*Current Location of GIPOP is at Upper Narrows, approximately 5 miles upstream from dam. A new location for a second oxygen injection system was investigated at Lower Narrows at a depth of 50’ and approximately 3 miles upstream from the dam.

<table>
<thead>
<tr>
<th>Model Run</th>
<th>Point Source Conditions</th>
<th>Oxygen Injection (ppd)</th>
<th>% of Pond Volume &lt; DO Criteria</th>
<th>Maximum Chl a (ppb)</th>
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<tbody>
<tr>
<td></td>
<td>Existing Loc.</td>
<td>New Loc.</td>
<td>GIPOP 1*</td>
<td>GIPOP 2*</td>
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<tr>
<td>0A</td>
<td>0</td>
<td>0</td>
<td>92000</td>
<td>0</td>
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<tr>
<td>0B</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>0D</td>
<td>Paper Mills =0</td>
<td>Municipal = Actual</td>
<td>92000</td>
<td>0</td>
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<td>License</td>
<td>Lic. Flow Actual Conc.</td>
<td>92000</td>
<td>0</td>
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<tr>
<td>1B</td>
<td>Actual (98-00)</td>
<td>Actual Flow 98-00</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2A</td>
<td>Actual (98-00)</td>
<td>Actual Flow 98-00</td>
<td>92000</td>
<td>0</td>
</tr>
<tr>
<td>2B</td>
<td>Actual (98-00)</td>
<td>Actual Flow 98-00</td>
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<td>0</td>
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<td>67% Point Source TP</td>
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<td>40% Point Source TP</td>
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<td>5C</td>
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<td>40% Point Source TP</td>
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<td>45000</td>
<td>90000</td>
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<td>6B</td>
<td>Actual (98-00)</td>
<td>40% Point Source TP</td>
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<td>70000</td>
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</table>
Figure 1
Percentage of Gulf Island Pond
Not Meeting Minimum Class C Dissolved Oxygen Criteria

Figure 2
Summary of Gulf Island Pond Chlorophyll A Data 1998 - 2000
Figure 3
Time of Travel Androscoggin River

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Figure 4
Gulf Island Pond Summer 1999
% Volume of Dissolved Oxygen Non-Attainment Vs Chlorophyll a
Figure 5
Gulf Island Pond Summer 1999
% Volume of Dissolved Oxygen Non-Attainment Vs Temperature

River Temperature (°C)

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Figure 6
Gulf Island Pond Summer 1999
% Volume of Dissolved Oxygen Non-Attainment Vs Temperature Vs Flow

River Temp (°C)  Temp (°C) Gulf Island Dam 50' Depth
Temp (°C) Turner Brudge
% Volume Pond DO Non-Attainment
River Flow at Rumford (Thousands of CFS)

Figure 7
Gulf Island Pond Summer 1999
% Volume of Dissolved Oxygen Non-Attainment Vs Temperature Vs Chlorophyll A
Figure 7a  WASP Model Schematic

- **N₂**
- **CBOD**
- **Atmospheric Reaeration**

**Dissolved Oxygen**

- **NO₃-N**
- **Light**
- **Photosynthesis**
- **Respiration**

**PHYTOPLANKTON**

- **Growth and Nutrient Consumption**
- **Death and Nutrient Recycling**

**NH₃-N**

- **Nitrification**
- **Denitrification**

**Sediment**

- **NH₃ Flu**
- **SOD**
- **PO₄ Flu**
Figure 8
Qual2EU Model Setup for Upper Androscoggin River

<table>
<thead>
<tr>
<th>Sample Locations</th>
<th>River Mile</th>
<th>Inputs</th>
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<tbody>
<tr>
<td>Berlin</td>
<td>134</td>
<td>Pulp and Paper America Burgess Mill Berlin, NH</td>
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<tr>
<td></td>
<td>120</td>
<td>Pulp and Paper America Cascade Mill</td>
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<tr>
<td>Gorham</td>
<td>110</td>
<td>Peabody River Gorham, NH</td>
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<td>Gilead</td>
<td>90</td>
<td>Wild River</td>
</tr>
<tr>
<td>Bethel</td>
<td>80</td>
<td>Ellis River</td>
</tr>
<tr>
<td>Rumford Point</td>
<td>70</td>
<td>Swift River Mead Paper Co. Rumford-Mexico, ME Webb River</td>
</tr>
<tr>
<td>Peru</td>
<td>60</td>
<td>International Paper Co.</td>
</tr>
<tr>
<td>Canton</td>
<td>50</td>
<td>Livermore Falls, ME</td>
</tr>
<tr>
<td>Riley Dam</td>
<td>41</td>
<td>Dead River</td>
</tr>
<tr>
<td>Twin Bridges</td>
<td>31</td>
<td>Gulf Island Pond WASP Model</td>
</tr>
<tr>
<td>Gulf Island Dam</td>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>
Figure 9
WASP Model Segmentation for Gulf Island Pond
Figure 10
Androscoggin River Flow
August 2000

Flow (cfs)

Sampling Dates

Rumford
Turner
Sampling Dates
Figure 11 - Model Calibration of Ultimate BOD - August 2000 Data

Turner Bridge

Upper Narrows

Lower Narrows

Deep Hole

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Figure 12
Model Solar Radiation

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Figure 13 - Model Calibration of Chlorophyll a - August 2000 Data

Turner Bridge

Upper Narrows

Lower Narrows

Deep Hole
Figure 14 - Model Calibration of Total Nitrogen - August 2000 Data

Turner Bridge

Upper Narrows

Lower Narrows

Deep Hole

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Figure 15 - Model Calibration of Total Phosphorus - August 2000

Turner Bridge

Upper Narrows

Lower Narrows

Deep Hole

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Figure 16 - Model Vertical Dispersion Rate

August 2000 Calibration

August 1984 Verification
Figure 17
Continuous Model Calibration of Dissolved Oxygen
Turner Bridge Monitor     August 2000
Figure 18 - Continuous Model Calibration of Dissolved Oxygen - Gulf Island Dam - August 2000

Above Gulf Island Dam
Monitor 5' Depth

Above Gulf Island Dam
Monitor 35' Depth

Above Gulf Island Dam
Monitor 63' Depth

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Figure 19a - Calibration of Dissolved Oxygen by River Mile - August 9, 2000

**D0 Top Layer  8-9-00**

**D0 Middle Layer  8-9-00**

**D0 Bottom Layer  8-9-00**
Figure 19b - Calibration of Dissolved Oxygen by River Mile - August 15, 2000
Figure 19c - Calibration of Dissolved Oxygen by River Mile - August 31, 2000

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Figure 20 - Model Verification of the August 1984 Data in Gulf Island Pond

1. **PO4-P**
   - River Mile: 43 to 25
   - PO4-P (ppm): 0 to 30
   - Data High, Data Ave, Data Low, Model

2. **Carbonaceous BOD**
   - River Mile: 42 to 26
   - CBOD (ppm): 0 to 12
   - Data High, Data Ave, Data Low, Model

3. **Chlorophyll A**
   - River Mile: 42 to 26
   - Chl a (ppb): 0 to 6
   - Data High, Data Ave, Data Low, Model
Figure 20a - Model Verification of the August 1984 DO in Gulf Island Pond

D0 Top Layer   Aug 1984

D0 Middle Layer   Aug 1984

D0 Bottom Layer   Aug 1984

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