BROCKWAY
ENGINEERING
P.L.L.C.

Hydraulics
Hydrology
Water Resources

RECEIVED
SEP 28 2006
DEPT. OF WATER RESOURCES
SOUTHERN REGION

September 20, 2006

Mark & Jo Anne Lupher
Epicenter Aquaculture
P.O. Box 336
Challis, ID 83313

Re: Applications for Permit 72-7577 through 72-7580

Dear Mr. & Mrs. Lupher:

Introduction
This letter report presents the information required by Water Appropriation Rules 40.05.c through 40.05.g. in order to provide IDWR with adequate information to evaluate the following criteria with respect to Applications for Permit 72-7577 through 72-7580:

- The potential to reduce the quantity of water under existing water rights
- The sufficiency of the water supply for the proposed appropriation
- The good faith nature of the application
- The adequacy of the applicant's financial resources to complete the project
- The local public interest related to the public water resource
- The conservation of water resources in Idaho
- Impacts to the economy of the local area or watershed

Pending Applications
Although it appears that initially a relatively simple application for permit was submitted to IDWR for additional diversion through the Epicenter Aquaculture facility to maximize production, review by IDWR personnel identified multiple existing water uses on the property and the applications were expanded to 4 separate permits:

- **72-7577 (1.1 cfs: Fish Propagation)**
  Application 72-7577 proposes capture and diversion from existing springs seeping below the primary Warm Springs discharge for use in the proposed facility.

CHARLES E. BROCKWAY, PH.D., P.E.

CHARLES G. BROCKWAY, PH.D., P.E.

2016 NORTH WASHINGTON STREET • SUITE 4

TWIN FALLS, IDAHO 83301

208•736•8543

FAX: 736•8506

- **72-7578 (13.1 cfs: Fish Propagation)**
  Application 72-7578 proposes total diversion through the fish propogation facility of 12 cfs from the primary Warm Springs discharge in addition to the 1.1 cfs from the additional seeps identified in application 72-7577

- **72-7579 (1.7 acre-ft: Wildlife Storage)**
  Application 72-7579 proposes to authorize the existing settling ponds which are actually part and parcel of the fish propagation facility to treat the waste products associated with the facility.

- **72-7580 (0.02 cfs/0.1 acre-ft: Commercial, Wildlife Storage)**
  Application 72-7580 proposes to authorize the existing cooling pond which will supply trucking water at an appropriate temperature to relax the fish for live shipping. The consumptive use identified with this application relates to the holding water utilized for fish trucking of approximately 6,000 gallons per week.

Background of Warm Springs Creek

The following summary is based primarily on research of available Idaho Department of Water Resources (IDWR) water rights data and published studies prepared by the Idaho Department of Environmental Quality (DEQ) as well as the Environmental Protection Agency in relation to the NPDES Permit approval process associated with the existing aquaculture facility.

- Historical geothermal flow prior to 1983 approximately 12-15 cfs.
- October 28, 1983 Mt Borah earthquake altered subsurface flows[1]
- Post earthquake flow peaked ~70 cfs
- Temperature at spring source ~90° F.

Following the 1983 earthquake, the additional spring flows were eventually captured and diverted through a series of two power plants under currently licensed water rights 72-7372 & 72-7375. During the period directly after the earthquake, significant work was performed through public and private cooperation to enlarge the existing diversion canal system in the Round

[1] R. L. Whitehead, R. W. Harper, H.G. Sisco, "Hydrologic Changes Associated with the October 28, 1983, Idaho Earthquake" Pure and Applied Geophysics. Volume 122, Numbers 2-4 / March, 1984

Valley area to restrain the new flow of highly turbid geothermal water from directly discharging into the Salmon River and degrading water quality.

Epicenter Aquaculture Facility Design

A layout of the existing facility and proposed additional construction pending approval of these applications is included as **Exhibit A**. The current configuration of the diversion system at the fish facility circulates a portion of the flow (currently 6.98 cfs authorized by 72-7209 – See **Exhibit B**) from the hydropower canal into the raceways and eventually down to the lower settling pond where it is pumped back up into the hydropower canal. Since the hydropower canal flow directly below the fish facility is maintained at the same level as upstream of the facility, no impacts are expected to existing water rights diverting from the hydropower canal. Any losses within measurable limits are required to be replaced from the lower seep springs[2].

Anticipated Effects on Existing Water Rights

Based on review of the 2004 aerial photo, the natural Warm Springs Creek channel no longer exists as a continuous reach. This is not surprising considering that every effort was made to collect the full flow into the hydropower feeder canal thus making it the de-facto primary channel of Warm Springs Creek below the first hydropower plant. The original Warm Springs Creek channel does still exists just downstream of the Epicenter facility conveying any remaining uncaptured seeps downstream for irrigation and other uses after which the majority of the flow is captured in the feeder canal and conveyed northeast across the highway to the second hydropower plant. The total additional consumptive use resulting from the proposed facility expansion and approval of Permits 72-7577 through 7580 is relatively insignificant (0.1 afa) and the majority of the identified consumption actually already exists as part of current facility operations. Most all remaining flow from the lower seep springs continues in the existing natural channel where it provides water for irrigation on the Warm Springs Ranch and incidental wildlife habitat. The natural channel appears to be captured after the first hydropower plant so no impacts on other water rights from this channel are expected. A listing of water rights associated with Warm Springs & Warm Springs Creek is included as **Exhibit C.**

Review of the power plant water right applications indicates that some diversion bypass (~2.0 cfs) in the SENWNE of Section 32, T.13N, R.20E is required after passing through the first power plant in order to supply certain downstream water rights through a ditch on the west side of the highway

[2] See Exhibit E (Page 4).

(likely the original Warm Springs channel). This requirement was determined during IDWR review of application for permit 72-7372 associated with the hydropower development. This diversion requirement is several miles downstream of the fish propagation facility, and therefore should not be impacted significantly by approval of these applications.

A map and listing of active water rights associated with Warm Springs Creek is included as **Exhibit C**. Based on the nature of the applications; it is expected that no water rights will be significantly impacted by approval of Applications 72-7577, 7578, 7579 & 7580 which in total are estimated to consume no more than 4 acre-ft per year[3] from a source which currently seeps within the Warm Springs Ranch property boundary.

The primary method utilized to minimize impacts to downstream water users consists of two existing measuring devices (submerged orifices) which are currently installed on the inflow and outflow of the main raceway which is attached to the hydrocanal. These orifices will be monitored and adjusted as necessary to maintain the existing flow of the hydropower canal which supplies downstream water rights.

Several water rights appear to list points of diversion on Warm Springs Creek downstream of the Epicenter facility (See Exhibit C). No impact to the rights is anticipated assuming the current seepage bypassing the facility is continued. No further information was readily available regarding the configuration of the diversions, however it has been mentioned that no protest would be made and in fact it would probably be preferred even if the additional flow in the historical Warm Springs channel were to be diverted into the hydrocanal for additional power generation.

Sufficiency of Proposed Water Supply

The water supply is ideal for the proposed use due to its elevated temperature and the facility was designed to operate with full diversion of the 12 cfs currently estimated to exist in the hydrocanal. The additional flow sought by application 72-7577 will also allow a separate source for convenient construction and diversion to hatchery and fingerling ponds. **Exhibit D** includes some information specifically related to water quality and quantity requirements for Tilapia and other warm water species production.

[3] Primarily free water surface evaporation of the fish ponds and raceways (< 1.0 acre) in addition to approximately 0.1 acre-feet per year for live shipping.

Applications Made in Good Faith and not for Speculative Purposes
The existing facility is currently designed to operate most efficiently with the full diversion identified in application 72-7578. Currently the fish facility is operating at approximately half capacity due to the current diversion limit and is unable to provide an environment suitable for full Tilapia production from hatchling to adult.

The applicants are fully committed to the water use applied for and have diligently pursued completion of the water right applications. To demonstrate, a copy of the existing lease agreement and pending EPA permits for the facility are included as **Exhibit E.**

Financial Resources to Complete Project
The additional flow will provide adequate water quality to allow additional facility construction for self-sufficient hatchery operations including the addition of hatchery ponds, fingerling raceways and holding ponds. The additional construction is expected to cost between $50,000 and $100,000 and should significantly increase the profitability of the facility. A notarized financial statement demonstrating the ability to complete the proposed construction is included as **Exhibit F.**

Local Public Interest
Approval of these applications will allow additional fish production increasing the income and tax base for the community while providing additional employment. Comment letters from the Idaho Department of Environmental Quality, Idaho Department of Fish & Game, Custer County Board of Commissioners and the Watermaster (See **Exhibit G**) all indicate no foreseeable negative impacts from approval of the applications. Although downstream water users would certainly benefit by lifting the lower spring seeps into the hydrocanal, it is the firm position of the Idaho Department of Fish & Game that this water be allowed to remain in the lower channel to continue to provide beneficial habitat in the original Warm Springs streambed just north of the fish facility where it eventually seeps into the ground. Regardless of the ultimate fate of the lower spring water, the flow in the hydrocanal will be maintained at or above the level it exists above the facility through re-lift of the water from the main settling pond and any consumption in the facility will be effectively replaced from the lower spring source.

Review of the Idaho Department of Environmental Quality Upper Salmon River Subbasin Assessment and TMDL[4] indicates Warm Springs Creek has likely seeped into the ground prior to reaching the Salmon river for many years and more recently has been diverted in its entirety for irrigation and other uses. Since the waters are warm, no 303(d) assessment was made. Comments and responses related to the 303(d) listing study conclude that Warm Springs Creek does not connect to the Salmon River, is diverted in its entirety, the natural channel is dry and most likely does not fit the U.S. Army Corps of Engineers definition for a "navigable water" so there is no anticipated impact to the Salmon River due to approval of these applications.

Conclusions

- No injury to existing water rights will occur. Water available under all existing water rights will not be reduced below the historical amount beneficially used by the existing water right holders. The majority of the water consumption proposed is already realized in the existing facility and these applications are designed to provide adequate water for full facility operation and eliminate any ambiguity regarding the configuration of the facility and the water uses therein.
- The water considered in these applications is currently available at the facility but the flow is restricted or allowed to bypass to maintain currently authorized uses under water right 72-7209 only.
- The existing facility as currently constructed can utilize the full amount of water proposed under these applications and approval would allow the facility to operate at full capacity with minimal additional construction.
- Current water quality available to existing water right holders will not be impaired. Some minor additional cooling of the geothermal water source is possible; however no downstream users specifically require the geothermal quality beyond maintaining the flow in the hydrocanal without freezing which should not be impaired by the approval of these applications.
- The applications actually seek to increase efficient use of the water based on economies of scale for the existing facility and every effort will be made to continue to meet contemporary standards for reasonably efficient use of water.

[4] State of Idaho Department of Environmental Quality, Upper Salmon River Subbasin Assessment and TMDL (January, 2003) pgs. 54-55, 116.

- The proposed use of water under the applications is compatible with the objectives and policies of the State Water Plan pertaining to beneficial use and conservation of water resources.

It is my professional opinion that these applications meet the criteria for the best use of the available resource and have little or no impact on other water users and I look forward to their approval by IDWR. If you have any questions or comments or need any additional information please don't hesitate to contact our office. Thank you for the opportunity to provide this service to you.

Sincerely,

Jason C. Helms, P.E.

Attachment: Exhibits

Cc: Rob Williams
Allen Merritt (IDWR-Southern Region)

Project No. 921-01-2006

Exhibits

Epicenter Aquaculture Application for Permits 72-7577, 7578, 7579, 7580 - Custer County, Idaho

RECEIVED
SEP 26 2006
DEPT. OF WATER RESOURCES
SOUTHERN REGION

Prepared for:

Mark Lupher

September 25, 2006

For information concerning this report, contact
Jason C Helms, P.E.

BROCKWAY ENGINEERING P.L.L.C.

CHARLES E. BROCKWAY, PH.D., P.E.
CHARLES G. BROCKWAY, PH.D., P.E.
JASON C. HELMS, P.E.

2016 NORTH WASHINGTON, SUITE 4
TWIN FALLS, IDAHO 83301

Mark & Jo Anne Lupher – Epicenter Aquaculture
Water Right Application No's. 72-7577, 7578, 7579, 7580

List of Exhibits

Exhibit A. **Facility Design**

Exhibit B. **Existing water right license 72-7209 and pending application summaries**

Exhibit C. **Effect on existing water rights**

- C.1. Map – Active Water Right Licenses & Decrees in Vicinity
- C.2. IDWR Active Water Right Listing ("Warm Springs")

Exhibit D. **Information relative to sufficiency of water supply**

- D.1. Tilapia Production
- D.2. Water Quantity & Quality Requirements for Channel Catfish Hatcheries

Exhibit E. **Information relative to good faith, delay or speculative purposes**

- E.1. Existing Lease Agreement & Survey
- E.2. EPA NPDES Permit ID-002826-6 & related documents

Exhibit F. **Information relative to financial resources**

- F.1. Current financial statement - Mark L. & Jo Anne W. Lupher dba Epicenter Aquaculture
- F.2. Additional facility estimated construction costs

Exhibit G. **Information relative to conflict with the local public interest**

- G.1. Letter of comment from Idaho Department of Environmental Quality
- G.2. Letter of comment from Idaho Department of Fish & Game (2)
- G.3. Letter of comment from Custer County Commissioners
- G.4. Recommendation of Watermaster (RE: 72-7579)

Exhibit A

Facility Design

0 100 200 400 600 Feet

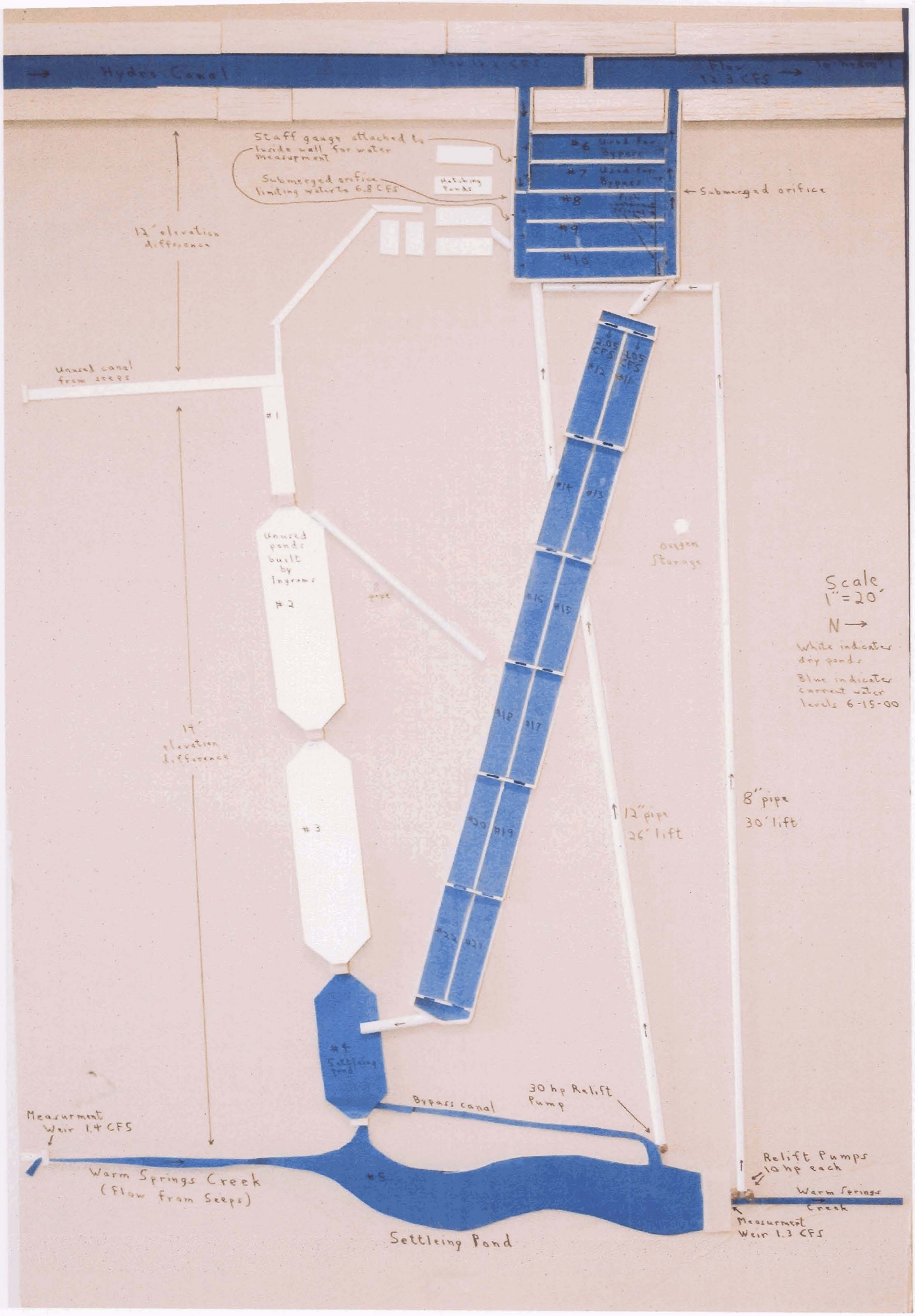
LUPHER - FISH FACILITY SYSTEM
NAIP 2004 AERIAL PHOTO
T. 12N., R. 20E. Section 9

Legend

- Ext'g Facility
- Ext'g Pipe
- QQ Lines
- Parcels Lupher
- Proposed Structures
- Current Bypass
- Section Lines
- Water ways
- Proposed Pipeline
- Ext'g check structure

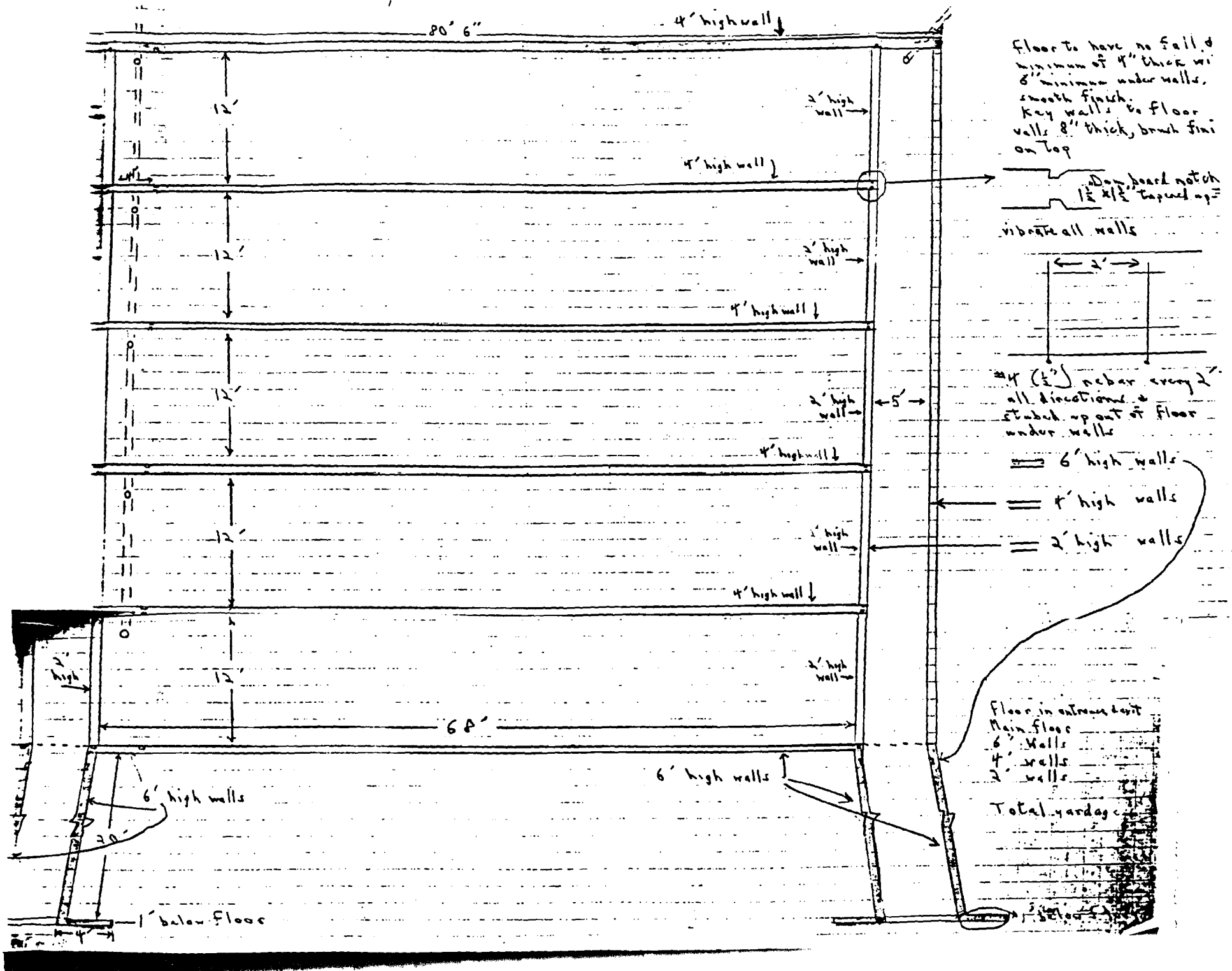
N

BROCKWAY ENGINEERING, PLLC.
ALR - Sept. 22, 2006

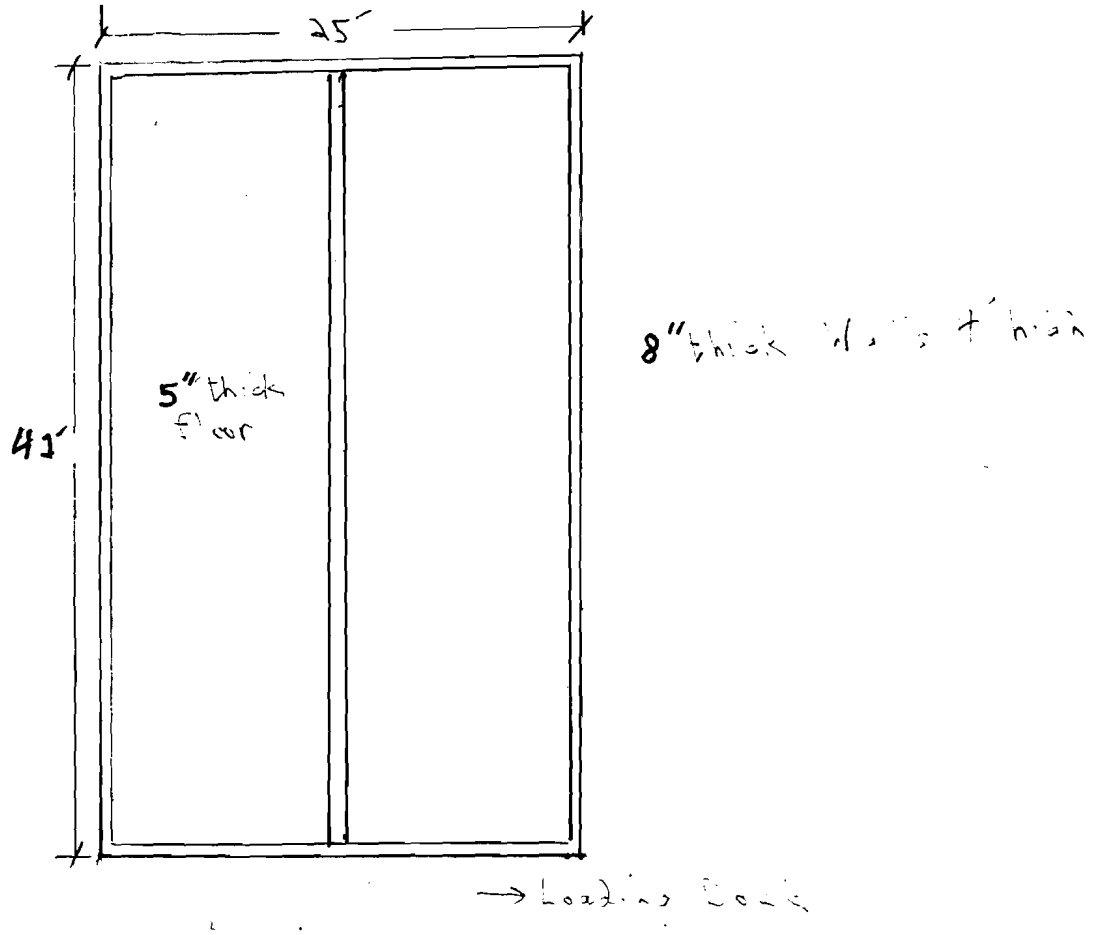


Hydro Canal
Flow 12.3 CFS
Staff gauge attached to inside wall for water measurment
Submerged orifice limiting water to 6.8 CFS
Hatching Ponds
#6 Used for Bypass
#7 Used for Bypass
#8
#9
#10
Submerged orifice
12' elevation difference
Unused canal from seeps
#1
Unused ponds built by Ingrams
#2
pipe
#3
14' elevation difference
#4 Settleing pond
Bypass canal
30 hp Relift Pump
Measurment Weir 1.4 CFS
Warm Springs Creek (Flow from Seeps)
#5
Settleing Pond
2.05 CFS
2.05 CFS
#12
#11
#14
#13
#16
#15
#18
#17
#20
#19
#22
#21
Oxygen Storage
12" pipe 26' lift
8" pipe 30' lift
Scale 1" = 20'
N →
White indicates dry ponds
Blue indicates current water levels 6-15-00
Relift Pumps 10 hp each
Warm Springs Creek
Measurment Weir 1.3 CFS

HYDROCANAL

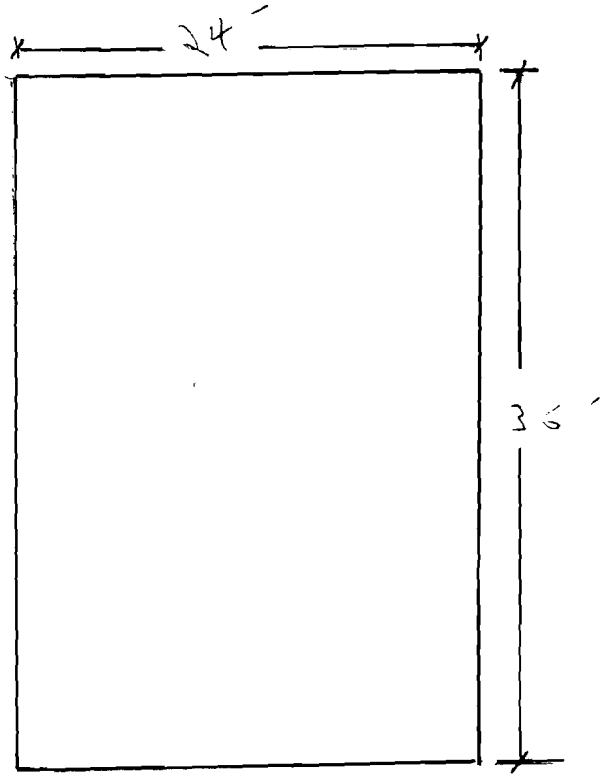

80' 6"
4' high wall
12'
2' high wall
5'
68'
6' high walls
20'
1' below floor
Floor to have no fall & minimum of 4" thick w/ 8" minimum under walls, smooth finish.
Key walls to floor walls 8" thick, brush finish on top
Dow board notch 1½ x 1½" tapered up
vibrate all walls
2'
#4 (½") rebar every 2' all directions & stubs up out of floor under walls
6' high walls
4' high walls
2' high walls
Floor in entrance exit
Main floor
6' Walls
4' walls
2' walls
Total yardage

Holding ponds 1" = 10'
Cost $10,000



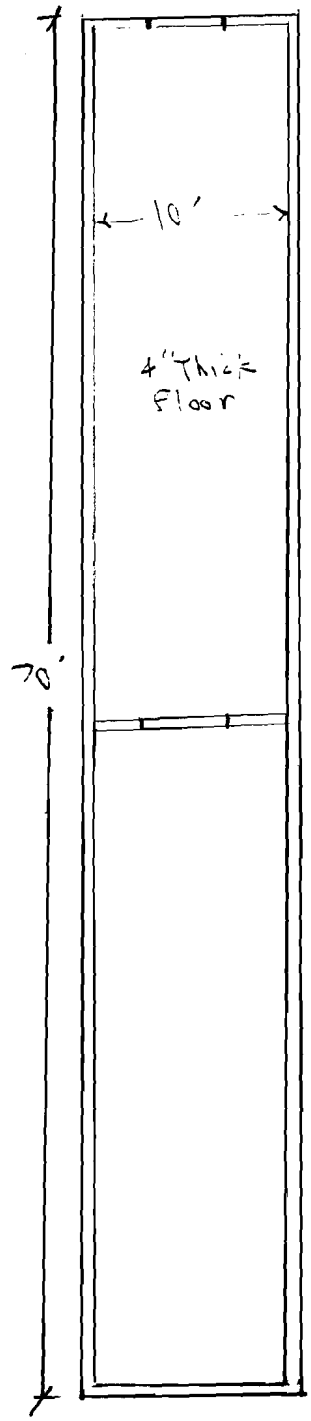
Concrete:
16 yards floor
17 yards walls

Hatchery Building 1" = 10'
Cost ~25,000



Greenhouse style with open walls
10' walls

Fingerling Raceway
Cost $5,000 (8" pipe is on hand)



6" Thick walls 3' high

9 yrds Floor
9 ½ yrds walls

Exhibit B

Existing water right license 72-7209 and pending applications 72-7577 through 72-7580

Close

IDAHO DEPARTMENT OF WATER RESOURCES
Water Right Report

08/23/2006

WATER RIGHT NO. 72-7209

Owner Type	Name and Address
Current Owner	TIMOTHY A INGRAM HC 61 BOX 3020 CHALLIS, ID 83226 (208)879-4721
Original Owner	WARM SPRINGS RANCH C/O JACK SIMPSON PO BOX 336 KETCHUM, ID 83340 (208)726-3249

Priority Date: 09/01/1982
Basis: License
Status: Active

Source	Tributary
SPRINGS	WARM SPRING CREEK
WARM SPRINGS	WARM SPRINGS CREEK

Beneficial Use	From	To	Diversion Rate	Volume
FISH PROPAGATION	1/01	12/31	6.98 CFS	5052.2 AFA
Total Diversion			6.98 CFS	

Location of Point(s) of Diversion:

SPRINGS	SWNW	Sec. 10	Township 12N	Range 20E	CUSTER County
WARM SPRINGS	NWSW	Sec. 10	Township 12N	Range 20E	CUSTER County

Licensed Diversion Capacity: 6.98

lace(s) of use:

Place of Use Legal Description: FISH PROPAGATION CUSTER County

Township	Range	Section	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres
12N	20E	10		SWNW										

13N		32		NENE										

Conditions of Approval:

1.	R09	Return water shall be treated to insure that the effluent meets Idaho Water Quality Standards.
2.	R03	Measuring devices of a type approved by this Department shall be maintained at the point of diversion and point of effluent discharge.
3.	R11	Should the use of the water on this right reduce the quality of water available to prior water rights and make it unusable to satisfy the prior appropriations, the right holder shall cease diversion under this right.
4.		The facility volume = .8 acre feet.

Dates:
Licensed Date: 07/28/1995
Decreed Date:
Permit Proof Due Date: 7/1/1989
Permit Proof Made Date: 6/28/1989
Permit Approved Date: 7/25/1983
Permit Moratorium Expiration Date:
Enlargement Use Priority Date:
Enlargement Statute Priority Date:
Water Supply Bank Enrollment Date Accepted:
Water Supply Bank Enrollment Date Removed:
Application Received Date: 09/01/1982
Protest Deadline Date:
Number of Protests: 0

Other Information:
State or Federal:
Owner Name Connector:
Water District Number:
Generic Max Rate per Acre:
Generic Max Volume per Acre:
Combined Acres Limit:
Combined Volume Limit:
Combined Rate Limit: 25
Civil Case Number:
Old Case Number:
Decree Plantiff:
Decree Defendant:
Swan Falls Trust or Nontrust:
Swan Falls Dismissed:
DLE Act Number:
Cary Act Number:
Mitigation Plan: False

Close

Close

IDAHO DEPARTMENT OF WATER RESOURCES
Water Application Report

09/05/2006

WATER RIGHT NO. 72-7577

Owner Type	Name and Address
Current Owner	EPICENTER AQUACULTURE
Current Owner	JO ANNE LUPHER
Current Owner	MARK L LUPHER
	PO BOX 336
	CHALLIS, ID 83226

Priority Date: 10/14/1999
Status: Active

Source	Tributary
SPRINGS	WARM SPRING CREEK
WARM SPRINGS CREEK	SALMON RIVER

Beneficial Use	From	To	Diversion Rate	Volume
FISH PROPAGATION	1/01	12/31	1.1 CFS	
Total Diversion			1.1 CFS	

ocation of Point(s) of Diversion:

SPRINGS	SESENE	Sec. 09	Township 12N	Range 20E	CUSTER County
WARM SPRINGS CREEK	NENWSW	Sec. 10	Township 12N	Range 20E	CUSTER County

lace(s) of use:

Place of Use Legal Description: FISH PROPAGATION CUSTER County

Township	Range	Section	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres
12N	20E	9		NENE			SENE							

Dates:
ate Application Received: 10/14/1999
ate Application Denied:
Last Date of Beneficial Use:
Extension End Date:
otest Deadline Date: 1/10/2000

Number of Protests: 1
Enlargement Use Priority Date:
Enlargement Statute Priority Date:

Other Information:
State or Federal:
Owner Name Connector:
Water District Number:
Generic Max Rate per Acre:
Generic Max Volume per Acre:
Application Type: New Appropriation
Applicant Remarks:
Other Water Rights:
Time to Complete Works:
Transfer Affected Description:
Transfer Affected Contracts:
Old Transfer Number:
Transfer Reason:
Transfer Return Flows:
Swan Falls Trust or Nontrust:
Swan Falls Dismissed:
DLE Act Number:
Cary Act Number:
Mitigation Plan: False

Close

Close

IDAHO DEPARTMENT OF WATER RESOURCES
Water Application Report

09/05/2006

WATER RIGHT NO. 72-7578

Owner Type	Name and Address
Current Owner	ANNE W LUPHER HC 61 BOX 3016 CHALLIS, ID 83226
Current Owner	EPICENTER AQUACULTURE
Current Owner	MARK L LUPHER PO BOX 336 CHALLIS, ID 83226

Priority Date: 12/14/1999
Status: Active

Source	Tributary
WARM SPRINGS	WARM SPRINGS CREEK

Beneficial Use	From	To	Diversion Rate	Volume
FISH PROPAGATION	1/01	12/31	13.1 CFS	
Total Diversion			13.1 CFS	

Location of Point(s) of Diversion:

WARM SPRINGS	SENWSW	Sec. 10	Township 12N	Range 20E	CUSTER County

lace(s) of use:

Place of Use Legal Description: FISH PROPAGATION CUSTER County

Township	Range	Section	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres
2N	20E	9		NENE			SENE							

Dates:
ate Application Received: 10/14/1999
ate Application Denied:
Last Date of Beneficial Use:
Extension End Date:
otest Deadline Date: 1/10/2000

Number of Protests: 1
Enlargement Use Priority Date:
Enlargement Statute Priority Date:

Other Information:
State or Federal:
Owner Name Connector:
Water District Number:
Generic Max Rate per Acre:
Generic Max Volume per Acre:
Application Type: New Appropriation
Applicant Remarks:
Other Water Rights:
Time to Complete Works:
Transfer Affected Description:
Transfer Affected Contracts:
Old Transfer Number:
Transfer Reason:
Transfer Return Flows:
Swan Falls Trust or Nontrust:
Swan Falls Dismissed:
DLE Act Number:
Cary Act Number:
Mitigation Plan: False

Close

Close

IDAHO DEPARTMENT OF WATER RESOURCES
Water Application Report

09/05/2006

WATER RIGHT NO. 72-7579

Owner Type	Name and Address
Current Owner	EPICENTER AQUACULTURE
Current Owner	JO ANNE LUPHER
Current Owner	MARK L LUPHER
	PO BOX 336
	CHALLIS, ID 83226

Priority Date: 10/25/1999
Status: Active

Source	Tributary
WARM SPRINGS CREEK	SALMON RIVER

Beneficial Use	From	To	Diversion Rate	Volume
WILDLIFE STORAGE	1/01	12/31		1.7 AFA
Total Diversion			1.7 AFA	

ocation of Point(s) of Diversion:

WARM SPRINGS CREEK	NENWSW	Sec. 10	Township 12N	Range 20E	CUSTER County

Place(s) of use:

ace of Use Legal Description: WILDLIFE STORAGE CUSTER County

Township	Range	Section	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres
2N	20E	10		NWSW										

nditions of Approval:

	This application being held pending withdrawal of Wilderness Moratorium.

Dates:
te Application Received: 10/25/1999

Date Application Denied:
Last Date of Beneficial Use:
Extension End Date:
Protest Deadline Date:
Number of Protests: 0
Enlargement Use Priority Date:
Enlargement Statute Priority Date:

Other Information:
State or Federal:
Owner Name Connector:
Water District Number:
Generic Max Rate per Acre:
Generic Max Volume per Acre:
Application Type: New Appropriation
Applicant Remarks:
Other Water Rights:
Time to Complete Works:
Transfer Affected Description:
Transfer Affected Contracts:
Old Transfer Number:
Transfer Reason:
Transfer Return Flows:
Swan Falls Trust or Nontrust:
Swan Falls Dismissed:
DLE Act Number:
Cary Act Number:
Mitigation Plan: False

Close

Close

IDAHO DEPARTMENT OF WATER RESOURCES
Water Application Report

09/05/2006

WATER RIGHT NO. 72-7580

Owner Type	Name and Address
Current Owner	EPICENTER AQUACULTURE
Current Owner	JO ANNE LUPHER
Current Owner	MARK L LUPHER
	PO BOX 336
	CHALLIS, ID 83226

Priority Date: 12/17/1999
Status: Active

Source	Tributary
WARM SPRINGS CREEK	SALMON RIVER

Beneficial Use	From	To	Diversion Rate	Volume
COMMERCIAL	6/01	9/30	0.02 CFS	
WILDLIFE STORAGE	1/01	12/31		0.1 AFA
DIVERSION TO STORAGE	1/01	12/31	0.1 CFS	
Total Diversion			0.1 CFS	

Location of Point(s) of Diversion:

WARM SPRINGS CREEK	NENWSW	Sec. 10	Township 12N	Range 20E	CUSTER County

lace(s) of use:

Place of Use Legal Description: COMMERCIAL CUSTER County

Township	Range	Section	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres
2N	20E	9		SENE										

Place of Use Legal Description: WILDLIFE STORAGE CUSTER County

Township	Range	Section	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres
12N	20E	10		SWNW										

Conditions of Approval:

1.	Commercial use is for cooling live fish in tanker trucks for interstate shipping. Application being held pending withdrawal of Wilderness Mora- torium.

Dates:
Date Application Received: 12/17/1999
Date Application Denied:
Last Date of Beneficial Use:
Extension End Date:
Protest Deadline Date:
Number of Protests: 0
Enlargement Use Priority Date:
Enlargement Statute Priority Date:

Other Information:
State or Federal:
Owner Name Connector:
Water District Number:
Generic Max Rate per Acre:
Generic Max Volume per Acre:
Application Type: New Appropriation
Applicant Remarks:
Other Water Rights:
Time to Complete Works:
Transfer Affected Description:
Transfer Affected Contracts:
Old Transfer Number:
Transfer Reason:
Transfer Return Flows:
Swan Falls Trust or Nontrust:
Swan Falls Dismissed:
DLE Act Number:
Cary Act Number:
Mitigation Plan: False

Close

Close

TRANSFER NO. 67067

MARK L LUPHER
PO BOX 336
CHALLIS ID 83226, has filed Application No. 67067 for changes to the following water rights within
County: CUSTER

Purpose of Transfer	Water Right Number

Right No. 72-7209
Priority Sep 1 1982 12:00AM
Source SPRINGS, WARM SPRINGS,
Use FISH PROPAGATION 6.98 CFS 5052.2 AFA,
Total Amount 6.98 CFS 5052.2 AFA
Point(s) of Diversion

Township	Range	Section	QQQ	QQ	Quarter	GovernmentLotNumber
12N	20E	10		SW	NW	
12N	20E	10		NW	SW	

Place Of Use
Place of Use Legal Description: FISH PROPAGATION CUSTER County

Township	Range	Section	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres
12N	20E	10		SWNW										
13N		32		NENE										

The purpose of the transfer is to change the above rights a follows:

Proposed Right No. 72-7209
Priority Sep 1 1982 12:00AM
Source
Use FISH PROPAGATION 6.98 CFS 5052.2 AFA,
Total Amount 6.98 CFS 5052.2 AFA

Township	Range	Section	QQQ	QQ	Quarter	GovernmentLotNumber
12N	20E	10	NE	NW	SW	
12N	20E	10	SE	NW	SW	
12N	20E	9	SE	SE	NE	
12N	20E	9	NW	SE	NE	

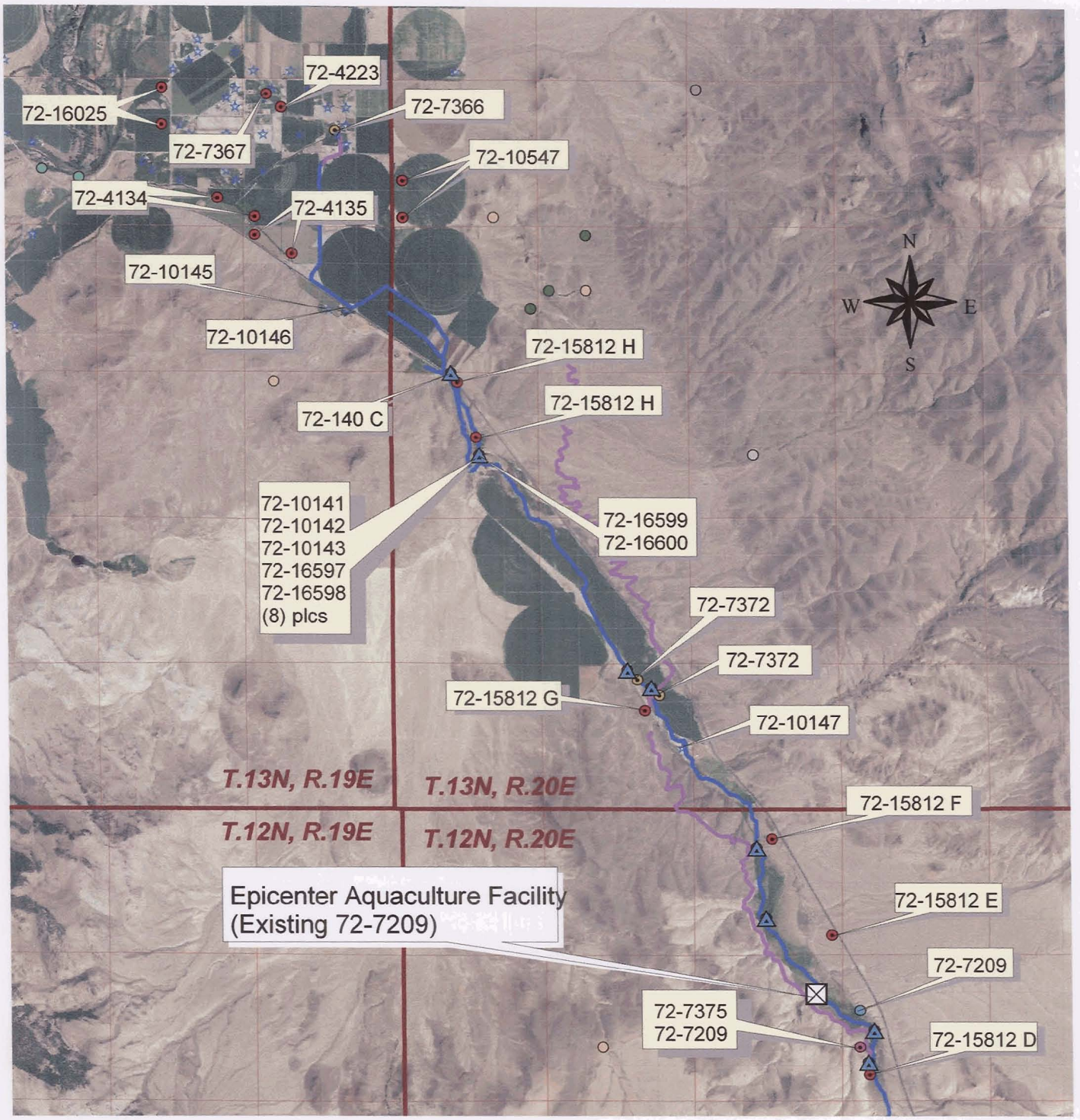
Place Of Use
Place of Use Legal Description: FISH PROPAGATION CUSTER County

Township	Range	Section	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres	Lot	Tract	Acres
12N	20E	9		NENE			SENE							

Exhibit C

Effect on existing water rights

Warm Springs Creek & Vicinity
(Active Water Right Licenses & Decrees)



1 0 1 2 3 4 5 Miles

Warm Springs Creek
Hydropower Canal
PLSS Township Boundaries
PLSS Section Lines
40's

IDWR - P.O.D.

- GROUND WATER
- WARM SPRING CREEK
- WARM SPRINGS
- WARM SPRINGS CREEK
- 72-10141 thru 72-10143
  72-16597, 72-16598

Brockway Engineering, PLLC
JCH - 8/21/06

Query parameters:
basinFrom = 72
Source = WARM SPRING
Search for: active Records

Information for type: Recommendation

Basin	Sequence	Suffix	Version	Basis	Status	Priority Date	Diversion Rate	Source List	Water Uses	Owner List
72	16049		1	Reserved	Active			WARM SPRING CREEK	AVERAGE ANNUAL FLOW, BANKFULL FLOW, CHANNEL MAINTENANCE, FISH HABITAT	UNITED STATES OF AMERICA TRUSTEE (Current)
72	16062		1	Reserved	Active			WARM SPRING CREEK	AVERAGE ANNUAL FLOW, BANKFULL FLOW, CHANNEL MAINTENANCE, FISH HABITAT	UNITED STATES OF AMERICA TRUSTEE (Current)
72	16081		1	Reserved	Active			WARM SPRINGS CREEK	AVERAGE ANNUAL FLOW, BANKFULL FLOW, CHANNEL MAINTENANCE, FISH HABITAT	UNITED STATES OF AMERICA TRUSTEE (Current)
72	16093		1	Reserved	Active			WARM SPRINGS CREEK	AVERAGE ANNUAL FLOW, BANKFULL FLOW, CHANNEL MAINTENANCE, FISH HABITAT	UNITED STATES OF AMERICA TRUSTEE (Current)
72	16131		1	Reserved	Active			WARM SPRINGS CREEK	AVERAGE ANNUAL FLOW, BANKFULL FLOW, CHANNEL MAINTENANCE, FISH HABITAT	NEZ PERCE TRIBE ACTING THROUGH THE (Current)
72	16144		1	Reserved	Active			WARM SPRING CREEK	AVERAGE ANNUAL FLOW, BANKFULL FLOW, CHANNEL MAINTENANCE, FISH HABITAT	NEZ PERCE TRIBE ACTING THROUGH THE (Current)
72	16163		1	Reserved	Active			WARM SPRINGS CREEK	AVERAGE ANNUAL FLOW, BANKFULL FLOW, CHANNEL MAINTENANCE, FISH HABITAT	NEZ PERCE TRIBE ACTING THROUGH THE (Current)
72	16175		1	Reserved	Active			WARM SPRINGS CREEK	AVERAGE ANNUAL FLOW, BANKFULL FLOW, CHANNEL MAINTENANCE, FISH HABITAT	NEZ PERCE TRIBE ACTING THROUGH THE (Current)

Information for type: Application

Basin	Sequence	Suffix	Version	Basis	Status	Priority Date	Diversion Rate	Source List	Water Uses	Owner List
72	7364				Active	12/19/1983	5	WARM SPRING CREEK	IRRIGATION, POWER	SCHOWENGERDT, RICHARD W (Current)
72	7577				Active	10/14/1999	1.1	SPRINGS , WARM SPRINGS CREEK	FISH PROPAGATION	EPICENTER AQUACULTURE (Current); LUPHER, JO ANNE (Current); LUPHER, MARK L (Current)
72	7578				Active	12/14/1999	13.1	WARM SPRINGS	FISH PROPAGATION	EPICENTER AQUACULTURE (Current); LUPHER, ANNE W (Current); LUPHER, MARK L (Current)
72	7579				Active	10/25/1999		WARM SPRINGS CREEK	WILDLIFE STORAGE	EPICENTER AQUACULTURE (Current); LUPHER, JO ANNE (Current); LUPHER, MARK L (Current)
72	7580				Active	12/17/1999	0.1	WARM SPRINGS CREEK	COMMERCIAL, DIVERSION TO STORAGE, WILDLIFE STORAGE	EPICENTER AQUACULTURE (Current); LUPHER, JO ANNE (Current); LUPHER, MARK L (Current)

Information for type: Statutory Claim, Decree and License

Basin	Sequence	Suffix	Version	Basis	Status	Priority Date	Diversion Rate	Source List	Water Uses	Owner List
72	140	C		Decreed	Active	1877-04-01	0.2	WARM SPRING CREEK	IRRIGATION	KOEPPEN, KENT K (Current)
72	144			Decreed	Active	1877-02-01	6.4	WARM SPRING CREEK	IRRIGATION, STOCKWATER	MOUNTAIN SPRINGS RANCH (Current)
72	146			Decreed	Active	1885-11-01	0.02	WARM SPRING CREEK	STOCKWATER	CHIVERS, GARTH T (Current); CHIVERS, GLENIS M (Current)
72	4005			Decreed	Active	11/1/1932	0.84	WARM SPRING CREEK	STOCKWATER	SALMON RIVER RANCHES LTD CO (Current)
72	4093	A		Decreed	Active	6/1/1916	0.09	WARM SPRINGS CREEK	IRRIGATION	SORENSEN, CAROLE K (Current)
72	4093	B		Decreed	Active	6/1/1916	1.58	WARM SPRINGS CREEK	IRRIGATION	SORENSEN, CAROLE K (Current)
72	4134			Decreed	Active	6/1/1962	0.05	WARM SPRING CREEK	STOCKWATER	HUNT, GLENDON H (Current)
72	4135			Decreed	Active	6/1/1970	0.05	WARM SPRING CREEK	STOCKWATER	HUNT, RYAN N (Current)
72	4192	A		Decreed	Active	1898-04-16	6.19	SALMON RIVER , WARM SPRING CREEK	IRRIGATION	HUNT, RYAN N (Current)
72	4222	A		Decreed	Active	6/1/1951	4	WARM SPRING CREEK	IRRIGATION	CHIVERS, GARTH T (Current); CHIVERS, GLENIS M (Current)
72	4222	B		Decreed	Active	6/1/1951	4	WARM SPRING CREEK	IRRIGATION	ROJOEMCO (Current)

Information for type: Statutory Claim, Decree and License

Basin	Sequence	Suffix	Version	Basis	Status	Priority Date	Diversion Rate	Source List	Water Uses	Owner List
72	4223			Decreed	Active	4/15/1970	0.52	WARM SPRING CREEK	IRRIGATION	TUPPER, FRANCES (Current); TUPPER, MICHAEL (Current)
72	7209			License	Active	9/1/1982	6.98	SPRINGS , WARM SPRINGS	FISH PROPAGATION	INGRAM, TIMOTHY A (Current)
72	7366			License	Active	7/30/1984	0.03	WARM SPRINGS CREEK	IRRIGATION, STOCKWATER	WOOLWINE, ANDREW JACKSON (Current); WOOLWINE, GWENDOLYN O (Current)
72	7367			Decreed	Active	4/3/1984	0.08	WARM SPRING CREEK	IRRIGATION, STOCKWATER	NALLION, MYLA R (Current); NALLION, WILLIAM M (Current)
72	7372			License	Active	4/19/1984	25	WARM SPRINGS CREEK	POWER	VON MORGANROTH, LOIS (Current)
72	7375			License	Active	4/19/1984	25	WARM SPRINGS CREEK	POWER	VON MORGANROTH, LOIS (Current)
72	7499			License	Active	6/9/1992	0.28	WARM SPRINGS CREEK	FISH PROPAGATION	STATE OF IDAHO (Current)
72	10141			Decreed	Active	1877-03-01	8	WARM SPRING CREEK	IRRIGATION, STOCKWATER	VON MORGANROTH, LOIS (Current)
72	10142			Decreed	Active	1878-03-01	11.4	WARM SPRING CREEK	IRRIGATION	VON MORGANROTH, LOIS (Current)
72	10143			Decreed	Active	1/26/1911	3.9	WARM SPRING CREEK	IRRIGATION	VON MORGANROTH, LOIS (Current)
72	10547			Decreed	Active	10/1/1970	0.02	WARM SPRING CREEK	STOCKWATER	ROGERS, PAMELA A (Current); ROGERS, W GARY (Current)
72	10922			Decreed	Active	12/31/1900	0.02	WARM SPRING CREEK	STOCKWATER	UNITED STATES OF AMERICA ACTING THROUGH (Current)
72	15812	A		Decreed	Active	6/28/1934	0.02	WARM SPRING CREEK	STOCKWATER	UNITED STATES OF AMERICA ACTING THROUGH (Current)
72	15812	C		Decreed	Active	6/28/1934	0.02	WARM SPRING CREEK	STOCKWATER	UNITED STATES OF AMERICA ACTING THROUGH (Current)
72	15812	D		Decreed	Active	6/28/1934	0.02	WARM SPRING CREEK	STOCKWATER	UNITED STATES OF AMERICA ACTING THROUGH (Current)
72	15812	E		Decreed	Active	6/28/1934	0.02	WARM SPRING CREEK	STOCKWATER	UNITED STATES OF AMERICA ACTING THROUGH (Current)
72	15812	F		Decreed	Active	6/28/1934	0.02	WARM SPRING CREEK	STOCKWATER	UNITED STATES OF AMERICA ACTING THROUGH (Current)
72	15812	G		Decreed	Active	6/28/1934	0.02	WARM SPRING CREEK	STOCKWATER	UNITED STATES OF AMERICA ACTING THROUGH (Current)
72	15812	H		Decreed	Active	6/28/1934	0.02	WARM SPRING CREEK	STOCKWATER	UNITED STATES OF AMERICA ACTING THROUGH (Current)
72	16025			Decreed	Active	10/15/1945	0.02	WARM SPRING CREEK	STOCKWATER	WINTER, FRED M (Current); WINTER, KATHERINE K (Current)
72	16597			Decreed	Active	6/13/1977	6.58	WARM SPRING CREEK	IRRIGATION	VON MORGANROTH, LOIS (Current)
72	16598			Decreed	Active	6/13/1977	0.31	WARM SPRING CREEK	IRRIGATION	UNITED STATES OF AMERICA ACTING THROUGH (Current)
72	16599			Decreed	Active	1/1/1950		WARM SPRING CREEK	IRRIGATION FROM STORAGE, IRRIGATION STORAGE, STOCKWATER FROM STORAGE, STOCKWATER STORAGE	VON MORGANROTH, LOIS (Current)
72	16600			Decreed	Active	1/1/1950		WARM SPRING CREEK	IRRIGATION FROM STORAGE, IRRIGATION STORAGE	UNITED STATES OF AMERICA ACTING THROUGH (Current)

Information for type: Permit

Basin	Sequence	Suffix	Version	Basis	Status	Priority Date	Diversion Rate	Source List	Water Uses	Owner List
72	7360				Active	12/2/1983	6	WARM SPRING CREEK	IRRIGATION	HUNT, GLENDON H (Current)
72	7498				Active	6/9/1992	0.8	WARM SPRINGS CREEK	FISH PROPAGATION	STATE OF IDAHO (Current)

Information for type: Transfer

Application ID	Existing Water Right Nos.	Proposed Water Right Nos.	Received Date	Status	Protest Deadline	Total Div. Rate (cfs)	Total Div. Vol (af)	Total Acres	Applicant
67067	72-7209,	72-7209,	1/31/2000	Active	3/20/2000				MARK L LUPHER (Transfer Applicant), JO ANNE LUPHER (Transfer Applicant),

Exhibit D

Information relative to sufficiency of water supply

North Dakota State University
NDSU Extension Service

Tilapia

Author: **Randy Sell**, Research Assistant
Department of Agricultural Economics, NDSU

Series Editor: **Dwight Aakre**, Farm Mangement Specialist
NDSU Extension Service

The aquaculture industry in the United States and North Dakota is in its infancy. Presently, the success of the industry depends largely on two factors.

First, demand for high-quality fish products is increasing. In 1989 the United States consumed a record 15.9 pounds of seafood per capita, up 5 percent -- or 3.9 billion pounds -- from 1988. Most of the fish consumed by Americans is imported. Of all products imported to the United States in 1989, the value of imported seafood was second only to that of imported petroleum.

Second, world supplies of wild fish stock are decreasing. As wild stocks continue to be depleted, aquaculture represents an alternative means to meet the increasec demand for fish products. Currently, aquaculture is the most rapidly growing segment of the agricultural sector of the United States economy. The National Fisheries Institute expects to meet an annual consumption goal of 20 pounds per capita by the year 2000.

Some of the more established species currently produced on fish farms include catfish, trout and salmon. According to Andrew Davlin, Jr., an industry spokesman aquaculture should increase production by 10 to 15 percent annually through the year 2000. U.S. aquaculture will depend largely on five species: shrimp, salmon, catfish, trout and tilapia. Tilapia is a relatively new species, just beginning to be produced on farms in the United States. Tilapia production will expand through he 1990s as consumers become more aware of the product.

Tilapia is poised to make a substantial contribution to aquaculture. It is hardier and more prolific than other species. Also, tilapia produces a fine-tasting white, lakey meat. Initial consumer taste panels have indicated that tilapia is a delicious fish. The main impediment to an increase in tilapia consumption is the lack of amiliarity of tilapia to the American consumer.

Characteristics

Tilapia is a hardy, prolific, fast-growing tropical fish native to Israel, where it has been farmed for about 2,500 years. It requires water temperatures from 76 to 84 degrees Fahrenheit. Currently, tilapia are produced in outdoor ponds and indoor systems. They are prolific breeders and were considered a national pest in Indonesia until the citizens began using them as a food source. Tilapia production in outside ponds is strictly regulated in the southern United States for fear that ome fish may escape from the farm ponds and encroach on native sport fishing populations.

Food

Tilapia can survive on a diversity of food. Algae is probably their most common food in the wild. On fish farms they are fed a high-protein pelleted feed. When aised in a controlled environment they can achieve growth rates of up to 3 percent of body weight per day, but 2 percent is a more likely average. The fish is efficient and should gain about one pound for every 1.5 pounds of food. Tilapia fingerlings are typically purchased at a weight of 0.07 of an ounce. They are marketed at 1½ to 1¾ pounds at 6 months of age.

Tilapia are fed commercially available pelleted fish food which costs approximately $.23 per pound. They can be fed by hand or with a sprinkler mechanism, and are generally fed twice per day. Tilapia are generally quite hardy and readily adapt to new environments. Death loss of 10 percent is common until the fingerlings weigh about 1.0 ounce. Death loss of 0.5 percent from 1.0 ounce to selling weight is common.

Special Considerations

Potential disadvantages to producing tilapia in North Dakota include the need for warm water and the lack of nearby production experience. The need for warm water suggests that combining a tilapia fish farm and an industry with warm water as a waste product could be beneficial.

Lack of producer experience will be less of a problem as interest in aquaculture increases. Also, because tilapia are extremely hardy they can withstand a relatively greater amount of disease and temperature variability than catfish or trout.

Here are key factors for starting a successful tilapia farming business:

1. A viable market
2. Appropriate water quality and availability
3. Financial backing
4. Consistent product inspection
5. Disease control and availability of therapeutics
6. Appropriate stock quality
7. Appropriate feed quality and price

Economic Feasibility

Producing tropical tilapia in North Dakota requires an indoor installation where water and air temperature can be controlled, and this requires a relatively larger capital investment than producing the fish outdoors in a warmer climate. This means North Dakota tilapia producers must maintain a continuous level of high output to justify the high capital requirements. The size of tilapia farms in North Dakota could vary dramatically, depending to a large extent on market demand. The economic feasibility analysis for tilapia production presented here is for a structure producing 80,000 pounds of tilapia per year (live weight) with a 2 percent growth rate.

---

able 1. Estimated Tilapia Enterprise Budget For 0,000-Pound Facility In North Dakota, 1992

		Budgets	
		Economic	**Cash**
eturns			
uantity sold			
lb. live weight)	80,048	80,048	
rice per lb.(a)	$1.12	$1.12	
Gross revenue	$89,654	$89,654	
ariable expenses			
ingerlings(b)		$5,413	$5,413
eed(c)		27,617	27,617
tilities(d)	15,515	15,515	
Operating interest(e)	4,733	4,733	
Total variable expenses	53,277	53,277	
ixed Expenses			
quipment	$4,450	$4,450	
uilding and lagoon	2,550	2,550	
Depreciation(f)		25,438	
Total fixed expenses	32,438	7,000	
Total Expenses		$85,715	$60,277
eturn to labor, anagement & equity	$3,939	------	
ash flow (debt service-family living)	-------	$29,377	

(a) Actual price would need to be contracted prior to building facility and beginning construction.
(b) 54,126 fingerlings purchased at $.10 per fingerling.
(c) 120,072 pounds of pelleted fish food purchased (or 1.5 pounds feed per pound of gain) at $.23 per pound of food.
(d) Calculated as percent of plant cost.
(e) Operating interest charged on fingerlings, feed, utilities, and insurance at 9.75 percent on borrowed capital and 4 percent for equity capital for 12 months

(f) Equipment value ($111,250) depreciated over five years,
Building and lagoon ($63,750) depreciated over 20 years.

The economic budget is generated by charging market rates for all resources needed for production. It helps answer the question "Is this enterprise profitable?" The bottom line repre-sents a return to labor and management.

The cash flow budget is an estimate of the out-of-pocket cash needed to run the enterprise, including not only direct costs but indirect cash costs such as principle and interest pay-ments, insurance and taxes. It helps answer the question "Can I make meet my cash obligations if I go into this enter-prise?" Total cash expenses are subtracted from total cash receipts to calculate the net cash which is available for family living and other needs.

Marketing

While consumer trends indicate that per capita fish consumption has been increasing and will probably continue to do so, efforts are focused on market development for tilapia since it is a relatively new fish to American consumers. Attempting to market tilapia through local retail outlets may prove to be unsuccessful unless some attempt is made to educate consumers about tilapia. The processed fish market may be easier to enter, but the selling price will be lower. Potential producers will probably find it necessary to obtain contracts from market outlets which specify the amount and price of fish to be sold before credit agencies will be willing to provide financing.

Facilities Requirements

Facilities required for the production of tilapia depend, to a large extent, on the size of the market. The smallest size which could be considered economically feasible for commercial production would be 63,000 pounds of fish (live weight) per year. Tilapia farms have existed which produced 2 million pounds (live weight) per year. Facility requirements for an indoor fish farm producing 80,000 pounds per year (live weight) are presented here. A facility of this size is big enough to be profitable, yet allows for future expansion should the market potential exist. It would require 4-to-5 hours per day of labor. An insulated pole shed measuring 75 feet by 90 feet in length with 14 foot sidewalls could efficiently house the facility. The building would have nine tanks 46 inches deep with diameters from 9 to 30 feet. The total cost for constructing and equipping a facility of this type would be $175,000.

The 80,000-pound facility would require about 46,000 gallons of water for the holding tanks. An additional 4,000 gallons would be needed for the biotreatment unit, sump tank, and pipe and waste treatment. With a projected water flow rate of 10 gallons per minute, a total of 82 hours would be required to fill the system. A constant supply of make up water running at 3 to 5 gallons per minute would be required. Make-up water is necessary to replace water loss because of evaporation and waste disposal.

Costs associated with building and operating the facility are shown below. Based on a projected sale price of $1.12 per pound live weight and a 2 percent growth rate, each year the enclosed tilapia production facility would contribute $4,571 to owner labor, management and equity capital.

References For Further Information

Egan, Jack. "The Fish Story of the Decade," *U.S. News and World Report* 109 (1990): 52-56.

Keyes, Daniel R. "Rural Natural Resources Development Series, Technical Paper 2, A Generalized Guide to Small Aquaculture Enterprises." Prepared as part of a Midwest Research Institute project for the U.S. Economic Development Administration, 1989.

Mathsen, Don. "Indoor Aquaculture for the State of North Dakota," Final Report, Prime Contractor Center for Innovation and Business Development at University of North Dakota, Grand Forks. Sponsored by North Dakota Ag-Products Utilization Commission and Basin Electric Cooperative. Contract No. 160484, Feb. 1992.

Superber, R.M. "Aquaculture's Growing Pains," *Food Processing: The Magazine of the Food Industry* 53 (Aug. 1992): 49-54.

United States Department of Agriculture. *Aquaculture Situation and Outlook Report.* Washington, D.C.: United States Department of Agriculture and Economic Reporting Service, March 1991.

Funds to support the research for and production of the Alternative Agriculture Series were made available to the Value-Added Agriculture project by "Growing North Dakota" legislation through Technology Transfer, Inc.

Alternative Agriculture Series, **Number 2**
January 1993

Go to Alternative Agriculture Publication Index

NDSU Extension Service, North Dakota State University of Agriculture and Applied Science, and U.S. Department of Agriculture cooperating. Sharon D. Anderson, Director, Fargo, North Dakota. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. We offer our programs and facilities to all persons regardless of race, color, national origin, religion, sex, disability, age, Vietnam era veterans status, or sexual orientation; and are an equal opportunity employer.

This publication will be made available in alternative format for people with disabilities upon request 701/231-7881.

North Dakota State University
NDSU Extension Service

SRAC Publication No. 461

Southern
Regional
Aquaculture
Center

November 1991

Water Quantity and Quality Requirements for Channel Catfish Hatcheries

Craig S. Tucker*

Simple and inexpensive production of seed stock is a key to successful aquaculture. Indeed, the rapid growth of commercial channel catfish culture is owed in no small part to the ease with which large numbers of channel catfish fry can be produced using relatively unsophisticated hatchery technology.

Although the production of channel catfish fry is technically a simple process, success in some hatcheries is poor year after year. Problems may include poor egg matchability, low fry survival, poor fry growth, or a high incidence of infectious diseases of eggs or fry. Sometimes these problems are related to poor management practices, but quite often they are the result of poor water quality within the hatchery.

With appropriate treatment, any water can be made suitable for use in a catfish hatchery. Cost of treatment is often not economically justifiable. It is usually good practice to use a source that provides, as nearly as possible, water of correct quality for optimum matchability of eggs and survival and growth of fry. Good water quality is maintained in the hatchery by providing adequate water flow and aeration to hatching and rearing troughs. Frequent removal of uneaten feed and other accumulated organic debris will also aid in maintaining proper rearing conditions within troughs or tanks.

Water sources

In many regions, water from several sources may be available for use in the hatchery. Sources may include ground waters from aquifers lying at different depths and various surface water supplies. Before the hatchery is built, the manager should become familiar with the quality and availability of these potential hatchery water supplies. The best water supply may then be selected by comparing desired water quality and flow requirements with the chemical characteristics, temperature, and availability of various water sources.

The success of other hatcheries using water from a common source is the best indicator of the suitability of a particular water. Obviously, if poor water quality at other hatcheries is causing low survival of eggs or fry, or if costly treatment is required to make the water suitable for use, then it may be wise to seek an alternative water source. If there are no other hatcheries in the area and the quality of the water supply is questionable, a pilot-scale hatchery can be constructed to ensure that the water is suitable for use.

Ground water

Ground water generally is considered to be the best source of water for catfish hatcheries. Ground waters are usually free of suspended matter, pollutants, and fish disease organisms. Temperature and chemical composition are relatively constant, and, in regions with abundant ground water, the supply is dependable. The chemical composition and well pumping rates for some ground water supplies may be obtained from well logs for existing nearby wells. Alternatively, a test well can be drilled to assess the source. The quality of most ground waters is relatively constant over time, so a single chemical analysis will suffice to characterize water quality. Nevertheless, it is good practice to have the supply reanalyzed every year or two.

Although ground waters are preferred for hatcheries, some waters may have to be treated to make them suitable for use. Depending upon the water, treatments may include:

* Delta Research and Extension Center, Mississippi State University

- aeration to increase dissolved oxygen concentrations;
- degassing to reduce total gas pressure and remove carbon dioxide and hydrogen sulfide;
- temperature regulation using water heaters or mixing of waters of different temperatures;
- sedimentation and filtration to remove iron; and
- addition of calcium to waters of low hardness.

Surface waters

Surface water supplies include streams and rivers, ponds, lakes, and reservoirs. Unpolluted surface water offers several advantages over ground water as a hatchery water supply. For example, dissolved oxygen concentrations tend to be near saturation; dissolved carbon dioxide and hydrogen sulfide concentrations are usually low; total gas supersaturation is seldom a problem; and iron concentrations are usually very low. Nevertheless, all surface water supplies suffer the disadvantages of variable quality and availability with time and exposure to sources of pollution and turbidity. For these reasons, carefully evaluate any surface water before use as a hatchery water supply.

Because quality and availability vary over time, historical record is necessary to predict whether the water will be suitable. Such records are not available for most waters, however, and changes in water temperature, chemical composition, and water availability caused by unusual weather events cannot be predicted by records. The best advice is to use common sense and avoid those waters that may become unsuitable for use during the time the hatchery is in operation.

Another major constraint to using surface water for hatcheries is the potential for contamination by fish disease organisms or water-borne predators. Most surface waters have a resident fish community. The fish in the water supply may serve as a reservoir for fish disease organisms that could enter the hatchery and cause major losses. Natural predators of catfish fry, such as wild fish, insects, and other invertebrates, can also enter a hatchery and cause losses of fry.

Water quantity requirements

The success of a hatchery will suffer if insufficient water is available, even if that water is of optimum initial quality. Low water flow rates through hatching and rearing troughs allow waste products to accumulate which may quickly cause deterioration of water quality.

The typical trough (Figure 1) used for egg hatching and fry rearing holds roughly 100 gallons of water and is about 8 feet long, 2 feet wide and 10 inches deep. Troughs this size can hold 10 spawns at a time without crowding. Although the number of eggs per spawn varies with the size of the female brood fish, the ten spawns will contain (as a rough average) a total of 200,000 eggs. After the fry begin feeding, hold only about 100,000 fry in a trough of these dimensions. Thus, in a traditionally managed hatchery, two fry rearing troughs are available for each egg hatching trough.

Experience has indicated that minimum water turnover time (defined here as trough volume in gallons divided by water flow in gallons per minute) in hatching and rearing troughs should be about 40 minutes. Thus for a single 100 gallon trough, water flow should be a minimum of 2.5 gallons per minute. Larger troughs require proportionately higher flow rates. More water flow is also needed when egg or fry densities are higher.

Over a 10-to 12-week spawning season, each set of three 100-gallon troughs (one for eggs, two for fry) could be expected to produce roughly 1 to 1.5 million fry and would require a minimum flow of 7.5 gallons per minute (three troughs times 2.5 gallons/minute per trough). A hatchery capable of producing about 10 million fry per spawning season will typically contain 21 to 30 troughs and require a minimum water flow to the hatchery of 50 to 75 gallons per minute.

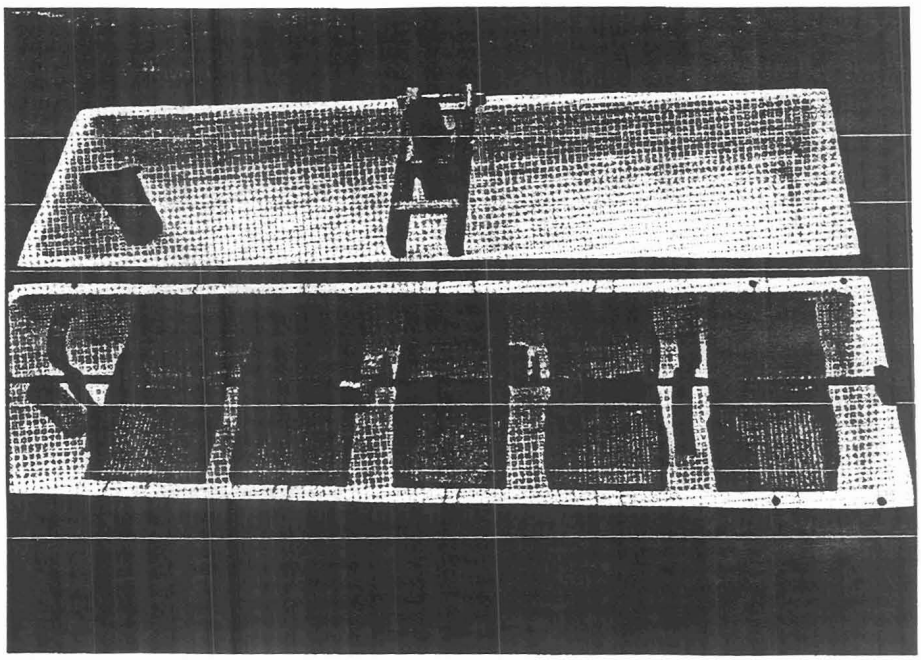


Figure 1. Traditional equipment used in a channel catfish hatchery: a fry rearing trough (top) with a 1/20-horsepower electric agitator and an egg hatching trough (bottom) with egg baskets and paddles.

The calculations above represent minimum flows. It is good practice to use at least twice those flow rates (turnover times of 20 minutes) to ensure against deterioration of water quality within hatcheries. Additional water flow is particularly important during the peak of the spawning season when the number of spawns arriving at the hatchery and the number of fry being reared temporarily exceeds the planned hatchery capacity. Thus, as a rough guide, a hatchery expected to produce 10 million fry per season should be supplied with roughly 100 to 150 gallons of water per minute.

Water quality requirements

Some of the more important water quality requirements for hatchery water supplies are discussed in the following sections. Aside from these specific requirements the water should also be:

- free of pesticides, solvents, petroleum products, and other pollutants;
- free of fish disease organisms;
- of relatively constant quality and availability.

Temperature

The optimum temperature range for development of eggs and rearing of fry is between 78 and 82°F (26 to 28°C). If the temperature is too low, hatching and development are prolonged, and fungi, which thrive in cool waters, often invade the egg mass. At higher water temperatures, embryos develop too fast and there may be a high incidence of malformed or nonviable fry. Also, bacterial diseases of eggs or fry and channel catfish virus disease of fry are more common if the water temperature is greater than 82°F (28°C).

Considerable energy is required to heat or cool water, and it is usually too costly to attempt major changes in water temperature. Therefore, the temperature of the water supply should be near 80°F before it enters the hatchery.

Ground water from deep wells (500 to 1,000 feet deep) is warmed by the internal heat of the earth and may be suitable for use in channel catfish hatcheries without temperature modification. Water from shallow wells (less than 300 feet) and some surface waters are too cool to use directly. Cool ground waters can be impounded in a small reservoir pond where solar heating will raise the temperature to some extent.

Nevertheless, water temperatures in the reservoir pond and in most other surface waters will vary with local weather conditions and still may be too cool for use early in the spawning season. An in-line water heater can be used to ensure a minimum temperature in the inlet water. The opposite condition may be encountered late in the spawning season when surface waters become too warm for use in hatcheries. It is very expensive to cool large volumes of water using refrigeration or chiller units, The best method of reducing water temperature is to mix the water that is too warm with cool water (such as water from a shallow well) to achieve the correct temperature.

Dissolved oxygen

Adequate dissolved oxygen is critical in hatcheries because eggs and fry have high metabolic rates and thus a high requirement for oxygen. Dissolved oxygen concentrations should not fall below 4-5 ppm at any time within the hatchery. Proper management of dissolved oxygen involves two distinct considerations: (1) ensuring that the water is oxygenated before use and (2) providing adequate aeration in hatching and rearing units to maintain optimal levels of dissolved oxygen throughout the hatchery.

Waters deficient in dissolved oxygen should be aerated before use. Pre-aeration not only ensures adequate initial levels of dissolved oxygen, but also may benefit some waters by partially degassing waters supersaturated with total dissolved gases and by removing some carbon dioxide and hydrogen sulfide. The two most common systems for pre-aerating water supplies for catfish hatcheries are packed column aerators (Figure 2) and aeration of water in an aeration tank.

Properly designed packed columns are highly effective aerators and relatively inexpensive to operate. They offer an added advantage of being good degassing devices for waters supersaturated with total dissolved gases. Packed columns are filled with a high surface area plastic packing. Influent water is evenly distributed at the top of the column and flows down over the packing in a thin film where gas exchange with the atmosphere occurs. Various plastic materials have been used as packing media and materials specifically designed for use in packed columns are commonly available from aquaculture supply companies.

Specific design criteria for packed columns are based upon water flow, water temperature, dissolved gas concentrations in the influent water, and desired dissolved gas concentrations in the effluent. These considerations are discussed in detail in appropriate references listed at the end of this report. As a rough guide, a packed column 4 to 6 feet high and about 30 inches in diameter will be sufficient to pre-aerate water for a catfish hatchery supplied with 100 gallons per minute of anoxic, 80°F groundwater.

As an alternative to packed columns, influent water maybe pumped into a metal or fiberglass tank and oxygenated with surface aerators or underwater diffusers. In such a system considerable initial aeration can be accomplished by running the influent water onto a splashboard or through an expanded metal grate to break the flow into small drops. The aeration tank should be large enough to provide adequate water residence time for aeration, but the appropriate tank volume will

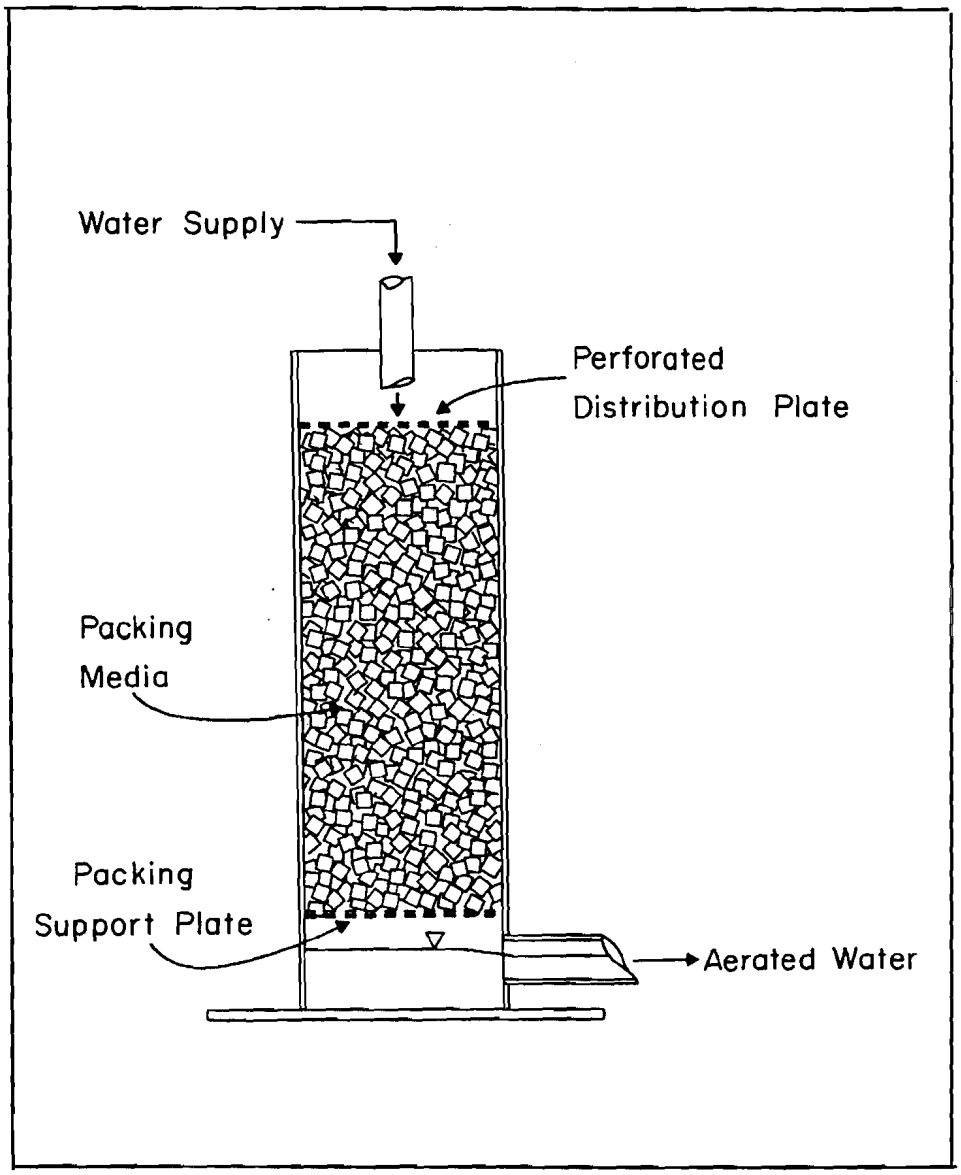


Figure 2. Cross section of a simple packed-column aerator.

depend upon the type and size of aerator used. Some experimentation may be required to find the best combination of tank volume and aeration device; the goal is generally to achieve an effluent dissolved oxygen concentration exceeding about 5 ppm.

As a starting point, pre-aeration tanks used in many existing catfish hatcheries provide a turnover time of 10 to 15 minutes (a capacity of 1,000 to 1,500 gallons for a water flow of 100 gallons per minute). Water is aerated with one or two 1/3-horsepower surface agitators (Figure 3).

Some type of aeration device must be provided to each trough within the hatchery to replenish dissolved oxygen lost as eggs or fry respire. Again, some trial and error may be necessary to find the right size and type of aerator. Common practice is to provide one 1/20 horsepower surface agitator per 100-gallon fry rearing trough. The agitators should be covered with small-mesh screening to prevent injury to fry.

Water circulation, in addition to adequate dissolved oxygen, is important in egg hatching troughs because oxygenated water must flow around and through the egg mass to ensure that all eggs receive sufficient dissolved oxygen. A common sign of inadequate water circulation in hatching troughs is the presence of dead eggs in the center of the egg mass. Those areas may serve as foci for fungal or bacterial infection. Slowly rotating paddles in egg hatching troughs serve both to aerate and circulate the water through the egg mass. Vigorous aeration with diffusers (air stones) may also be used to aerate and circulate water in hatching troughs. Air flows and the size and placement of diffusers must be determined through experience.

Carbon dioxide

High levels of dissolved carbon dioxide interfere with respiration by eggs and fry. Ideally, water supplies for catfish hatcheries should not contain measurable levels of dissolved carbon dioxide, but concentrations up to at least 10 ppm seem to be well tolerated, provided that dissolved oxygen concentrations are adequate. Some groundwaters may contain in excess of 20 ppm dissolved carbon dioxide and should be vigorously aerated to drive off some of the gas.

Total gas pressure

Total gas pressure is a measure of the "concentration" of all gases dissolved in water. It is expressed in pressure units such as millimeters of mercury (mm Hg). When total gas pressure in water exceeds local barometric pressure, water is supersaturated and gas will tend to leave the water by diffusion or by forming bubbles. Gas bubble trauma (also called gas bubble disease) may occur in fish living in gas-supersaturated water when gases in the blood or tissues come out of solution and form bubbles. The bubbles can block blood flow or damage tissues.

Instruments called "saturometers" are used to measure total gas pressures. Values are usually expressed as delta-P, which is the total gas pressure in water compared to local barometric pres-

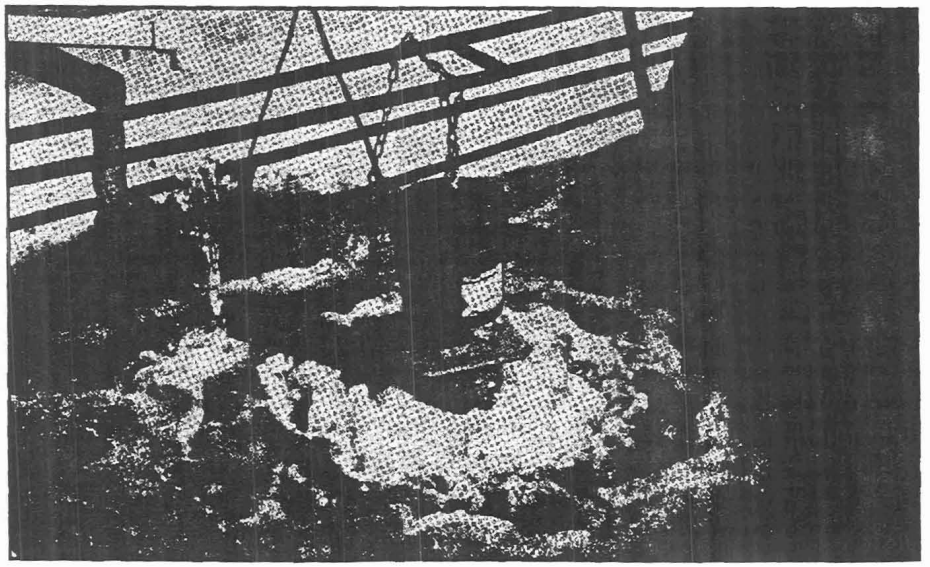


Figure 3. A 1/3-horsepower surface agitator used to oxygenate water in a pre-aeration tank.

sure. Positive delta P values mean the water is supersaturated. Saturometers are not commonly available to catfish hatchery managers, but supersaturated conditions can sometimes be diagnosed by the formation of bubbles on the surface of tanks or the milky appearance of water as gases come out of solution.

Channel catfish eggs are fairly resistant to high delta P-values because the naturally high pressure within the eggs helps prevent bubble formation. Eggs appear to withstand delta P-values at least as high as 100 mm Hg with no adverse effects. At high delta P-values, bubbles may form on and in the egg mass causing it to float high in the egg hatching basket. The top of the egg mass may be above water and will tend to dry out. Dislodging the bubbles by shaking and rotating the mass will temporarily alleviate the problem, although decreasing the delta P of the water is the best solution. Quite often, however, the first indication of supersaturated conditions is death of fry.

Clinical signs of gas bubble trauma in catfish fry include loss of equilibrium, abnormal swimming and gas bubbles in the yolk sac, behind the eyes, or on the skin. The bubbles prevent normal swimming and feeding and fry may become trapped at the surface. In severe cases, newly hatched fry rapidly die as blood flow is restricted or the yolk sac ruptures. Gas bubble trauma may occur in fry when delta P-values exceed about 70 to 80 mm Hg. To be safe, delta P-values should not exceed about 40 mm Hg in channel catfish hatcheries.

Gas supersaturation can be caused by a variety of natural and man-made conditions. Many groundwaters and some surface waters are naturally supersaturated. Surface water gas supersaturation is common below dams where air is entrained in the spillway overflow or when water is heated in electrical generating facilities. Gas supersaturation can also be caused within the hatchery water supply system.

The most common cause of supersaturation in supply systems is entrainment of air from a leak in the pipes on the suction side of a water pump. Some of the gases in the entrained air are driven into solution as the water is pressurized after moving through the pump. In those situations, it is often possible to hear air bubbles moving through elbows and valves in the delivery system. Heating water can also cause considerable increases in delta P unless the water is degassed after heating. The increase in delta P attributable to heating can be substantial: if water is heated from 70°F to 80°F, delta-P increases by more than 60 mm Hg.

Pre-aeration of the influent water is commonly used to reduce supersaturation to tolerable levels. Packed column aerators are particularly effective at degassing supersaturated waters, but other types of systems providing vigorous aeration may be used. Be aware, however, that underwater diffused aeration (air bubbled through airstones) is relatively inefficient at degassing waters and, in some systems, may actually cause supersaturation. If supersaturation is caused by air leaks in the water supply line, the first course of action is to locate and repair the problem.

Salinity

Salinity is the dissolved salt content of water and is often expressed as the parts of salt by weight per thousand parts of water by weight (ppt). Channel catfish can breed and reproduce over a wide range of salinities. Eggs can hatch and fry will develop in waters with salinities up to at least 8 parts per thousand, but the optimum salinity for channel catfish hatchery supplies appears to be between 0.5 and 3 ppt (500 to 3,000 ppm).

Hardness

Hardness refers to the amounts of calcium and magnesium in the water and is expressed as ppm of equivalent $CaCO_3$. Adequate concentrations of environmental calcium are required for "hardening" of eggs and for normal bone and tissue development of fry. Symptoms of environmental calcium deficiency include swelling and poor matchability of eggs and slow development, lack of vigor, poor stress resistance, and low survival of sac fry.

A minimum of 5 ppm calcium hardness is required for adequate egg matchability and for development and vigor of sac fry. Higher calcium concentrations are desirable because calcium also protects fry from ammonia and metal toxi-

cosis. All things considered, hatchery water supplies should contain at least 20 ppm calcium hardness. Calcium levels can be increased by adding a solution of calcium chloride to the water supply. The calcium solution can be added by chemical metering pumps or by using an inexpensive "drip system" where a concentrated solution of calcium chloride is slowly dripped into the pre-aeration system.

Alkalinity

Alkalinity is a measure of the capability of water to neutralize acids. In most natural waters, the predominant bases are bicarbonate and carbonate. Alkalinity is expressed as ppm equivalent $CaCO_3$. Catfish eggs and fry thrive in waters with a wide range of alkalinity, although waters of very low alkalinity (<10 ppm as $CaCO_3$) should be avoided as hatchery supplies if possible. These waters are poorly buffered and pH can fluctuate drastically with small additions of acid or base. More importantly, dissolved metals such as copper and zinc are very toxic to fry in waters of low alkalinity. Copper and zinc can leach from pipes used to plumb the hatchery water distribution system.

pH

pH expresses the intensity of the acidic or basic character of the water. The pH scale is usually represented as ranging from O to 14. Conditions become more acidic as pH values decrease and more basic as they increase. At 77°F, pH 7.0 is the neutral point. The pH of most fresh waters is a function of total alkalinity and dissolved carbon dioxide concentration. Generally, if levels of those two variables are within the desired range, pH will be between 7.0 and 8.5, which is the desired pH range for incubating eggs and rearing fry.

An important exception to this general rule exists when surface waters containing dense submersed plant communities are used as a water supply. During sunny afternoons, rapid carbon dioxide removal by photosynthesizing plants may cause pH values to temporarily rise above pH 9. In extreme instances, values well above pH 10 have been recorded. Exposure to pH-values above 9 are undesirable and even short-term exposure to waters of pH 10 or above may kill fry and reduce egg matchability. Vigorous aeration of such waters will add some carbon dioxide to the water and somewhat reduce the pH, but this reaction is not rapid enough to be effective in extreme circumstances. The best solution is to avoid the use of surface waters that contain dense stands of submersed plants.

Ammonia

Un-ionized ammonia is quite toxic to channel catfish sac fry and early swim-up fry. Ideally, water in rearing troughs should be free of ammonia for optimal health and growth of fry, and the maximum concentration of un-ionized ammonia that should be allowed is about 0.05 ppm NH_3-N. Above this concentration, fry develop more slowly and are more susceptible to infectious diseases.

Removing ammonia from water supplies is difficult, so waters containing appreciable ammonia should not be used to supply catfish hatcheries. Ammonia is a product of fish metabolism, and ammonia production can be significant when high densities of fry are held in rearing troughs. Ammonia levels in rearing troughs can be decreased by either decreasing fry density or increasing water flow to flush the troughs.

Iron

Most surface waters contain very low concentrations of iron. Some anoxic ground waters, however, contain considerable iron in a dissolved form. When the water is aerated the iron is oxidized to a rust-colored precipitate of iron oxide. Dissolved iron is considered to be of relatively low toxicity to most aquatic organisms. Solid precipitates of iron oxide are even less toxic but may coat the gills of fry and interfere with respiration. Dense precipitates of iron oxide also may cover eggs and hinder gas exchange and suffocate the eggs. Total iron concentrations should be less than about 0.5 ppm for hatchery water supplies.

The simplest system used to remove iron is to pump the water into a small reservoir pond (0.5 to 1 acre) where the dissolved iron is oxidized and some of the iron oxide precipitate settles out. Some of the remaining precipitate can be removed using sand filters. An alternate method is to oxidize the iron by vigorously aerating the water in a tank or chamber prior to sand filtration. Complete removal of iron is difficult regardless of the system used.

Hydrogen sulfide

Hydrogen sulfide gives water a "rotten-egg" odor and is very toxic to channel catfish fry. Sac-fry will be killed when exposed to as little as 0.005 ppm hydrogen sulfide. Avoid using waters containing appreciable hydrogen sulfide. If this is not possible, hydrogen sulfide should be removed from water before it enters the rearing trough. Vigorous aeration will remove some hydrogen sulfide by volatilization and by oxidation of the sulfide to sulfate, which is nontoxic.

Treatment processes

The most common water quality problems encountered in channel catfish hatcheries and the treatment processes required to correct those problems are summarized in Table 1. But remember, it is often easier to seek an alternative water source rather than add expensive treatment systems in an effort to make a particular water suitable for use.

Table 1. Common water quality problems in channel catfish hatchery water supplies.

Variable	Desired level	Problem	Solution
Temperature	78-82°F	too low	reservoir pond for solar heating or use water heaters
		too high	blend with cooler water
Dissolved oxygen	5 ppm to saturation	too low	vigorous aeration of incoming water and supplemental aeration in troughs
Carbon dioxide	less than 10 ppm	too high	vigorous aeration (degassing) of incoming water and supplemental aeration in vats or troughs
Total dissolved gases	delta P less than 40 mmHg	too high	vigorous aeration (degassing)
Calcium hardness	more than 20 ppm as $CaCO_3$	too low	addition of calcium chloride to water supply
Ammonia (un-ionized)	less than 0.05 ppm NH_3-N	too high	do not use as a water supply; avoid accumulation within hatchery by decreasing fry density or increasing water flow
Iron	less than 0.5 ppm total iron	too high	aeration (oxidation) followed by precipitation or sand filtration
Hydrogen sulfide	less than 0.005 ppm H_2S-S	too high	vigorous aeration (degassing) of incoming water

Additional readings

Bouck, G. R., R. E. King, and G. Bouck-Schmidt. 1984. Comparative removal of gas supersaturation by plunges, screens, and packed columns. Aquacultural Engineering 3:159-176.

Colt, J. and G. Bouck. 1984. Design of packed columns for degassing. Aquacultural Engineering 3:251 - 273.

Hackney, G. E. and J. E. Colt. 1982. The performance and design of packed column aeration systems for aquaculture. Aquacultural Engineering 1:275-295.

Tucker, C. S. and E. H. Robinson, 1990. Channel Catfish Farming Handbook. Van Nostrand Reinhold, New York.

Wheaton, F. W. 1977. Aquacultural Engineering. Wiley Interscience, New York.

The work reported in this publication was supported in part by the Southern Regional Aquaculture Center through Grant No. 89-38500-4516 from the United States Department of Agriculture.

Exhibit E

Information relative to good faith, delay or speculative purposes

LEASE AGREEMENT

THIS AGREEMENT is made and entered into effective as of the 1st day of July, 1994, by and between INGRAM WARM SPRINGS RANCH, a Partnership, herein referred to as "Lessor" or "Lessors" and MARK LUPHER AND JO ANNE W. LUPHER, husband and wife, residing at HC 61 Box 3016, Challis, Idaho 83226, herein referred to as "Lessee" or "Lessees".

WITNESSETH:

The Lessor has leased and by these presents does lease unto the Lessee on the terms herein mentioned the real property located in Custer County, Idaho, described as follows:

> 40 acres located on the Ingram Warm Springs Ranch as follows:
>
> 40 acres to be selected by Lessees at their sole and separate discretion on or before the 1st day of July, 1995, from the following described tract of land:
>
> Township 12 North, Range 20 East, Boise Meridian
> NW¼ SW¼ Section 10
> SW¼ SE¼ Section 4
> NW¼ NE¼ Section 9
> NE¼ NE¼ Section 9
> SW¼ NW¼ Section 10
> NW¼ SW¼ Section 10
> Township 13 North, Range 20 East, Boise Meridian
> NE¼ NE¼ Section 32
> SE¼ NE¼ Section 32
>
> The selected lands shall be in no more than three separate contiguous tracts unless otherwise consented to by Lessors.

TOGETHER WITH all appurtenances, to have and to hold the said premises with the appurtenances thereon from the 1st day of July, 1994.

LESSOR: The parties agree that Lessor may for whatever reason transfer the leased lands to a new or different entity or person and that so long as it is clearly understood that such new entity is taking the lands subject to the terms of this lease, the transfer or assignment will not be objected to by Lessees. In fact, Lessee understands that Lessor intends to assign or transfer the leased lands and this lease to partner, Timothy Ingram, or to an entity designated by him.

TERM: The term of this Lease shall be from July 1, 1994 to July 1, 2009. This Lease may be renewed for another 15-year term if written notice of intent to extend the Lease is provided by Lessee to Lessor no later than July 1, 2008. If no such notice is given, then this Lease shall terminate on midnight of July 1, 2009, and Lessee shall promptly vacate the premises.

PURPOSE: Lessee is leasing the real property for the purpose of fish propagation.

RENTAL: Lessee agrees to pay to the Lessor as rent for said premises 50% of all profits arising from the sale of fish products grown or processed on the leased property.

For the purpose of this agreement, profit shall be computed by subtracting from gross receipts all operating expenses directly incurred in the production of fish products. It is further agreed that the Lessee's compensation will be his 50% of the profits. Further that Lessee, Mark Lupher, will not

charge to the above expenses for his work as manager of the fish propagation business to be established on the leased site.

Lessor must apply any and all payments from profits first toward the cost of leasehold improvements. Lessor's excess share of profit over and above the cost of such improvements shall be paid to Lessor in cash. For valuation purposes, the value of leasehold improvements shall be the cost of construction of said improvements to Lessee. The attached Exhibits "A" and "B" shall govern the interpretation of this section in regard to Gross Sales, Allowable Expenses and Leasehold Improvements. Profits as used herein shall be determined by deducting Allowable Expenses from Gross Sales. This interpretation of income and expenses shall not necessarily be related to income or allowable expense for tax purposes. Additions or deletions to Exhibits "A" and "B" shall be accomplished only upon the mutual consent of the parties.

All payments due Lessor shall be due and payable by the 10th day of the month following Lessee's receipt of said funds. Lessees shall provide an accounting monthly on or before such date in regard to cost of improvements and the credits given Lessors for their share of profits.

INSPECTION OF BOOKS AND RECEIPTS: Lessor may inspect Lessee's financial books and receipts which will be kept on the premises. Inspection will be subject to reasonable notice of not less than 12 hours.

RESIDENTIAL SITES: Lessor will supply sufficient real property to enable Lessee to establish two (2) residential sites on the leased property. These sites shall be located in such a manner as not to interfere with access to hydropower facilities or ingress and egress from the leased real property or interfere with agricultural uses or facilities.

POWER AND ELECTRICAL: Lessee shall pay all power and utility expenses incurred on the leased real property. However, cost of utility construction shall be considered a reimbursable leasehold improvement as defined in Exhibit "B". Power and utility expenses are to be included as one category of the aforementioned expenses to be deducted from gross receipts.

GEOTHERMAL WATER RIGHT: Lessor shall provide to Lessee the natural flow of geothermal water pursuant to License #72-7209 (copies attached as Exhibits "C", "D", and "E") to enable Lessee to use geothermal water for fish propagation. It is understood that Lessor currently has in operation a hydropower plant from the same geothermal source. Lessee agrees not to interfere with said source in any manner which will decrease income to Lessor. Specifically, Lessees agree that they will allow nothing to be done on the premises which will cause the water level at the spring source to be raised above the normal level given the present and existing situation. Further, it is agreed that Lessees will at all times put at least an equal or greater amount of water back into the existing hydro canal compared to the

amount diverted or used by Lessee. For the purpose of fulfilling this requirement Lessees may utilize the seeps or springs flowing upon the leased premises. All water will be returned upstream from the hydro-plant or facility. If Lessor's income from the hydropower plant does decrease due to Lessee's use of the geothermal water or because of Lessees use of the property, Lessee shall reimburse Lessor for its actual loss. Lessee shall also be fully responsible for any and all damage or loss caused Lessor from its operation including but not limited to pollution, waste water quality and other damage.

WATER FOR OTHER USES: All water used for residential purposes or any use other than fish propagation shall be taken from wells and Lessees shall meter such use and pay Lessor at the rate of $1.00 per thousand gallons for all water used unless otherwise agreed.

INSPECTION OF PREMISES: Lessor or Lessor's agent may inspect the leased premises at reasonable times and upon reasonable notice.

NEW CONSTRUCTION: Lessee shall submit the plans for any new construction or development to be undertaken on the leased premises to Lessor for Lessors approval prior to commencement of any project or improvement. Lessor agrees to only deny such request upon the basis of what may be determined to affect Lessors hydro income.

FENCE: Lessor shall construct and maintain a fence surrounding the leased real property in order to keep Lessor's livestock from entering the leased premises.

LIENS AND ENCUMBRANCES: Neither party shall allow or cause any liens or encumbrances to be placed on the real property which is the subject of this Lease during the term of this Lease without prior written approval of the other party. Lessee acknowledges that Lessors presently have a mortgage upon the premises which Lessors will endeavor to remove.

INGRESS AND EGRESS: Lessee shall have the right of ingress and egress from Highway 93 to the leased real property. Lessor shall not interfere with or hinder said ingress and egress in any manner.

TAXES: Lessor shall pay all real property taxes assessed against the leased lands during the term of this Lease except for taxes assessed against all improvements or structures erected by Lessee or put in place at Lessee's request which shall be paid by Lessee as an operating expense.

MANAGEMENT AND INSURANCE: Lessee intends to operate a fish propagation business on the leased premises. It is understood that the operation and management thereof is under the sole and exclusive control of Lessee. Additionally, Lessee shall have total and complete control over the nature and extent of facilities constructed upon the premises for fish propagation, and the variety and amount of fish to be propagated. However,

Lessee agrees to take every precaution to keep Lessees business and operation totally separate and apart from Lessor and to minimize all liability to Lessor. Lessee further agrees to maintain a general and products liability policy of insurance in good standing at all times for the protection of Lessor as well as Lessee in the minimum coverage of $500,000/$1,000,000. Should Lessor be held accountable for any debt or assessment against the business, Lessee will be responsible to Lessor for full reimbursement.

LETTER OF CONSENT: Lessor shall provide to Lessee's residential financial institution a Letter of Consent to enter upon the leased premises in order to foreclose, if necessary, on the mobile homes used by Lessee and located upon the residential sites described herein so long as such entry or action does not threaten Lessor's title to the underlying lands.

FIRST RIGHT OF REFUSAL: If, during the term of this Lease or at the termination of this Lease, Lessor receives an offer to sell or lease the above described property to a third person, Lessee shall have the first right of refusal to purchase or lease the real property upon the same terms and conditions as the original proposed offer. However it is to be noted that if the proposed sale or offer is in regard to a sale of the entire Ingram's Warm Springs Ranch or a smaller component of agricultural land in addition to the lands described in this lease, then in that event, the within First Right of Refusal

shall have no effect, it being understood, however, that any such sale would nonetheless be made specifically subject to the terms of this lease. Should the within First Right of Refusal come into effect, Lessor will first determine that the prospective Buyer is a qualified and bona fide buyer. Lessor will then advise Lessee in writing of the specific terms and conditions of the offer. Lessee will have forty five (45) days thereafter within which to review the offer and to respond to Lessor with an acceptance of the terms and conditions or a rejection of the same. No response by Lessee within the term set out will constitute a rejection. In the event that Lessee accepts the terms of the offer the sale will close as set forth in the notice so long as Lessee is given a reasonable time of not less than thirty (30) days after acceptance within which to secure closing funds. Unless otherwise mutually agreed, closing will take place under the direction of Custer County Title, Inc. in the customary and standard fashion with Lessee to receive clear title subject only to the usual or general exceptions.

NON-ASSIGNMENT BY LESSEES: Lessees agree that the within lease may not be assigned by them at any time without Lessor's consent, which consent will not be unreasonably withheld.

IMPROVEMENTS: At the end of the term of this lease for whatever cause or reason, all improvements and facilities set in place upon the premises shall remain in place and shall become

the property of Lessor, including but not limited to dams, raceways, ponds, headgates, or other structures, fences, roads, ditches, utilities. In no event upon termination shall Lessor owe Lessee for cost of the improvements even should sums remain owing upon the same from Lessor's share of profits as noted above. During the first five years, however, improvements not yet paid for by Lessor may be removed and liquidated by Lessee. In any event, all liens, debts or other encumbrances will be satisfied by Lessee in regard to the property remaining on the leased premises at the time of termination. However this clause shall not affect the provisions contained in the "LESSOR BUY-BACK" paragraph set forth below. The personal property or movables and equipment, however, shall remain the property of Lessee upon termination.

LESSOR BUY-BACK: At the end of the first Lease period ending July 1, 2009, should Lessees elect to renew as provided above, Lessor shall have the counter-right, or right, to buy back the remaining lease term from Lessees. If Lessor so elects to purchase or buy back, Lessees shall be entitled to a cash payment as mutually agreed upon, but if agreement cannot be mutually reached then the price shall be determined based upon the appraised value of the 15 year lease. The valuation to be determined shall not include value of the improvements, land or water but will include the business value and profit potential.

In the event of a dispute regarding selection of an appraiser the same shall be resolved by arbitration.

ARBITRATION: In the event a disagreement or dispute arises in connection with this Lease, parties agree that prior to either bringing or filing a suit or cause of action against the other they will submit the dispute to arbitration. The parties further agree that unless otherwise agreed the arbitrators shall be three in number, one to be selected by each party with the third selected by agreement of the two arbitrators selected by the parties. An award or decision may be rendered by a majority of the three arbitrators who will be governed as established by the laws and rules of arbitration under Idaho law except as otherwise set forth herein or by mutual agreement of the parties.

EXCLUSIVE USE: Lessor and Lessees agree that the water furnished by Lessor will be used exclusively for fish propagation and that excessive amounts, not dictated by good fish propagation practices, will not be used. It is also agreed that to the extent of its control, Lessor will not permit any fish propagation operation other than Lessee's to exist on the water source or the flow of Warm Spring water upstream from the point where the waters flow under U.S. Highway 93 in the present hydro canal, or if the flows are returned to the original channel, then upstream from the point of such flow which is due West from the above point.

AGRICULTURAL LANDS: No facilities or uses will be employed by Lessee that may unreasonably interfere with, damage or detrimentally affect agricultural uses currently in place upon the lands held by Lessor, whether the injury occurs, or would occur, upon the leased lands or the surrounding lands of Lessor.

DEFAULT: Should either party default in their duties and responsibilities contained herein and should the defaulting party fail to cure said default within forty five (45) days after receiving written notice of said default, this agreement may be terminated by the non-defaulting party. Upon default the non-defaulting party shall have any and all remedies allowed at law or equity.

LITIGATION/ATTORNEY FEES: In the event of any litigation between the parties concerning their respective rights and obligations hereunder, the prevailing party shall be entitled to a judgment for its costs of suit, reasonable litigation expenses, and attorney's fees reasonably incurred, in addition to any other relief awarded by the Court.

REPRESENTATION: This Lease Agreement was prepared jointly by the attorneys for Lessee and Lessor. The parties acknowledge their right to individual counsel. Each party agrees to pay all of its respective attorney's fees incurred in negotiation and execution of this Agreement; however, all costs related to document preparation beneficial to both parties shall be equally shared.

RECORDING: The parties agree that once the leased lands have been selected and set forth by Lessee as noted above, Lessee or Lessee's agent may record a copy of this lease complete with the property description or that in the alternative the parties execute a Memorandum of Lease or an abstract setting forth the parties, the property, the first right of refusal and other pertinent data which may be recorded.

BINDING EFFECT: The provisions of this contract shall be binding upon and inure to the benefit of the heirs, personal representatives, successors and assigns of the parties hereto.

IN WITNESS WHEREOF, the parties hereunto set their hands the day and year first above written.

Ingram Warm Spring Ranch
By Will Ingram
INGRAM WARM SPRINGS RANCH

"LESSOR"

MARK LUPHER

JO ANNE LUPHER

"LESSEE"

STATE OF IDAHO)
) ss.
County of Custer)

On this 10th day of November, 1994, before me, the undersigned, a Notary Public in and for said County and State, personally appeared Will Ingram + Timothy A. Ingram known or identified to me to be the persons whose names are subscribed to the within instrument, and acknowledged to me that they executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year in this certificate first above written.

James R Bennett
NOTARY PUBLIC FOR IDAHO
Residing at Challis Idaho
My Commission Expires 1-21-99

STATE OF IDAHO)
) ss.
County of Custer)

On this 10th day of November, 1994, before me, the undersigned, a Notary Public in and for said County and State, personally appeared MARK LUPHER and JO ANNE W. LUPHER, husband and wife, known or identified to me to be the persons whose names are subscribed to the within instrument, and acknowledged to me that they executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year in this certificate first above written.

James R Bennett
NOTARY PUBLIC FOR IDAHO
Residing at Challis Idaho
My commission expires 1-21-94

EXHIBIT "A"

LUPHER/INGRAM WARM SPRINGS RANCH LEASE AGREEMENT

For the purpose of this lease the following items will be used to determine profit:

Income - Gross Receipts

Rental Income	
Fingerlings	Fish
Food Fish	Fish
All Eggs, By-Products or Miscellaneous Sales	
Total Income	Total Sales

Operating Expense

Advertising	Advertising (Not to exceed 5% of sales)
Bank Charge	Bank service charge
Chemicals	Chemicals
Contract Labor	Contract Labor
Dues	Dues and Subscriptions (Not to exceed 1% of sales)
Equipment Rent	Equipment Rental
Feed	Feed
Fuel	Fuel
Insurance	Liability, disability, workman's compensation, crop
Interest	Interest expense
Machine Hire	Machine Hire
Miscellaneous	Miscellaneous Expense (not to exceed 1% of sales)
Office Supplies	Office Supplies
Payroll	Payroll Expense
Professional Fees	Professional Fees (for the benefit of both parties)
a) Accounting	Accountant Fees
b) Legal	Legal Fees
Repairs	Repairs (building, computer, equipment, etc.)
Seed Fish	Seed fish
Supplies	Supplies
T & E	Travel and entertainment (not to exceed 2% of sales)
Taxes	Federal, local, property, state

Tools and Equipment	Tools and equipment
Utility	Electricity, LP Gas
Vehicle	Vehicle
R & D	Research and Development (not to exceed 10% of sales)

Total Expense

Net

EXHIBIT "B"

LUPHER/INGRAM WARM SPRINGS RANCH

For the purpose of this lease the following items will be used to define leasehold improvements:

Commercial Buildings

Dams, Canals and Waterways

Fish Ponds and Raceways

Residences

Roads and Fences

Utility Construction

Water and Sewer Systems

ORIGINAL

MEMORANDUM

This is to acknowledge that in January, 1996, Timothy Ingram, representing Ingram Warm Springs Ranch, Lessor, and Mark Lupher and Jo Anne Lupher, Lessees, verbally agreed and consented, pursuant to the paragraph entitled "Rental," page 3 of the Lease Agreement dated the 1st day of July, 1994, to add to Exhibit "A" of said Lease Agreement the additional line item entitled "Freight and Hauling."

We mutually agreed that the charge for this item would be $1.00 per mile both ways for this service to the Ingram Warm Springs lease.

DATED this 9 day of Nov., 1998.

INGRAM WARM SPRINGS RANCH

By: Timothy Ingram

Timothy Ingram

"Lessor"

Mark Lupher

MARK LUPHER

Jo Anne W. Lupher

JO ANNE LUPHER

"Lessees"

STATE OF IDAHO)
) ss.
County of Twin Falls)

On this 9th day of November, 1998, before me, the undersigned, a Notary Public in and for said County and State, personally appeared TIMOTHY INGRAM, known or identified to me to be the Authorized Agent of INGRAM WARM SPRINGS RANCH, the corporation that executed the instrument, or the person who executed the instrument on behalf of said corporation, and acknowledged to me that such corporation executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year in this certificate first above written.

Kathryn M Swendell
NOTARY PUBLIC FOR IDAHO
Residing at Challis ID
My commission expires 11/17/2000

STATE OF IDAHO)
) ss.
County of Twin Falls)

On this 27 day of October, 1998, before me, the undersigned, a Notary Public in and for said County and State, personally appeared MARK LUPHER, known or identified to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that he executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year in this certificate first above written.

NOTARY PUBLIC FOR IDAHO
Residing at Twin Falls
My commission expires 2002

STATE OF IDAHO)
) ss.
County of Twin Falls)

On this 27 day of October, 1998, before me, the undersigned, a Notary Public in and for said County and State, personally appeared JO ANNE LUPHER, known or identified to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that she executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year in this certificate first above written.

NOTARY PUBLIC FOR IDAHO
Residing at Twin Falls
My commission expires 2002

SEC. 9 & 10, T.12N., R.20E., B.M.

ERICKSON SERVICES
Construction & Land Surveying
William B. Erickson, Professional Land Surveyor
P.O. Box 606/110 North Main
MACKAY, IDAHO 83251
(208) 588-3112

JOB LUPHER / INGRAM LEASE ARE
SHEET NO. 1 OF
CALCULATED BY B.E. DATE 6-27-95
CHECKED BY DATE
SCALE

~ LEGAL DESCRIPTION ~

PARCEL "A" – A PARCEL OF LAND SITUATED IN SECTIONS 9 AND 10, T.12N., R.20E., B.M., CUSTER COUNTY, STATE OF IDAHO. SAID PARCEL IS LOCATED WITHIN THE FENCED AND OCCUPIED LAND KNOWN AS "INGRAMS WARM SPRINGS RANCH." THE FOLLOWING DESCRIPTION MAY NOT AGREE WITH DEED BOUNDARY LINES.

BEGINNING AT A POINT WHICH BEARS S 34°32'39"W 1266.30 FEET FROM THE NORTHWEST CORNER OF SECTION 10, T.12N., R.20E., B.M.; THENCE S54°25'55"W 717.54 FEET TO THE CENTERLINE OF WARM SPRINGS CANAL; THENCE THE FOLLOWING COURSES ALONG SAID CENTERLINE OF CANAL;

S 11°30'50"E 92.74 FEET;
S 27°28'56"E 148.72 FEET;
S 42°52'49"E 270.40 FEET;
S 53°34'51"E 190.38 FEET;
S 75°59'44"E 242.87 FEET;
S 86°30'57"E 144.52 FEET;
S 64°50'47"E 50.93 FEET;
S 39°10'56"E 52.34 FEET;
S 30°10'46"E 32.92 FEET;

PROFESSIONAL LAND SURVEYOR REGISTERED 6-27-95 3577 STATE OF IDAHO WILLIAM B. ERICKSON

William B. Erickson

THENCE LEAVING SAID CENTERLINE OF WARM SPRINGS CANAL N 51°13'30"E 557.75 FEET TO A POINT; THENCE N 40°00'07"W 277.77 FEET TO A POINT; THENCE N 46°16'55"W 792.20 FEET TO THE POINT OF BEGINNING:

ENCOMPASSING 18.605 ACRES, MORE OR LESS.

ERICKSON SERVICES
Construction & Land Surveying
William B. Erickson, Professional Land Surveyor
P.O. Box 606/110 North Main
MACKAY, IDAHO 83251
(208) 588-3112

JOB LUPHER / INGRAM LEASE

SHEET NO. 2 OF

CALCULATED BY B.E. DATE 6-27-95

CHECKED BY DATE

SCALE

~LEGAL DESCRIPTION~

PARCEL "B" – A PARCEL OF LAND SITUATED IN SECTIONS 9 AND 10, T.12N., R.20E., B.M. CUSTER COUNTY, STATE OF IDAHO. SAID PARCEL IS LOCATED WITHIN THE FENCED AND OCCUPIED LAND KNOWN AS "INGRAMS WARM SPRINGS RANCH." THE FOLLOWING DESCRIPTION MAY NOT AGREE WITH DEED BOUNDARY LINES.

BEGINNING AT A POINT WHICH BEARS S 7°33'23"E 2070.20 FEET FROM THE NORTHWEST CORNER OF SECTION 10, T.12N., R.20E., B.M.; THENCE S 33°43'17"W 506.01 FEET TO THE CENTERLINE OF WARM SPRINGS CANAL; THENCE THE FOLLOWING COURSES ALONG SAID CENTERLINE OF CANAL;

S 76°15'36"E 82.77 FEET;
S 65°19'50"E 64.76 FEET;
S 43°16'06"E 52.05 FEET;
S 11°49'41"E 132.96 FEET;
S 28°53'58"E 73.68 FEET;
S 78°26'31"E 116.57 FEET;
N 50°42'50"E 60.59 FEET;
N 70°24'19"E 127.69 FEET;
N 85°36'00"E 135.27 FEET;
N 81°51'19"E 96.55 FEET;
S 71°10'13"E 79.17 FEET;
S 50°42'24"E 96.27 FEET;
S 28°55'25"E 95.78 FEET;
S 10°46'53"W 91.31 FEET;
S 22°55'51"W 142.83 FEET;
S 4°14'15"W 218.84 FEET;
S 38°07'51"E 200.05 FEET;
S 47°56'40"E 70.86 FEET;
S 19°39'55"W 105.78 FEET;

PROFESSIONAL LAND SURVEYOR REGISTERED 6-27-95 3577 STATE OF IDAHO WILLIAM B. ERICKSON

William B. Erickson

CONT. ON SHEET 3

ERICKSON SERVICES
Construction & Land Surveying
William B. Erickson, Professional Land Surveyor
P.O. Box 606/110 North Main
MACKAY, IDAHO 83251
(208) 588-3112

JOB [illegible]
SHEET NO. 3 OF
CALCULATED BY B.E. DATE 6-27-95
CHECKED BY DATE
SCALE

~ LEGAL DESCRIPTION ~
CONT. FROM SHEET 2

S 5°09'48"E 241.14 FEET;
THENCE LEAVING SAID CENTERLINE OF WARM SPRINGS CANAL S57°26'43"E 179.02 FEET TO A POINT; THENCE N77°35'42"E 89.45 FEET TO A POINT; THENCE N6°07'22"E 887.24 FEET TO A POINT; THENCE N8°52'22"W 214.36 FEET TO A POINT; THENCE N29°13'09"W 342.05 FEET TO A POINT; THENCE N55°12'27"W 423.26 FEET TO A POINT; THENCE N67°35'15"W 565.83 FEET TO THE POINT OF BEGINNING.
ENCOMPASSING ~~18.605~~ 21.395 ACRES, MORE OR LESS.

PROFESSIONAL LAND SURVEYOR
REGISTERED
6-27-95
3577
STATE OF IDAHO
WILLIAM B. ERICKSON

William B. Erickson

SEC. 9 & 10, T. 12N., R. 20E., B.M.

ERICKSON SERVICES
Construction & Land Surveying
William B. Erickson, Professional Land Surveyor
P.O. Box 606/110 North Main
MACKAY, IDAHO 83251
(208) 588-3112

JOB LUPHER/INGRAM LEASE AREA
SHEET NO. 4 OF
CALCULATED BY B.E. DATE 6-27-95
CHECKED BY DATE
SCALE

~ LEGAL DESCRIPTION ~

PARCEL "C" — A PARCEL OF LAND SITUATED IN SECTIONS 9 AND 10, T. 12N., R. 20E., B.M., CUSTER COUNTY, STATE OF IDAHO. SAID PARCEL IS LOCATED WITHIN THE FENCED AND OCCUPIED LAND KNOWN AS "INGRAMS WARM SPRING RANCH." THE FOLLOWING DESCRIPTION MAY NOT AGREE WITH DEED BOUNDARY LINES.

BEGINNING AT A POINT WHICH BEARS S1°03'03"E 1803.61 FEET FROM THE NORTHWEST CORNER OF SECTION 10, T. 12N., R 20E., B.M.; THENCE S51°13'30"W 557.75 FEET TO THE CENTERLINE OF WARM SPRINGS CANAL; THENCE THE FOLLOWING COURSES ALONG SAID CENTERLINE OF CANAL;

S 16° 04' 54"E 62.88 FEET;
S 27° 02' 50"E 70.83 FEET;
S 52° 18' 42"E 112.30 FEET;
S 71° 31' 54"E 88.66 FEET;
S 79° 52' 02"E 102.59 FEET;
S 32° 32' 21"E 48.96 FEET;
S 46° 32' 10"E 59.46 FEET;

THENCE LEAVING SAID CENTERLINE OF WARM SPRINGS CANAL N 33° 43' 17"E 506.01 FEET TO A POINT; THENCE N 67° 35' 15"W 50.10 FEET TO A POINT; THENCE N 40° 00' 07"W 300.00 FEET TO THE POINT OF BEGINNING.

ENCOMPASSING 5.393 ACRES, MORE OR LESS.

PROFESSIONAL LAND SURVEYOR
REGISTERED
6-27-95
3577
STATE OF IDAHO
WILLIAM B. ERICKSON

William B. Erickson

SEC. 9 & 10, T. 12N., R. 20E., B.M.

ERICKSON SERVICES
Construction & Land Surveying
William B. Erickson, Professional Land Surveyor
P.O. Box 606/110 North Main
MACKAY, IDAHO 83251
(208) 588-3112

JOB LUPHER/INGRAM LEASE AREA
SHEET NO. 4 OF
CALCULATED BY B.E. DATE 6-27-95
CHECKED BY DATE
SCALE

~ LEGAL DESCRIPTION ~

PARCEL "C" — A PARCEL OF LAND SITUATED IN SECTIONS 9 AND 10, T. 12N., R. 20E., B.M., CUSTER COUNTY, STATE OF IDAHO. SAID PARCEL IS LOCATED WITHIN THE FENCED AND OCCUPIED LAND KNOWN AS "INGRAMS WARM SPRING RANCH." THE FOLLOWING DESCRIPTION MAY NOT AGREE WITH DEED BOUNDARY LINES.

BEGINNING AT A POINT WHICH BEARS S1°03'03"E 1803.61 FEET FROM THE NORTHWEST CORNER OF SECTION 10, T. 12N., R 20E., B.M.; THENCE S51°13'30"W 557.75 FEET TO THE CENTERLINE OF WARM SPRINGS CANAL; THENCE THE FOLLOWING COURSES ALONG SAID CENTERLINE OF CANAL;

S 16° 04' 54"E 62.88 FEET;
S 27° 02' 50"E 70.83 FEET;
S 52° 18' 42"E 112.30 FEET;
S 71° 31' 54"E 88.66 FEET;
S 79° 52' 02"E 102.59 FEET;
S 32° 32' 21"E 48.96 FEET;
S 46° 32' 10"E 59.46 FEET;

THENCE LEAVING SAID CENTERLINE OF WARM SPRINGS CANAL N 33° 43' 17"E 506.01 FEET TO A POINT; THENCE N 67° 35' 15"W 50.10 FEET TO A POINT; THENCE N 40° 00' 07"W 300.00 FEET TO THE POINT OF BEGINNING.

ENCOMPASSING 5.393 ACRES, MORE OR LESS.

PROFESSIONAL LAND SURVEYOR
REGISTERED
6-27-95
3577
STATE OF IDAHO
WILLIAM B. ERICKSON

William B. Erickson

SEC. 9 & 10, T. 12N., R. 20E., B.M.

ERICKSON SERVICES
Construction & Land Surveying
William B. Erickson, Professional Land Surveyor
P.O. Box 606/110 North Main
MACKAY, IDAHO 83251
(208) 588-3112

JOB LUPHER/INGRAM LEASE AREA
SHEET NO. 4 OF
CALCULATED BY B.E. DATE 6-27-95
CHECKED BY DATE
SCALE

~ LEGAL DESCRIPTION ~

PARCEL-"C"- A PARCEL OF LAND SITUATED IN SECTIONS 9 AND 10, T. 12N., R. 20E., B.M., CUSTER COUNTY, STATE OF IDAHO. SAID PARCEL IS LOCATED WITHIN THE FENCED AND OCCUPIED LAND KNOWN AS "INGRAMS WARM SPRING RANCH." THE FOLLOWING DESCRIPTION MAY NOT AGREE WITH DEED BOUNDARY LINES.

BEGINNING AT A POINT WHICH BEARS S1°03'03"E 1803.61 FEET FROM THE NORTHWEST CORNER OF SECTION 10, T. 12N., R 20E., B.M.; THENCE S51°13'30"W 557.75 FEET TO THE CENTERLINE OF WARM SPRINGS CANAL; THENCE THE FOLLOWING COURSES ALONG SAID CENTERLINE OF CANAL;

S 16° 04' 54"E 62.88 FEET;
S 27° 02' 50"E 70.83 FEET;
S 52° 18' 42"E 112.30 FEET;
S 71° 31' 54"E 88.66 FEET;
S 79° 52' 02"E 102.59 FEET;
S 32° 32' 21"E 48.96 FEET;
S 46° 32' 10"E 59.46 FEET;

THENCE LEAVING SAID CENTERLINE OF WARM SPRINGS CANAL N 33° 43' 17"E 506.01 FEET TO A POINT; THENCE N 67° 35' 15"W 50.10 FEET TO A POINT; THENCE N 40° 00' 07"W 300.00 FEET TO THE POINT OF BEGINNING.

ENCOMPASSING 5.393 ACRES, MORE OR LESS.

PROFESSIONAL LAND SURVEYOR
REGISTERED
6-27-95
3577
STATE OF IDAHO
WILLIAM B. ERICKSON

William B. Erickson

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Authorization to Discharge under the National Pollutant Discharge Elimination System

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 *et seq.*, as amended by the Water Quality Act of 1987, P.L. 100-4, the "Act",

Epicenter Aquaculture

is authorized to discharge from its facility located near Challis, Idaho, at the following location(s):

Outfall	Receiving Water	Latitude	Longitude
001	Warm Springs Hydro-Canal	44 23' 30" N	114 06' 40" W

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein.

A copy of this Permit shall be kept at the facility where discharges occur.

This permit shall become effective *insert date*

This permit and the authorization to discharge shall expire at midnight, *insert date*

Each permittee shall reapply for a permit reissuance on or before *insert date*, 180 days before the expiration of this permit, if the permittee intends to continue operations and discharges at the facility beyond the term of this permit.

Signed this _____day of _____, _____,

Draft
Michael F. Gearheard, Director
Office of Water and Watersheds

Table of Contents

Schedule of Submissions **4**

I. Limitations and Monitoring Requirements **5**

A. Discharge Authorization 5
B. Effluent Limitations 5
C. Prohibited Discharges 5
D. Prohibited Practices 6
E. Monitoring Requirements 6
F. Monitoring of Polychlorinated Biphenyls (PCBs) 8
G. Quality Assurance (QA) Plan 8

II. Best Management Practices Plan **9**

A. Purpose 9
B. Development and Implementation Deadline 10
C. Certification 10
D. Annual Review 10
E. Requirements of the BMP Plan 10
F. Documentation 11
G. BMP Plan Modification 11

III. Aquaculture Specific Reporting Requirements **12**

A. Drug and Other Chemical Use and Reporting Requirements 12
B. Structural failure or damage to the facility 13
C. Spills of feed, drugs, pesticides or other chemicals 13
D. Annual Report of Operations 13

IV. Standard Monitoring, Recording and Reporting Requirements **13**

A. Representative Sampling (Routine and Non-Routine Discharges) 13
B. Reporting of Monitoring Results 13
C. Monitoring Procedures 14
D. Additional Monitoring by Permittee 14
E. Records Contents 14
F. Retention of Records 14
G. Twenty-four Hour Notice of Noncompliance Reporting 15
H. Other Noncompliance Reporting 16

V. Compliance Responsibilities **16**

A. Duty to Comply 16
B. Penalties for Violations of Permit Conditions 16
C. Need To Halt or Reduce Activity not a Defense 17
D. Duty to Mitigate 18
E. Proper Operation and Maintenance 18
F. Bypass of Treatment Facilities 18
G. Upset Conditions 19

H. Toxic Pollutants 19
I. Planned Changes 19
J. Anticipated Noncompliance 20

VI. General Provisions 20

A. Permit Actions 20
B. Duty to Reapply 20
C. Duty to Provide Information 20
D. Other Information 21
E. Signatory Requirements 21
F. Availability of Reports 22
G. Inspection and Entry 22
H. Property Rights 22
I. Transfers 22
J. Permit reopener and modification. 23
K. State Laws 23

VII. Definitions 23

Tables

Table 1: Effluent Limitations 5

Table 2: Raceway and Associated Full-flow Settling Basin Discharge Monitoring Requirements 6

Table 3: Method Detection Levels 8

Appendices

Appendix A: Flow Measurement Methods Approved by Idaho Department of Water Resources

Appendix B: Effluent calculations

Appendix C: Quality Assurance Plan and Best Management Practices Plan Certification

Appendix D: Drug and Chemical Use Report Contents

Appendix E: Annual Report Contents

Schedule of Submissions

The following is a summary of some of the items which the permittee must complete and/or submit to the U.S. Environmental Protection Agency (EPA) and the Idaho Department of Environmental Quality (IDEQ) during the term of this permit:

Item	Due Date
1. Discharge Monitoring Reports (DMRs)	DMRs are due monthly and must be postmarked by the 10th day of the following month.
2. Quality Assurance Plan (QA Plan)	The permittee must develop and implement a QA Plan within 60 days of the effective date of this permit (see Part I.G.). The Plan must be kept on site and made available to EPA and IDEQ upon request. The permittee must submit a certification that the QA Plan has been developed and implemented to EPA and IDEQ within 90 days of the effective date of this permit.
3. Best Management Practices (BMP) Plan	The permittee must submit a certification that the BMP Plan has been developed and implemented to EPA and IDEQ within 90 days of the effective date of this permit (see Part II.C.).
4. Sediment Monitoring Report	The Sediment Monitoring Report must be submitted with the DMR for the first month of the second year of coverage under this permit. (see Part I.F.)
5. Submittal of a permit application	The application to continue coverage under the next permit must be submitted by ***<180 days before the expiration date of this permit>*** (see Part VI.B.).
6. Annual Report	The Annual Report must be submitted by January 20th each year (see Part III.D).

I. Limitations and Monitoring Requirements

A. Discharge Authorization

During the effective period of this permit, the permittee is authorized to discharge pollutants from the outfalls specified in this permit to the Warm Springs Hydro-Canal, within the limits and subject to the conditions set forth herein. This permit authorizes the discharge of only those pollutants resulting from facility processes, waste streams, and operations that have been clearly identified in the permit application process, including non-production facilities, such as incubators, laboratories, etc. It does not authorize the discharge of any waste streams, including spills and other unintentional or non-routine discharges of pollutants, that are not part of the normal operation of the facility as disclosed in the permittee's application nor does it authorize the discharge of any pollutants that are not ordinarily present in such waste streams.

B. Effluent Limitations

The permittee must limit discharges from all outfalls authorized under this permit as specified in Table 1, below. All limits represent maximum effluent limits. unless otherwise indicated. The permittee must comply with the applicable effluent limits at all times, unless otherwise indicated, regardless of the frequency of monitoring required in Table 2, below, or reporting required by Part IV.B, below.

Table 1

Effluent Limitations

Parameter	Limitations (mg/l)	
	Average Monthly	Maximum Daily
Net[1] TSS	15	25
Net Total Phosphorus	0.20	0.32

[1] Net addition = effluent concentration – influent concentration. See Appendix B.

C. Prohibited Discharges

1. Discharges from aquaculture facilities must not cause or contribute to a violation of Idaho State Water Quality Standards.

2. The permittee must not discharge:

   a) Any floating solids or visible foam in other than trace amounts on the surface of the receiving water;

b) Any hazardous materials;

c) Any sludge, grit and accumulated solid residues;

d) Any untreated cleaning wastewater (e.g., obtained from a vacuum or standpipe bottom drain system or rearing/holding unit disinfection); or

e) Any floating, suspended or submerged matter, including dead fish, in amounts causing nuisance or objectionable condition or that may impair designated beneficial uses in the receiving water.

f) Any toxic substances, including drugs, pesticides, or other chemicals, in concentrations that impair designated uses.

D. Prohibited Practices

The permittee is prohibited from engaging in any of the following practices:

1. Practices (e.g., the removal of dam boards in raceways or ponds) which allow accumulated solids to be discharged to waters of the United States.

2. Sweeping, raking, or otherwise intentionally discharging accumulated solids from raceways or ponds to waters of the United States.

3. Containing, growing or holding fish within an offline or full-flow settling basin.

E. Facility Monitoring Requirements

1. The permittee must monitor discharges from all outfalls authorized under this permit as specified in Table 2, below. All influent and effluent samples and flow measurements required must be taken on the same day. Facilities with multiple effluent discharge points and/or influent points must composite samples from all points proportionally to their respective flows. Only the composite sample must be analyzed.

2. The permittee must collect effluent samples from the effluent stream just prior to discharge into the receiving waters or subsequent mixing with other water flows.

Table 2

Raceway and Associated Full-flow Settling Basin Discharges

Monitoring Requirements

Parameter	Units	Sample Frequency	Sample Type	Sample Location
Flow	Cfs	1/month[2]	Approved method[3]	Effluent[4]
Total Suspended Solids	mg/l	1/month	Composite[5]	Influent & Effluent
	lbs/day[6]			

Table 2
Raceway and Associated Full-flow Settling Basin Discharges
Monitoring Requirements

Parameter	Units	Sample Frequency	Sample Type	Sample Location
Flow	Cfs	1/month[2]	Approved method[3]	Effluent[4]
Total Phosphorus	mg/l	1/month	Composite[5]	Influent & Effluent
	lbs/day[6]			
Temperature	°Celsius	1/month	Thermometer	Effluent[4]
Total Copper	mg/l	1/quarter[7]	composite	effluent
Hardness	µg/l	1/quarter	composite	effluent

[2] Flow measurement must be taken concurrently with each pollutant sampling; it may be taken on either the influent or effluent as long as the measurement at that location accurately reflects the discharge flow to the receiving water.

[3] Flow measurement method must be one of those specified in Appendix A, Part I.A, unless IDWR authorizes a non-standard device as allowed in Part I.B. This requirement applies to measuring flow at each point where pollutants are measured.

[4] Flow measurements may be taken on the influent if the measurement at that location accurately reflects the discharge flow to the receiving water and must be taken concurrently with pollutant sampling.

[5] Composite samples must consist of four (4) or more discrete samples taken at one-half hour intervals or greater over a 24-hour period; at least one fourth of the samples must be taken during quiescent zone or raceway cleaning. If the facility had multiple effluent discharge points and/or influent points, it must composite samples from all points proportionally to their respective flows. Only the composite sample must be analyzed.

[6] See Appendix B (Effluent Calculations) for guidance on calculating loads.

[7] Only when using chelated copper compounds or copper sulfate.

3. Method Detection Limits (MDL).

a) The permittee must use methods that can achieve MDLs less than or equal to those specified in Table 3.

b) For purposes of reporting on the DMR, if a value is greater than the MDL, the permittee must report the actual value. If an influent or effluent value is less than the MDL, the permittee must report "less than {numeric MDL}" on the DMR, but use one-half the MDL when calculating the net value. If both influent and effluent values are less than the MDL, the permittee must report zero on the DMR, and use this for calculating monthly averages. See Appendix B (Effluent Calculations).

Table 3: Method Detection Limits	
Parameter	Method Detection Limit (MDL)
Phosphorus	0.005 mg/l
Total Suspended Solids	2 mg/l
Ammonia Nitrogen as N	0.01 mg/l
pH	0.1 S.U.
Temperature	0.1° C
Aroclor (PCB)	33 μg/kg (dry weight)
Total Copper	0.02 µg/l

4. Quality assurance/quality control plans for all the monitoring must be documented in the Quality Assurance Plan required under Part I.G (Quality Assurance Plan).

F. Monitoring of Polychlorinated Biphenyls (PCBs)

Facilities that have painted surfaces or caulking in hatch houses or raceways are required to conduct the following sampling, analysis, reporting, and, if warranted, investigation.

1. Sediment Monitoring -- The permittee must take a sediment sample downstream of the facility's outfall from painted or caulked raceways or hatch houses and analyze for PCBs as Aroclors once during the first year of coverage under the permit. The sediment sample must be a composite of at least three samples each of which is collected from the nearest depositional area downstream of the outfall.

2. PCB Reporting – The permittee must submit results of the PCB analysis of the sediment sampling along with a description of the location of sampling and a justification for the choice of location with the DMR by the 10th of the first month of the second year of coverage under this permit.

a) If the sediment results show any Aroclor (PCB) higher than 34 μg/kg dry weight, the permittee must investigate the source of PCBs in its facility; this investigation should include fish feed, and paint and caulking in raceways and hatch houses.

b) A report on the required investigation of PCBs in the facility must be submitted to EPA and IDEQ by 18 months after the first day of coverage under this permit. See Part IV.B. for details on submitting reports.

G. Quality Assurance (QA) Plan

The permittee must develop a quality assurance (QA) plan for all monitoring required by this permit. The plan must be developed and implemented within 60 days of coverage under this

permit. Any existing QA Plans may be modified to meet this requirement. The permittee must certify that a QA Plan has been developed and is being implemented and must submit the certification, which includes the information specified in Appendix C, to EPA and to IDEQ (see Part IV.B, below) within 90 days of the effective date of this permit.

1. The QA Plan must be designed to assist in planning for the collection and analysis of effluent and receiving water samples in support of the permit and in explaining data anomalies when they occur.

2. Throughout all sample collection and analysis activities, the permittee must use the EPA-approved quality assurance and quality control (QA/QC) and chain-of-custody procedures described in Requirements for Quality Assurance Project Plans (EPA/QA/R-5)[1] and Guidance for Quality Assurance Project Plans (EPA/QA/G-5)[2]. The QA Plan must be prepared in the format that is specified in these documents.

3. At a minimum, the QA Plan must include the following:

a) Details on the number of samples, type of sample containers, preservation of samples, holding times, analytical methods, analytical detection and quantification limits for each parameter, type and number of quality assurance field samples, precision and accuracy requirements, sample preparation requirements, sample shipping methods, and laboratory data delivery requirements (see Part IV.A.-F. for additional requirements regarding monitoring);

b) Description of flow measuring devices used to measure influent and/or effluent flow at each point, calibration procedures, and calculations used to convert to flow units. Facilities with multiple effluent discharge points and/or influent points must describe their method of compositing samples from all points proportionally to their respective flows;

c) Maps indicating the location of each sampling point;

d) Qualification and training of personnel; and

e) Name, address and telephone number of the laboratory used by or proposed to be used by the permittee.

4. The permittee must amend the QA Plan whenever there is a modification in sample collection, sample analysis, or other procedure addressed by the QA Plan and must update it whenever there is a change in ownership or operator.

5. Copies of the QA Plan must be kept on site and made available to EPA and IDEQ upon request.

II. Best Management Practices Plan

A. Purpose

Through implementation of the best management practices (BMP) plan, the permittee must prevent or minimize the generation and discharge of wastes and pollutants from the facility to

[1] http://www.epa.gov/quality/qs-docs/r5-final.pdf
[2] http://www.epa.gov/quality/qs-docs/g5-final.pdf

the waters of the United States and ensure disposal or land application of wastes in such a way as to minimize negative environmental impact and comply with relevant Idaho solid waste disposal regulations.

B. Development and Implementation Deadline

The permittee must develop and implement a BMP Plan which meets the specific requirements listed in Part II.E, below. An existing BMP Plan may be modified for use under this section. The permittee must implement the provisions of the BMP Plan as conditions of this permit within 90 days of the effective date of this permit.

C. Certification

The permittee must certify that a BMP Plan has been developed and is being implemented, The certification must be submitted to EPA and to IDEQ (see Part IV.B., below) and must include the information specified in Appendix C. The permittee must submit the certification within 90 days of the effective date of this permit.

D. Annual Review

1. The permittee must review the BMP Plan annually.

2. A certified statement that the annual review has been completed and that the BMP Plan fulfills the requirements set forth in this permit must be submitted to EPA in the Annual Report of Operations, due by January 20 each year. See Appendix E.

E. Requirements of the BMP Plan

The BMP Plan must include, at a minimum, the following BMPs:

1. Chemical Storage:

   a) Ensure proper storage of drugs and other chemicals to prevent spills that may result in the discharge to waters of the United States.

   b) Implement procedures for properly containing, cleaning, and disposing of any spilled materials.

2. Structural Maintenance:

   a) Routinely inspect rearing and holding units and waste collection and containment systems to identify and promptly repair damage.

   b) Regularly conduct maintenance of rearing and holding units and waste collection and containment systems to ensure their proper function.

3. Training Requirements:

   a) Train all relevant personnel in spill prevention and how to respond in the event of a spill to ensure proper clean-up and disposal of spilled materials.

b) Train personnel on proper structural inspection and maintenance of rearing and holding units and waste collection and containment systems.

4. Operational Requirements:

a) Water used in the rearing and holding units or hauling trucks which is disinfected with chlorine or other chemicals must be treated before it is discharged to waters of the U.S.

b) Treatment equipment used to control the discharge of floating, suspended or submerged matter must be cleaned and maintained at a frequency sufficient to prevent overflow or bypass of the treatment unit by floating, suspended, or submerged matter.

c) Procedures must be implemented to prevent fish from entering quiescent zones, full-flow and off-line settling basins. Fish which have entered quiescent zones or basins must be removed as soon as practicable.

d) All drugs and pesticides must be used in accordance with applicable label directions (FIFRA or FDA), except under the following conditions, both of which must be reported to EPA and IDEQ in accordance with Part III.A, below:

(1) Participation in Investigational New Animal Drug (INAD) studies, using established protocols; or

(2) Extralabel drug use, as prescribed by a veterinarian.

e) Chelated copper compounds and copper sulfate, when used, must be applied to only one raceway at a time. For required concurrent monitoring, see section I.E.

f) Identify and implement procedures to collect, store, and dispose of wastes, such as biological wastes, in accordance with IDAPA §02.04.17 and IDAPA §58.01.02. Such wastes include fish mortalities and other processing solid wastes from aquaculture.

F. Documentation

The permittee must maintain a copy of the BMP Plan at the facility and make it available to EPA, IDEQ, or an authorized representative upon request.

G. BMP Plan Modification

The permittee must amend the BMP Plan whenever there is a change in the facility or in the operation of the facility which materially increases the generation of pollutants or their release or potential release to surface waters. With any change in operator, the BMP plan must be reviewed and modified, if necessary. The new operator must submit a certification in accordance with Part II.C., above.

III. Aquaculture Specific Reporting Requirements

(See Part IV for standard reporting requirements)

A. Drug and Other Chemical Use and Reporting Requirements

The following requirements apply for chemicals that are used in such a way that they will be or may be discharged to waters of the United States.

1. Use of Drugs, Pesticides, and Other Chemicals

a) All drugs, pesticides and other chemicals must be applied in accordance with label directions.

b) Records required

Records of all applications of drugs, pesticides, and other chemicals must be maintained and must include, at a minimum, information specified in Appendix D (Drug Use Report Contents). This information must also be summarized in the annual report as required in Part III.D below.

2. Investigational New Animal Drugs (INAD) and Extralabel Drug Use.

The following written and oral reports must be provided to EPA and IDEQ:

a) Anticipated INAD Study participation and Extralabel drug use:

Written Report: A permittee must provide a written report to EPA and IDEQ within seven days of agreeing or signing up to participate in an INAD drug study, or receiving a prescription for extralabel drug use. The report must include the information specified in Appendix D.

b) Actual Use of INADs or Extralabel Drug Use:

(1) Oral report:

For INAD and extralabel drug uses, the permittee must provide an oral report to EPA (206-553-1846) and to IDEQ (see Part IV.B. below) as soon as possible during business hours, preferably in advance of use, but no later than 7 days after initiating use of the drug. The report must include the information specified in Appendix D.

(2) Written report:

For INADs and extralabel drug uses, the permittee must provide to EPA and IDEQ a written report within 30 days after initiating use of the drug. The report must include the information specified in Appendix D.

B. Structural failure or damage to the facility

Failure or damage to the facility must be reported to EPA and IDEQ orally within 24 hours and in writing within five days when there is a resulting discharge of pollutants to waters of the U.S. Reports must include the identity and quantity of pollutants released. (See Representative Sampling and Noncompliance Reporting in Parts IV.A and G)

C. Spills of feed, drugs, pesticides or other chemicals

The permittee must monitor and report to EPA and IDEQ any spills that result in a discharge to waters of the United States; these must be reported orally within 24 hours and in writing within five days. Reports must include the identity and quantity of pollutants released. (See Representative Sampling and Noncompliance Reporting in Parts IV.A. and G.)

D. Annual Report of Operations

During the term of this permit, the permittee must prepare and submit an annual report of operations by January 20th of each year to EPA and IDEQ. A copy of the annual report and the data used to compile it must be available to EPA and IDEQ upon request and during inspections. The report must include the information specified in Appendix E (Annual Report Contents).

IV. Standard Monitoring, Recording and Reporting Requirements

A. Representative Sampling (Routine and Non-Routine Discharges)

Samples and measurements must be representative of the volume and nature of the monitored discharge or source water.

In order to ensure that the effluent limits set forth in this permit are not violated at times other than when routine samples are taken, the permittee must collect additional samples at the appropriate outfall whenever any discharge occurs that may reasonably be expected to cause or contribute to a violation that is unlikely to be detected by a routine sample. The permittee must analyze the additional samples for those parameters limited in Part I.B (Effluent Limitations) that are likely to be affected by the discharge.

The permittee must collect such additional samples as soon as the spill, discharge, or bypassed effluent reaches the outfall. The samples must be analyzed in accordance with Part IV.C (Monitoring Procedures). The permittee must report all additional monitoring in accordance with Part IV.D (Additional Monitoring by Permittee).

B. Reporting of Monitoring Results

The permittee must summarize monitoring results, including influent, effluent, and net results, each month on the Discharge Monitoring Report (DMR) form (EPA No. 3320-1) or equivalent. The permittee must submit reports monthly, postmarked by the 10th day of the following month. The permittee must sign and certify all DMRs, and all other reports, in accordance with the requirements of Part VI.E ("Signatory Requirements"). The permittee

must submit the legible originals of these documents to the EPA Region 10 Director, Office of Compliance and Enforcement, with copies to IDEQ at the addresses below:

US EPA Region 10
Attn: PCS Data Entry Team
1200 Sixth Avenue, OCE-133
Seattle, Washington 98101

Idaho Department of Environmental Quality
Idaho Falls Regional Office
900 N. Skyline
Idaho Falls, Idaho 83402

C. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit or approved by EPA as an alternate test procedure under 40 CFR §136.5.

D. Additional Monitoring by Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR Part 136 or as specified in this permit, the permittee must include the results of this monitoring in the calculation and reporting of the data submitted in the DMR.

Upon request by EPA or IDEQ, the permittee must submit results of any other sampling, regardless of the test method used.

E. Records Contents

Records of monitoring information must include:

1. the date, exact place, and time of sampling or measurements;
2. the name(s) of the individual(s) who performed the sampling or measurements;
3. the date(s) analyses were performed;
4. the names of the individual(s) who performed the analyses;
5. the analytical techniques or methods used; and
6. the results of such analyses.

F. Retention of Records

The permittee must retain records of all monitoring information, including, all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, copies of DMRs, a copy of the

NPDES permit, and records of all data used to complete the application for this permit, for a period of at least five years from the date of the sample, measurement, report or application submittal. This period may be extended by request of EPA or IDEQ at any time. Data collected on site, copies of Discharge Monitoring Reports, and a copy of the permit must be maintained on site during the duration of activity at the permitted location.

G. Twenty-four Hour Notice of Noncompliance Reporting

1. The permittee must report the following occurrences of noncompliance by telephone to EPA (206-553-1846), and to IDEQ at the phone numbers listed in §I.C.1, above, as soon as possible, but no later than 24 hours from the time the permittee becomes aware of the circumstances (for noncompliance that endangers listed Snake River snail species, a permittee also must report within 24 hours to the U.S. Fish and Wildlife Service at 208-378-5243):

a) any discharge to the receiving water not authorized under this permit;

b) any noncompliance that may endanger health, the environment or listed Snake River snail species;

c) any unanticipated bypass that exceeds any effluent limitation in the permit (See Part V.F., "Bypass of Treatment Facilities"); or

d) any upset that exceeds any effluent limitation in the permit (See § V.G., "Upset Conditions.

2. For incidents involving releases of hazardous or deleterious chemicals to the environment, the permittee must contact the Idaho State Communications Center (StateComm) at 1-800-632-8000 as soon as possible.

3. The permittee must also provide a written submission within five days of the time that the permittee becomes aware of any event required to be reported under subpart 1 above. The written submission must contain:

a) a description of the noncompliance and its cause;

b) the period of noncompliance, including exact dates and times;

c) the estimated time noncompliance is expected to continue if it has not been corrected; and

d) steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

4. The Director of the Office of Compliance and Enforcement may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the NPDES Compliance Hotline in Seattle, Washington, by telephone, 206-553-1846.

5. Reports must be submitted to the addresses in § IV.B ("Reporting of Monitoring Results"). Reports on noncompliance that endangers listed Snake River snail species must be sent also to the U.S. Fish and Wildlife Service, Snake River Office, 1387 South

Vinnell Way, Room 368, Boise, Idaho 83709.

H. Other Noncompliance Reporting

The permittee must report all instances of noncompliance, not required to be reported within 24 hours, at the time that monitoring reports for Part.IV.B ("Reporting of Monitoring Results") are submitted. The report must contain the information listed in §IV.G.3 of this permit ("Twenty-four Hour Notice of Noncompliance Reporting").

V. Compliance Responsibilities

A. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action, for permit termination, or for denial of a permit renewal application.

B. Penalties for Violations of Permit Conditions

1. Civil and Administrative Penalties. Pursuant to 40 CFR §19 and the Act, any person who violates Section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any such sections in a permit issued under Section 402, or any requirement imposed in a pretreatment program approved under Sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed the maximum amounts authorized by Section 309(d) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $32,500 per day for each violation).

2. Administrative Penalties. Any person may be assessed an administrative penalty by the Administrator for violating Section 301, 302, 306, 307, 308, 318 or 405 of this Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of this Act. Pursuant to 40 CFR Part 19 and the Act, administrative penalties for Class I violations are not to exceed the maximum amounts authorized by Section 309(g)(2)(A) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $11,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $32,500). Pursuant to 40 CFR Part 19 and the Act, penalties for Class II violations are not to exceed the maximum amounts authorized by Section 309(g)(2)(B) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $11,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $157,500).

3. Criminal Penalties:

a) Negligent Violations. The Act provides that any person who negligently violates Sections 301, 302, 306, 307, 308, 318, or 405 of the Act, or any condition or limitation implementing any of such sections in a permit issued under Section 402 of

the Act, or any requirement imposed in a pretreatment program approved under Section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than 1 year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation, or by imprisonment of not more than 2 years, or both.

b) Knowing Violations. Any person who knowingly violates such sections, or such conditions or limitations is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than 3 years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

c) Knowing Endangerment. Any person who knowingly violates Section 301, 302, 303, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in Section 309(c)(3)(B)(iii) of the Act, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions.

d) False Statements. The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both. The Act further provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

C. Need To Halt or Reduce Activity not a Defense

It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with this permit.

D. Duty to Mitigate

The permittee must take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

F. Bypass of Treatment Facilities

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur that does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of §§ 2 and 3 of this Part.

2. Notice.

a) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it must submit prior notice, if possible at least 10 days before the date of the bypass.

b) Unanticipated bypass. The permittee must submit notice of an unanticipated bypass as required under Part IV.G (Twenty-four Hour Notice of Noncompliance Reporting).

3. Prohibition of bypass.

a) Bypass is prohibited, and the Director of the Office of Compliance and Enforcement or IDEQ may take enforcement action against the permittee for a bypass, unless:

(1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The permittee submitted notices as required under §2 of this Part.

b) The Director of the Office of Compliance and Enforcement and IDEQ may approve an anticipated bypass, after considering its adverse effects, if the Director

and IDEQ determine that it will meet the three conditions listed above in §3.a. of this Part.

G. Upset Conditions

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the permittee meets the requirements of §2 of this Part. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

2. Conditions necessary for a demonstration of upset. To establish the affirmative defense of upset, the permittee must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

a) An upset occurred and that the permittee can identify the cause(s) of the upset;

b) The permitted facility was at the time being properly operated;

c) The permittee submitted notice of the upset as required under Part IV.G, (Twenty-four Hour Notice of Noncompliance Reporting); and

d) The permittee complied with any remedial measures required under Part V.D, (Duty to Mitigate).

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

H. Toxic Pollutants

The permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

I. Planned Changes

1. The permittee must give notice as soon as possible to the Director of the Office of Water and Watersheds and to IDEQ of any planned physical alterations or additions to the permitted facility whenever:

a) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as determined in 40 CFR§122.29(b); or

b) The alteration or addition, including production changes, could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in the permit.

2. The permittee must submit the notification to the following addresses:

US EPA Region 10

1200 Sixth Avenue, OWW-130
Seattle, Washington 98101

Idaho Department of Environmental Quality
Idaho Falls Regional Office
900 N. Skyline
Idaho Falls, Idaho 83402

3. A permittee must submit to IDEQ all plans and specifications for the construction, modification, expansion, or alteration of waste treatment or disposal facilities for review and approval before construction may begin (Idaho Code § 39-118).

J. Anticipated Noncompliance

The permittee must give advance notice to the Director of the Office of Compliance and Enforcement and IDEQ of any planned changes in the permitted facility or activity that may result in noncompliance with this permit.

VI. General Provisions

A. Permit Actions

This permit or coverage under this permit may be modified, revoked and reissued, or terminated for cause as specified in 40 CFR §§122.62, 122.64, or 124.5. The filing of a request by the permittee for a permit modification, revocation and reissuance, termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

B. Duty to Reapply

If the permittee intends to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. In accordance with 40 CFR §122.21(d), and unless permission for the application to be submitted at a later date has been granted by the Regional Administrator, the permittee must submit a new application at least 180 days before the expiration date of this permit.

If the application is received by that deadline, even if the permit is not reissued before the expiration date, the conditions of the permit will continue in force until the effective date of the subsequently reissued permit. If the facility is no longer operating but still has a potential to discharge when the permit is due to expire, the permittee must reapply for coverage.

C. Duty to Provide Information

The permittee must furnish to EPA and IDEQ, within the time specified in the request, any information that EPA or IDEQ may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee must also furnish to EPA or IDEQ, upon request, copies of records required to be kept by this permit.

D. Other Information

When the permittee becomes aware that it failed to submit any relevant facts in an application or that it submitted incorrect information on an application or any report to EPA or IDEQ, it must promptly submit the omitted facts or corrected information.

E. Signatory Requirements

All applications, reports or information submitted to EPA and IDEQ must be signed and certified as follows.

1. All applications must be signed by the permittee as follows:

   a) For a corporation: by a responsible corporate officer.

   b) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.

   c) For a municipality, state, federal, Indian tribe, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by EPA or IDEQ must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a) The authorization is made in writing by a person described above;

   b) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company; and

   c) The written authorization is submitted to the Director of the Office of Compliance and Enforcement and IDEQ.

3. Changes to authorization. If an authorization under § VI.E.2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of § VI.E.2 must be submitted to the Director of the Office of Compliance and Enforcement and IDEQ prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this Part must make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the

information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

F. Availability of Reports

In accordance with 40 CFR §2, information submitted to EPA pursuant to this permit may be claimed as confidential by the permittee. In accordance with the Act, applications, permits and effluent data are not considered confidential. Any confidentiality claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice to the permittee. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR § 2, Subpart B (Public Information) and 41 Fed. Reg. 36902 through 36924 (September 1, 1976), as amended.

G. Inspection and Entry

The permittee must allow the Director of the Office of Compliance and Enforcement, EPA Region 10; IDEQ; or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

H. Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to persons or property or invasion of other private rights, nor any infringement of federal, tribal, state or local laws or regulations.

I. Transfers

This permit is not transferable to any person except after notice to the Director of the Office of Water and Watersheds as specified in § V.I. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate

such other requirements as may be necessary under the Act. (See 40 CFR §122.61; in some cases, modification or revocation and reissuance of the permit is mandatory).

J. Permit reopener and modification.

EPA is authorized to modify or revoke and reissue a permit pursuant to 40 CFR §122.62. Effluent limits, monitoring requirements or other permit conditions may be modified if new information is received which was not available at the time of issuance and would have justified the application of different permit conditions at the time of issuance (e.g. information showing violations of state water quality standards). This includes information indicating cumulative effects which are unacceptable. New information may originate from future waste load allocations and biological opinions issued pursuant to the Endangered Species Act.

K. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

VII. Definitions

1. "Act" means the Clean Water Act.
2. "Administrator" means the Administrator of the EPA, or an authorized representative.
3. "Aquaculture facility" means a hatchery, fish farm, or other facility which contains, grows, or holds fish for later harvest (or process) and sale or for release for conservation enhancement purposes.
4. "Average monthly limitation" means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.
5. "Beneficial use" means any of the various uses which may be made of the water of Idaho, including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics. (IDAPA §58.01.003.04).
6. "Best Management Practices" (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage areas.
7. "Biosolids" means waste material from an aquaculture facility, primarily fish manure and uneaten feed.
8. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.
9. "CFR" means Code of Federal Regulations.

10. "cfs" means cubic feet per second.
11. "cold water aquatic animals" include, but are not limited to, the *Salmonidae* family of fish: e.g., trout and salmon.
12. "compliance schedule" means a schedule of remedial measures included in a permit (or authorization to discharge), including an enforceable sequence of interim requirements (for example, actions, operation, or milestone events) leading to compliance with the CWA and regulations. (40 CFR§122.2)
13. "composite" sample means a combination of four (4) or more discrete samples taken at one-half hour intervals or greater over a 24-hour period; at least one fourth of the samples must be taken during quiescent zone or raceway cleaning. Facilities with multiple effluent discharge points and/or influent points must composite samples from all points proportionally to their respective flows.
14. "CWA" means Clean Water Act, 33 U.S.C. §1251 *et seq.*
15. "Daily discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.
16. "Deleterious material" means any nontoxic substance which may cause the tainting of edible species of fish, taste and odors in drinking water supplies, or the reduction of the usability of water without causing physical injury to water users or aquatic and terrestrial organisms. (IDAPA §58.01.02.003.23)
17. "Director of the Office of Compliance and Enforcement" means the Director of the Office of Compliance and Enforcement, EPA Region 10, or an authorized representative.
18. "Director of the Office of Water and Watersheds" means the Director of the Office of Water and Watersheds, EPA Region 10, or an authorized representative.
19. "DMR" means discharge monitoring report, the EPA uniform national form, including any subsequent modifications, for the reporting of self-monitoring results by permittees.
20. "EPA" means the United States Environmental Protection Agency.
21. "Environmental assessment (EA)" consists of a brief discussion of the following: the need for the proposal; alternatives (when there is an unresolved conflict concerning alternative uses of available resources); the environmental impacts of the proposed action and alternatives; and a listing of agencies and persons consulted.
22. "Environmental impact statement (EIS)" consists of discussions of the purpose of and need for the action, alternatives, the affected environment, the environmental consequences of the proposed action, lists of preparers, agencies, organizations and persons to whom the statement is sent, an index, and an appendix (if any).
23. "Extralabel drug use" means a drug approved under the Federal Food, Drug, and Cosmetic Act that is not used in accordance with the approved label directions, see 21 CFR Part 530.

24. "FDA" means Food and Drug Administration.
25. "FIFRA" means Federal Insecticide, Fungicide, and Rodenticide Act.
26. "Finding of No Significant Impact (FNSI or FONSI)" is a document issued by a federal agency, such as EPA, if an environmental assessment finds that a proposed action will have no significant impact (FONSI). The FONSI may address measures which an agency will take to reduce (mitigate) potentially significant impacts.
27. "General permit" means an NPDES permit issued under 40 CFR §122.28 authorizing a category of discharges under the CWA within a geographical area.
28. "Grab" sample is an individual sample collected over a period of time not exceeding 15 minutes.
29. "Hazardous material" means a material or combination of materials which, when discharged in any quantity into state waters, presents a substantial present or potential hazard to human health, public health, or the environment. [IDAPA §58.01.02.003.49]
30. "IDAPA" means Idaho Administrative Procedure Act; the acronym refers to the compilation of promulgated administrative rules in Idaho.
31. "IDEQ" means the Idaho Department of Environmental Quality.
32. "INAD" means *Investigational New Animal Drug*, which is a drug for which there is a valid exemption in effect under Section 512(j) of the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. 360b(j), to conduct experiments.
33. "Maximum daily limitation" means the highest allowable "daily discharge."
34. "Method Detection Limit (MDL)" means the minimum concentration of a substance (analyte) that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
35. "Minimum Level (ML)" means the concentration at which the entire analytical system must give a recognizable signal and an acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method-specified sample weights, volumes and processing steps have been followed.
36. "Monthly average"—see "average monthly limitation".
37. "NPDES" means National Pollutant Discharge Elimination System, the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits . . . under Sections 307, 402, 318, and 405 of the CWA.
38. "Net" means the difference between influent and effluent load, concentration or volume.
39. "New source" means a facility from which there is or may be a pollutant discharge, the construction of which commenced after September 22, 2004. [40 CFR §122.2].
40. "Nuisance" means anything which is injurious to the public health or an obstruction to the free use, in the customary manner, of any waters of the state. (IDAPA 58.01.02.003.73)

41. "Off-line settling basin" means a constructed retention basin that receives wastewater from cleaning of other aquaculture facility rearing/holding units or quiescent zones, or both, for the retention and treatment of the wastewater through settling of solids.
42. "Permittee" means the operator who has substantial control over the day-to-day operations of the facility; when a facility or activity is owned by one person but is operated by another person, it is the operator's duty to obtain a permit [40 CFR §122.21(b)].
43. "Pollutant" means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C.§2011 *et seq.)*), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water.
44. "Pond" means an earthen-bottomed rearing/holding unit for fish production.
45. "Production" means the amount of fish grown and fed in a given period of time for harvest, processing, or release.
46. "QA Plan" means quality assurance plan.
47. "QA/QC" means quality assurance/quality control.
48. "Regional Administrator" means the Regional Administrator of Region 10 of the EPA, or the authorized representative of the Regional Administrator.
49. "s.u." means Standard Units (a measure of pH).
50. "solids" means sand, silt, or other debris collected from facility intake or source waters, and accumulated waste material from aquaculture raceways and their quiescent zones, offline settling basins, full-flow settling basins, ponds, or other areas of the accumulation.
51. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
52. "TMDL" means Total Maximum Daily Load, which is the sum of the individual wasteload allocations for point sources and load allocations for nonpoint sources and natural background.
53. "TP" means Total Phosphorus.
54. "TSS" means Total Suspended Solids.
55. "Technology-based effluent limitation" means wastewater treatment requirements under Section 301(b) of the CWA that represent the minimum level of control that shall be imposed in a permit issued under Section 402 of the CWA. (IDAPA §58.01.02.003.117)
56. "U.S.C." means United States Code.
57. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include

noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

58. "WLA" means Wasteload Allocation, which is the portion of a receiving water's load capacity that is allocated to one of its existing or future point sources of pollution. (IDAPA §58.01.02.003.129)

59. "Waters of the United States (or waters of the U.S.)" means

    a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

    b) All interstate waters, including interstate wetlands;

    c) All other waters, such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands", sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

        (i) Which are or could be used by interstate or foreign travelers for recreational or other purposes;

        (ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

        (iii) Which are used or could be used for industrial purposes by industries in interstate commerce;

    d) All impoundments of waters otherwise defined as waters of the United States under this definition;

    e) Tributaries of waters identified in paragraphs (a) through (d) of this definition;

    f) The territorial sea; and

    g) "Wetlands" adjacent to water (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition. (40 CFR §122.2)

Appendix A

Flow Measurement Methods

Approved by

Idaho Department of Water Resources

Flow Measurement Methods
Approved by Idaho Department of Water Resources[1]

The source and means of diversion of water, whether surface or ground water, generally determines the measurement and reporting process. Surface water sources such as streams, springs and waste channels are normally diverted into open channels (ditches or canals), but closed conduits (pipes or culverts) are also used. Ground water is usually diverted into pipes (which may also discharge into open channels).

Measuring devices are required at or near the point of diversion form the public water source.

SURFACE WATER DIVERSIONS

I. Flow Measurement

The following discussion is applicable only to diversions from surface water sources. Measurement of a ground water diversion with an open channel measuring device must be pre-approved by the Department.

A. Standard Open Channel Measuring Devices

All open channel flow diversions should be measured using one of the following standard open channel flow measuring devices commonly used in Idaho:

- contracted rectangular weir
- suppressed rectangular weir
- cipolletti weir
- 90 degree V-notch weir
- ramped broad crested weir (or ramped flume)
- parshall flume
- trapezoidal flume
- submerged rectangular orifice
- constant head orifice

Construction and installation of these devices should follow published guidelines. References are available upon request.

B. Non-standard open channel devices: Rated Structures or Rated Sections

IDWR may authorize the use of non-standard devices and rated sections provided the device or section is rated or calibrated against a set of flow measurements using an acceptable open channel current meter or a standard portable measuring device. Further restrictions and requirements are available from the Department upon request.

C. Closed conduit measuring devices

Refer to the Ground Water measuring section for installation, accuracy, and calibration standards of closed conduit measuring devices.

II. Reporting

All surface water measuring devices, rated structures and rated sections should be read and readings recorded at least once per week, and more frequently if necessary. IDWR will accept the assumption of constant flow rates between readings if flow rates are continuous and reasonable constant. Forms will be provided for recording dates, stage (or water levels) and flow rates.

Users with diversions located within water districts may report their diversions individually to IDWR or provide for the water district water master to report their diversions in acceptable annual water distribution reports. Ground water diversions are not normally included in a water district, and must be reported individually.

---

[1] ***Excerpt From***: State of Idaho Department of Water Resources (IDWR). Minimum Acceptable Standards for Measurement and Reporting of Surface and Ground Water Diversions.

Appendix B

Effluent Calculations

Guidance on Calculating Effluent Values

1. Calculating "Net" Effluent Values

a. **Pollutant Concentrations** for TSS and Total Phosphorus are measured at both influent and effluent monitoring locations. The net concentration is the difference between the two measurements and can either be positive or negative since the pollutant load may either increase or decrease as the water passes through the facility. It is calculated as follows:

Effluent concentration (mg/l) -- influent concentration (mg/) =

Net concentration (mg/l)

2. Conversion from concentration to mass values:

The following calculations are conducted separately for **raceway discharges** and for **off-line settling basins** (if applicable). The two results are added together to yield the total loading discharged from the facility; see *step d,* below.

a. Pollutant levels are measured in terms of concentration, usually in milligrams/liter (mg/l). If they are reported in micrograms /liter (µg/l), divide by 1000 to get the result in mg/l.

$$\frac{1\ \mu g}{liter} \times \frac{1\ mg}{1000 \mu g} = 0.001\ mg/l$$

Therefore: **µg/l / 1000 = mg/l**

b. Flow is usually measured in cubic feet per second (cfs) or gallons per minute (gpm). If it is measured in gpm, divide by 448.8 to convert to cfs.

$$\frac{1\ gallon}{minute} \times \frac{1\ minute}{60\ seconds} \times \frac{1\ cu.\ ft.}{7.48\ gals} = 1/448.8\ cfs$$

Therefore: **gpm / 448.8 = cfs**

c. **Load** (in pounds/day) is calculated using the concentration and flow measurements for the day of pollutant sampling:

$$\frac{1\ mg}{l} \times \frac{28.3\ liters}{cu.\ ft} \times \frac{cu.\ ft.}{sec.} \times \frac{86400\ secs}{day} \times \frac{2.2\ lbs}{1{,}000{,}000\ mg} = lbs/day$$

Therefore: **mg/l × cfs × 5.4 = lbs/day**

d. **Total facility loading** (in pounds/day) is calculated by adding the loading from the raceways and the loading from the off-line settling basins.

Raceway loading (lbs/day) + OLSB loading (lbs/day) = Total facility loading (lbs/day)

3. DMR Reporting

a. Values greater than the MDL: the permittee must report the actual value.

b. Influent or effluent value less than the MDL: the permittee must report "less than {numeric MDL}" on the DMR, but use one-half the MDL when calculating the net value.

c. Both influent and effluent values less than the MDL: the permittee must report zero on the DMR, and use this for calculating monthly averages.

Appendix C

Quality Assurance Plan

and

Best Management Practices Plan

Certification

Idaho Aquaculture

Best Management Practices Plan (BMP Plan)

Certification

Facility Name:_____

NPDES Permit Number:_____

The BMP Plan is complete and is available upon request to EPA and IDEQ.

The BMP Plan is being implemented by trained employees.

The BMP Plan has been reviewed and endorsed by the facility manager.

The individuals responsible for implementation of the BMP Plan have been properly trained.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature:	**Title/Company:**
Print Name:	**Date:**

An existing discharger must submit this certification within 90 days of the effective date of this permit. For a new permittee, this certification must be submitted no later than the written Notice of Intent to be covered under this permit. The certification must be submitted to EPA and to the responsible IDEQ office (§I.C.1 of the permit).

Idaho Aquaculture

Quality Assurance Plan

(QA Plan)

Certification

Facility Name:_____

NPDES Permit Number:_____

The QA Plan is complete and is available upon request to EPA and IDEQ.

The QA Plan is being implemented by trained employees.

The QA Plan has been reviewed and endorsed by the facility manager.

The individuals responsible for implementation of the QA Plan have been properly trained.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature:	**Title/Company:**
Print Name:	**Date:**

An existing discharger must submit this certification within 90 days of the effective date of this permit. For a new permittee, this certification must be submitted no later than the written Notice of Intent to be covered under this permit. The certification must be submitted to EPA and to the responsible IDEQ office (§I.C.1 of the permit).

Appendix D

Drug and Chemical Use Report Contents

CHECKLIST FOR ORAL REPORT FOR INAD AND EXTRALABEL DRUG USE

(Provide an oral report to EPA: 206-553-1846; and IDEQ
within 7 days after initiating use of the drug)
(First row is an example.)

Reported to Permitting Authority?	Name of Drug (INAD & Extralabel) Used & Reason for Use	Method of Application	First Date of Drug Use	Date Oral Report Submitted to Permitting Authority	Initials
☑	Extralabel: Erythromycin Treat bacterial infections	Injection	09/09/04	09/10/04	MJ
☐					
☐					
☐					
☐					
☐					
☐					
☐					
☐					

WRITTEN REPORT FOR AGREEING TO PARTICIPATE IN AN INAD STUDY

(Submit a written report to EPA and IDEQ within 7 days of agreeing or signing up to participate in an INAD study)

Facility Name:_____NPDES Permit Number:_____

Name of person submitting this report:_____

Date of agreement to participate in INAD study: _____

Date this written report will be submitted:_____

The first row is an example.

Expected Dates of Use	Name of INAD Used	Disease or Condition Intended to Treat	Method of Application	Dosage
09/09/04	Oxytetracycline	For controlling columnaris in trout	☑ Medicated feed ☐ Injection ☐ Bath treatment ☐ Other: _____	
			☐ Medicated feed ☐ Injection ☐ Bath treatment ☐ Other: _____	
			☐ Medicated feed ☐ Injection ☐ Bath treatment ☐ Other: _____	
			☐ Medicated feed ☐ Injection ☐ Bath treatment ☐ Other: _____	

WRITTEN REPORT FOR INAD AND EXTRALABEL DRUG USE

(Submit a written report to EPA and IDEQ
within 30 days after initiating use of the drug)

Facility Name:_____ NPDES Permit Number:_____

Name of person submitting this report:_____

Date this written report will be submitted to the permitting authority:_____

For Extralabel Drug Use, include the **name of the prescribing veterinarian** and **date of the prescription** in a footnote.

The first row is an example.

Name of Drug & Reason for Use	Date and Time of Application (start date/time end date/time)	Duration	Method of Application	Total Amount of Active Ingredient Added	Total Amount of Medicated Feed Added*
Oxytetracycline For control of columnaris in walleye	09/09/04 10:00 AM 09/13/04 10:00 AM	5 consecutive days	☑ Medicated feed ☐ Injection ☐ Bath treatment ☐ Other: _____	1 g/lb as sole ration	50 lbs
			☐ Medicated feed ☐ Injection ☐ Bath treatment ☐ Other: _____		
			☐ Medicated feed ☐ Injection ☐ Bath treatment ☐ Other: _____		
			☐ Medicated feed ☐ Injection ☐ Bath treatment ☐ Other: _____		

* Applies only to drugs applied through medicated feed.

Chemical Log Sheet

Facility Name:_____ NPDES Permit Number:_____

Date	Raceway Treated	Chemical Name[1]	Active Ingredient	Amount Applied	Units	Duration of Treatment	Treatment Type[2]	Flow Treated (cfs)	Total Effluent Flow (cfs)	Effluent Concentration (ppb)	Initials

[1] Both a copy of the label with application requirements and the Material Safety Data Sheet (MSDS) must be kept in your records.
[2] Treatment type means, for example, static or flush bath, injection or feed.

Appendix E

Annual Report

Contents

*ANNUAL REPORT OF OPERATIONS FOR YEAR*_____

Idaho Aquaculture Permit

I. Facility Name:	**NPDES #**
Operator Name (*Permittee*):	**Phone:**
Address:	**Fax:**
	E-Mail:
Owner Name (*if different from operator*):	**Phone:**

II. Annual Production:	***Number of pounds of fish produced in the year*** _____ **pounds**
III. Food used:	***Number of pounds of food fed to the fish during the maximum month:***_____ **pounds**

IV. Noncompliance Summary:

Include description & dates of noncompliance, the reasons for such incident, and the steps taken to correct the problem. Attach additional pages, if necessary.

V. Best Management Practices (BMP) Plan

BMP Plan has been reviewed this year? *Yes* *No*
BMP Plan fulfills the requirements set forth in the permit: *Yes* *No*
Summarize changes in the BMP Plan since last annual report:

VI. Land application of solids and/or irrigation with wastewater

Attach Maps of Application Sites. **(Note: IDAPA 58.01.02.650 requires IDEQ approval for solids disposal on land.)**

Date	Location and Acreage of Application	Solids Applied in Pounds	Wastewater Applied in Gallons
	Yearly Total		

VII. Chemical Usage (including drugs and pesticides)

Date	Chemicals used, number of days used, and maximum concentration in effluent.
Yearly Total	

VIII. Inspections and Repairs for production and wastewater treatment systems

Date Inspected	Date Repaired	Description of system inspected and/or repaired

Signature & Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure the qualified personnel properly gather and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature:	*Title/Company:*
Print Name:	*Date:*

FACT SHEET

June 14, 2006

NPDES Permit Numbers:	**IDG-130000** **IDG-131000** **IDG-132000** **ID-002826-6**
Public Notice Start Date:	June 19, 2006
Public Notice Expiration Date:	August 3, 2006
Technical Contacts:	Carla Fromm, 208-378-5755 fromm.carla@epa.gov Sharon Wilson, 206-553-0325 wilson.sharon@epa.gov 1-800-424-4372 ext.8-5755 or 3-0325 (within Region 10)

The United States Environmental Protection Agency (EPA)
Region 10

Proposes to Issue Three General Wastewater Discharge Permits,

Two of them for

Aquaculture Facilities in Idaho,

One of them for

Fish Processors associated with Aquaculture Facilities in Idaho

and an individual permit for

Epicenter Aquaculture

C. Epicenter Aquaculture

Epicenter Aquaculture acquires source water from a canal which diverts water from a naturally hot water spring, the headwaters of Warm Springs Creek. Pollutants generated at the facility are the same as those described above for other rearing facilities, i.e. solids, nutrients, drug and other chemical residuals. The majority of the facility's effluent is discharged back into the canal (6 cfs), which joins another canal after water flows through a hydroelectric generator. All 13--16 cfs of canal water is used for irrigation in the Warm Spring Creek Valley from May through September or October. During those months, little, if any, water is left to flow into the Salmon River, approximately 15 miles downstream of Epicenter Aquaculture. During the rest of the year, all of the canal water, including the Epicenter discharge, reaches the Salmon River. The remaining effluent from the facility (1 cfs) flows into Warm Springs Creek to deliver a water right downstream. Warm Springs Creek has no defined streambed or channel within a mile of the Salmon River; therefore, it is unlikely that any facility discharge to Warm Springs Creek enters the Salmon River.

V. Permit History

The first NPDES permit issued to aquaculture facilities in Idaho became effective in May 1975. Subsequent permits were issued to the facilities in October 1984, October 1990, and September 1999.

A. Effluent limitations of the 1999 General Permit

The general permit for aquaculture facilities issued in 1999 contained technology-based limitations on total phosphorus, total suspended solids, and settleable solids; and water quality-based limitations on total phosphorus based on the WLAs assigned to the largest facilities discharging in the Upper Snake Rock watershed. Derivation of these limits was included in the fact sheet for that permit. The permit required that solids, sludge, filter backwash, and other pollutants removed in the treatment of wastewaters be disposed of in a manner so as to prevent any pollutant from such materials from entering the waters of the United States. The limits, disposal requirements, and discharge prohibitions collectively reduced discharges of oxygen-demanding materials, residual feed, and floating, suspended, and submerged matter, including dead fish. The water-quality based total phosphorus limits had a compliance deadline of September 10, 2004.

B. Monitoring history

Monitoring requirements of past NPDES permits issued to aquaculture facilities and fish processors have included effluent compliance monitoring and effluent characterization monitoring. Effluent compliance monitoring required sampling the discharge and analyzing for pollutant parameters which were limited in the permit: TSS, Total Phosphorus (TP), and settleable solids. Effluent characterization monitoring in the 1999 permit included analysis for

Therefore, EPA determined in its best professional judgment that the control technology in place at the facilities was providing a high level of removal for this pollutant and that a separate settleable solids limit was no longer necessary. The proposed effluent limits in the draft Cold Water Permit are provided in Tables 6 and 7. For comparison, the effluent limits in the 1999 permit are included also.

Three warm-water facilities (FBI Catfish Farm, First Ascent, and Canyon Springs) discharge at temperatures averaging 26 degrees Celsius into the Upper Snake Rock watershed in the vicinity of known populations of endangered or threatened snails, which require water temperatures no greater than 18 degrees Celsius to survive. Therefore, EPA is considering setting a temperature limit for these facilities. Alternatively, we may wait until IDEQ develops its temperature TMDL (by 2008), require the implementation of best management practices, require the conduct of temperature and/or snail studies, and/or require the reporting of technology alternatives for cooling the effluent. Any selected option would need the concurrence of the US Fish and Wildlife Service. EPA is inviting public comment and input of information including available technology to reduce the temperature of warm water discharges.

Two warm water facilities discharge to Jacks Creek in the Bruneau River watershed. These facilities utilize water from warm water wells drilled for supplying irrigation for farmers. Because the temperature of the water in the stream is elevated already and because the water used in the facility is cooled by evaporation and conductivity in the process, the facility is actually a heat sink and discharges cooler water than would otherwise be discharged to the stream for irrigation. Therefore, EPA is not proposing to limit temperature from these facilities. However, we are inviting comment on this issue and submittal of information regarding the technology available to reduce the temperature of the discharges.

For Epicenter Aquaculture, the lone warm-water facility with an individual permit, we determined that the previously applied technology-based effluent limits TSS and TP for warm-water raceway and full-flow settling basins were fully protective of the water quality in the receiving stream, Warm Springs Hydro Canal; therefore, those limits were proposed for this permit; they are provided in Table 8.

The limits in Table 9 are those proposed in the WLA permit for most of the facilities that are subject to WLAs in the Upper Snake Rock watershed. As explained in Appendix B, EPA determined that technology-based limits were more stringent than the WLAs for four of the aquaculture facilities and three of the fish processors in this watershed; therefore, those lower limits are footnoted in Table 8 and in the respective permits.

The proposed limits for those facilities with seasonally variable limits are listed in Table 10. For two of the facilities in this table, FBI Catfish Farm and Smith Farm Ponds, the State has informed EPA that the WLAs in the approved TMDL had some errors. We have used the

2. Limitations on **Offline Settling Basin Discharges** from all permittees; see Table 7.

Table 7
Limitations on Offline Settling Basin Discharges
from all permittees

Parameter	Average Monthly		Maximum Daily	
	1999	**2005**	**1999**	**2005**
Settleable Solids	0.7 ml/L (0.3 ml/L)[2]	None	1.0 ml/L (0.5 ml/L)[2] & ≥95% removal	None
Total Suspended Solids (TSS)	67 mg/l	67 mg/l	100 mg/l & ≥90% removal	100 mg/l & ≥90% removal

[2] Limit on settleable solids for facilities discharging to Billingsley Creek.

3. Effluent Limitations for **Epicenter Aquaculture**; see Table 8.

Table 8
Effluent Limitations for Epicenter Aquaculture

Parameter	Limitations (mg/l)	
	Average Monthly	**Maximum Daily[3]**
Net TSS	15	25
Net Total Phosphorus	0.20	0.32

[3] Reporting is required within 24 hours of violating a maximum daily limit; .see Part V.G.

4. Effluent Limitations for facilities in the **Upper Snake Rock Watershed**.

All of these limitations are based on 2005 wasteload allocations, which were reviewed in a public process and determined to comply with Idaho Water Quality Standards; see Table 9 and Appendix B.

this segment will be studied in this process. An upper limit of 18 degrees Celsius is necessary to protect the habitat for listed snail species, which are known to be present in the vicinity of these three facilities. Therefore, EPA is considering several options regarding setting a temperature limit, possibly at 18 degrees Celsius, and is inviting public input including information regarding available technology to reduce the temperature of warm water discharges to the requisite 18 degrees Celsius to protect endangered snails. Any chosen options would require the concurrence of U.S. Fish and Wildlife Service. The options presently under consideration are:

(a) Set a limit at 18 degrees Celsius;

(b) Wait for IDEQ to develop a temperature TMDL which assigns load reductions to all significant sources;

(c) Require that the facilities:

(i) conduct studies of the presence of snails;

(ii) monitor ambient stream temperatures;

(iii) report on available strategies for reducing effluent temperature; and/or

(iv) implement best management practices to reduce effluent temperatures.

Two warm water facilities discharge to Jacks Creek in the Bruneau watershed. These facilities utilize water from warm water wells drilled for supplying irrigation water to farmers. Because the temperature of the water in the stream is elevated already and because the water used in the facility is cooled by evaporation and conductivity in the process, the facility is actually a heat sink and discharges cooler water than would otherwise be discharged from the wells to the stream for irrigation. Therefore, EPA is not proposing to limit temperature from these facilities. However, we are inviting comment on this issue and submittal of information regarding the technology available to reduce the temperature of the discharges.

The source water for Epicenter Aquaculture is Warm Springs Hydro-Canal, a private canal, which flows from a naturally warm water spring. The facility discharges back to the Warm Springs Hydro-Canal, which discharges to a public canal seven miles downstream; that canal discharges to the Salmon River approximately seven miles further downstream. Because the temperature of the water in the canal is naturally elevated because of its warm source water and because the water used in the facility (from the same source water) is actually cooled by evaporation and conductivity in the facility, the facility is actually a heat sink and discharges water cooler than that same water would be if it had not been withdrawn from the canal for use in the aquaculture facility. Therefore, the proposed individual permit for this facility will not have a limit for temperature. However, we are inviting comment on this issue and submittal of information

regarding the technology available to reduce the temperature of the discharges.

f. Ammonia

Idaho's State Water Quality Standard provides acute and chronic criteria for total ammonia that are dependent on temperature and pH levels. (IDAPA §58.01.02.250.02.c.iii). Ammonia data collected from the discharges from raceways at aquaculture facilities indicate that the discharges are not exceeding the State standard that is applicable in the receiving water. But data collected from offline settling basin discharges from some aquaculture facilities, revealed that ammonia concentrations in these discharges may exceed the ambient State standards at some times. In such cases, EPA analyzes the reasonable potential of the discharge to cause a violation of the State water quality standard. Unfortunately, we do not have temperature and pH data which are necessary to conduct this analysis. Therefore, in these draft permits, EPA is proposing to require the monitoring of ammonia, pH and temperature of the effluents and of the receiving water above offline settling basin discharges. These data will allow the calculation in the next permit cycle of the reasonable potential to exceed State standards for total ammonia at the temperatures and pH of the facilities' discharges and of the receiving streams. We are also requesting comment on the issue of requiring streamflow monitoring or data to support the application of mixing zones for such limits. EPA believes the intermittent nature and small volume of OLSB discharges relative to raceway discharges minimizes adverse effects that occasional spikes in ammonia would have on receiving water.

2. WLA Parameters in WLA Permit

a. Applicable TMDLs

The regulations at 40 CFR §122.44(d)(1)(vii)(B) require that effluent limits be consistent with the assumptions and requirements of any available wasteload allocation (WLA) for a discharge to a water body subject to an approved TMDL. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources that may be discharged to a water body without causing the water body to exceed the state water quality criterion for that pollutant. The State of Idaho is developing, has issued, and, if appropriate, EPA has approved final TMDLs, all of which include WLAs for aquaculture facilities and/or fish processors, for the water bodies listed in Table B-5. The TMDLs themselves can be accessed at http://www.deq.state.id.us/water/data_reports/surface_water/tmdls/sba_tmdl_master_list.cfm.

3. Epicenter Aquaculture individual permit

a. TSS – EPA determined above that the technology-based limits of 15 mg/l AML and 25 mg/l MDL were protective of the water quality standards in the receiving waters and therefore did not develop water quality-based effluent limits. Therefore, EPA proposes these limits for Epicenter Aquaculture. See Table B-8.

b. Total Phosphorus – EPA determined above that the technology-based limits of 0.2 mg/l AML and 0.32 mg/l MDL were protective of the water quality standards in the receiving waters. Therefore, EPA proposes these limits for Epicenter Aquaculture. See Table B-8.

Table B-8
Epicenter Aquaculture
Effluent Limitations

Parameter	Limitations (mg/l)	
	Average Monthly	Maximum Daily
Net TSS	15	25
Net Total Phosphorus	0.20	0.32

4. WLA Permit

The selected limits for the permittees under the WLA permit are listed in the WLA Permit (Tables 2—10) and in the Fact Sheet (Tables 9—17). To conserve paper, they are not repeated here.

a. Upper Snake Rock Watershed

(1) Total Suspended Solids Limits

The IDEQ waste load allocations for TSS for the Upper Snake Rock watershed facilities were based on the technology-based average monthly limit in the previous permit for cold water facilities of 5 mg/l TSS. This concentration limit was converted to a WLA of TSS in units of tons/year for each facility using its long term average facility flows. EPA converted the IDEQ's tons/year WLA to pounds per day for each facility.

Extension for Aquaculture Facilities and Associated Fish Processors in Idaho.

United States Environmental Protection Agency (EPA)
Region 10
1200 Sixth Avenue, OWW-130
Seattle, Washington 98101

Notice of
EXTENSION of PUBLIC COMMENT PERIOD

For Three
National Pollutant Discharge Elimination System (NPDES)
General Permits
and One Individual Permit
to Discharge to
Waters of the United States
For **Aquaculture Facilities And Associated Fish Processors**
In The State Of Idaho

Technical Contacts:
Carla Fromm
(208) 378-5755,
fromm.carla@epa.gov

Sharon Wilson
(206) 553-0325
wilson.sharon@epa.gov

Public Notice Issuance Date: June 19, 2006
Original Public Notice Expiration Date: August 3, 2006
Extended Public Notice Expiration Date: August 18, 2006

1. Summary

In response to requests from the regulated community, EPA is extending to August 18, 2006, the public comment period on its proposal to reissue three general permits (GPs) and one individual permit for aquaculture facilities and associated fish processors in the State of Idaho.

2. Tentative Determination

The Region 10 Office of EPA has tentatively determined to issue the permits.

3. Public Comments

Persons wishing to comment on the tentative determinations contained in the proposed permits may do so in writing, by August 18, 2006.
Comments must be received by August 18, 2006, to be considered in the formulation of final determinations regarding the permits. All comments should include the name, address, and telephone number of the commenter, a concise statement of any comment, and the relevant facts upon which it is based. All written comments and requests should be submitted to EPA at the above address to the attention of the Director, Office of Water and Watersheds, 1200 Sixth Avenue, OWW-130, Seattle, WA 98101. Comments may also be submitted via email to wilson.sharon@epa.gov.

4. Document Availability

Copies of the proposed permits and fact sheet may be found on the internet at the following website: http://yosemite.epa.gov/r10/WATER.NSF/NPDES+Permits/General+NPDES+Permits#Aquaculture . The proposed permits and Fact Sheet are also on file and may be inspected at EPA Region 10 offices at 1200 Sixth Avenue, Seattle, WA 98101 any time between 8:30 a.m. and 4:00 p.m., Monday through Friday. Copies and other information may be requested by writing to the EPA at the above address to the attention of the NPDES Permits Unit, by calling Audrey Washington at 1-800-424-4372 (within Alaska, Idaho, Oregon & Washington) or (206) 553-0523, or by e-mail at washington.audrey@epa.gov.

For other physical locations in Idaho and Seattle where the documents may be viewed, see the public notice in this publication on June 19, 2006.
To ensure effective communication with everyone, additional services can be made available to persons with disabilities by contacting one of the above EPA representatives. For those with impaired hearing or speech, please contact EPA's telecommunication device for the deaf (TDD) at (206) 553-1598.

See the previous public notice for more details.

Unit: NPDES Permits
Point of contact: Carla Fromm
Email: fromm.carla@epa.gov
Phone Number: (206) 553-5755
Last Updated:

Tilapia are fed commercially available pelleted fish food which costs approximately $.23 per pound. They can be fed by hand or with a sprinkler mechanism, and re generally fed twice per day. Tilapia are generally quite hardy and readily adapt to new environments. Death loss of 10 percent is common until the fingerlings weigh about 1.0 ounce. Death loss of 0.5 percent from 1.0 ounce to selling weight is common.

Special Considerations

otential disadvantages to producing tilapia in North Dakota include the need for warm water and the lack of nearby production experience. The need for warm water suggests that combining a tilapia fish farm and an industry with warm water as a waste product could be beneficial.

ack of producer experience will be less of a problem as interest in aquaculture increases. Also, because tilapia are extremely hardy they can withstand a relatively greater amount of disease and temperature variability than catfish or trout.

ere are key factors for starting a successful tilapia farming business:

1. A viable market
2. Appropriate water quality and availability
3. Financial backing
4. Consistent product inspection
5. Disease control and availability of therapeutics
6. Appropriate stock quality
7. Appropriate feed quality and price

Economic Feasibility

oducing tropical tilapia in North Dakota requires an indoor installation where water and air temperature can be controlled, and this requires a relatively larger pital investment than producing the fish outdoors in a warmer climate. This means North Dakota tilapia producers must maintain a continuous level of high output to justify the high capital requirements. The size of tilapia farms in North Dakota could vary dramatically, depending to a large extent on market demand. The economic feasibility analysis for tilapia production presented here is for a structure producing 80,000 pounds of tilapia per year (live weight) with a 2 percent owth rate.

---

ble 1. Estimated Tilapia Enterprise Budget For 80,000-Pound Facility In North Dakota, 1992

		Budgets	
		Economic	Cash
turns			
ntity sold			
lb. live weight)	80,048	80,048	
rice per lb.(a)	$1.12	$1.12	
ross revenue	$89,654	$89,654	
riable expenses			
gerlings(b)		$5,413	$5,413
eed(c)		27,617	27,617
tilities(d)	15,515	15,515	
rating interest(e)	4,733	4,733	
al variable expenses	53,277	53,277	
ed Expenses			
quipment	$4,450	$4,450	
uilding and lagoon	2,550	2,550	
reciation(f)		25,438	
al fixed expenses	32,438	7,000	
al Expenses		$85,715	$60,277
urn to labor, anagement & equity	$3,939	------	
ash flow bt service-family living)	-------	$29,377	

Actual price would need to be contracted prior to building facility and beginning construction.
b) 54,126 fingerlings purchased at $.10 per fingerling.
c) 120,072 pounds of pelleted fish food purchased (or 1.5 pounds feed per pound of gain) at $.23 per pound of food.
Calculated as percent of plant cost.
Operating interest charged on fingerlings, feed, utilities, and insurance at 9.75 percent on borrowed capital and 4 percent for equity capital for 12 months

f) Equipment value ($111,250) depreciated over five years,
Building and lagoon ($63,750) depreciated over 20 years.

The economic budget is generated by charging market rates for all resources needed for production. It helps answer the question "Is this enterprise profitable?" The bottom line repre-sents a return to labor and management.

The cash flow budget is an estimate of the out-of-pocket cash needed to run the enterprise, including not only direct costs but indirect cash costs such as principle and interest pay-ments, insurance and taxes. It helps answer the question "Can I make meet my cash obligations if I go into this enter-prise?" Total cash expenses are subtracted from total cash receipts to calculate the net cash which is available for family living and other needs.

Marketing

While consumer trends indicate that per capita fish consumption has been increasing and will probably continue to do so, efforts are focused on market development for tilapia since it is a relatively new fish to American consumers. Attempting to market tilapia through local retail outlets may prove to be unsuccessful unless some attempt is made to educate consumers about tilapia. The processed fish market may be easier to enter, but the selling price will be lower. Potential producers will probably find it necessary to obtain contracts from market outlets which specify the amount and price of fish to be sold before credit agencies will be willing to provide financing.

---

acilities Requirements

Facilities required for the production of tilapia depend, to a large extent, on the size of the market. The smallest size which could be considered economically asible for commercial production would be 63,000 pounds of fish (live weight) per year. Tilapia farms have existed which produced 2 million pounds (live eight) per year. Facility requirements for an indoor fish farm producing 80,000 pounds per year (live weight) are presented here. A facility of this size is big enough to be profitable, yet allows for future expansion should the market potential exist. It would require 4-to-5 hours per day of labor. An insulated pole shed measuring 75 feet by 90 feet in length with 14 foot sidewalls could efficiently house the facility. The building would have nine tanks 46 inches deep with ameters from 9 to 30 feet. The total cost for constructing and equipping a facility of this type would be $175,000.

The 80,000-pound facility would require about 46,000 gallons of water for the holding tanks. An additional 4,000 gallons would be needed for the biotreatment unit, sump tank, and pipe and waste treatment. With a projected water flow rate of 10 gallons per minute, a total of 82 hours would be required to fill the system. A nstant supply of make up water running at 3 to 5 gallons per minute would be required. Make-up water is necessary to replace water loss because of evaporation d waste disposal.

osts associated with building and operating the facility are shown below. Based on a projected sale price of $1.12 per pound live weight and a 2 percent growth e, each year the enclosed tilapia production facility would contribute $4,571 to owner labor, management and equity capital.

References For Further Information

an, Jack. "The Fish Story of the Decade," *U.S. News and World Report* 109 (1990): 52-56.

Keyes, Daniel R. "Rural Natural Resources Development Series, Technical Paper 2, A Generalized Guide to Small Aquaculture Enterprises." Prepared as part of a idwest Research Institute project for the U.S. Economic Development Administration, 1989.

Mathsen, Don. "Indoor Aquaculture for the State of North Dakota," Final Report, Prime Contractor Center for Innovation and Business Development at University of North Dakota, Grand Forks. Sponsored by North Dakota Ag-Products Utilization Commission and Basin Electric Cooperative. Contract No. 160484, Feb. 1992.

Perber, R.M. "Aquaculture's Growing Pains," *Food Processing: The Magazine of the Food Industry* 53 (Aug. 1992): 49-54.

ited States Department of Agriculture. *Aquaculture Situation and Outlook Report.* Washington, D.C.: United States Department of Agriculture and Economic porting Service, March 1991.

Funds to support the research for and production of the Alternative Agriculture Series were made available to the Value-Added Agriculture project by "Growing orth Dakota" legislation through Technology Transfer, Inc.

. .lternative Agriculture Series, **Number 2**
January 1993

o to Alternative Agriculture Publication Index

NDSU Extension Service, North Dakota State University of Agriculture and Applied Science, and U.S. Department of Agriculture cooperating. Sharon D. Anderson, Director, Fargo, North Dakota. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. We offer our programs and facilities to l persons regardless of race, color, national origin, religion, sex, disability, age, Vietnam era veterans status, or sexual orientation; and are an equal opportunity nployer.

This publication will be made available in alternative format for people with disabilities upon request 701/231-7881.

---

orth Dakota State University
DSU Extension Service

SRAC Publication No. 461

Southern
Regional
Aquaculture
Center

November 1991

Water Quantity and Quality Requirements for Channel Catfish Hatcheries

Craig S. Tucker*

Simple and inexpensive production of seed stock is a key to successful aquaculture. Indeed, the rapid growth of commercial channel catfish culture is owed in no small part to the ease with which large numbers of channel catfish fry can be produced using relatively unsophisticated hatchery technology.

Although the production of channel catfish fry is technically a simple process, success in some hatcheries is poor year after year. Problems may include poor egg matchability, low fry survival, poor fry growth, or a high incidence of infectious diseases of eggs or fry. Sometimes these problems are related to poor management practices, but quite often they are the result of poor water quality within the hatchery.

With appropriate treatment, any water can be made suitable for use in a catfish hatchery. Cost of treatment is often not economically justifiable. It is usually good practice to use a source that provides, as nearly as possible, water of correct quality for optimum matchability of eggs and survival and growth of fry. Good water quality is maintained in the hatchery by providing adequate water flow and aeration to hatching and rearing troughs. Frequent removal of uneaten feed and other accumulated organic debris will also aid in maintaining proper rearing conditions within troughs or tanks.

Water sources

In many regions, water from several sources may be available for use in the hatchery. Sources may include ground waters from aquifers lying at different depths and various surface water supplies. Before the hatchery is built, the manager should become familiar with the quality and availability of these potential hatchery water supplies. The best water supply may then be selected by comparing desired water quality and flow requirements with the chemical characteristics, temperature, and availability of various water sources.

The success of other hatcheries using water from a common source is the best indicator of the suitability of a particular water. Obviously, if poor water quality at other hatcheries is causing low survival of eggs or fry, or if costly treatment is required to make the water suitable for use, then it may be wise to seek an alternative water source. If there are no other hatcheries in the area and the quality of the water supply is questionable, a pilot-scale hatchery can be constructed to ensure that the water is suitable for use.

Ground water

Ground water generally is considered to be the best source of water for catfish hatcheries. Ground waters are usually free of suspended matter, pollutants, and fish disease organisms. Temperature and chemical composition are relatively constant, and, in regions with abundant ground water, the supply is dependable. The chemical composition and well pumping rates for some ground water supplies may be obtained from well logs for existing nearby wells. Alternatively, a test well can be drilled to assess the source. The quality of most ground waters is relatively constant over time, so a single chemical analysis will suffice to characterize water quality. Nevertheless, it is good practice to have the supply reanalyzed every year or two.

Although ground waters are preferred for hatcheries, some waters may have to be treated to make them suitable for use. Depending upon the water, treatments may include:

* Delta Research and Extension Center, Mississippi State University

- aeration to increase dissolved oxygen concentrations;
- degassing to reduce total gas pressure and remove carbon dioxide and hydrogen sulfide;
- temperature regulation using water heaters or mixing of waters of different temperatures;
- sedimentation and filtration to remove iron; and
- addition of calcium to waters of low hardness.

Surface waters

Surface water supplies include streams and rivers, ponds, lakes, and reservoirs. Unpolluted surface water offers several advantages over ground water as a hatchery water supply. For example, dissolved oxygen concentrations tend to be near saturation; dissolved carbon dioxide and hydrogen sulfide concentrations are usually low; total gas supersaturation is seldom a problem; and iron concentrations are usually very low. Nevertheless, all surface water supplies suffer the disadvantages of variable quality and availability with time and exposure to sources of pollution and turbidity. For these reasons, carefully evaluate any surface water before use as a hatchery water supply.

Because quality and availability vary over time, historical record is necessary to predict whether the water will be suitable. Such records are not available for most waters, however, and changes in water temperature, chemical composition, and water availability caused by unusual weather events cannot be predicted by records. The best advice is to use common sense and avoid those waters that may become unsuitable for use during the time the hatchery is in operation.

Another major constraint to using surface water for hatcheries is the potential for contamination by fish disease organisms or water-borne predators. Most surface waters have a resident fish community. The fish in the water supply may serve as a reservoir for fish disease organisms that could enter the hatchery and cause major losses. Natural predators of catfish fry, such as wild fish, insects, and other invertebrates, can also enter a hatchery and cause losses of fry.

Water quantity requirements

The success of a hatchery will suffer if insufficient water is available, even if that water is of optimum initial quality. Low water flow rates through hatching and rearing troughs allow waste products to accumulate which may quickly cause deterioration of water quality.

The typical trough (Figure 1) used for egg hatching and fry rearing holds roughly 100 gallons of water and is about 8 feet long, 2 feet wide and 10 inches deep. Troughs this size can hold 10 spawns at a time without crowding. Although the number of eggs per spawn varies with the size of the female brood fish, the ten spawns will contain (as a rough average) a total of 200,000 eggs. After the fry begin feeding, hold only about 100,000 fry in a trough of these dimensions. Thus, in a traditionally managed hatchery, two fry rearing troughs are available for each egg hatching trough.

Experience has indicated that minimum water turnover time (defined here as trough volume in gallons divided by water flow in gallons per minute) in hatching and rearing troughs should be about 40 minutes. Thus for a single 100 gallon trough, water flow should be a minimum of 2.5 gallons per minute. Larger troughs require proportionately higher flow rates. More water flow is also needed when egg or fry densities are higher.

Over a 10-to 12-week spawning season, each set of three 100-gallon troughs (one for eggs, two for fry) could be expected to produce roughly 1 to 1.5 million fry and would require a minimum flow of 7.5 gallons per minute (three troughs times 2.5 gallons/minute per trough). A hatchery capable of producing about 10 million fry per spawning season will typically contain 21 to 30 troughs and require a minimum water flow to the hatchery of 50 to 75 gallons per minute.

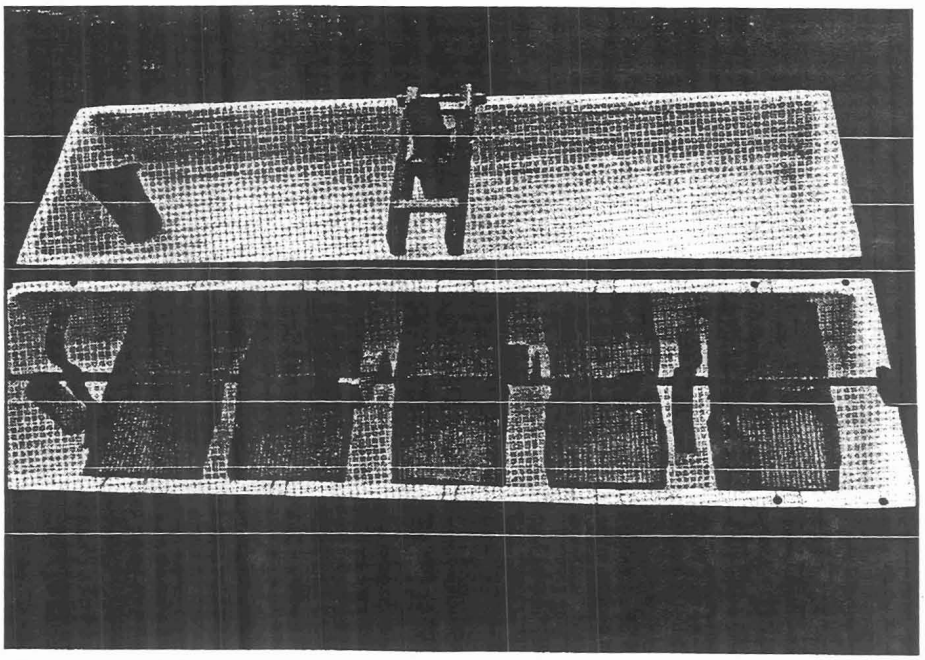


Figure 1. Traditional equipment used in a channel catfish hatchery: a fry rearing trough (top) with a 1/20-horsepower electric agitator and an egg hatching trough (bottom) with egg baskets and paddles.

The calculations above represent minimum flows. It is good practice to use at least twice those flow rates (turnover times of 20 minutes) to ensure against deterioration of water quality within hatcheries. Additional water flow is particularly important during the peak of the spawning season when the number of spawns arriving at the hatchery and the number of fry being reared temporarily exceeds the planned hatchery capacity. Thus, as a rough guide, a hatchery expected to produce 10 million fry per season should be supplied with roughly 100 to 150 gallons of water per minute.

Water quality requirements

Some of the more important water quality requirements for hatchery water supplies are discussed in the following sections. Aside from these specific requirements the water should also be:

- free of pesticides, solvents, petroleum products, and other pollutants;
- free of fish disease organisms;
- of relatively constant quality and availability.

Temperature

The optimum temperature range for development of eggs and rearing of fry is between 78 and 82°F (26 to 28°C). If the temperature is too low, hatching and development are prolonged, and fungi, which thrive in cool waters, often invade the egg mass. At higher water temperatures, embryos develop too fast and there may be a high incidence of malformed or nonviable fry. Also, bacterial diseases of eggs or fry and channel catfish virus disease of fry are more common if the water temperature is greater than 82°F (28°C).

Considerable energy is required to heat or cool water, and it is usually too costly to attempt major changes in water temperature. Therefore, the temperature of the water supply should be near 80°F before it enters the hatchery.

Ground water from deep wells (500 to 1,000 feet deep) is warmed by the internal heat of the earth and may be suitable for use in channel catfish hatcheries without temperature modification. Water from shallow wells (less than 300 feet) and some surface waters are too cool to use directly. Cool ground waters can be impounded in a small reservoir pond where solar heating will raise the temperature to some extent.

Nevertheless, water temperatures in the reservoir pond and in most other surface waters will vary with local weather conditions and still may be too cool for use early in the spawning season. An in-line water heater can be used to ensure a minimum temperature in the inlet water. The opposite condition may be encountered late in the spawning season when surface waters become too warm for use in hatcheries. It is very expensive to cool large volumes of water using refrigeration or chiller units, The best method of reducing water temperature is to mix the water that is too warm with cool water (such as water from a shallow well) to achieve the correct temperature.

Dissolved oxygen

Adequate dissolved oxygen is critical in hatcheries because eggs and fry have high metabolic rates and thus a high requirement for oxygen. Dissolved oxygen concentrations should not fall below 4-5 ppm at any time within the hatchery. Proper management of dissolved oxygen involves two distinct considerations: (1) ensuring that the water is oxygenated before use and (2) providing adequate aeration in hatching and rearing units to maintain optimal levels of dissolved oxygen throughout the hatchery.

Waters deficient in dissolved oxygen should be aerated before use. Pre-aeration not only ensures adequate initial levels of dissolved oxygen, but also may benefit some waters by partially degassing waters supersaturated with total dissolved gases and by removing some carbon dioxide and hydrogen sulfide. The two most common systems for pre-aerating water supplies for catfish hatcheries are packed column aerators (Figure 2) and aeration of water in an aeration tank.

Properly designed packed columns are highly effective aerators and relatively inexpensive to operate. They offer an added advantage of being good degassing devices for waters supersaturated with total dissolved gases. Packed columns are filled with a high surface area plastic packing. Influent water is evenly distributed at the top of the column and flows down over the packing in a thin film where gas exchange with the atmosphere occurs. Various plastic materials have been used as packing media and materials specifically designed for use in packed columns are commonly available from aquaculture supply companies.

Specific design criteria for packed columns are based upon water flow, water temperature, dissolved gas concentrations in the influent water, and desired dissolved gas concentrations in the effluent. These considerations are discussed in detail in appropriate references listed at the end of this report. As a rough guide, a packed column 4 to 6 feet high and about 30 inches in diameter will be sufficient to pre-aerate water for a catfish hatchery supplied with 100 gallons per minute of anoxic, 80°F groundwater.

As an alternative to packed columns, influent water maybe pumped into a metal or fiberglass tank and oxygenated with surface aerators or underwater diffusers. In such a system considerable initial aeration can be accomplished by running the influent water onto a splashboard or through an expanded metal grate to break the flow into small drops. The aeration tank should be large enough to provide adequate water residence time for aeration, but the appropriate tank volume will

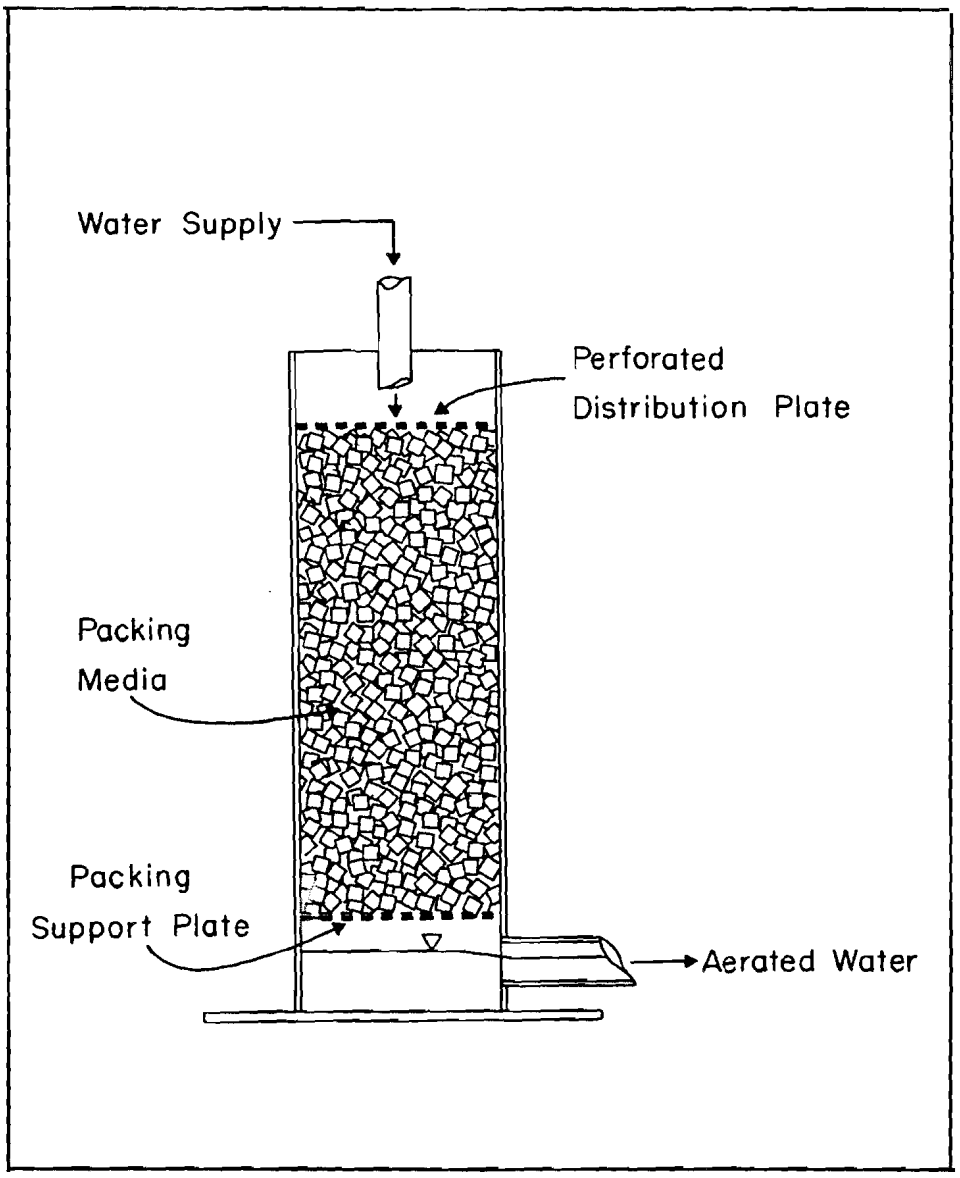


Figure 2. Cross section of a simple packed-column aerator.

depend upon the type and size of aerator used. Some experimentation may be required to find the best combination of tank volume and aeration device; the goal is generally to achieve an effluent dissolved oxygen concentration exceeding about 5 ppm.

As a starting point, pre-aeration tanks used in many existing catfish hatcheries provide a turnover time of 10 to 15 minutes (a capacity of 1,000 to 1,500 gallons for a water flow of 100 gallons per minute). Water is aerated with one or two 1/3-horsepower surface agitators (Figure 3).

Some type of aeration device must be provided to each trough within the hatchery to replenish dissolved oxygen lost as eggs or fry respire. Again, some trial and error may be necessary to find the right size and type of aerator. Common practice is to provide one 1/20 horsepower surface agitator per 100-gallon fry rearing trough. The agitators should be covered with small-mesh screening to prevent injury to fry.

Water circulation, in addition to adequate dissolved oxygen, is important in egg hatching troughs because oxygenated water must flow around and through the egg mass to ensure that all eggs receive sufficient dissolved oxygen. A common sign of inadequate water circulation in hatching troughs is the presence of dead eggs in the center of the egg mass. Those areas may serve as foci for fungal or bacterial infection. Slowly rotating paddles in egg hatching troughs serve both to aerate and circulate the water through the egg mass. Vigorous aeration with diffusers (air stones) may also be used to aerate and circulate water in hatching troughs. Air flows and the size and placement of diffusers must be determined through experience.

Carbon dioxide

High levels of dissolved carbon dioxide interfere with respiration by eggs and fry. Ideally, water supplies for catfish hatcheries should not contain measurable levels of dissolved carbon dioxide, but concentrations up to at least 10 ppm seem to be well tolerated, provided that dissolved oxygen concentrations are adequate. Some groundwaters may contain in excess of 20 ppm dissolved carbon dioxide and should be vigorously aerated to drive off some of the gas.

Total gas pressure

Total gas pressure is a measure of the "concentration" of all gases dissolved in water. It is expressed in pressure units such as millimeters of mercury (mm Hg). When total gas pressure in water exceeds local barometric pressure, water is supersaturated and gas will tend to leave the water by diffusion or by forming bubbles. Gas bubble trauma (also called gas bubble disease) may occur in fish living in gas-supersaturated water when gases in the blood or tissues come out of solution and form bubbles. The bubbles can block blood flow or damage tissues.

Instruments called "saturometers" are used to measure total gas pressures. Values are usually expressed as delta-P, which is the total gas pressure in water compared to local barometric pres-

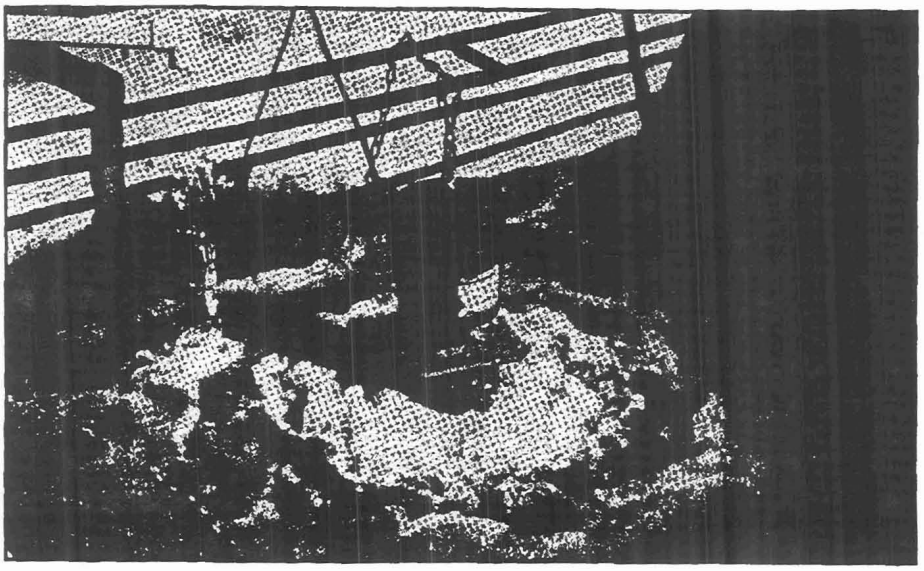


Figure 3. A 1/3-horsepower surface agitator used to oxygenate water in a pre-aeration tank.

sure. Positive delta P values mean the water is supersaturated. Saturometers are not commonly available to catfish hatchery managers, but supersaturated conditions can sometimes be diagnosed by the formation of bubbles on the surface of tanks or the milky appearance of water as gases come out of solution.

Channel catfish eggs are fairly resistant to high delta P-values because the naturally high pressure within the eggs helps prevent bubble formation. Eggs appear to withstand delta P-values at least as high as 100 mm Hg with no adverse effects. At high delta P-values, bubbles may form on and in the egg mass causing it to float high in the egg hatching basket. The top of the egg mass may be above water and will tend to dry out. Dislodging the bubbles by shaking and rotating the mass will temporarily alleviate the problem, although decreasing the delta P of the water is the best solution. Quite often, however, the first indication of supersaturated conditions is death of fry.

Clinical signs of gas bubble trauma in catfish fry include loss of equilibrium, abnormal swimming and gas bubbles in the yolk sac, behind the eyes, or on the skin. The bubbles prevent normal swimming and feeding and fry may become trapped at the surface. In severe cases, newly hatched fry rapidly die as blood flow is restricted or the yolk sac ruptures. Gas bubble trauma may occur in fry when delta P-values exceed about 70 to 80 mm Hg. To be safe, delta P-values should not exceed about 40 mm Hg in channel catfish hatcheries.

Gas supersaturation can be caused by a variety of natural and man-made conditions. Many groundwaters and some surface waters are naturally supersaturated. Surface water gas supersaturation is common below dams where air is entrained in the spillway overflow or when water is heated in electrical generating facilities. Gas supersaturation can also be caused within the hatchery water supply system.

The most common cause of supersaturation in supply systems is entrainment of air from a leak in the pipes on the suction side of a water pump. Some of the gases in the entrained air are driven into solution as the water is pressurized after moving through the pump. In those situations, it is often possible to hear air bubbles moving through elbows and valves in the delivery system. Heating water can also cause considerable increases in delta P unless the water is degassed after heating. The increase in delta P attributable to heating can be substantial: if water is heated from 70°F to 80°F, delta-P increases by more than 60 mm Hg.

Pre-aeration of the influent water is commonly used to reduce supersaturation to tolerable levels. Packed column aerators are particularly effective at degassing supersaturated waters, but other types of systems providing vigorous aeration may be used. Be aware, however, that underwater diffused aeration (air bubbled through airstones) is relatively inefficient at degassing waters and, in some systems, may actually cause supersaturation. If supersaturation is caused by air leaks in the water supply line, the first course of action is to locate and repair the problem.

Salinity

Salinity is the dissolved salt content of water and is often expressed as the parts of salt by weight per thousand parts of water by weight (ppt). Channel catfish can breed and reproduce over a wide range of salinities. Eggs can hatch and fry will develop in waters with salinities up to at least 8 parts per thousand, but the optimum salinity for channel catfish hatchery supplies appears to be between 0.5 and 3 ppt (500 to 3,000 ppm).

Hardness

Hardness refers to the amounts of calcium and magnesium in the water and is expressed as ppm of equivalent $CaCO_3$. Adequate concentrations of environmental calcium are required for "hardening" of eggs and for normal bone and tissue development of fry. Symptoms of environmental calcium deficiency include swelling and poor matchability of eggs and slow development, lack of vigor, poor stress resistance, and low survival of sac fry.

A minimum of 5 ppm calcium hardness is required for adequate egg matchability and for development and vigor of sac fry. Higher calcium concentrations are desirable because calcium also protects fry from ammonia and metal toxi-

cosis. All things considered, hatchery water supplies should contain at least 20 ppm calcium hardness. Calcium levels can be increased by adding a solution of calcium chloride to the water supply. The calcium solution can be added by chemical metering pumps or by using an inexpensive "drip system" where a concentrated solution of calcium chloride is slowly dripped into the pre-aeration system.

Alkalinity

Alkalinity is a measure of the capability of water to neutralize acids. In most natural waters, the predominant bases are bicarbonate and carbonate. Alkalinity is expressed as ppm equivalent $CaCO_3$. Catfish eggs and fry thrive in waters with a wide range of alkalinity, although waters of very low alkalinity (<10 ppm as $CaCO_3$) should be avoided as hatchery supplies if possible. These waters are poorly buffered and pH can fluctuate drastically with small additions of acid or base. More importantly, dissolved metals such as copper and zinc are very toxic to fry in waters of low alkalinity. Copper and zinc can leach from pipes used to plumb the hatchery water distribution system.

pH

pH expresses the intensity of the acidic or basic character of the water. The pH scale is usually represented as ranging from O to 14. Conditions become more acidic as pH values decrease and more basic as they increase. At 77°F, pH 7.0 is the neutral point. The pH of most fresh waters is a function of total alkalinity and dissolved carbon dioxide concentration. Generally, if levels of those two variables are within the desired range, pH will be between 7.0 and 8.5, which is the desired pH range for incubating eggs and rearing fry.

An important exception to this general rule exists when surface waters containing dense submersed plant communities are used as a water supply. During sunny afternoons, rapid carbon dioxide removal by photosynthesizing plants may cause pH values to temporarily rise above pH 9. In extreme instances, values well above pH 10 have been recorded. Exposure to pH-values above 9 are undesirable and even short-term exposure to waters of pH 10 or above may kill fry and reduce egg matchability. Vigorous aeration of such waters will add some carbon dioxide to the water and somewhat reduce the pH, but this reaction is not rapid enough to be effective in extreme circumstances. The best solution is to avoid the use of surface waters that contain dense stands of submersed plants.

Ammonia

Un-ionized ammonia is quite toxic to channel catfish sac fry and early swim-up fry. Ideally, water in rearing troughs should be free of ammonia for optimal health and growth of fry, and the maximum concentration of un-ionized ammonia that should be allowed is about 0.05 ppm NH_3-N. Above this concentration, fry develop more slowly and are more susceptible to infectious diseases.

Removing ammonia from water supplies is difficult, so waters containing appreciable ammonia should not be used to supply catfish hatcheries. Ammonia is a product of fish metabolism, and ammonia production can be significant when high densities of fry are held in rearing troughs. Ammonia levels in rearing troughs can be decreased by either decreasing fry density or increasing water flow to flush the troughs.

Iron

Most surface waters contain very low concentrations of iron. Some anoxic ground waters, however, contain considerable iron in a dissolved form. When the water is aerated the iron is oxidized to a rust-colored precipitate of iron oxide. Dissolved iron is considered to be of relatively low toxicity to most aquatic organisms. Solid precipitates of iron oxide are even less toxic but may coat the gills of fry and interfere with respiration. Dense precipitates of iron oxide also may cover eggs and hinder gas exchange and suffocate the eggs. Total iron concentrations should be less than about 0.5 ppm for hatchery water supplies.

The simplest system used to remove iron is to pump the water into a small reservoir pond (0.5 to 1 acre) where the dissolved iron is oxidized and some of the iron oxide precipitate settles out. Some of the remaining precipitate can be removed using sand filters. An alternate method is to oxidize the iron by vigorously aerating the water in a tank or chamber prior to sand filtration. Complete removal of iron is difficult regardless of the system used.

Hydrogen sulfide

Hydrogen sulfide gives water a "rotten-egg" odor and is very toxic to channel catfish fry. Sac-fry will be killed when exposed to as little as 0.005 ppm hydrogen sulfide. Avoid using waters containing appreciable hydrogen sulfide. If this is not possible, hydrogen sulfide should be removed from water before it enters the rearing trough. Vigorous aeration will remove some hydrogen sulfide by volatilization and by oxidation of the sulfide to sulfate, which is nontoxic.

Treatment processes

The most common water quality problems encountered in channel catfish hatcheries and the treatment processes required to correct those problems are summarized in Table 1. But remember, it is often easier to seek an alternative water source rather than add expensive treatment systems in an effort to make a particular water suitable for use.

Table 1. Common water quality problems in channel catfish hatchery water supplies.

Variable	Desired level	Problem	Solution
Temperature	78-82°F	too low	reservoir pond for solar heating or use water heaters
		too high	blend with cooler water
Dissolved oxygen	5 ppm to saturation	too low	vigorous aeration of incoming water and supplemental aeration in troughs
Carbon dioxide	less than 10 ppm	too high	vigorous aeration (degassing) of incoming water and supplemental aeration in vats or troughs
Total dissolved gases	delta P less than 40 mmHg	too high	vigorous aeration (degassing)
Calcium hardness	more than 20 ppm as $CaCO_3$	too low	addition of calcium chloride to water supply
Ammonia (un-ionized)	less than 0.05 ppm NH_3-N	too high	do not use as a water supply; avoid accumulation within hatchery by decreasing fry density or increasing water flow
Iron	less than 0.5 ppm total iron	too high	aeration (oxidation) followed by precipitation or sand filtration
Hydrogen sulfide	less than 0.005 ppm H_2S-S	too high	vigorous aeration (degassing) of incoming water

Additional readings

Bouck, G. R., R. E. King, and G. Bouck-Schmidt. 1984. Comparative removal of gas supersaturation by plunges, screens, and packed columns. Aquacultural Engineering 3:159-176.

Colt, J. and G. Bouck. 1984. Design of packed columns for degassing. Aquacultural Engineering 3:251 - 273.

Hackney, G. E. and J. E. Colt. 1982. The performance and design of packed column aeration systems for aquaculture. Aquacultural Engineering 1:275-295.

Tucker, C. S. and E. H. Robinson, 1990. Channel Catfish Farming Handbook. Van Nostrand Reinhold, New York.

Wheaton, F. W. 1977. Aquacultural Engineering. Wiley Interscience, New York.

The work reported in this publication was supported in part by the Southern Regional Aquaculture Center through Grant No. 89-38500-4516 from the United States Department of Agriculture.

Exhibit F

Information relative to financial resources

Mark L . And Jo Anne W. Lupher dba Epicenter
BALANCE SHEET
21-Jun-06

ASSETS		
Current Assets		
	Checking & Savings	$59,554.00
	Accounts Receivable	$ 10,271.00
	Inventory and Other Current Assets	$213,651.00
	Total Current Assets	$283,476.00
Other Assets		
	Leasehold Improvements	$ 212,497.00
	Capital Credit/Custer Telephone	$ 4,215.21
	Capital Credit/SREC	$ 14,561.68
	Conesco Life	$ 10,783.91
	Household Goods	$ 34,296.09
	Vehicles and Equipment	$ 101,928.00
	Valley Street House	$ 70,000.00
	Winberg Note Payabel	$ 3,641.39
	Total Other Assets	$ 451,923.28
Total Assets		$735,399.28
LIABILITIES & EQUITY		
Current Liabilities		
	Accounts Payable	$ 81,569.00
	Bank Loans	$ 89,339.00
	Total Current Liabilities	$ 170,908.00
Long Term Liabilities		$ 50,465.00
Total Liabilities		$ 221,373.00
Equity		$514,026.28
TOTAL LIBILITIES & EQUITY		$ 735,399.28

I certify that this is a true and correct statement to the best of my knowledge
Mark L. Lupher

7-25-06

STATE OF IDAHO)
SS.
COUNTY OF CUSTER)

On this 25th day of July, 2006.
before me, a notary public in and for the said State, personally
appeared Mark L. Lupher
known or identified to me to be the person whose name
subscribed to the within instrument, and acknowledged to me that
he she they executed the same.

Lura H. Baker
Notary Public
Residing in Clayton
My Commission Exp. 12-12-09

LURA H. BAKER
NOTARY PUBLIC
STATE OF IDAHO

Exhibit G

Information relative to conflict with the local public interest

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

900 NORTH SKYLINE DRIVE, SUITE B • IDAHO FALLS, IDAHO 83402 • (208) 528-2650

JAMES E. RISCH, GOVERNOR
TONI HARDESTY, DIRECTOR

July 18, 2006

RECEIVED
JUL 27 2006
DEPT. OF WATER RESOURCES
SOUTHERN REGION

Mr. and Mrs. Mark Lupher
Epicenter Aquaculture
HC 61 Box 3016
Challis, Idaho 83226

RE: Water Rights Application Comments

Dear Mr. and Mrs. Lupher:

The Idaho Department of Environmental Quality ("Department") has reviewed our existing water quality information near your proposed project site identified in Application 72-07577 through 72-07580.

The Department does not have any information regarding Warm Springs Creek near your facility. We would encourage you to use only the water appropriated by these applications and allow as much water a possible to travel downstream.

The Department also suggests any outlets be screened according to local Fish and Game specifications.

We do not have any other substantive comments at this time.

Please do not hesitate to contact me at 208.528.2650 for additional information we may be able to provide.

Thank you for the opportunity to review your application.

Sincerely,

Troy Saffle
Regional Water Quality Manager
Idaho Falls Regional Office

c: Shelly Keen, IDWR
Marti Bridges, IDEQ
Allen Merritt, IDWR

35132

IDAHO DEPARTMENT OF FISH AND GAME
SALMON REGION
99 Highway 93 North 756-2271
P.O. Box 1336
Salmon, Idaho 83467

James E. Risch / Governor
Steven M. Huffaker / Director

July 24, 2006

RECEIVED
JUL 26 2006
DEPT. OF WATER RESOURCES
SOUTHERN REGION

Allen Merritt
Idaho Department of Water Resources
1341 Fillmore Street, Suite 200
Twin Falls, Idaho 83301-3380

Re: Water Right Application No's. 72-7577, 7578, 7579, & 7580 (Lupher)

Dear Allen,

Idaho Department of Fish and Game staff has attempted to review the above applications from Mr. and Mrs. Lupher for water rights in the Warm Springs drainage and found insufficient information in the application to make a determination of potential impacts. The Department requests additional time for our staff to work with the applicants and your office to gain a thorough understanding of the applications.

Sincerely,

James R. Lukens

James R. Lukens
Regional Supervisor

cc: Cindy Robertson
Walt Poole
Mark Armbruster
Mark and JoAnne Lupher
Bob Foster
Shelley Keen

IDAHO DEPARTMENT OF FISH AND GAME
SALMON REGION
99 Highway 93 North
P.O. Box 1336
Salmon, Idaho 83467

James E. Risch/Governor
Steven M. Huffaker/Director

September 1, 2006

Department of Water Resources
Attn: Allen Merritt
1341 Fillmore Street, Suite 200
Twin Falls, Idaho 83301-3380

Re: Applications for Water Permit No's. 72-7577, 7578, 7579, & 7580 (Lupher)

Allen,

The Department staff has met with Mr. Lupher regarding his application for water rights in the Warm Springs drainage. The Department is willing to withdrawal our concerns to Mr. Lupher's proposal if at least 1.5 cfs is allowed to continue to flow down the main stem Warm Springs Creek below the Lupher settling pond. The stream channel below the settling pond supports a variety of riparian and wetland habitats that are important to many wildlife species. Thank you for the opportunity to comment.

Sincerely,

for JRL

Jim Lukens
Regional Supervisor

Cc:
Cindy Robertson - NRPB
Walt Poole - NRPB
Mark and Anne Lupher - Applicants
Bob Foster – Idaho Department of Water Resources
Shelley Keen- Idaho Department of Water Resources

RECEIVED
SEP 1 9 2006

BOARD OF COMMISSIONERS
CUSTER COUNTY, IDAHO
P.O. BOX 385 – CHALLIS, IDAHO 83 226

(208) 879-2360

Idaho Department of Water Resources
1341 Fillmore Street, Suite 200
Twin Falls, ID 83301-3380

July 25, 2006

Re: Mark and Joanne W. Lupher DBA Epicenter Aquaculture Water Appropriate 72-07577, 72-07578, 72-07579 and 72-07580

The Custer County Board of Commissioners reviewed the above four water permits. We have no comment on the applications in questions.

If you have any questions, please let me know.

Ethel M. Peck

Wayne F. Butts, Acting Chairman
Custer County Board of Commissioners

State of Idaho
Department of Water Resources
Application for Permit

RECOMMENDATION OF WATERMASTER

Application for Permit No 72-7579
Applicant's Name: EPICENTER AQUACULTURE
PO BOX 336
CHALLIS ID 83226

MARK L LUPHER
PO BOX 336
CHALLIS ID 83226

JO ANNE LUPHER
PO BOX 336
CHALLIS ID 83226

RECEIVED
JUL 20 2006
DEPT. OF WATER RESOURCES
SOUTHERN REGION

Watermaster's Recommendation:

a) X I do not oppose approval of this application.

b) ____ I do not oppose approval of this application if it is conditioned as follows:

c) ____ I oppose approval of this application for the following reasons:

d) ____ Additional Comment:

Dated this 18TH day of July, 2006

Water District No: 170

Roxanne Brown
Watermaster's Signature