an additional 300mm to retain effluent at the upper section of the system until land spreading can commence.</p> <p>Water depths at the outlet of each pond is being monitored every second day by Alan.</p> <p>Water depth in pond 4 has decreased by 300mm due to no discharge from pond 3 and seepage through the lower point of the outlet pipe.</p> <p>Flow meter has been re-installed and flow monitoring commenced again on Wednesday (31/01/07).</p> <p>Operation and maintenance manual reviewed.</p>

Discussion points and actions arising

	Discussion Point	Action	Responsible	Due date
1.	Water levels in ponds 1-9	Water levels in ponds 1, 3-9 to be maintained. Water depth in pond 1 has almost increased by 300mm. Once effluent discharges from pond 1, extra 300mm pipe to be placed on the outlet pipe of pond 2.	Alan O'Dwyer	31/01/07-14/02/07
2.	Pond 4 water depth	Water depth in pond 4 has dropped by 300mm, water level to be maintained.	Alan O'Dwyer	14/02/07
3.	Lysimeter 2 (below pond 5)	The lysimeter collection area still to be upgraded.	Alan O'Dwyer	14/02/07
4.	Flow meter	The flow meter that monitors effluent volumes discharging to the wetland has been re-installed and monitoring has commenced again. Flow meter readings to be recorded daily.	Alan O'Dwyer	31/01/07
5.	Land spreading	Assess possibility of land spreading effluent from last two ponds by mid February.	Victoria Kerr Alan O'Dwyer	14/02/07

	Discussion Point	Action	Responsible	Due date
6.	Volumes being treated through wetland	Water usage in the factory has been +/- 100m ³ /day, therefore volumes in excess of 100m ³ are due to dirty yard run-off. Area of dirty yard to be confirmed	V. Kerr	14/02/07
7.	Operation and maintenance manual	The draft O & M manual was discussed and appendicies B, C, D, E, F, J, L, M, N and P to be filled in.	Alan O'Dwyer	31/01/07
8.	Staff gauges and rain gauge	Order and deliver rain gauge and staff gauges to complete O. & M	Victoria Kerr	14/02/07
9.	O & M training	O & M training to be carried out once all monitoring equipment is in place.	Aila Carty Victoria Kerr Alan O'Dwyer	
10.	Planting	Quote from Dermot Boyle for planting pond 9 - € 1000. Quote to be sent to Victoria.	Aila Carty	31/01/07
11.	Area and capacity of ponds	Details of the area and capacity of all ponds at Slane and Kilbeegan to be forwarded to Victoria.	Aila Carty	05/02/07


	Discussion Point	Action	Responsible	Due date
12.	Appendix P of O & M manual	Appendix P of O & M manual to be completed	Aila Carty	06/02/07
13.	Assessment of effluent volumes on site, capacity of wetlands and possible requirements for additional wetland area or alternative treatment	The present volumes of effluent produced on site and future plans for the facility to be assessed in conjunction with the capacity of the wetland and requirement of additional treatment such as additional wetland area or land spreading for volumes in excess of 100m3 per day.	Victoria Kerr Aila Carty	7/02/07
14.	Next site meeting	The next site visit	Victoria Kerr Alan O'Dwyer Aila Carty	End February 07

Site sign-off

Signed: _____

Name: _____

Date: _____



 Gilmar Jesus

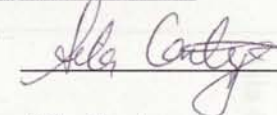
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


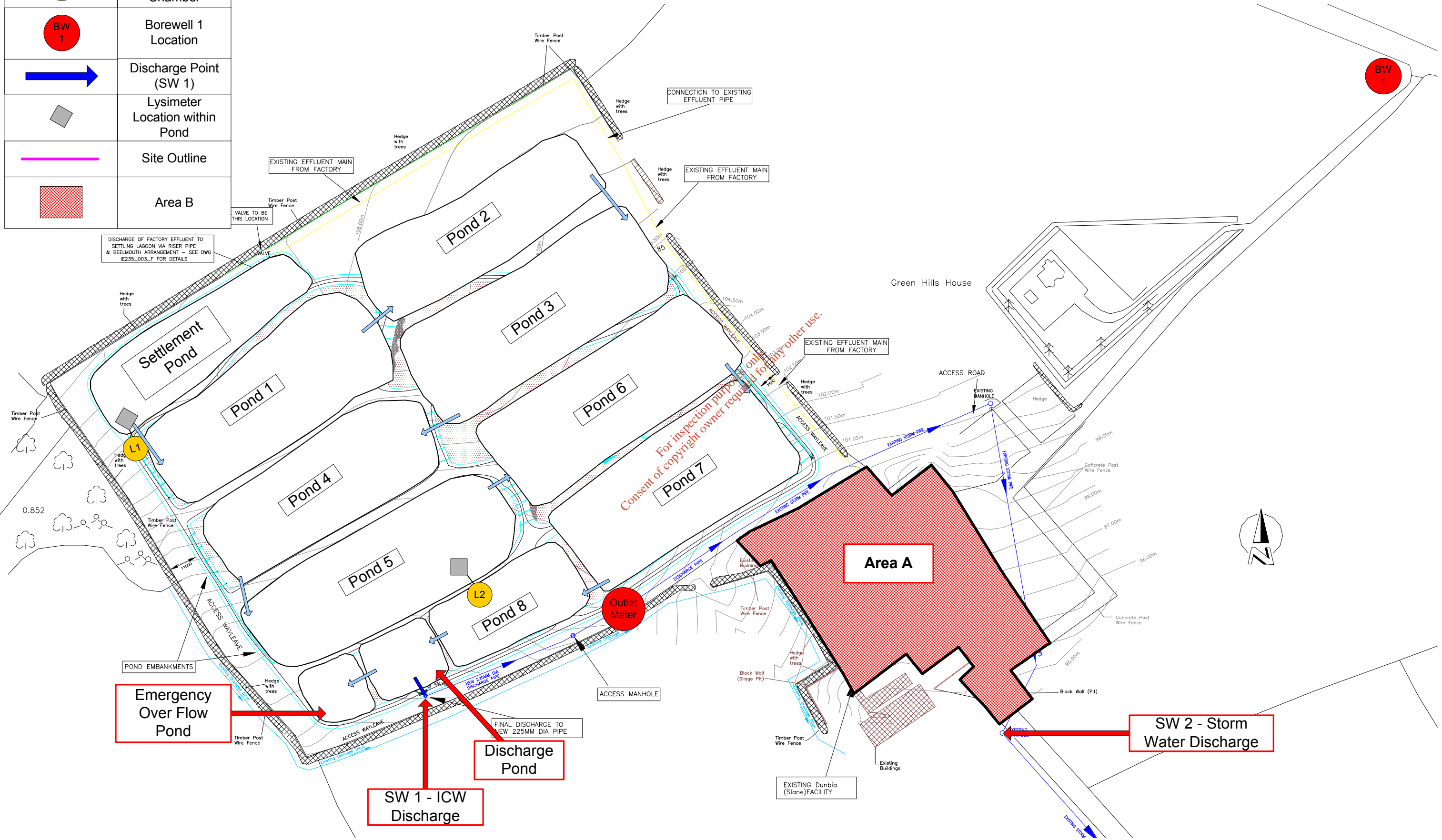
 Aila Carty

 4 February 2007

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Attachment H1.2 Map Showing Location of AREA : B Storage

KEY	
	Direction of Effluent Flow
	Lysimeter Collection Chamber
	Borewell 1 Location
	Discharge Point (SW 1)
	Lysimeter Location within Pond
	Site Outline
	Area B



INSTALLATION OF LYSIMETERS

Materials used for installation: Machinery: excavator, lysimeter, mesh, shovel, pea gravel, saw, level, measuring tape, inch diameter pipe, glue.

The pictures provided are taken from the installation of lysimeters at an existing wetland.

The installation procedure described is a general description of how a lysimeter is installed, however, site conditions vary and therefore the installation procedure may differ slightly between sites.

An assessment of site conditions should be carried out prior to installing the lysimeter, such as groundwater level and soil conditions.

It is important that the system is installed correctly to ensure accurate readings are achieved of the infiltration rates.



Select a suitable location for the lysimeter, considering access and collection of the effluent.

The area where the lysimeter is to be placed in the pond is dug out to the specified depth and width.

The area in which the lysimeter is placed must be level and secure, as shown above.

Measure the height from the top of the lysimeter to the wetland floor.

A 0.5cm diameter pipe is connected to the outlet of the collection chamber at the bottom of the lysimeter, as shown above.



A mesh is placed on the bottom of the lysimeter to prevent dirt getting into the collection chamber, which would otherwise block the outlet pipe, see white mesh in the lysimeter above.

Approximately 5cm thickness of pea gravel is placed over the mesh (as above). And a second mesh is then placed over the gravel (below).



The embankment is dug out to allow the pipe from the lysimeter to go through the embankment (as above). A collection container is placed onto the end of the pipe (a fall is needed), into which the effluent will flow and collected for monitoring.



The lysimeter is secured by placing the clay firmly around the system.



The above Lysimeter was installed 0.8m below the bottom of the wetland floor.

The soil excavated is carefully redistributed over the lysimeter and compacted. The channel dug from the pond through to the outer embankment of the wetland is also covered in.

Newgrange Meats, Co. Meath Groundwater Quality (from spring)

Parameter	Units	Drinking Water Standards SI No. 439 of 2000	Spring
		Max. Admissable Conc.	g/w sample Sampled 10/2/05 Analysed: 10/2/05
pH		6.5 < pH < 9.5	
Conductivity	uS/cm at 20°C	2,500	
Total Hardness	mg/l CaCO ₃		
Total Alkalinity	mg/l CaCO ₃		
Total Dissolved Solids	mg/l at 180°		
Ammonium	mg/l NH ₄	0.3	1.83
Calcium	mg/l Ca	200	
Chloride	mg/l Cl	250	153.00
Iron	mg/l Fe	0.2	
Lead	mg/l Pb	0.01	
Magnesium	mg/l Mg	50	
Manganese	mg/l Mn	0.05	
Nitrate	mg/l NO ₃	50	11.58
Nitrite	mg/l NO ₂	0.5	0.10
Phosphorus (Total)	mg/l P	2.18	0.03
Potassium	mg/l K	12	
Sodium	mg/l Na	200	
Sulphate	mg/l SO ₄	250	
COD	mg/l		8
suspended solids	mg/l		<5
Total Coliforms	CFU per 100ml	Nil	
Faecal Coliforms	CFU per 100ml	Nil	0

TABLE E.2(ii): EMISSIONS TO SURFACE WATERS - Characteristics of the emission (1 table per emission point)

Emission point reference number : SW 1- Discharge from ICWs

Parameter	Prior to treatment (SE1)				Predicted Discharge (SW 1)				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	
BOD	875	875	87.5	22750	10	10	0.5	182.5	
COD	1200	1200	120	31200	40	40	2	730	
Nitrates	0.2	0.2	0.02	5.2	50	50	2.5	912.5	
Ortho Phosphate	50.215	50.215	5.0215	1305.6					
Total Phosphate	51.123	51.123	5.1123	1329.2	0.5	0.5	0.025	9.125	
Chloride	287	287	28.7	7462					
Ammonia	608.73	608.73	60.873	15827	1	1	0.05	18.25	
Total Suspended Solids	632	632	63.2	16432	10	10	0.5	182.5	
Nitrite	0.043	0.043	0.0043	1.118					

NB: SE1 refers to the Wetlands receiving 100m³ per day (Based on 5 days per week)
 SW1 refers to the discharge occurring at 50m³ per day (Based on 7 days per week)

**Aila H. Carty,
Environmental Consultant**

**1 Beechwood Ave,
Newtown, Cobh,
Co. Cork.**

**Tel/fax: +353 21 4201008
Mob: + 353 86 8092003
Email: ailacec@gmail.com**

15 February 2007.

Victoria Kerr,
Dunbia (Slane) Ltd,
Beaupairc,
Navan,
Co. Meath.

Re: Constructed Wetland performance at Dunbia Slane.

Victoria,

As requested please find the predicted performance of the constructed wetlands at Slane as well as details on any measures that must be implemented to ensure these limits are met, including the timescale.

Yours sincerely

Aila Carty

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Perdicted final effluent concentration

Parameter	Concentration
BOD	10 mg/l
COD	40 mg/l
Suspended solids	10 mg/l
pH	6-9 pH unit
Nitrates	50 mg/l
Phosphorus	0.5 mg/l
Ammonia	1 mg/l
Oil, fats and grease	5
Temperature	Ambient

Actions and Timescales to meet discharge licence consent

Actions	Timescales
Maximum discharge to wetlands 100m ³ /day	Continuous
Effluent to be discharged to wetland to be comprised only of wash waters and dirty yard run-off, the concentration of which must not exceed the limits detailed in the design specification.	Continuous
Undertake the monitoring, operation and maintenance of the wetlands as specified in the Operation and Maintenance Manual.	Continuous
Drain pond 8-10 and re-circulate or land spread (whilst still ensuring that the discharge rate to pond 1 is no greater than 100m ³ /day)	March 1 st – 31 st March '07
Lower water depths within pond 1-7, by lowering the outlet pipes 1cm at a time.	15 th March – 30 th April '07
Drain final pond again if necessary once water levels have been lowered in 1-8.	15 th April – 15 th May '07
Plant final ponds (8 and 9) with aquatic vegetation. Facilitate further BOD and SS removal.	15 th May – 1 st June
Cease adjustment of water levels in the settlement lagoon, to ensure there are no flushes of effluent through the system.	Effective immediately and maintain
Proposed discharge of effluent from final pond.	Winter 2007

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SECTION A NON-TECHNICAL SUMMARY**Non-Technical Summary of IPPC Licence Application**

A non-technical summary of the application is to be included here. The summary should identify all environmental impacts of significance associated with the carrying on of the activity/activities, and describe mitigation measures proposed or existing to address these impacts. This description should also indicate the normal operating hours and days per week of the activity.

The following information must be included in the non-technical summary:

A description of:

- the installation and its activities,
- the raw and auxiliary materials, other substances and the energy used in or generated by the installation,
- the sources of emissions from the installation,
- the conditions of the site of the installation,
- the nature and quantities of foreseeable emissions from the installation into each medium as well as identification of significant effects of the emissions on the environment,
- the proposed technology and other techniques for preventing or, where this not possible, reducing emissions from the installation,
- where necessary, measures for the prevention and recovery of waste generated by the installation,
- further measures planned to comply with the general principles of the basic obligations of the operator i.e.
 - (a) all the appropriate preventive measures are taken against pollution, in particular through application of the best available techniques;
 - (b) no significant pollution is caused;
 - (c) waste production is avoided in accordance with Council Directive 75/442/EEC of 15 July 1975 on waste; where waste is produced, it is recovered or, where that is technically and economically impossible, it is disposed of while avoiding or reducing any impact on the environment;
 - (d) energy is used efficiently;
 - (e) the necessary measures are taken to prevent accidents and limit their consequences;
 - (f) the necessary measures are taken upon definitive cessation of activities to avoid any pollution risk and return the site of operation to a satisfactory state.
- measures planned to monitor emissions into the environment.

Supporting information should form **Attachment N^o A**.

SECTION A NON-TECHNICAL SUMMARYIntroduction

Dunbia (Slane) is part of the Dunbia Group which is a family owned business by two brothers Jim and Jack Dobson. The installation slaughters Cattle and produces sides and quarters for further processing and direct sales to other sites. The average daily processing figure for Dunbia (Slane) is 130 cattle.

Operating hours are as follows:

Slaughter Process	7.00 – 19.30
Lairage Area & Yard Area	Potentially 24hours

The days of operation for the site are Monday to Friday perhaps with an occasional Saturday during peak times of year.

The Dunbia (Slane) installation is located just off the N2, approximately 4.5Km South of Slane in Co. Meath.

1. Emissions and their control

- Abatement of point source emissions to air
There are two main sources of emissions to air, the Boiler plant and Generator plant. There are currently 3 abatement technologies used for the reduction of point source emissions to air:
 1. Use of Low Sulphur Diesel to reduce Sulphur emissions to air
 2. Preventative Maintenance programme for the Generator and Boiler to ensure expected efficiencies are met and that emissions to air are optimised.
 3. The use of an appropriate stack height for the boiler to ensure sufficient particulate dispersal.
- Abatement of point source emissions to surface water and sewer
There are two releases to surface water from the site and these are from the Integrated Constructed Wetlands (ICWs), and the yard run off (Storm water). The emissions from the ICWs are regulated by the local council.

Abatement technologies used within the ICW system are:

1. Continual gross cleaning within production areas with brush and shovel
2. Initial Screening to 1mm removing gross solids by meva screen
3. Further settling and removal of solids within initial holding lagoon
4. Individual settling and removal of solids and organics within subsequent treatment ponds

Abatement technology used for storm water discharge is:

1. Yard water only goes to storm from the clean yard area, the dirty yard area drains to the ICW.
- Abatement of point source emissions to groundwater
Groundwater flow is thought to flow to the South..
There is as a matter of course a small amount of infiltration to the ground from each of the ponds and this is monitored by sampling of the lysimeters and the on-site borewell and as highlighted in Section F.

Abatement technology used to reduce point source emissions to groundwater is the engineered and compacted clay liners of the sequential treatment ponds to 300mm depth.

A hydrogeologist carried out monitoring which reported that the assimilative capacity of the spring discharge has been shown to provide adequate assimilative capacity for the discharge from the wetland. Therefore no impact on the River Boyne is anticipated.

- Control of fugitive emissions to air
Refrigeration gas, Maintenance Aerosols, and Fuel (Gas Oil) are used on the installation. The pipe work is regularly checked within the preventative maintenance system. There are minimal emissions to air from the refrigeration system. Maintenance Aerosols are used and are applied direct to plant and machinery where air emissions are released; these are kept to a minimum and used when required. Fuel such as, Gas Oil is used for the main combustion equipment within the installation and are BAT for the installation thus reducing potential emissions.
- Control of fugitive emissions to surface water, sewer and ground water
The installation has a number of storage vessels and tanks with substances varying from Fuels, Blood, Effluent, Chemicals (Cleaning and Maintenance). These are all stored on hardstanding and either/ and / or bunded and linked to a foul drainage system to ensure that fugitive emissions are mitigated as best possible.

A report by a hydrogeologist indicated that the natural permeability rating of the site is between 1×10^{-8} and 1×10^{-9} , and this is before the effects of the 300mm compacted clay liner have been taken into consideration.

There is a stop valve on the outlet from the wetlands that also reduces the possibility of a fugitive emission and there is also weekly sampling of the discharge pond.

- Odour
An odour assessment for the installation was not deemed necessary, as putrescible wastes are removed on a daily or bi-weekly basis. Odour is deemed to have an insignificant impact, see section E1.C (Odour and Potential Emissions). Also there have been no known complaints relating to odour, although this information has been requested from Meath County Council see attachment E1.4.

2. Management

- Dunbia (Slane) will be implementing an Environmental Management System as detailed within DISIP. Dunbia (Slane) is currently undergoing the introduction of a management system and has a dedicated environmental team to implement policies, procedures, materials and improvements.

3. Material Inputs

- Raw Materials selection
Raw materials selection for the installation is well controlled as no chemical, oil, fuel is allowed within the installation before being reviewed by Health and Safety, Technical, Maintenance, Purchasing and Environmental Departments. Materials such as cleaning chemicals and cooling water chemicals are required to meet certain specification to ensure both hygiene, environmental and safety levels before storage and use on site, and suppliers and regulating authorities are consulted on usage amounts and concentrations.

- **Water Use**

The installation is performing efficiently as the water usage is below the upper benchmark comparison for the sector with approx. 575 litres per animal. This is below the industry benchmark of between 700 to 100 litres per animal and further methods to reduce water usage will be investigated in the planned water audit.
- **Waste handling**
 - **Waste minimisation**

Minimisation of waste for Dunbia (Slane) is difficult due to the nature of the process where there is a lot of unavoidable waste.
 - **Waste recovery or disposal**

The main waste products from this site are animal by-products. These are divided into Category 1,2 and 3. All category 1 & 2 material with the exception of manure and digestive tract contents is collected and sent for rendering as is required by legislation and all manure and digestive tract contents is taken for landspreading. Category 3 material is split between being used for pet food or sent for rendering.
- **Energy**

There are plans to implement an Environmental Management System where further objectives will be made in tandem with current in-house measures.
- **Accidents and their environmental consequences**

Dunbia (Slane) is not a COMAH top tier or lower tier site and Section J has shown that there are no unacceptable risks / potential for release for the installation.
- **Noise and vibration**

Further to a noise assessment that was carried out in October 2006, the results in Section E and Section I show that there is little likelihood that noise from the installation will lead to an unacceptable noise impact at Noise Sensitive Receptors.
- **Monitoring**

Monitoring is currently carried out in house on the emission from the ICWs after treatment of the effluent to surface water and the discharge is also monitored by Meath County Council. Emissions to air for boiler plant are carried out yearly along with yearly services.
- **De-commissioning**

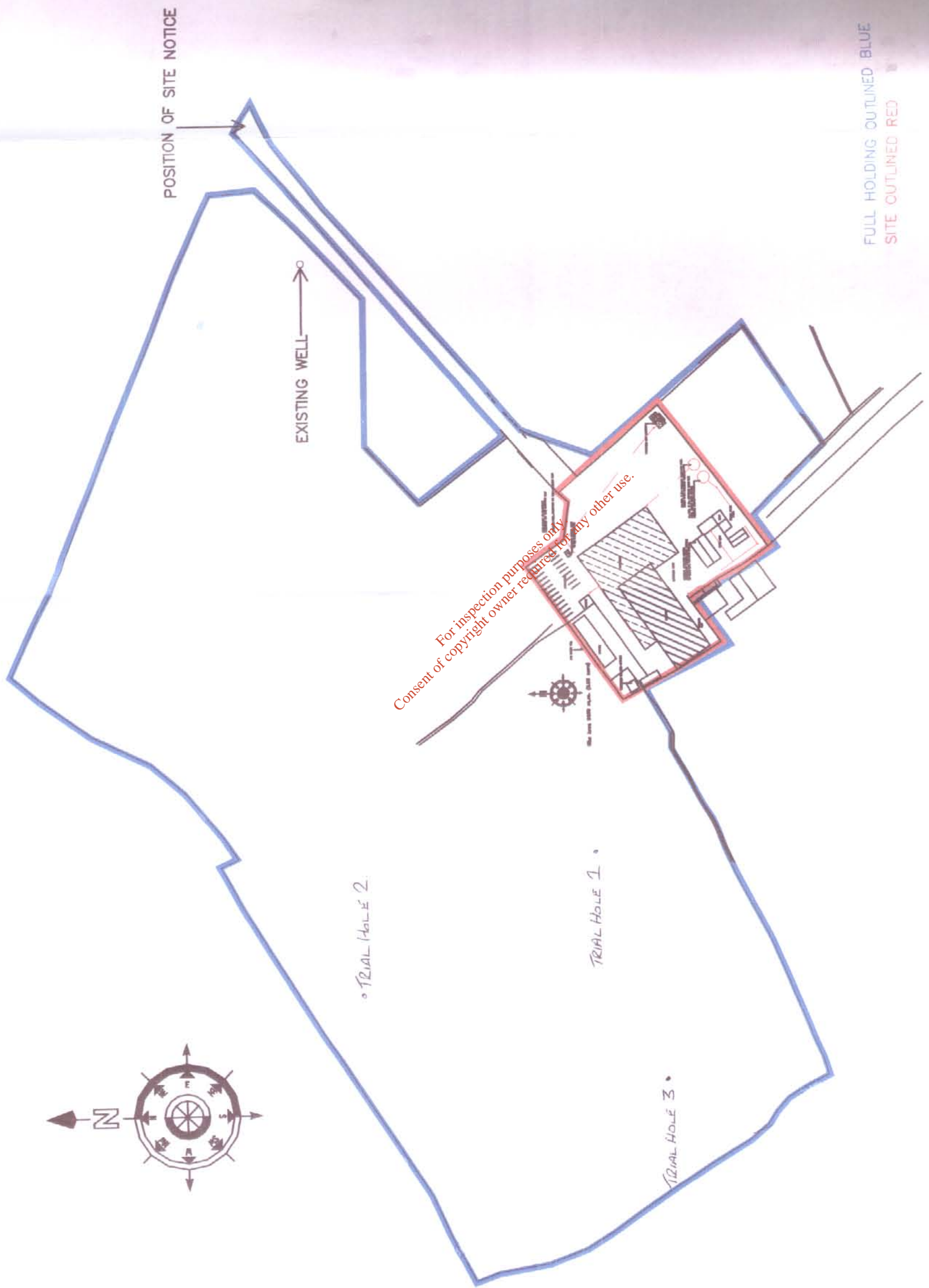
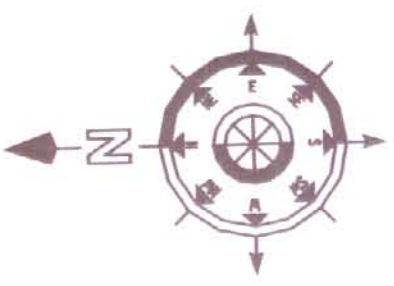
De-commissioning will be carried out as agreed with the regulator and as within Section K of the application. The site will be returned to its original state with all plant, pipework and buildings removed.
- **Habitats**

The Dunbia (Slane) installation is not within 2km of any SPAs or cSACs, although it is within 4.5km of a cSAC (River Boyne and River Blackwater (002299). Therefore the likelihood of an environmental impact from the installation affecting these areas is highly unlikely. However there are three NHAa within 6Km of Dunbia (Slane). pNHA Boyne Woods (001592) 4.5km, pNHA Slane River Bank (001591) 5.5km and pNHA Crewbane Marsh (000553) 5.75km away. There is a very low potential for impact to these areas due to their distance from the installation and the nature of the discharges from site. Also the emissions to air from the boiler are of such a minor nature that they should not cause any negative impacts to any of the above sites and the generator use is very infrequent that it would be deemed to cause no impact either.

**Dunbia (Slane)
Integrated Constructed Wetlands
Lysimeter Monitoring**

		Lysimeter 1	Lysimeter 2
Week No.	Date	Volume (l)	Volume (l)
Week 1	03/09/2006	1.5	0.5
Week 2	12/09/2006	3	0.5
Week 3	19/09/2006	2.5	1
Week 4	26/09/2006	2.5	1.5
Week 5	03/10/2006	1	0.5
Week 6	10/10/2006	3	0.3
Week 7	17/10/2006	3	0.8
Week 8	24/10/2006	1.8	1.2
Week 9	31/10/2006	5.4	0.8
Week 10	02/11/2006	2	1.2
Week 11	14/11/2006	2	1.6
Week 12	21/11/2006	2	1.9
Week 13	28/11/2006	2	2.2
Week 14	03/12/2006	6	2.2
Week 15	12/12/2006	6	4.2
Week 16	19/12/2006	3.2	N/A Under water level
Week 17	26/12/2006	3.2	N/A Under water level
Week 18	02/01/2007	2.2	N/A Under water level
Week 19	09/01/2007	2.2	N/A Under water level
Week 20	16/01/2007	6.4	N/A Under water level
Week 21	23/01/2007	18	N/A Under water level
Week 22	31/01/2007	20	N/A Under water level

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FULL HOLDING OUTLINED BLUE
SITE OUTLINED RED

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DRAWN BY: A. McGovern	DESIGNED BY: M.P.O' Grady	DATE: Nov. '02	SCALE: 1:500
U.S. Sheet No. Meath 28-06	02-		