Appendix F

Paspaley Pearls Oyster Trials at Port Hurd

DEPARTMENT OF BUSINESS, INDUSTRY AND RESOURCE DEVELOPMENT

Berrimah Veterinary Laboratories
Berrimah Farm
Makagon Road
BERRIMAH NT 0801

GPO Box 3000
DARWIN NT 0801
TELEPHONE: (08) 8999 2249
FACSIMILE: (08) 8999 2024

FINAL LABORATORY REPORT ACCESSION NO: 2005-0111 (SAN B31480)

PATHOLOGY

Fixed tissues of 12 *P. maxima* Ex Bynoe Harbour; identified as "healthy" and collected on 19-01-05 were submitted for examination for health monitoring purposes. Fixed tissues of a single *P. maxima* identified as "unhealthy" were also submitted. The age / class of the oysters was not supplied.

HISTOPATHOLOGY

"Healthy" Oysters x 12

There are no changes of histopathological significance.

Gonadal Maturation. 8/12 oysters are males and 2/12 are female and 1/12 is an haemaphrodite.

"Unhealthy" Oyster

Changes of histopathological significance are present in

Digestive gland. There is marked atrophy or degeneration of glandular tissue, with small remnants only of digestive diverticula and collecting ducts present amidst a dense fibrous stroma. A moderately intense, diffuse haemocytic cellular infiltration is present in the stromal tissues, extending into the remnants of the glands. There is no evidence of microbial or parasitic involvement.

Heart. A mild diffuse haemocytic infiltration s present, with low-grade focal aggregates of haemocytes apparent.

INTERPRETATION AND COMMENTS

The changes in the digestive gland are severe and appear irreversible. The changes are, in my opinion, long-standing (>2-3 weeks?). The cause is obscure. Although there is no direct histological evidence of a primary microbial (virus, fungal, bacterial or parasitic) cause, I would not exclude an earlier bacterial septicaemia. Single oyster involved? May be worth phoning to discuss.

John Humphrey
Veterinary Pathologist
31st January 2005

Distribution
Dave Mills / Heide Mumme; Paspaley Pearls
Murray Barton; Darwin Aquaculture Centre
Accessions; Berrimah Veterinary Laboratories

DEPARTMENT OF BUSINESS, INDUSTRY AND RESOURCE DEVELOPMENT

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Makagon Road
BERRIMAH NT 0801

GPO Box 3000
DARWIN NT 0801
TELEPHONE: (08) 8999 2249
FACSIMILE: (08) 8999 2024

FINAL LABORATORY REPORT **ACCESSION NO: 2005-0238 (SAN B31484)**

PATHOLOGY

Formalin fixed tissues of 8 *P. maxima* submitted for health examination. History of coated shell held at Marine Harvest.

HISTOPATHOLOGY

There are no significant histopathological changes. There is no evidence of inflammatory, degenerative or proliferative lesions in the oysters. There is no evidence of infection by microbial (viral, bacterial, fungal) organisms and no evidence of parasitic infections.

Gonadal Maturation

6/8 oysters are males and 2/8 are females. All are assessed as Stage 3 (spawning ripe).

INTERPRETATION AND COMMENTS

These oysters are histologically normal. Tissues are well developed and appear in excellent condition.

John Humphrey
Veterinary Pathologist
3rd March 2005

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Appendix G

Greenhouse Gases Calculations

CALCULATIONS OF POTENTIAL GREENHOUSE GAS EMISSIONS FOR PROPOSED BARRAMUNDI FARM AND LIVE-ON BARGE

1. Diesel Fuel Combustion from the Generator

It has been estimated that the amount of diesel required for the barge is around 1000 litres per month (i.e. 12,000 litres per annum).

Non-CO_2 Compounds

The publication '*Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2003 – Energy (Stationary Sources)*' issued by the National Greenhouse Gas Inventory Committee of the Department of the Environment and Heritage, Australian Greenhouse Office (AGO) provides information for the calculation of emissions of non-CO_2 compounds from stationary equipment.

Table 3 of this publication notes that **the oxidation factor for CO_2 is 99 percent**. The emission factors for the non-CO_2 compounds are provided in Table 26 of the referenced publication. It is also known that diesel has an **energy density of 38.6 MJ/L**.

The calculation of estimated annual emissions is done via the equation:

$$CO_2 \text{ emission / year} = (\text{litres / year} \times \underset{\text{Density}}{\text{Energy}}) \ \mathbf{X} \ \underset{\text{Factor}}{\text{Emission}} \ \mathbf{X} \ \underset{\text{Factor}}{\text{Oxidation}}$$

Given the estimate of 12,000 litres annual diesel consumption by the electricity generator on the barge, it is estimated that:

12,000 litres x 38.6 MJ/litre = **463,200 MJ = 463.2 GJ**
would be consumed on the barge.

Estimated annual emissions for non-CO_2 compounds are provided in Table 1 below.

Table 1: Annual Emissions for non-CO_2 compounds from the diesel-fired generator

Compound	Emission Factor [1] (Mg/PJ)	Estimated annual emission (t/yr)	GWP[2]	CO_2 equivalent (t/yr)
CH_4	5.2	2.38	23	**57.7**
N_20	0.6	0.28	296	**82.9**
NO_x	906.7	418.8	nd	nd
CO	341	156.4	nd	nd
NMVOC	93	42.6	nd	nd

(1) Sourced from Table 26 of Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2003, Energy (Stationary Sources), issued by the National Greenhouse Gas Inventory Committee of the Department of the Environment and Heritage, Australian Greenhouse Office.

(2) Global Warming Potential (GWP) provided by the Third Assessment (2001) by the Intergovernmental Panel on Climate Change (IPCC).

CO_2 Emissions

Calculation of CO_2 emissions was carried out according to the publication '*Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2003 – Energy (Stationary Sources)*'.

For automotive diesel oil, Table 2 of the above publication provides a **CO_2 Emission Factor of 69.7 kg CO_2 / GJ**.

The CO_2 emissions from the barge base generator would be:

(463.2 GJ) x 69.7 kg CO_2/GJ = 32,285 kg of CO_2

= **32.3 t of CO_2 / year**

When adding the contribution from methane and nitrous oxide determined earlier, the total CO_2 equivalent would be:

32.3 t of CO_2/year
+ 57.7 t of CO_2 eq/year
+ 82.9 t of CO_2 eq/year
= 172.9 t of CO_2 eq/year from the barge-base generator

2. Unleaded Fuel

It has been estimated that approximately 1000 litres of unleaded fuel per month would be required by the operation to run the outboard motor boats and the fish feeding pump. This represents around 12,000 litres of unleaded fuel per annum.

Non-CO_2 Compounds

The publication '*Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2003 – Energy (Transport)*' issued by the National Greenhouse Gas Inventory Committee of the Department of the Environment and Heritage, Australian Greenhouse Office (AGO) provides information for the calculation of emissions of non-CO_2 compounds for equipment using automotive gasoline fuel.

Table A.2 of this publication notes that **the oxidation factor for this type of fuel is 99 percent**. Table A.2 also notes that automotive gasoline has an **energy density of 34.2 MJ/L**. The emission factors for the non-CO_2 compounds are provided in Table A.5 of the referenced publication. The factors for 'motorcycles' have been used given the similarity in engine types with outboard motors and the small Honda pump engines.

The calculation of estimated annual emissions is done via the equation:

$$CO_2 \text{ emission / year} = (\text{litres / year} \times \underset{\text{Density}}{\text{Energy}}) \; \mathbf{X} \; \underset{\text{Factor}}{\text{Emission}} \; \mathbf{X} \; \underset{\text{Factor}}{\text{Oxidation}}$$

Given the estimate of 12,000 litres annual unleaded fuel consumption by the outboard motor boats and the fish feed pump, it is estimated that:

12,000 litres x 34.2 MJ/litre = **410,400 MJ = 410.4 GJ/year**

would be consumed.

Estimated annual emissions for non-CO_2 compounds are provided in Table 2 below.

Table 2: Annual Emissions for non-CO_2 compounds from the outboard motor boats and the fish feed pump

Compound	Emission Factor (1) (g/km)	Emission Factor(2) (g/l)	Emission Factor(3) (g/MJ)	Estimated annual emission (t/yr)	GWP(4)	CO_2 equivalent (t/yr)
CH_4	0.15	2.63	0.76	0.31	23	**7.13**
N_20	0.002	0.035	0.01	0.004	296	**1.184**
NO_x	0.21	3.68	1.067	0.4	nd	nd
CO	19.27	338	98.02	39.8	nd	nd
NMVOC	4.58	80.35	23.3	9.5	nd	nd

(1) Sourced from Table A.5 of Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2003, Energy (Transport), issued by the National Greenhouse Gas Inventory Committee of the Department of the Environment and Heritage, Australian Greenhouse Office.

(2) Table A.10 of Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2003, Energy (Transport), issued by the National Greenhouse Gas Inventory Committee of the Department of the Environment and Heritage, Australian Greenhouse Office, notes that motorcycles consume around 0.057 litres of automotive gasoline per kilometres.

(3) Energy density = 34.2 MJ/l = 0.29 l/MJ; this has been used to convert Column 2 to Column 3.

(4) Global Warming Potential (GWP) provided by the Third Assessment (2001) by the Intergovernmental Panel on Climate Change (IPCC).

CO_2 Emissions

Calculation of CO_2 emissions was carried out according to the publication '*Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2003 – Energy (Transport)*'.

For automotive diesel oil, Table A.2 of the above publication provides a **CO_2 Emission Factor of 66 g CO_2 / MJ**.

The CO_2 emissions from the outboard motor boats and the onboard pumps would be:

(410,400 MJ) x 66 g CO_2/MJ = 27,086,400 g of CO_2
= **27.1 t of CO_2 / year**

When adding the contribution from methane and nitrous oxide determined earlier, the total CO_2 equivalent would be:

27.1 t of CO_2/year
+ 7.13 t of CO_2 eq/year
+ 1.18 t of CO_2 eq/year
= 35.41 t of CO_2 eq/year **from the outboard motors and the pumps**

3. References

Department of the Environment and Heritage, 2005: *Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2003 – Energy (Transport)*. National Greenhouse Gas Inventory Committee of the Department of the Environment and Heritage, Australian Greenhouse Office, Australian Government, Commonwealth of Australia, May 2005.

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Australian Greenhouse Office, 2004: AGO Factors and Methods Workbook – August 2004, for use in Australian Greenhouse Office Programmes. Australian Greenhouse Office, Australian Government, Commonwealth of Australia, August 2004.

Intergovernmental Panel on Climate Change (IPCC), 2002: Comparison of Global Warming Potentials from the Second and Third Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC), updated August 12, 2002, downloaded from IPCC Global Warming Potential page: www.eia.doe.gov/oiaf/1605/gwp.html.

Appendix H

Fish Feed Residue Monitoring

Skretting Residue Monitoring

Skretting feed mills are owned by global food & animal nutrition company Nutreco. The Skretting mill at Cambridge forms part of the global network that consists of 16 feed mills around the world. The strength and depth of this network ensures highly thorough and effective control of quality and food safety issues.

Residue monitoring is completed each year as a combined effort from 16 factories in 11 different countries. The Skretting network is coordinated at a corporate level by Nutreco's technical experts, the Nutreco Advisory Team. This approach ensures that analysis is carried out on the most relevant materials, with the most appropriate methods. Nutreco initially audits potential laboratories to produce a list of 'Approved Laboratories', which are used for all analysis.

Results are shared between all Skretting factories, and discussion occurs between all countries and the Nutreco Advisory Team. This allows for in-depth interpretation of results, and adjustments to future testing. The global approach provides each Skretting factory with far more than they could achieve independently. A thorough understanding of risk is achieved for raw material suppliers and geological region.

Hundereds of results are collected each year mainly focussed on Heavy Metals, Antioxidants, Dioxins, PCB's, Nitrosamines and Pesticides. EU limits are applied to all tests, as these are the most thorough and stringent. To support the residue monitoring program, all Skretting factories have implemented a Risk Management System. This consists of procedures that outline responsibilities and actions for food safety issues such as high residue levels. Skretting have also implemented internal notification limits to ensure that the Nutreco Advisory Team can act quickly with the appropriate advice.

Results are available to AQIS on request. Contact Stuart Fyfe for any further questions regarding food safety issues.

Regards

Stuart Fyfe
Food Safety & Quality Coordinator
Skretting

Skretting Australia - Cambridge - Residue Results 2003, 2004, 2005

	Unit	Product	Max limit	Results 2005	Results 2004	Results 2003
Heavy Metals						
As	mg/kg	Poultry Meal	2		0.6	0.8 (0.3 inorganic)
	mg/kg	Feather Meal	2		0.8	0.4 (0.2 inorganic)
	mg/kg	Fish Meal	15		2.2	2.3 (<0.1)
	mg/kg	Fish Oil	15		5.2	9.3 (0.1 inorganic)
	mg/kg	Fishfeed	6	2.0	2.5	2.2 (0.1 inorganic)
	mg/kg	Fish Meal	15		2.2	Not tested
	mg/kg	Tuna Meal	15		10	Not tested
	mg/kg	Poultry Oil	none		0.2	Not tested
Cd	mg/kg	Poultry Meal	1		0.05	0.03
	mg/kg	Feather Meal	1		<0.03	<0.03
	mg/kg	Fishfeed	0.5	0.4	0.29	0.17
	mg/kg	Fish Meal	2		0.77	Not tested
	mg/kg	Fish Oil	none		<0.03	Not tested
	mg/kg	Fish Meal	2		0.68	Not tested
	mg/kg	Tuna Meal	1		1.1	Not tested
	mg/kg	Poultry Oil	none		<0.03	Not tested
Hg	mg/kg	Poultry Meal	0.1		<0.01	0.02
	mg/kg	Feather Meal	0.1		<0.01	0.01
	mg/kg	Fishfeed	0.1	0.013	0.01	0.02
	mg/kg	Fish Meal	0.5		0.02	Not Tested
	mg/kg	Fish Oil	none		<0.01	Not Tested
	mg/kg	Fish Meal	0.5		0.05	Not Tested
	mg/kg	Tuna Meal	0.1		0.02	Not Tested
	mg/kg	Poultry Oil			0.03	
Pb	mg/kg	Poultry Meal	10		<0.2	0.2
	mg/kg	Feather Meal	10		<0.2	0.3
	mg/kg	Fishfeed	5	0.11	<0.2	0.4
	mg/kg	Fish Meal	10		<0.2	Not Tested
	mg/kg	Fish Oil	none		<0.2	Not Tested
	mg/kg	Fish Meal	10		<0.2	Not Tested
	mg/kg	Tuna Meal	10		<0.2	Not Tested
	mg/kg	Poultry Oil	none		0.3	Not Tested

Pesticides						
Aldrin	mg/kg	Fish feed		<0.005	<0.000008	
	mg/kg	Fish Oil		<0.005	0.000157	
	mg/kg	Fish Meal			0.000013	
	mg/kg	Poultry Meal			0.000008	<0.005
	mg/kg	Poultry Oil			0.000083	<0.01
	mg/kg	Lupin			0.000001	
	mg/kg	Corn Gluten				<0.005
alpha-Chlordane	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
alpha-Endosulphan	mg/kg	Fish feed			0.000009	
	mg/kg	Fish Oil			0.000028	
	mg/kg	Fish Meal			0.000002	
	mg/kg	Poultry Meal			0.000002	<0.01
	mg/kg	Poultry Oil			0.00003	<0.01
	mg/kg	Lupin			0.000004	<0.01
	mg/kg	Corn Gluten				<0.01
alpha-HCH	mg/kg	Fish feed	0.02	<0.005	0.000005	
	mg/kg	Fish Oil	0.2	<0.005	0.000018	
	mg/kg	Fish Meal	0.02		0.000001	
	mg/kg	Poultry Meal	0.2		<0.000001	<0.005
	mg/kg	Poultry Oil	0.2		0.000012	<0.01
	mg/kg	Lupin	0.02		<0.000001	<0.005
	mg/kg	Corn Gluten	0.02			<0.005
Benfluralin	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
beta-Endosulphan	mg/kg	Poultry Meal				<0.01
	mg/kg	Corn Gluten				<0.01
	mg/kg	Lupin				<0.01
	mg/kg	Poultry Oil	0.1			<0.01
beta-HCH	mg/kg	Fish feed	0.01	<0.01	0.00002	
	mg/kg	Fish Oil	0.1	<0.01	0.000171	
	mg/kg	Fish Meal	0.01		<0.000001	
	mg/kg	Poultry Meal	0.01		<0.000001	<0.005
	mg/kg	Poultry Oil	0.1		0.000011	<0.02
	mg/kg	Lupin	0.01		<0.000001	<0.005
Chlordene	mg/kg	Fish feed			<0.000001	
	mg/kg	Fish Meal			0.000001	
	mg/kg	Poultry Meal			<0.000001	
	mg/kg	Fish Oil			<0.000001	
	mg/kg	Poultry Oil			<0.000001	
	mg/kg	Lupin			<0.000001	
Chlorfenapyr	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		

Chlorfenson	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
Chloroneb	mg/kg	Fish feed		<0.05		
	mg/kg	Fish Oil		<0.05		
Chlorothalonil	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
Chlorthal-dimethyl	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
cis-Chlordane	mg/kg	Fish feed			0.000009	
	mg/kg	Fish Oil			0.000097	
	mg/kg	Fish Meal			0.00001	
	mg/kg	Poultry Meal			0.000002	<0.005
	mg/kg	Poultry Oil			0.000016	<0.01
	mg/kg	Lupin			0.000001	<0.005
	mg/kg	Corn Gluten				<0.005
cis-Heptachlorepoxide	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
cis-Nonaclor	mg/kg	Fish feed			0.000005	
	mg/kg	Fish Oil			0.00003	
	mg/kg	Fish Meal			0.000002	
	mg/kg	Poultry Meal			0.000001	
	mg/kg	Poultry Oil			0.000011	
	mg/kg	Lupin			0.000001	
delta-HCH	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
Dichlobenil	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Dicloran	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
Dicofol	mg/kg	Fish feed		<0.04		
	mg/kg	Fish Oil		<0.04		
Dieldrin	mg/kg	Fish feed		<0.005	<0.000029	
	mg/kg	Fish Oil		<0.005	0.000553	
	mg/kg	Fish Meal			0.000026	
	mg/kg	Poultry Meal			0.000022	<0.005
	mg/kg	Poultry Oil			0.000219	<0.01
	mg/kg	Lupin			0.000034	<0.005
	mg/kg	Corn Gluten				<0.005
Dienochlor	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
Dinitramine	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Dinobuton	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		

Endosulfan 1	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Endosulfan 2	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Endosulfan sulfat	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
	mg/kg	Poultry Meal				<0.02
	mg/kg	Corn Gluten				<0.02
	mg/kg	Lupin				<0.02
	mg/kg	Poultry Oil				<0.02
Endrin	mg/kg	Fish feed		<0.01	0.000017	
	mg/kg	Fish Oil		<0.01	0.000143	
	mg/kg	Fish Meal			<0.000002	
	mg/kg	Poultry Meal			<0.000002	<0.01
	mg/kg	Poultry Oil			<0.000007	<0.01
	mg/kg	Lupin			<0.000001	<0.02
	mg/kg	Corn Gluten				<0.01
Endrin ketone	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
epsilon-HCH	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
Etridiazole	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Fenson	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
Flubenzimine	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Fluchloralin	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Flumetralin	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
gamma-Chlordane	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
gamma-HCH (lindane)	mg/kg	Fish feed	0.2	<0.005	0.000006	
	mg/kg	Fish Oil	2.0	<0.005	0.000009	
	mg/kg	Fish Meal	0.2		<0.000001	
	mg/kg	Poultry Meal	0.2		<0.000001	<0.005
	mg/kg	Poultry Oil	2.0		0.00001	<0.01
	mg/kg	Lupin	0.2		0.000012	<0.005
	mg/kg	Corn Gluten	0.2			<0.005
Genite	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
Heptachlor	mg/kg	Fish feed		<0.005	<0.000003	
	mg/kg	Fish Oil		<0.005	0.000067	
	mg/kg	Fish Meal			<0.000001	

	mg/kg	Poultry Meal			<0.000002	<0.005
	mg/kg	Poultry Oil			0.000013	<0.01
	mg/kg	Lupin			<0.000001	<0.005
	mg/kg	Corn Gluten				<0.005
Heptachlor-exo-epoxide	mg/kg	Fish feed			<0.000042	
	mg/kg	Fish Oil			0.000125	
	mg/kg	Fish Meal			<0.000014	
	mg/kg	Poultry Meal			<0.000016	
	mg/kg	Poultry Oil			0.000051	
	mg/kg	Lupin			0.000005	
Heptachlor-endo-epoxide	mg/kg	Fish feed			<0.000013	
	mg/kg	Fish Oil			<0.000036	
	mg/kg	Fish Meal			<0.000004	
	mg/kg	Poultry Meal			<0.000004	
	mg/kg	Poultry Oil			<0.000015	
	mg/kg	Lupin			<0.000001	
Hexachlorobenzene (HCB)	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
	mg/kg	Poultry Meal				<0.005
	mg/kg	Corn Gluten				<0.005
	mg/kg	Lupin				<0.005
	mg/kg	Poultry Oil				<0.01
Ioxynil	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
Isobenzan	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
Isodrin	mg/kg	Fish feed		<0.005	<0.000007	
	mg/kg	Fish Oil		<0.005	<0.000019	
	mg/kg	Fish Meal			<0.000002	
	mg/kg	Poultry Meal			<0.000003	
	mg/kg	Poultry Oil			0.000017	
	mg/kg	Lupin			<0.000001	
Isopropalin	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Methoxychlor	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
Mirex	mg/kg	Fish feed		<0.005	<0.000005	
	mg/kg	Fish Oil		<0.005	0.000113	
	mg/kg	Fish Meal			0.000035	
	mg/kg	Poultry Meal			<0.000001	
	mg/kg	Poultry Oil			<0.000006	
	mg/kg	Lupin			0.000003	
Nitrofen	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
o,p'-DDD	mg/kg	Fish feed		<0.005	0.000007	

	mg/kg	Fish Oil		<0.005	0.000045	
	mg/kg	Fish Meal			0.000002	
	mg/kg	Poultry Meal			<0.000001	<0.005
	mg/kg	Poultry Oil			0.000011	<0.01
	mg/kg	Lupin			<0.000001	<0.005
	mg/kg	Corn Gluten				<0.005
o,p'-DDE	mg/kg	Fish feed		<0.005	0.000003	
	mg/kg	Fish Oil		<0.005	0.000023	
	mg/kg	Fish Meal			0.000001	
	mg/kg	Poultry Meal			<0.000001	<0.005
	mg/kg	Poultry Oil			<0.000003	<0.01
	mg/kg	Lupin			<0.000001	<0.005
	mg/kg	Corn Gluten				<0.005
o,p'-DDT	mg/kg	Fish feed		<0.005	<0.000004	
	mg/kg	Fish Oil		<0.005	0.000024	
	mg/kg	Fish Meal			<0.000002	
	mg/kg	Poultry Meal			0.000002	<0..005
	mg/kg	Poultry Oil			<0.000013	<0.01
	mg/kg	Lupin			<0.000001	<0.005
	mg/kg	Corn Gluten				<0.005
Oxychlordane	mg/kg	Fish feed		<0.005	0.000012	
	mg/kg	Fish Oil		<0.005	0.000014	
	mg/kg	Fish Meal			0.000004	
	mg/kg	Poultry Meal			0.000001	<0.005
	mg/kg	Poultry Oil			<0.000002	<0.01
	mg/kg	Lupin			<0.000001	<0.005
	mg/kg	Corn Gluten				<0.005
p,p'-DDD	mg/kg	Fish feed		<0.005	0.00004	
	mg/kg	Fish Oil		0.01	0.000267	
	mg/kg	Fish Meal			0.00001	
	mg/kg	Poultry Meal			0.000007	<0.005
	mg/kg	Poultry Oil			0.000109	<0.01
	mg/kg	Lupin			<0.000001	<0.005
	mg/kg	Corn Gluten				<0.005
p,p'-DDE	mg/kg	Fish feed		<0.005	0.00018	
	mg/kg	Fish Oil		0.02	0.0013	
	mg/kg	Fish Meal			0.000057	
	mg/kg	Poultry Meal			0.000044	<0.005
	mg/kg	Poultry Oil			0.000296	<0.01
	mg/kg	Lupin			0.000003	<0.005
	mg/kg	Corn Gluten				<0.005
p,p'-DDT	mg/kg	Fish feed		<0.005	0.000014	
	mg/kg	Fish Oil		0.01	0.000127	
	mg/kg	Fish Meal			0.000002	
	mg/kg	Poultry Meal			<0.000001	<0.005

	mg/kg	Poultry Oil			<0.000017	<0.01
	mg/kg	Lupin			<0.000001	<0.005
	mg/kg	Corn Gluten				<0.005
Pendimethalin	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Pentachloranisol	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
Plifenate	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
Polychloroterpene (Camphechlor)	mg/kg	Fish feed		<0.2		
	mg/kg	Fish Oil		<0.2		
Profluralin	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
Quintozene	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
S 421 (Octachlordipropylether)	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
Tecnazene	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
Tetradifon	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Tetrasul	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
trans-Chlordane	mg/kg	Fish feed			0.000005	
	mg/kg	Fish Oil			0.000019	
	mg/kg	Fish Meal			0.000008	
	mg/kg	Poultry Meal			0.000003	<0.005
	mg/kg	Poultry Oil			0.000013	<0.01
	mg/kg	Lupin			0.000001	<0.005
	mg/kg	Corn Gluten				<0.005
trans-Heptachlorepoxide	mg/kg	Fish feed		<0.005		
	mg/kg	Fish Oil		<0.005		
trans-Nonachlor	mg/kg	Fish feed			0.000011	
	mg/kg	Fish Oil			0.000078	
	mg/kg	Fish Meal			0.000006	
	mg/kg	Poultry Meal			0.000003	
	mg/kg	Poultry Oil			0.000027	
	mg/kg	Lupin			0.000001	
Tri-allate	mg/kg	Fish feed		<0.02		
	mg/kg	Fish Oil		<0.02		
Trichloronat	mg/kg	Fish feed		<0.01		
	mg/kg	Fish Oil		<0.01		
Trifluralin	mg/kg	Fish Feed		<0.005	0.000003	
	mg/kg	Fish Oil		<0.005	0.000011	
	mg/kg	Fish Meal			<0.000001	

	mg/kg	Poultry Meal			0.000001	
	mg/kg	Poultry Oil			0.000018	
	mg/kg	Lupin			0.000007	
	mg/kg	Soya Meal			<50.0	
	mg/kg	Poultry Oil			<50.0	
	mg/kg	Corn Gluten			<50.0	
	mg/kg	Lupin			<50.0	
	mg/kg	Fish Feed			<50.0	
Toxaphene	mg/kg	Poultry Oil				<0.2
	mg/kg	Lupin				<0.2
	mg/kg	Corn Gluten				<0.2
	mg/kg	Poultry Meal				<0.2
Toxaphenes Congeners (26)	mg/kg	Fish feed		<0.02	0.000026	
	mg/kg	Fish Oil		<0.02	0.000332	
	mg/kg	Fish Meal			<0.000001	
	mg/kg	Poultry Meal			<0.000001	
	mg/kg	Poultry Oil			<0.000005	<0.02
	mg/kg	Lupin			<0.000001	
Toxaphenes Congeners (32)	mg/kg	Fish feed			<0.000008	
	mg/kg	Fish Oil			0.000082	
	mg/kg	Fish Meal			<0.000003	
	mg/kg	Poultry Meal			<0.000003	
	mg/kg	Poultry Oil			<0.000009	
	mg/kg	Lupin			<0.000001	
Toxaphenes Congeners (50)	mg/kg	Fish feed		<0.02	0.000055	
	mg/kg	Fish Oil		<0.02	0.000656	
	mg/kg	Fish Meal			<0.000002	
	mg/kg	Poultry Meal			<0.000002	
	mg/kg	Poultry Oil			<0.000006	<0.02
	mg/kg	Lupin			0.000005	
Toxaphenes Congeners (62)	mg/kg	Fish feed		<0.02	<0.000128	
	mg/kg	Fish Oil		<0.02	<0.000336	
	mg/kg	Fish Meal			<0.000042	
	mg/kg	Poultry Meal			<0.000049	
	mg/kg	Poultry Oil			0.000345	<0.02
	mg/kg	Lupin			<0.000016	
PAH						
Sum possibly carcinogenic PAH's	mg/kg	Fish Feed	no limit		0.0176	not tested
	mg/kg	Fish Oil	no limit		0.0495	not tested
Sum 16 EPA PAH's	mg/kg	Fish Feed	no limit	0.002	0.0725	not tested
	mg/kg	Fish Oil	no limit		0.229	not tested
Dioxins & PCB's						

Dioxins (PCDD/PCDF)						
GC-HR/MS	TEQ (WHO) fat weight ng/kg	Fishmeal	1.25	0.007	0.04	0.345
GC-HR/MS	TEQ (WHO) fat weight ng/kg	Poultry Oil	2.00	0.0004	0.22	0.149
GC-HR/MS	TEQ (WHO) fat weight ng/kg	Fish Oil	6.00	0.161	0.22	0.189
GC-HR/MS	TEQ (WHO) fat weight ng/kg	Fish Feed	2.25	0.0002	0.06	0.44
GC-HR/MS	TEQ (WHO) fat weight ng/kg	Poultry Meal	0.75	Not Detected	0.04	0.621
Dr Calux	Calux TEQ - weight ng/kg	Tuna Meal	1.25	Not tested	0.33	not tested
Dr Calux	Calux TEQ - weight ng/kg	Fish Meal	1.25	Not tested	1.01	0.345
Dioxin Like PCB's						
Non-ortho	TEQ (WHO) ng/kg	Fish Feed	No limits	Not Quantified	0.16	not tested
	TEQ (WHO) ng/kg	Fish Meal	No limits	Not Quantified	0.07	not tested
	TEQ (WHO) ng/kg	Poultry Meal	No limits	Not Quantified	0.03	not tested
	TEQ (WHO) ng/kg	Fish Oil	No limits	Not Quantified	1.06	not tested
	TEQ (WHO) ng/kg	Poultry Oil	No limits	Not Quantified	0.15	not tested
Mono-ortho	TEQ (WHO) fat weight ng/kg	Fish Oil	No limits	Not Quantified	0.24	not tested
Sum of non & ortho	TEQ (WHO) fat weight ng/kg	Fishmeal	No limits	0.07	0.02	0.724
	TEQ (WHO) fat weight ng/kg	Poultry Oil	No limits	0.003	0.05	0.266
	TEQ (WHO) fat weight ng/kg	FishOil	No limits		0.00751	1.4
	TEQ (WHO) fat weight ng/kg	Fish Feed	No limits	0.35	0.04	1.07
	TEQ (WHO) fat weight ng/kg	Poutry Meal	No limits	0.13	0.02	0.37
Seven Indicator PCBs - Sum	ng/g	Poultry Meal	No limits		0.12	Not Detectable
	ng/g	Fish Feed	No limits		0.99	not tested
	ng/g	Fish Meal	No limits		0.31	not tested
	ng/g	Fish Oil	No limits		7.51	not tested
	ng/g	Poultry Oil	No limits		1.36	not tested
Flame Retardants						
TBA	ng/g	Fish Feed	No limit		0.47	not tested
PBDE, TriBDE (28)	ng/g	Fish Feed	No limit		<0.01	not tested
PBDE, TetBDE (47)	ng/g	Fish Feed	No limit		0.24	not tested
PBDE Sum TetBDE (49) + (71)	ng/g	Fish Feed	No limit		0.01	not tested
PBDE, TetBDE (77)	ng/g	Fish Feed	No limit		<0.01	not tested
PBDE, PenBDE (99)	ng/g	Fish Feed	No limit		0.39	not tested
PBDE, PenBDE(100)	ng/g	Fish Feed	No limit		0.07	not tested

PBDE, PenBDE (119)	ng/g	Fish Feed	No limit		<0.01	not tested
PBDE, HexBDE (138)	ng/g	Fish Feed	No limit		<0.03	not tested
PBDE HexBDE (153)	ng/g	Fish Feed	No limit		0.06	not tested
PBDE HexBDE (154)	ng/g	Fish Feed	No limit		0.04	not tested
PBDE, HepBDE (183)	ng/g	Fish Feed	No limit		<0.01	not tested
PBDE, DecaBDE (209)	ng/g	Fish Feed	No limit		4.76	not tested
TBA	ng/g	Fish Meal	No limit		0.12	not tested
PBDE, TriBDE (28)	ng/g	Fish Meal	No limit		<0.01	not tested
PBDE, TetBDE (47)	ng/g	Fish Meal	No limit		0.01	not tested
PBDE Sum TetBDE (49) + (71)	ng/g	Fish Meal	No limit		<0.01	not tested
PBDE, TetBDE (77)	ng/g	Fish Meal	No limit		<0.01	not tested
PBDE, PenBDE (99)	ng/g	Fish Meal	No limit		0.01	not tested
PBDE, PenBDE(100)	ng/g	Fish Meal	No limit		<0.01	not tested
PBDE, PenBDE (119)	ng/g	Fish Meal	No limit		<0.01	not tested
PBDE, HexBDE (138)	ng/g	Fish Meal	No limit		<0.01	not tested
PBDE HexBDE (153)	ng/g	Fish Meal	No limit		<0.01	not tested
PBDE HexBDE (154)	ng/g	Fish Meal	No limit		<0.01	not tested
PBDE, HepBDE (183)	ng/g	Fish Meal	No limit		<0.01	not tested
PBDE, DecaBDE (209)	ng/g	Fish Meal	No limit		0.32	not tested
TBA	ng/g	Fish Oil	No limit		4.87	not tested
PBDE, TriBDE (28)	ng/g	Fish Oil	No limit		0.03	not tested
PBDE, TetBDE (47)	ng/g	Fish Oil	No limit		0.18	not tested
PBDE Sum TetBDE (49) + (71)	ng/g	Fish Oil	No limit		0.05	not tested
PBDE, TetBDE (77)	ng/g	Fish Oil	No limit		<0.01	not tested
PBDE, PenBDE (99)	ng/g	Fish Oil	No limit		0.08	not tested
PBDE, PenBDE(100)	ng/g	Fish Oil	No limit		0.04	not tested
PBDE, PenBDE (119)	ng/g	Fish Oil	No limit		<0.01	not tested
PBDE, HexBDE (138)	ng/g	Fish Oil	No limit		<0.01	not tested
PBDE HexBDE (153)	ng/g	Fish Oil	No limit		<0.05	not tested
PBDE HexBDE (154)	ng/g	Fish Oil	No limit		<0.03	not tested
PBDE, HepBDE (183)	ng/g	Fish Oil	No limit		<0.02	not tested
PBDE, DecaBDE (209)	ng/g	Fish Oil	No limit		34.9	not tested
TBA	ng/g	Poultry Oil	No limit		0.28	not tested
PBDE, TriBDE (28)	ng/g	Poultry Oil	No limit		0.02	not tested
PBDE, TetBDE (47)	ng/g	Poultry Oil	No limit		0.83	not tested
PBDE Sum TetBDE (49) + (71)	ng/g	Poultry Oil	No limit		0.03	not tested
PBDE, TetBDE (77)	ng/g	Poultry Oil	No limit		<0.01	not tested
PBDE, PenBDE (99)	ng/g	Poultry Oil	No limit		1.37	not tested
PBDE, PenBDE(100)	ng/g	Poultry Oil	No limit		0.33	not tested
PBDE, PenBDE (119)	ng/g	Poultry Oil	No limit		<0.02	not tested
PBDE, HexBDE (138)	ng/g	Poultry Oil	No limit		<0.09	not tested
PBDE HexBDE (153)	ng/g	Poultry Oil	No limit		0.25	not tested

PBDE HexBDE (154)	ng/g	Poultry Oil	No limit		0.18	not tested
PBDE, HepBDE (183)	ng/g	Poultry Oil	No limit		<0.04	not tested
PBDE, DecaBDE (209)	ng/g	Poultry Oil	No limit		12	not tested
Other Testing						
Copper	mg/kg	Fish Feed	No limit		6.3	not tested
Copper	mg/kg	Fish Meal	No limit		3.9	not tested
Copper	mg/kg	Poultry Meal	No limit		7	not tested
Iron	mg/kg	Fish Feed	No limit		370	180
Phosphorus	mg/kg	Fish Feed	No limit		16000	12000
Zinc	mg/kg	Fish Feed	No limit		250	270
Fluoride	mg/kg	Fish Feed	No limit		54	not tested
Fluoride	mg/kg	Fish Meal	No limit		48	not tested
Fluoride	mg/kg	Poultry Meal	No limit		43	not tested
Selenium	mg/kg	Fish Feed	No limit		Not Tested	1.2

Appendix I

Marine Harvest Port Hurd Standard Operating Procedures

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY	*CHECKS*	*HAZARDS*	*ENVIROMENTAL IMPACTS*	*AUTHORITIES*
ALGAE SAMPLES (Environmental)				
		Nil	Provides a high level of monitoring for potentially hazardous species.	1. Scientific Officer
Sampling to be carried out approximately once per week.				2. Team Leader
Use 30 cm diameter and 100 um screen algal net.				3. Ops Manager
Choose appropriate sample sit.				
Weight base of net and collect a vertical algal sample (approximately from 10m to surface)	Retrieve net slowly			
Transfer sample to a clean and labelled sample jar.				
Return to lab as soon as possible to examine fresh live algal sample.				
Clean plankton net thoroughly with fresh water and allow and allow to air dry.				
Prepare a wet slide without cover slip and examine under microscope using 10x objective and micrometer.				
Close down diaphram to improve contrast.				
Record algal groups, species and abundance on hardcopy form.				
Identify species using the photo database and/or appropriate reference material.	Experienced operator required			
If any potentially hazardous species are identified preserve sample with iodine (to a weak tea colour) and label with date and location of sample.				
Clean microscope, lower stage return to lowest level magnification and return cover.				
Transfer data to Access DataBase (Algal Monitoring)				

ISO 14001 PROCEDURE

ACTIVITY	*CHECK*	*HAZARDS*	*ENVIROMENTAL IMPACTS*	*AUTHORITIES*
BAG CRUSHING Take cover of wool baler/bag crusher If crusher is empty - plug power lead into power supply - lift hydraulics by pressing lever up Crusher prep: - Cut 4 x 3 meter lengths of packing strap - Pull back the top part of crusher - Tie in three lengths of tape inside crusher going from front to back and the fourth across the crusher. - place empty bags into crusher - when crusher is full press level down until it stops and place two holding pins into outside slots of crusher plates - Press leaver back up until it stops - Repeat until crusher is full of bags Strapping up crusher - Lift crusher plate up into position - Pull packing strap from back and join with tape from front - Use strap wrench to tighten strap - Secure strap using clips and use steel clip clamper to press clamps together - Open crusher door and pull out compressed bags, then jump into loader and take stinky maggoty bag to where the other stinky maggoty bags are in skip bin. - Take out power lead from source and protect wool press by replacing cover	Ensure power in on the strap is for holding the rubbish together, therefore do not have any of the strapping outside of the machine		Empty bags in environment Loose pieces(flying away) Bags with small amounts feed breeding maggots	teamleader engineer farm hand (experienced) ops manager

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY		SAFETY CHECKS	ENVIROMENTAL CHECKS	
COUNTING (AQUASCANS) Aqua scan counter to be placed SECURELY on end of pipe systems, grading table, nursery, fish counters etc. Counters placed after dewatering system, fish only, (MINIMAL WATER) to pass through counters, counters on gradient>20 degrees. Counters to be cleaned with DPI-MICRO CLEAN solution, camera window and splash shield through inspection plate. Counters connected to control unit and control unit connected to Honda inverter before start up. See Inverter SUP09 Read counter instructions prior to use. See Aquascan SUP01. Fit 18mm hose from Honda pump to outlet pipe below counter to assist wqashing through fish (See SUP08) Calibrate counters entering the average weight of fish (See SOP26 Weight Check). Continue Calibrating the counters by individually passing through >/= 100 fish until the CAL disappears from the counter display. Ensure number of fish counted is close to the actual number of fish passed through the unit. If not repeat the process. Commence counting pushing fish through counters at a STEADY rate. Monitor alarms and numbers constantly and record errors. Compare electronic count to manual count/observations. Record number off counter at end of day. Re-locate counter/control unit and inverter back to dive shed after each use.				

ISO 14001 PROCEDURES
Deck maintenance

ACTIVITY	*CHECKS*	*HAZARDS*	*ENVIROMENTAL IMPACTS*	*AUTHORITIES*
DIVE SEINING				
See dive setup				
Pull back seine net to one side				dive leader
Select side for net by checkng tide chart				teamleader
4 people neede for pulling net one pull leadline rope the other te buot line rope				technician
Deploy 3 divers one on bcd setup and 2 on surface supply.		entanglement		
People on surface to drop leadline of rail divers to check no hook ups.				
Surface crew to drop buoyline into water and pull on there surface ropes towards there oposite end.				
Divers to assist net along bottom trying to prevent holes for fish to get out.				
When the top side pullers get to one side they should slowly bring net around				
Pulling around promotes slackness in the net so when pulling to surface it gives the fish more space.				
Then pull lead line to surface	Hooks,	Correct lifting		
Spread net for the fish				
Divers to get out of the water.				

DIVE MAINTENANCE ACTIVITY NET DECONSTRUCTION See dive setup(sop08) Commence cutting net by divers. 2 divers in the water starty at oposite corners. Run along short 4m seams starting at the top of the corner.(wk down). Then start on long running seams working along spirals,(3 or 4 long running seams in each pen depending on age of net). When completed the above cutting you will then need to cut all those pieces in half by cutting east to west or south to north depending on how the net was built. This will leave you with 12 or 14 pieces to pull out. *Divers to move all dive gear from surrounding area where the net is to be pulled out.! Clear all obstructions from around area where net is to be pulled out eg.(rails, jump net and any loose deck hooks). Commercial diver to cut holes in pieces of net so as to connect strope for pulling piece of net out. (SU07), Bushman should be then tied up on the side of the pen where easy access for crane operation is at it's optimum. When you have two pieces of net on deck you will need to travel back to the beach. (SU10)Loader to pull pieces of net of deck of bushman and store in old net storage area. Continue this process until the net is completey gone from wave master.	Safety checks	enviromental checks

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY	*CHECKS*	*HAZARDS*	*ENVIROMENTAL IMPACTS*	*AUTHORITIES*
Nets are to be cleaned on a weekly cycle Nets can only be dive cleaned on low tide movement (change of tide or neap tide) and with reasonable visibility. Load HATZ cleaner from near Generator shed onto working vessel using Loader on straps (ussually SeaFarmer or BayWatch). Load dive equipment and cleaning equipment kept at Dive Shed. Small IDEMA head for diving. Set up for diving. Follow Work Instruction protocol for Dive Procedure (setup) SOP08 French Lay all hoses. Set up HATZ. Follow HATZ SUP06. **Clean bottom and sides of net.** When finished return HATZ cleaner to pallet near generator shed and wash down/flush hoses with fresh water. Spray electrics etc with CRC. Return cleaning head and HP hose to Dive Shed. Wash down and spray with CRC.	Dairy date and time for upcoming dives to ensure baot/time is available. Ensure appropriate tide for diving Licenced diver, observer, and dive log Allow approximately 1 hour	Failure to clean net leading to mortality events or poor growth and FCR. Diesel oil spill whilst filling HATZ	Minimal: Organic debris suspended in water column and flushed to	Scientific Officer Team Leader Ops Manager

ISO 14001 PROCEDURES
DIVE MINTENANCE

ACTIVITY	*CHECKS*	*HAZARDS*	*ENVIROMENTAL IMPACTS*	*AUTHORITIES*
SEAM CHECKS				
See dive setup (sop08)				dive leader
In water go to corner of net descend dwn corner checking for spiral breaks	safety gear(gloves, stinger suit etc.)	Stingers,barnacles		teamleader
when at bottom of corner swim along 4m spiral connection checking upright spiral connections along that side				farm diver
come up at corner checking spiral conncetions				manager
Swim along surface to 1st long running seam				
Swim down along seam checking spiral connections	Breaks in spirals	holes	Big hole could be bad for wild fisheries	
When on other side of net swim to next long running seam and swim along.				
When back at corner again do the same as previuosly mentioned				
Document holes or breaks on dive sheet.	Everything is documented			

ISO 14001 PROCEDURES
DIVING MAINTENANCE

ACTIVITY	*CHECK*	*HAZARDS*	*ENVIROMENTAL IMPACTS*	*AUTHORITIES*
DIVING PROCEDURES				
Dive panel.	*leaks*			*diveleader* *divers* *teamleader*
Dive hoses.	*holes*			
G size cylinder (main supply).	*vavlve(botox seal)*			*manager*
D size cylinder (standby air).	*vavle(o-ring)*			
INTERSPIRO DIVATOR MKII (Arga).	*diaphram,o-rings*			
2nd stage regulator	*check*			
Stinger/wet suit, booty's and hood	*for holes*	*stingers*		
Knife.	*sharp*	*predators*		
Face mask.				
Fins.	*straps*			
Dive watch.	*battery*			
Dive vest.		*weight release*		
Gloves.	*holes*	*stingers*		
Tools-stitching needles (nursery), pliers, spirals, twin				
Weights for vest, 2x3lb (1 for each side of the vest)				
Connect G size cylinder to main air supply gauge	*take off white plastic*	*bottle full, after remove seal*		
Connect D size cylinder to emergency air supply	*o-ring*			
Check air volumes on gauges (main and emergency)	*leaks*	*major lose of air*		
Connect hose to dive 1 on panel, (ensure idiot clip is in locked positior	*locking clips*	*locked*		
Connect ARGA to hose, (ensure idiot clip is in locked position	*unpressurised hose*			
Clip hose to vest	*safety rope on hose*	*secured by clip*		
Dress in stinger/wet suit, hood, booty's, knife, fins, watch and glove				
Check that air taps for both main and emergency air is in ON position, that the levers are in the correct HORIZONTAL position for a supply.				
Deploy dive ladder.				
Test air flow by purging regulator, (ARGA)	check			
Test air in water.	easy breathing			
READY TO DIVE.				

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY	*CHECKS*	*HAZARDS*	*ENVIROMENTAL IMPACTS*	*AUTHORITIES*
ENSILER				competent person
See loader start up (SUP10 Loader)				technician
Unload mort bin from boat with loader	make sure mort bin is secure	front of boat	spillages	teamleader
Drive to ensiler and raise mort bin to the level of the ensiler				
Turn loader off and lift ensiler hatch, pour morts into ensiler.	All fish go in ensiler	do not spill	attract crocs	
Put on protective clothing,(gloves,breathing aperatus,overalls & boots)	no holes in gear			
	fresh water near ensiler	acid splash. Turn tap in clockwise direction only.		
Add 400ml of each acid (85% Phosphoric acid and 85% Formic acid) per 25 kgs of fish.				
Return all gear to it's place and wash gloves with fresh water.	Wash out cylinder for each acid	acid	acid spills	
Ensure prop gear is in neutral				
See start up for Honda pump (SUP08). Fill pump with only about 50 mL of unleaded fuel.				
Once ensiler is going run propellor each way for a minute or two to start churning up fish	working correctly	smell		
Leave motor in gear and running to run dry of fuel (~20 mins). Ensiler can be left at this point.				
Take empty mort bin to wash area and hose out. Leave bin to drain.	lay bin on side to drain	not clean(crocs will come)		

ISO 14001 PROCEDURES
FEED MAINTENANCE

ACTIVITY	*CHECKS*	*HAZARDS*	*ENVIROMENTAL IMPACTS*	*AUTHORITIES*
FEED STORAGE				
See loader start up(SUP10)	oil, water etc.			licensed operator
Assess quantity & type of feed to be stored	4mm & 6mm(containers) 9mm & 11mm(shed)	container damage	mouldy food	
Remove feed in shed & set aside, put new feed in shed or under trees.	all older feed is moved out	food rotation	mouldy food	teamleader
Change faulks to bucket and level floor of shed & under trees	level of bucket			
Remove old pallets		hitting uprights on shed		
change buckets to faulks	locked in	not locked in		
Sort and stack 2 high in shed or under trees.	level stacks	stacks could fall over Hitting roof of shed dropping bags damaging bags	food spilage	
Clean all spills and report				
Shut down procedure for loader	kept on loader			

Purpose

This SOP describes the correct process for feeding fish which will ensure minimal waste, efficient feeding and safe practice.

Process

Feeding

1. Check daily feed sheet for type and amount of feed required.
2. Load feed onto barge using Loader (see Loader SUP10).
3. Move hopper to cage feeding position using HIAB (see HIAB SUP07).
4. Cut plastic that holds two 500kg bags of feed on pallet.
5. Cut 4 holes in top of plastic covering over 500kg feed bag lift points.
6. Lift with HIAB using snatch strap and lift feed bag directly over top of hopper.
7. Cut hole in bottom of feed bag to release pellets using the bag cutting knife on pole.
8. Setup firefighter pump and connect to hopper (see Honda pump start up SUP08).
9. Open chute on hopper just enough to give an appropriate feed rate.
10. Feeding must be for >40 minutes.
11. Spread pellets across cage.
12. Take into account direction of current on spring tides so feed is not washed out of cage before it is eaten.

Safety Issues

- Ensure lift points are secure when lifting feed.
- Avoid breathing in spray/dust from feed.
- Secure pump so it does not vibrate off deck.

Environmental Issues

- Feed Spills - Watch for spills and feed drifting out of pen. Re-adjust feeding position if needed.
- Overfeeding - Avoid overfeeding. Watch feeding behaviour and time feed session accurately.

Legislative Requirements

Marine Harvest must comply to the relevant section of the below documents:

- N.T. Waste Management and Pollution Control Act - 2003

Associated documents

- Honda pump start up SUP08
- HIAB SUP07
- Loader SUP10
- N.T. Waste Management and Pollution Control Act - 2003

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY	CHECK	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
FLUKE COUNT SAMPLING				
Sampling period from April through to September, (fluke numbers increase with lower temperatures)				Scientific Officer Ops manager
Sample larger fish or fish from pens that exhibit signs of fluke. Obvious signs include, vertical "hanging" in water column, swimming close to surface, free jumping clear of the water and head shaking	Carry out procedure if signs of disease.			Team Leader
2-3 sample fish per pen, fish caught on fishing rod or taken at weight check seine		spikes on fish		
Fish are to be kept alive in tub of water until gill autopsy is performed	Live fish for examination only.			
Return to laboratory and anaesthetise fish quickly with lethal dose of clove oil. Quickly remove third gill arch on left hand side, cutting base first then top of gill				
Rinse gill in salt water and place on petri dish. Cover gill with salt water.				
Place gill arch under dissecting microscope and fan through gill lamellae with fine tipped instrument counting fluke and copepods. Turn gill arch over and repeat process.				
Add total number of fluke and copepod numbers and multiply by 8, (8 gill arches) to find theoretical total fluke/copepod numbers.				
Repeat for each sample fish.				
Clean microscope and laboratory bench tops.				
Dispose of fish and gills, (whole fish to the kitchen if healthy, or fish/gills to ensiler.				
File findings (Formxx).				

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY	CHECKS	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
GRADING				
Pens to be graded will require the set up of the silkstream, pipe systems, grading table and the aqua scan counters. See Silkstream SUP13 and Aquascan SUP01	Secure pipe connections			
Silkstream pump to be set up so that intake pipe reaches seined fish in source pen				
Pipe system set up to reach pens which fish are to be graded into, (ensure head height is not to high as damage to the fish, seen as scale loss and fin damage may result).	Pumping height not too high			
Fish are seined in source pen and crowded by splitting the net and shallowing. Oxygen stones should be placed into crowded and uncrowded fish and monitored regularly.	Adequate crowding without overstressing fish Ensure oxygen level maintained			
Fish are sucked out of pen via silkstream and pushed through dewatering cannon, (bazooka) along pipe and onto grading table.				
Angle of grading table should provide adequate fall so that the fish do not congest on table	Fall of grading table adequate			
Speed of silkstream and aperture of valve, (located on bazooka) regulate the delivery of fish and water to grading table.	Appropriate pump speed settings			
Grading bar adjusted after pumping begins to ensure the number of fish exiting the big and small chutes is even/balanced.	Properly adjusted grading bar			
Small fish exit lower chute and pass through aqua scan counter after being dewatered on grading table. Fish then drop into pen.				
Large fish enter upper chute, pass through aqua scan counters and drop into a separate/different pen				
Once through the aqua scan counters the re-introduction of water may be necessary to push the fish to their fina destination and this is achieved with the Honda Fire pump and 18mm hose. (See Honda Pump SUP08).				

ISO 14001 PROCEDURES
MOORING MAINTENANCE

ACTIVITY	CHECKS	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
GRID DISCONNECTION				
See start up for seafarmer(SUP12)				Teamleader
Pull up at yellow buoy on the southern side which you want to disconnect				Dive leader
Start up hiab(SUP07) set that on starbard side	wearing hard hats	hiab boom		Farmhand(exp)
Run 24mm rope from winch up through block on a frame and back down to starboard front bollard.				manager
Lift rope connected to top of float which goes to your 2 metre ring on grid below yellow buoy.				
When ring below buoy is visible stop hiab				
Run rope which is connected to your front bollard through ring and connect to rope holding grid together				
Use a rolling hitch onto rope	rope wear, right size rope(24mm and above)	rope snapping when tensioning		
Rope going through block and back to winch (SUP04) should now be tensioned				
This takes strain of rope so that you can disconnect the shackle holding the grid rope to the ring		mousing wire	don't drop wire	
When disconnected slowly release pressure of winch rope tie of thimple to fornt bollard				
Disconnect rope to grid rope from winch				
Lower hiab back down and disconnect tie back to top of yellow buoy				
Drive grid rope conncected to starboard bollard back to yellow buoy where it is still connected				
Tie to top of the yellow buoy	Knot is correct (bowline)			
Now grid is open				
Reverse work instruction to reconnect.				

ISO 14001 PROCEDURES (FS)FISH SALE				
To empty the trans vac turn the same key to EMPTY, trans vac is empty when last of fish are pumped into the fish bins, (also by large volume of foam/air escaping from dewaterer)	Evenly over fish			teamleader manager
The rate the fish is pumped, (how many revs) is determined by the Teamleader				technician
At the end of each pump ice is to be shovelled into the fish bins				
The counter/team leader will record the total number of fish and identification number for each completed fish bin, and tally on harvest sheet provided	Hooks	Lifting net correctly		
At the end of each bin the trans vac operator will fill the trans vac with fish, ready to pump straight away as required, then idle down the trans vac				
Under direction from counter/team leader the fish can be released from the seine net whilst filling the final fish bin, as the trans vac and outlet hose/dewater will need several pumps to removed any fish stuck in the system				
Once harvest has finished idle down trans vac for 2-3 minutes, pull decompression lever/stop lever on engine and turn key to stop position, (alarm will go off) thus stopping trans vac Transvac shut downSOP15)	Check for fish	Exhaust Untiing and lifting		

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY	*CHECKS*	*HAZARDS*	*ENVIROMENTAL IMPACTS*	*AUTHORITIES*
HEALTH SURVEILLANCE				Scientific Officer
Observe for irregular behaviour of stock.	Make note of and report unusual behaviour in fish.		High: If stock lost through inaction.	Team Leader
Report any unusual signs to authorities as listed.			High: If failure to detect exotic disease.	Ops manager
Authorities to ring NT Government Aquatic Pathologist for further direction if required.				

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY	CHECKS	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
MORT COLLECTION Go to wash down area and grab yellow wheelie bin and place onto the barge When out at the cages pick up mort net, (blue nylon net). Start at one end of the cages, eg. Cage 1. Place wheelie bin near cage and begin to remove all dead fish from that cage. When the fish are removed place them into the wheelie bin. After completing each pen write down the number and type of mortality, (i.e. cannibalism, bloat or other) on the daily feed sheet. Continue this process until all pens and polar circles are free of dead fish. Whilst not using the wheelie bin place it at one end of the farm to eliminate the smell. At the end of the day after ALL morts have been collected return the wheelie bin to the barge and return to base. Once on the beach place mort bin onto a pallet. Pick the bin off the barge with the loader and take to ensiler for disposal (See SOP09).	Carefull with spills Lifting correctly	Crocodiles		

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY	CHECKS	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
NET CLEANING				Scientific officer
Go to the dive shed and select the cleaning head you will require for the job to be done, Large IDEMA Head for net sides.	Bearings, fittings for wear, head for damage			Nursery farmhand
French Lay HP hose	Holes, broken/loose wire ends			
Connect IDEMA head to long yellow pole	Fittings tight/no damage, Seals in place			Team leader
Start HATZ (See HATZ SUP06)	Head spinning properly			
		Pressurised water may cause injuy if it hits skin		
			Moderate: oil/diesel	
Using an up and down motion commence cleaning ne		Head caught on net	Low: Debris on net released to environment	
IT IS NOT A RACE, TAKE YOUR TIME AND DO A GOOD JOB				
Shut Down HATZ (See HATZ SUP06)				
Return HATZ and Cleaning Equipment to Base				
Clean and rinse all equipment with fresh water				
	Anchor points			
	Bearing seal in place			

ISO 14001 PROCEDURES FISH MAINTENANCE				
ACTIVITY	CHECKS	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
ORDERING & TRANSPORT OF FEED TO FARM Conduct food stocktake Calculate and project food usage including new fish requiremen Place order with Skretting in Tasmania (Phone Tim on 0362161200) confirm with fax on 0362161234 Check incoming stock records and fax Toll NT with feed container Nos required for farm Feed delivered by Toll to Tiwi Barge (TBC) Wednesday prior to departure Fax TBC incoming food details Tiwi Barge arrives with food at farm Feed stored in feed store	Food stock			teamleader manager

Purpose

This SOP describes the correct process for the storage and handling of fuel to ensure safety and minimal environmental impact.

Process

Re-fuelling Vessels

1. Pick up 200 ltr diesel tank on pallet or 1000L Unleaded fuel container
2. Pick up pallet with loader, drive to boat on beach.
3. Drive loader with fuel on pallet to waters edge and engage reverse gear and brake and turn off.
4. Boat drives to beach and moors side on to refuelling Drum and ties up
5. Open fuel cap and start pumping fuel (slowly).
6. when complete mop up any excess fuel
7. Return fuel cap, untie and move boat
8. Start loader and take fuel back to fuelling station
9. Ensure the vessel is carrying oil dispersing agent on board.

Re-fuelling the Diesel Tank

The Diesel tank is filled by a long hose from the barge directly to the tank connections.
Tiwi barge operators are responsible for refueling the tank.
All tiwi barge operators are to be inducted according to Marine Harvests procedures.

Storage of Fuel

1. Diesel is stored in the large tank suspended over the bunding.
2. Waste oil & fuel is put into the 44 gallon storage drums which must remain in the bunded area.
3. Waste is returned to Darwin for re-cycling once drums are full.
4. Water which accumulated in bund is drained out when clean.
5. If oil or fuel has contaminated the bund water, then it is pumped into a 44gallon waste drum.

Environmental Issues

- Fuel Spills - Watch for spills. Prepare to stop quickly and clean-up if spill occurs.
  - Take care not to over flow tanks & drums when filling.
  - Ensure bunded water containing oil or fuel is not drained to ground.

Legislative and Other Requirements

Marine Harvest must comply to the relevant section of the below documents:

- The storage and handling of flammable and combustible liquids. AS 1940-2004.
- N.T. Government - Dangerous Goods Regulations 2004

Associated documents

- Loader Start-up procedure (sup10)
- Emergency Procedure - Substance Spill.
- The storage and handling of flammable and combustible liquids. AS 1940-2004.
- N.T. Government - Dangerous Goods Regulations 2004

ISO 14001 PROCEDURES FISH MAINTENANCE				
ACTIVITY	CHECKS	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
ROOM VACATING				
Remove all personal items	pack up	loosing items		John & Chris Wong
Remove all rubbish	bin provided	rats and ants	droppings from rats	
Strip beds and pillows				
Turn off lights, fan & airconditioner	always check	breaking	saving energy	
Take linen and towel to laundry to be cleaned				
Any problems with room	all electrical			Chris Wong Teamleader
OPEN ALL WINDOWS TO AIR OUT ROOM.				

ISO 14001 PROCEDURES FISH MAINTENANCE				
Wrap 4-5 turns of rope around drum and winch rope, until seine net is above water. Aeration Place 1 x G size oxygen bottle at cage. Attach flow meter and oxygen hoses to bottle. Run out air stones and place into seine net at equal intervals. Turn flow meter on 6-81/sec and hoses on 4-61/sec. Check each stone to see if working properly. To ensure adequate numbers of fish are pumped, fish must be herded to suction pipe. This is achieved by lifting the seine net, (starting at the far end of net) and placing net onto hand rails as required.	Check quality Fine mist ensure stone cant be sucked up into suction pipe. For holes in seine net Checking all gear is in good order			

ISO 14001 PROCEDURES
FISH MAINTENANCE

ACTIVITY	CHECKS	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
TOWING POLARS				Teamleader
See bushman(SUP03), baywatch(SUP02) & seafarmer(SUP12) start ups		fuel,oil leaks		licenced operator
Find out where pen is going(what position	tides	too much tide		
Tow harness tied correctly to pen and boa	teamleader to check	wrong knots		
Release cage from grid or beach(SOP14)	secure mooring ropes	not securring ropes		
Tow pens at know more than 1200 rpms	Tow speed 1200rpms			
When at mooring point for pen release	moorings ready	loose moorings		
Release towline and pull on boat or pen	towline secured on boat	loose towline		
Then prepare to push pen into place preferably with seafarme				
While pushing into place 2 people should be on pen & 2 people on bay watc				
Connect ropes on southern side as pushing pen into plac	secure ropes to bollards	rope under 2 black pipes 1st		
when south moorings are on connect north moorings	Check all mooring points	boats around rope		

ISO 14001 PROCEDURES FISH MAINTENANCE				
ACTIVITY	CHECKS	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
Transporting Fingerlings Prepare tanker. Calculate fingerling load distribution between tanks. Load tanker and use form ff1 (transport sheet). Monitor water parameters. Transport and load onto Tiwi barge. Connect water supply and discharge hoses. Tie up vessel at farm. Connect fish discharge hose. Drop water levels. Discharge fish. Pack up tanker equipment. Tanker returns to Darwin to be cleaned and returned to hatchery.	 Bottles and connections Connections and water quality Ropes and knots Connections, correct cage connections Fish behaviour See start up	 leaks Tiwi barge heavy vessel confined space		

ISO 14001 PROCEDURES FISH MAINTENANCE				
ACTIVITY	CHECKS	HAZARDS	ENVIROMENTAL IMPACTS	AUTHORITIES
WASTE TRANSFER See loader startup(su10) Allow to idle for 2-3 minutes. Drive to back of kitchen and stop. Secure rubbish bin to pellet Drive fork to pallet and place forks into pellet. Lift pallet off ground. Drive slowly to tip area and stop. Empty wheelie bin and replace securely on pallet Drive forklift to wash down area. Stop forklift and wash rubbish bin with water/disinfectant Drive forklift to back of kitchen, put bin and pellet into position, remove forks from pellet and park fork. Secure bin to pallet. Drive forklift to shed. Let idle down for 2 minutes and turn off	obstructions while driving rope and knots Oil, water etc.	Obstructions	food waste being dropped and not retievec	Farmhand(exp) Technician teamleader manager

Purpose

This SOP describes the correct process for Storage & Handling of Chemicals, to ensure safety for the employee and to minimise environmental impact.

Process

Storage

20 liters and less

1. The Dive Shed / Lab is used to store aquaculture related chemicals.
2. A Chemicals Cabinet is located in the shed. Chemicals in the cabinet are listed on the door of the cabinet.
3. The Chemicals Cabinet is to remain locked at all times.
4. The Scientific Officer is responsible for maintaining the Chemical and the Chemicals Cabinet.
5. There must be a current MSDS for any chemical that the Scientific Officer deems to be a significant hazard to personnel or the environment.

Greater than 20 liters

1. Chemicals of this volume must be stored within an adequately bunded area.
2. The Operations Manager is responsible for ensuring the correct storage and handling.
3. There must be a current MSDS for all chemical of this volume.

Safety Issues

- Ensure the correct protective clothing and equipment is used.
- Do not pour, pump or handle chemical outside bunded areas.

Environmental Issues

Spills - Ensure pipes and connections are secure and free from leaks.
- Do not pour, pump or handle chemical outside bunded areas.

Legislative Requirements

Marine Harvest must comply to the relevant section of the below documents:

- The storage and handling of flammable and combustible liquids. AS 1940-2004.
- N.T. Government - Dangerous Goods Regulations 2004

Associated documents

- Emergency Procedure - Substance Spill.
- The storage and handling of flammable and combustible liquids. AS 1940-2004.
- N.T. Government - Dangerous Goods Regulations 2004
- SOP 09 Ensiler

Purpose

This SOP describes the Monitoring and Measuring conducted by Marine Harvest.

Process

Environmental Monitoring Program

- An Environmental Monitoring Program has been implemented by Marine Harvest to evaluate the impact of the farm on the environment and to collect information which will guide the management of the farm. The Monitoring Program is a Marine Harvest requirement for the NT Government.
- This monitoring is the responsibility of the Scientific Officer.
- Data is recorded in hard-copy on F-03 Environmental Monitoring Form and electronically in XL Spread sheet (Port Hurd Water Monitoring Data).
- Water Samples are processed by a NATA accredited facility (currently NT Environment Laboratory, Darwin.)
- Data is send to Aquenal Pty Ltd, Hobart each month by the Scientific Officer/Operations Manager.
- Sampling Methods are described in the 'Port Hurd Environmental Monitoring Plan, Aquenal Pty Ltd, 2003'

Environmental Objectives

Marine Harvest have set Environmental Objectives & Targets (see Objectives & Targets Register R-06). The below monitoring is carried to assess performance against the set targets:

Measurement	Responsibility	Reporting	Target	Where Recoded
Fresh Water Usage	Operations Manager	Each Month	100 L/ person	End of Month Report
Waste Oil	Operations Manager	Each Month	80 L/ month	End of Month Report
Solid Waste	Operations Manager	Each Month	$1m^3$ / 100 T biomass	End of Month Report
Fish Mortality	Operations Manager	Each Month	0.7% / month	End of Month Report
Fuel Usage	Operations Manager	Each Month	6 litres / tonne biomass	End of Month Report
Feed Usage	Operations Manager	Each Month	<=1.4 FCR	End of Month Report

Data is summarised each month on the Environment Report by the Operations Manager. The report is posted on the notice board each month and results discussed at operations meetings.

Environmental Objectives and Targets are reviewed at Management Review Meetings, see the EMS Manual for details of this process.

Calibration

Calibration is performed on the Temperature Probe and DO Meter each time it is used. Records of calibration are recorded on F-03 Environmental Monitoring Form, maintained by the Scientific officer.

Associated documents

- EMP Manual
- Objectives & Targets Register R-06
- Environmental Monitoring Form (F-03)
- Day Sheets (F12)
- Port Hurd Environmental Monitoring Plan, Aquenal Pty Ltd, 2003

- Environmental Baseline Report. August 2001. Australian Underwater Technology Pty Ltd.
- Environmental Management Plan Final. March 2003, Department of planning, infrastructure and environment.
- Assessment of the Biological Impact of Nutrients released from Marine Harvests Aquaculture Operation in Port Hurd, Bathurst Island. October 2003. Aquenal Pty Ltd