# Aquaculture Siting Study

State of Washington
Department of Ecology

Prepared by:
EDAW Inc.
Environmental Planning, Urban Design, Landscape Architecture

CH2M/HILL
Engineers, Planners, Economists, Scientists

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# Acknowledgements


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# INTRODUCTION

The Aquaculture Siting Study documents the analysis of potential visual and cumulative impacts from proposed aquaculture facilities. The intent is to provide an environmental assessment tool for use in evaluating and regulating these facilities. It was prepared for the State of Washington Department of Ecology by a private consultant team led by EDAW Inc.

Aquaculture is the development, maintenance and harvest of aquatic organisms in marine waters. In the Puget Sound, it includes shell, finfish and algae culture. Mussels, oysters, hardshell clams and geoduck clams are the main shellfish cultures. Salmon are the prime finfish culture. Nori is the prime algal species. Oysters and clams have been grown and harvested here since the nineteenth century, while shellfish longlines, rafts, salmon pens, and nori are recent industry developments.

Oyster and mussel cultures are grown on intertidal beds or float on the water surface suspended from lines or rafts. Shellfish longlines are suspended from cables, strung between anchored buoys. Shellfish rafts suspend cultured stock from horizontal poles supported by wood beams on styrofoam floats. Salmon culture utilizes rearing pens which float on the water surface. Nori culture utilizes nets which float on the water surface.

Recent proposals to site these aquaculture facilities in the Puget Sound and the Strait of Juan de Fuca have often been accompanied by intense and bitter opposition from adjacent shoreline residents. They are concerned about potential visual impact and cumulative impact from facilities that may follow. The information and analyses in this study will assist industry members, citizens' groups, planners, upland owners and elected officials in their effort to assess and mitigate such impacts.

# EXECUTIVE SUMMARY

# Study Process

The two key elements of the study are a Visual Impact Analysis and a Cumulative Impact Analysis. Each is documented though this report and an accompanying slide show (see Appendices). Each is developed with the assistance and review of an advisory committee. Its membership includes adjacent upland landowners, aquaculture industry representatives, and staff of state and local planning agencies. Three presentations were made to the committee during the course of this study.

## Visual Impact Analysis

The Visual Impact Analysis has four components. A display of Computer and Photo Simulations provide the basis for the Visual Impact Assessment and the accompanying Workbook.

The Computer Simulations provide an understanding of how different size aquaculture facilities would appear under a range of offshore distances and viewing heights.

The Photo Simulations, at five representative Puget Sound sites, illustrate a range of facility types, sizes, and designs in a variety of marine settings.

The Visual Impact Assessment examines the Computer and Photo Simulations to produce two related analyses. The first identifies the three major variables affecting visual impact -- the landscape, the viewer, and the facility. The second identifies two categories of mitigation measures -- alternate site selection, and facility layout and design.

The Visual Assessment Workbook utilizes the Visual Impact Assessment to develop an analytic process for evaluating proposed aquaculture facilities. The inventory component rates the site's scenic quality, the number of viewers, and the visibility of the facility. The analysis component synthesizes the inventory data to determine one of four levels of potential visual impact.

## Cumulative Impact Analysis

The identification and evaluation of Cumulative Impacts and Cumulative Impact Controls provide the basis for a tailored regulation mechanism for aquaculture facilities.

The Cumulative Impact component identifies four major problems related to aquaculture. They are biological, navigational, visual, and access.

The Cumulative Impact Controls component analyzes the four problems and reviews seven approaches for achieving separation of facilities, or otherwise lessening cumulative impact.

The following paragraphs summarize the key elements and conclusions of this study.

# Visual Impact Analysis

## Visual Impact

The degree of visual impact from aquaculture facilities is highly variable. Depending on the landscape setting, the attitude of the viewer, and the facility siting and design, aquaculture can have a positive or negative visual impact.

### Landscape Setting

The environmental condition of the landscape, its spatial definition, adjacent scenery and topography all affect the potential for visual impact. A permanently visible aquaculture facility along a pristine shoreline can degrade its scenic quality, while the same facility along a highly industrial shoreline may enhance is visual quality. Open shorelines and large embayments are generally less susceptible to visual impact than small, enclosed embayments. Concave embayments focus the viewer's attention on the flat plane of the water. Floating aquaculture facilities disrupt the plane and are visually evident. Landforms and vegetation can frame and focus views and heighten the viewer's attention; aquaculture facilities located in these areas will have a higher potential for visual impact. As the height of the adjacent shoreline increases, an aquaculture facility will become more visually evident. The viewer's line of sight is now more perpendicular to the plane of the water, and the foreshortening of objects on the water has decreased.

### The Viewer

The attitude of the viewers, their number, and the duration of their viewing all affect potential visual impact. The potential for visual impact is higher along shorelines where a majority of residents or visitors have a high level of concern for scenic quality. Along the Puget Sound, this includes full-time and temporary residents with views of the water, those who visit public parks and use areas, and those who travel scenic highways. This potential increases as the number of viewers and their viewing time increases. Conversely, aquaculture facilities may have a visual interest as an intrinsic Puget Sound industry. Out of curiosity, people may wish to visit, examine, and understand their operation.

### Facility Siting and Design

Eight major siting and design variables affect potential visual impact. They are distance offshore, vertical profile, size, surface coverage, color, solar orientation, form, and materials. At distances greater than 1,500 to 2,000 feet offshore, the visual presence of most facilities is reduced to a line near the horizon. At this distance, size and surface coverage doesn't seem to affect visual impact. Closer to the shoreline, those facilities with limited surface coverage or those with dispersed buoys or rafts have less visual impact than those with a large surface area or continuous coverage. Facilities which repeat the flat plane of the water have less visual impact than those which project vertically above the water surface. Sky conditions, sun angle, wind, and direction of view all affect color. In general, blues and greens complement the natural setting; greys and earth tones are neutral; white and black are highly variable in their response to lighting conditions; and oranges, yellows and reds have a high visual presence. Although highly variable, the glare of the sun off the water, or the shadow cast by adjacent landforms, can obscure aquaculture facilities. Finally, those facilities which borrow from structures and forms already in the marine environment (pilings, docks, marinas) can minimize visual impact.

## Mitigating Measures

The study identifies two categories of mitigating measures related to visual impact. They are alternate site selection and modification of siting and design.

When feasible, aquaculture facilities should be located in waters offshore:

- o Culturally modified landscapes, preferably those with existing commercial/industrial maritime activity;
- o Rural or uninhabited shorelines;
- o Low bank shorelines; or
- o Open shorelines.

When feasible, aquaculture facilities should be sited or designed to be:

- o At least 1,500 to 2,000 feet offshore;
- o Horizontal in profile;
- o Incorporated as part of, or designed to appear as, docks or marinas;
- o Limited in overall size and surface coverage so as not to cover more than 10% of normal cone of vision (dependent on the degree of foreshortening created by distance offshore to the facility and the height observer above sea level);
- o Of a color which complements the dominant blue/green colors of the Puget Sound; or
- o Ordered and of limited variations in material and color.

# Cumulative Impact Analysis

## Cumulative Impacts

The four major areas of cumulative impact related to aquaculture are biological, navigational, visual, and access. Each is described below.

### Biological

Intense aquaculture may result in the pollution of nearby waters from digestive waste and unused fish food, or potentially transfer disease from cultured stock to free run or native stock. The cautious approach to dealing with these biological concerns is to incrementally develop facilities, with testing in between increments to detect possible impacts.

### Navigational

Aquaculture, in certain locations or densities, may restrict navigation, making it inconvenient or unsafe. Designating areas where impact to navigation is negligible can be handled through development controls or standards.

### Visual

Multiple aquaculture facilities in the same area can have a visual impact higher than the same facilities located separately. The size of the proposed project, size of the embayment, distance offshore, and viewing height all contribute to the potential for cumulative impact. Pre-defining areas where probable visual impacts would be lessened can be accomplished through performance standards or other development controls that would guide projects to locations with low visual access or areas with existing visual disruption.

### Access

Most aquaculture facilities require land-based access for staging, parking, launching, and storage of equipment and supplies. If several facilities are located adjacent to each other in an area with limited land access, a conflict may arise between aquaculture operators and abutting upland property owners. Shoreline permits for aquaculture can list conditions to address the impacts of staging if they appear to be a concern.

## Cumulative Impact Controls

The key approaches for controlling density and placement of aquaculture projects are Zones/Districts, Density Standards, Performance Standards, Floating Zones, Conditional Use, Phasing with Monitoring, and No Action. Each has aspects which local planning officials, industry members, and concerned citizens can use to regulate, develop and monitor the industry. At the same time, each has aspects which make them hard or expensive to administer, adversely impact the industry, or aggregates impacts in one area.

Therefore, the study recommends a tailored regulation mechanism for aquaculture and its special set of impacts (biological, navigational, visual, and access). The control mechanism should be predictable and address impacts through performance standards and conditional use requirements.

If an agency can describe or limit the probable areas where aquaculture can and cannot go, industry members and concerned citizens will have a more predictable review mechanism. It would eliminate much of the case-by-case controversy.

Performance Standards would establish acceptable levels of impacts, providing the needed environmental control. If problems are encountered, additional permits would be denied.

Conditional Use Standards would contain a formalized agreement for use, stating terms of performance and obligations of both the project proponent and the permitting agency. The conditions may include terms under which the permit may be revoked.

# VISUAL IMPACT ANALYSIS

The Visual Impact Analysis provides visual and analytic tools for evaluating and mitigating the visual impact of proposed aquaculture facilities. The objective of the analysis is to provide a methodology for resolving potential conflict between the goals of maintaining scenic shoreline quality, and developing the State's aquatic resources. As such, it provides a guide that state and local governments can use to review projects subject to the Shoreline Management Act.

## COMPONENTS

The visual component illustrates a range of prototypical aquaculture facilities. The computer simulations illustrate the relationship between the distance offshore to the facility and the observer's position above sea level. Twelve views of a hypothetical grid are shown. The photo simulations show detailed renderings of a range of facility types and designs at five representative Puget Sound sites. Both types of simulations represent the normal human 60-degree cone of vision.

The analytic component provides a description of the components of visual impact and a list of potential mitigating measures. It also provides a visual assessment workbook.

## SHORELINE MANAGEMENT ACT

The State of Washington Shoreline Management Act identifies aquaculture "as an activity of statewide and national interest. [Because] aquaculture is dependent on use of the water, [it] is a preferred use of the water area when the environment is properly protected."[1] It also implies that each local master program address potential visual impact from proposed aquaculture facilities.

The Act requires local governments develop shoreline master programs to manage and regulate use and development in shoreline area. They are mandated to address seven objectives in the following order:

(1) Recognize and protect the statewide interest over local interest (i.e. aquaculture);

(2) Preserve the natural character of the shoreline;

(3) Result in long-term over short-term benefit;

(4) Protect the resources and ecology of the shoreline;

(5) Increase public access to publicly owned areas of the shorelines;

(6) Increase recreational opportunities for the public in the shoreline;

(7) Provide for any other element as defined in RCW 90.58.100 deemed appropriate or necessary.[2]

1 Hurlburt, p. 32.
2 Ibid.

The Act also requires each local master program to address potential visual impact from proposed aquaculture facilities. It requires:

> "the protection of visual assets of shorelands and water bodies as a primary objective of shoreline management. In developing and applying a program to shorelands and adjacent areas, consideration must be given to protection of the visual quality of the shoreline resource and to maintenance of view corridors to waterways and shoreland features. In the implementation of this policy, the public's opportunity to enjoy the physical and aesthetic qualities of natural shorelines of the state shall be preserved to the greatest extent feasible consistent with the overall best interest of the state and the people generally."3

Several local programs require minimization of potential visual conflict with current upland residents. They also define types of aquaculture, list potential impact, and list locational restrictions. Shellfish longlines and rafts, and fish pens, are specifically mentioned in several programs.

# Computer Simulations

The computer simulations provide an understanding of how different size aquaculture facilities would appear under a range of offshore distances and viewing heights. As such, they provide an easy review tool in evaluating aquaculture proposals.

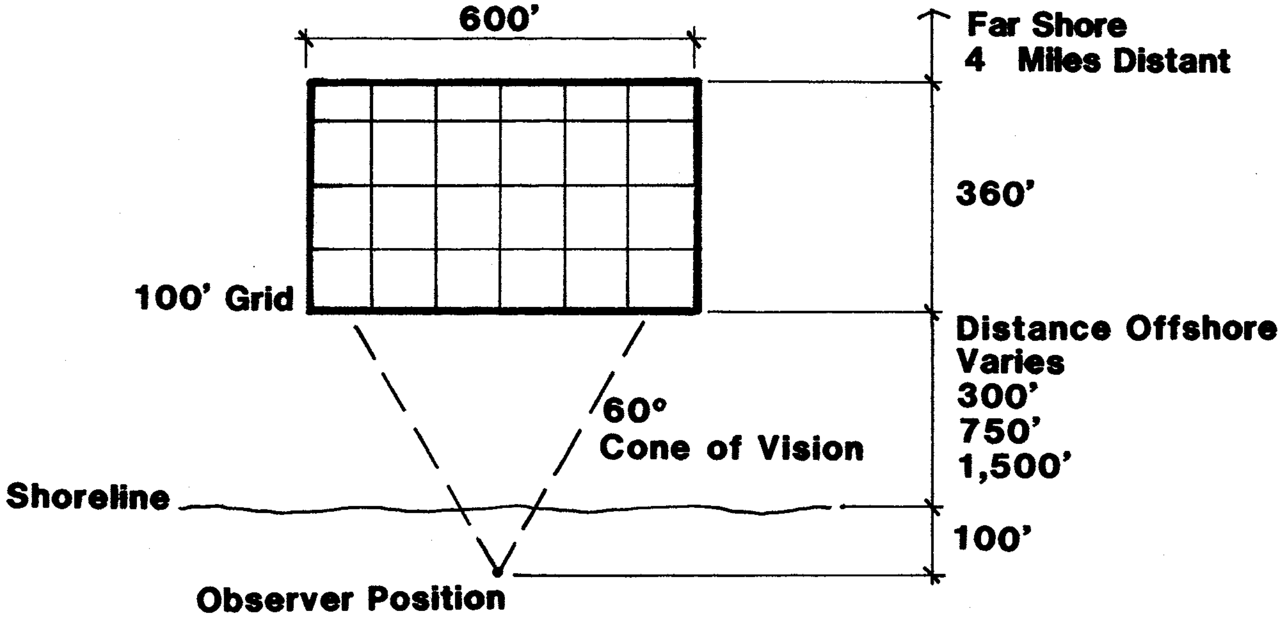
They indicate that distance offshore and the observer's height above sea level are critical variables affecting the visibility of aquaculture facilities. The greater the distance offshore the facility is, or the closer the observer is to sea level, the less visible the facility is.

The computer simulations illustrate hypothetical five acre, and two adjacent three and seven-and-a-half acre aquaculture facilities. The matrix below summarizes each simulation.

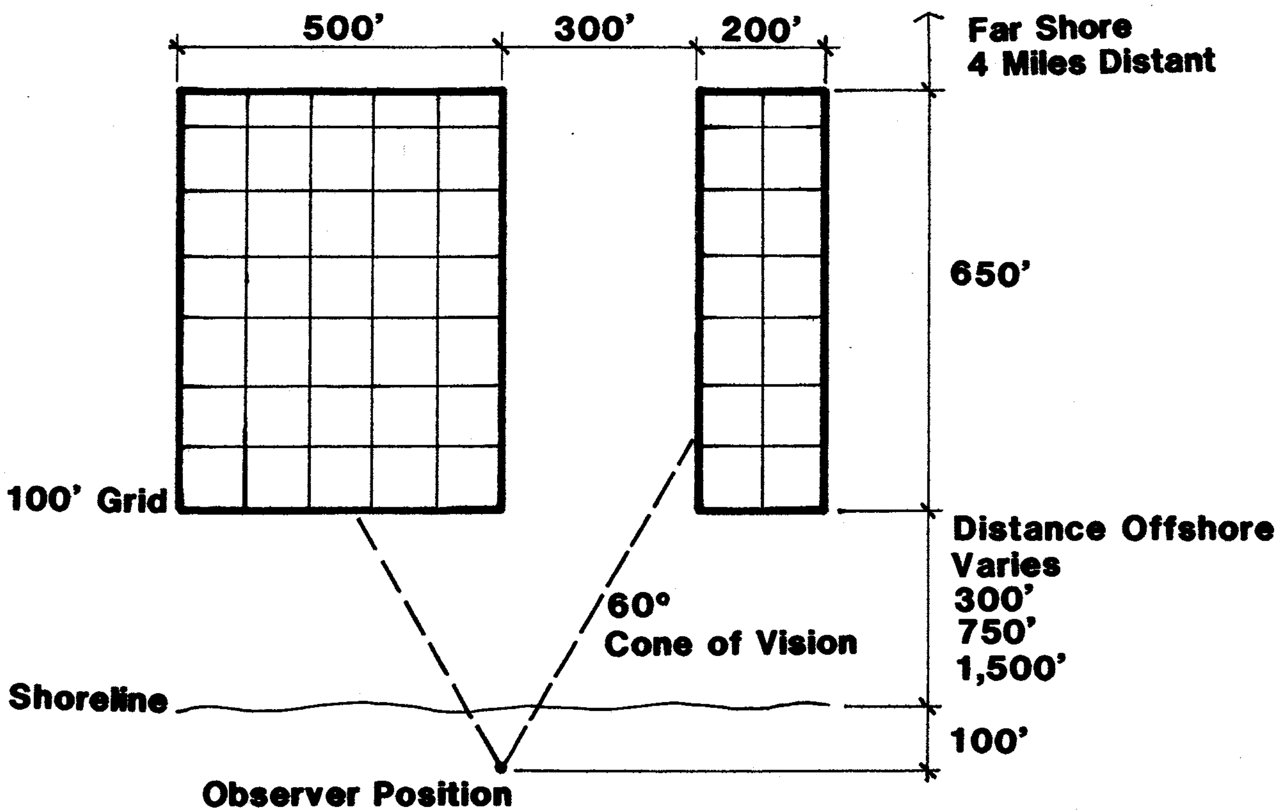
| | | OBSERVER POSITION (Height Above Sea Level) | | | |
|---|---|---|---|---|---|
| | | 5 ft. | 30 ft. | 55 ft. | 105 ft. |
| DISTANCE OFFSHORE (closest edge) | 300 ft. | View 1 | View 2 | View 3 | View 4 |
| | 750 ft. | View 5 | View 6 | View 7 | View 8 |
| | 1,500 ft. | View 9 | View 10 | View 11 | View 12 |

Figure 1 Computer Simulations Matrix

3 WSDOE, p. 43.



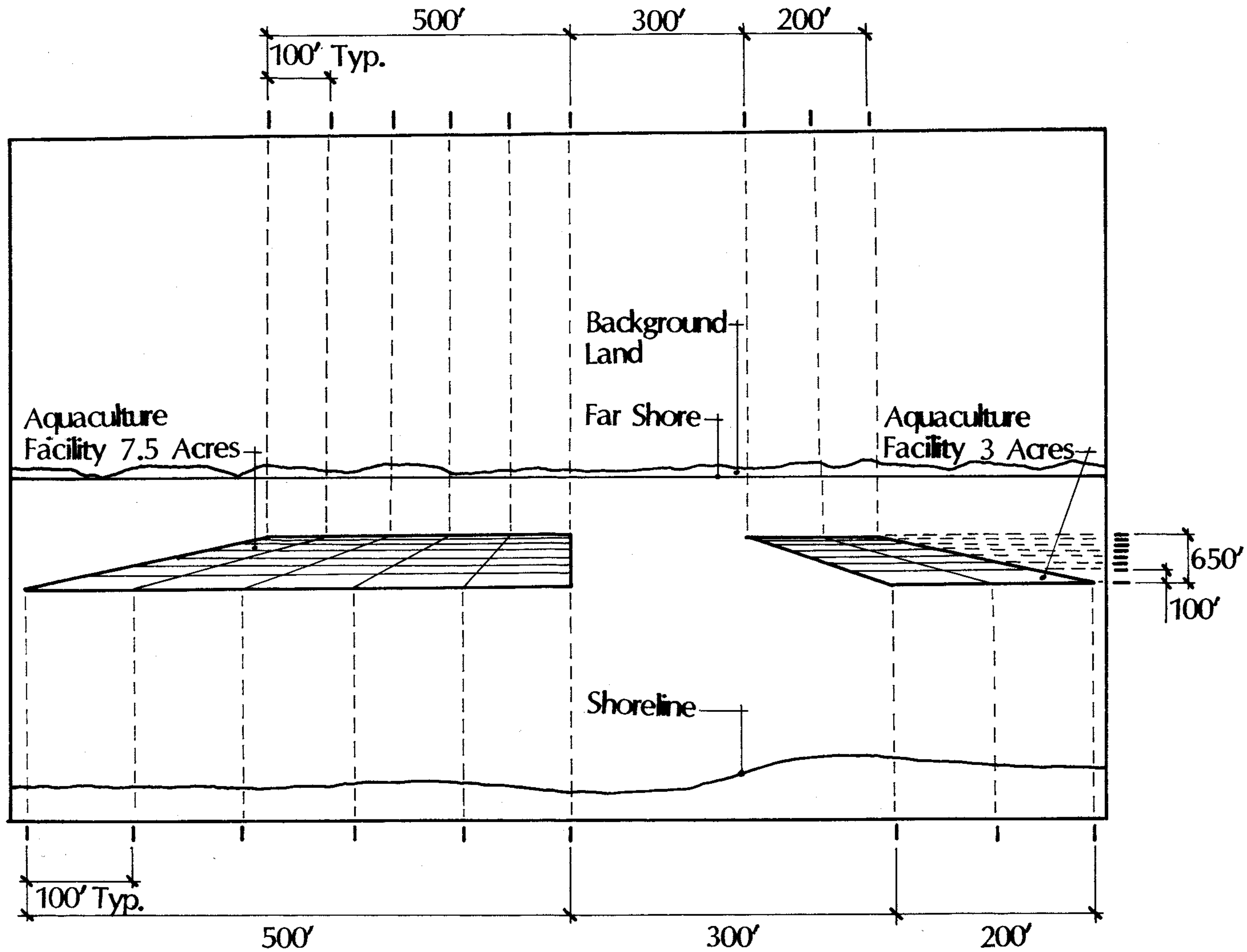

5 Acres - 600′ X 360′




7.5 Acres - 500′ X 650′/3 Acres - 200′ X 650′
(2 Adjacent Facilities)

# Computer Simulation-Plan View

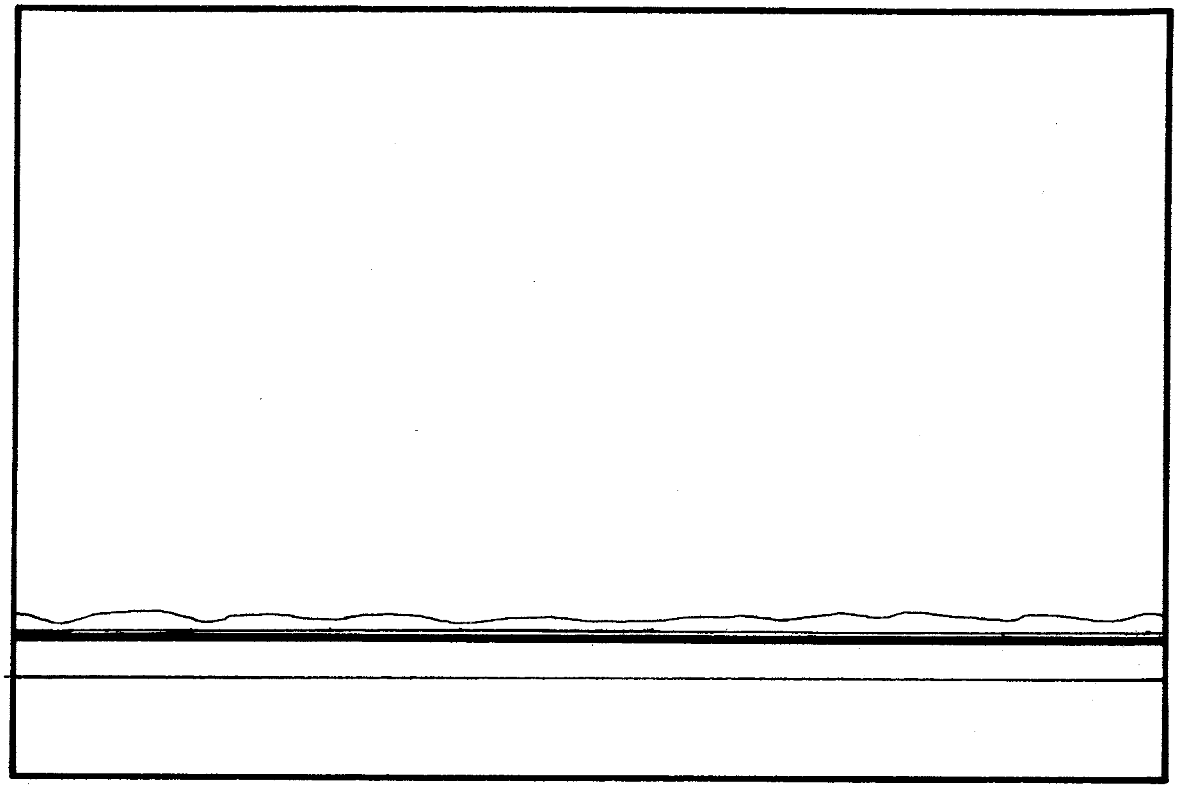
Figure 2 Computer Simulations - Plan View



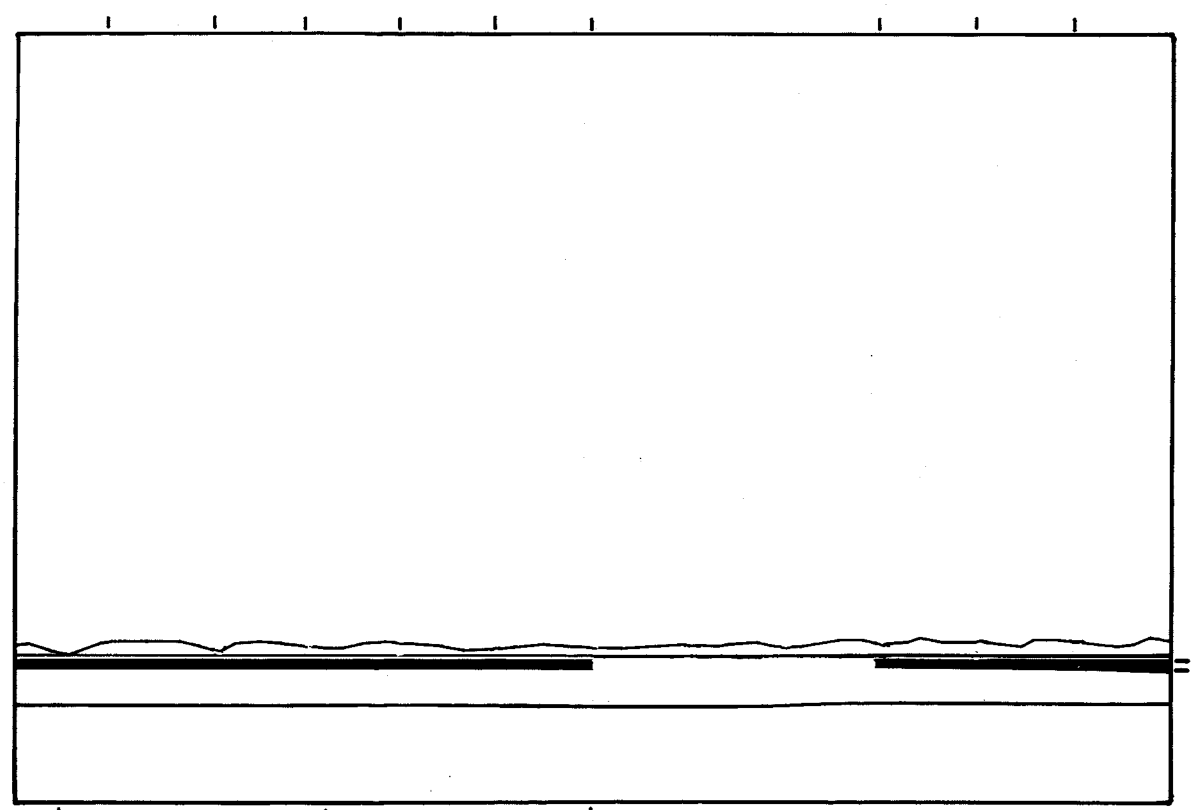

7.5 and 3 Acre Adjacent Facilities

# Typical Computer Simulation

Figure 3



5 Acres 100 ft. Grid

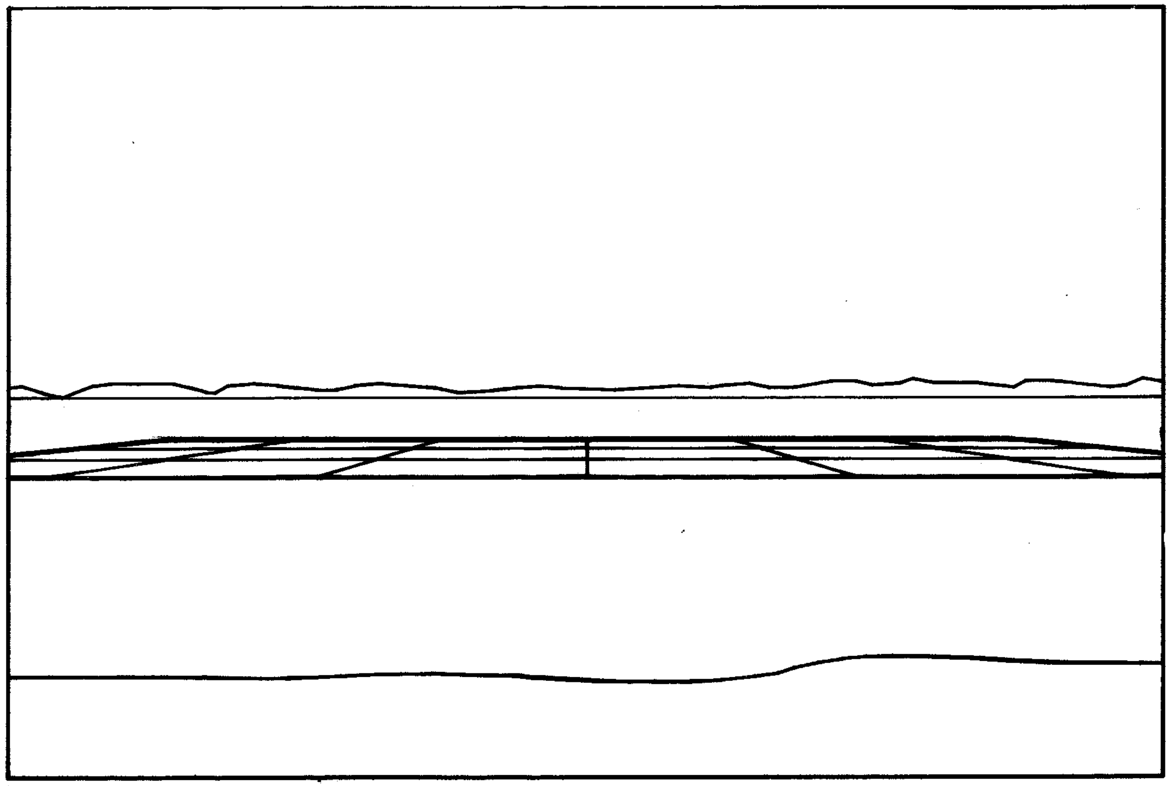


(2 Adjacent Projects)
7.5 and 3 Acres 100' Grid

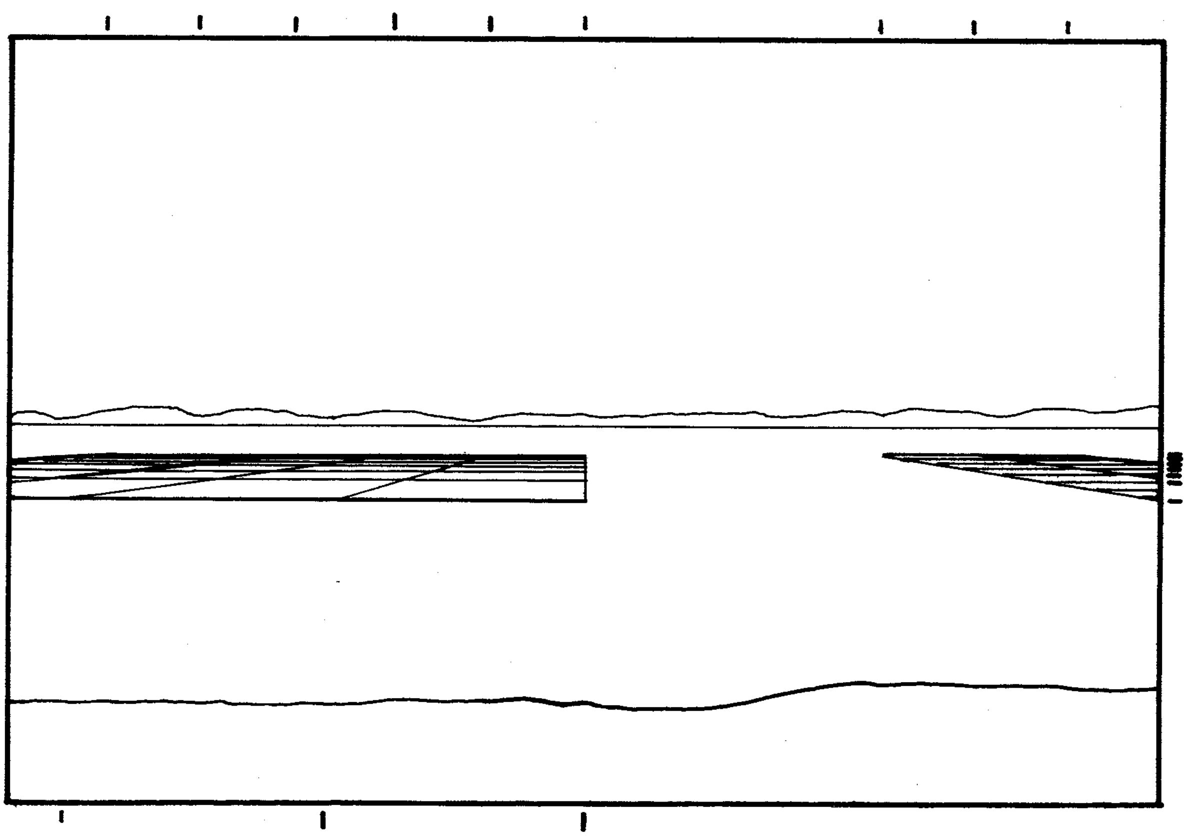
Distance Offshore: 300 ft.
Observer Position: 5 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 4 Computer Simulation - View 1



5 Acres 100 ft. Grid

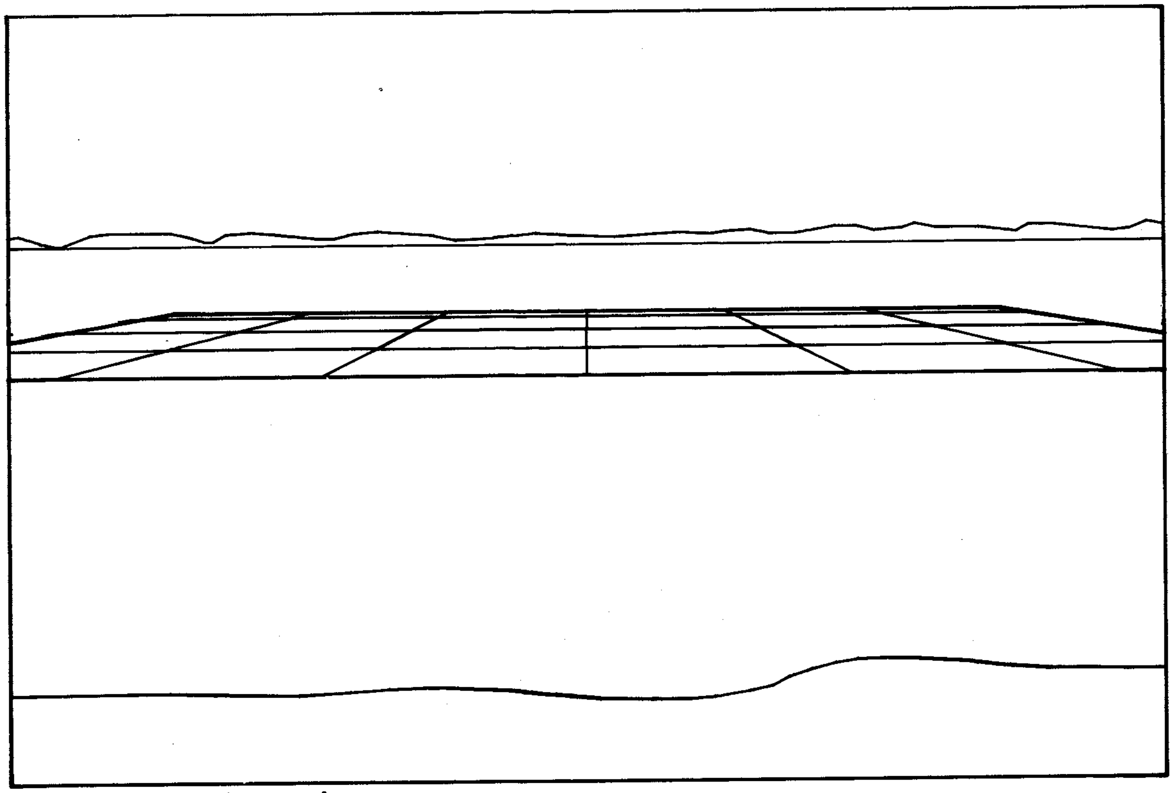


(2 Adjacent Projects)
7.5 and 3 Acres 100' Grid

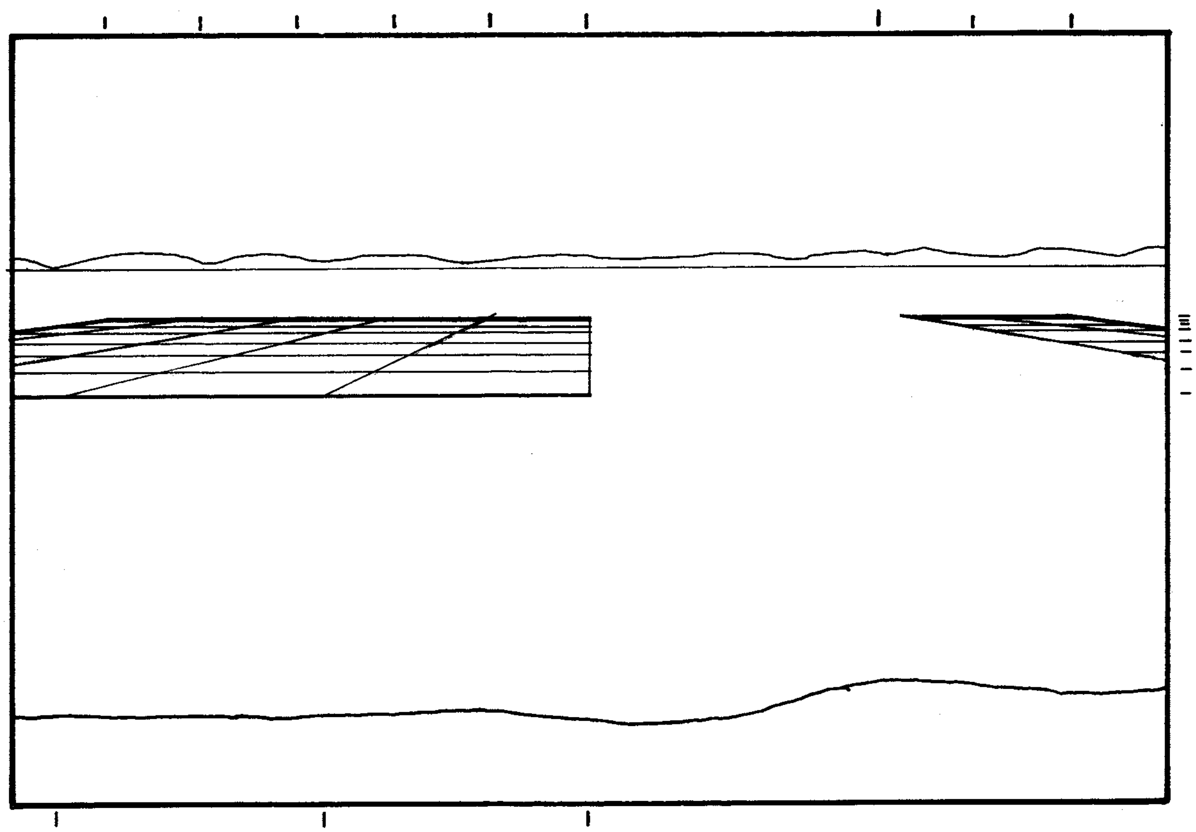
Distance Offshore: 300 ft.
Observer Position: 30 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 5 · Computer Simulation - View 2



5 Acres 100 ft. Grid

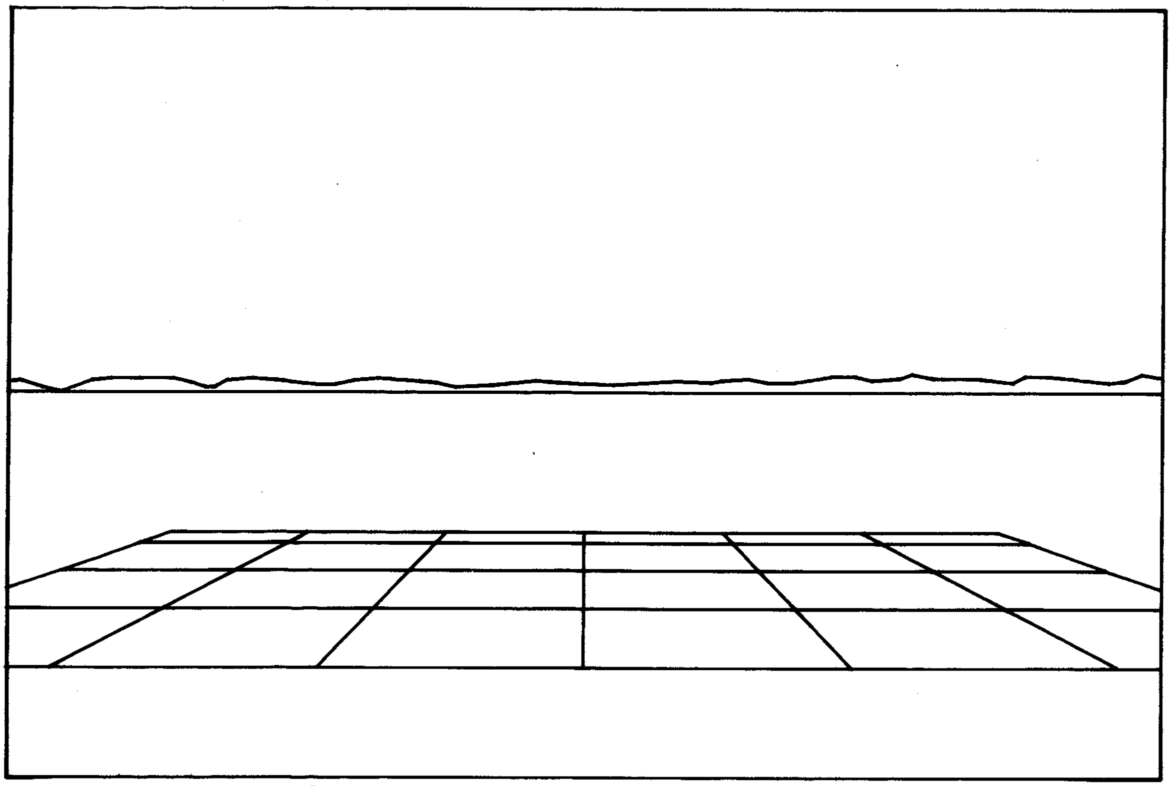


(2 Adjacent Projects)
7.5 and 3 Acres 100' Grid

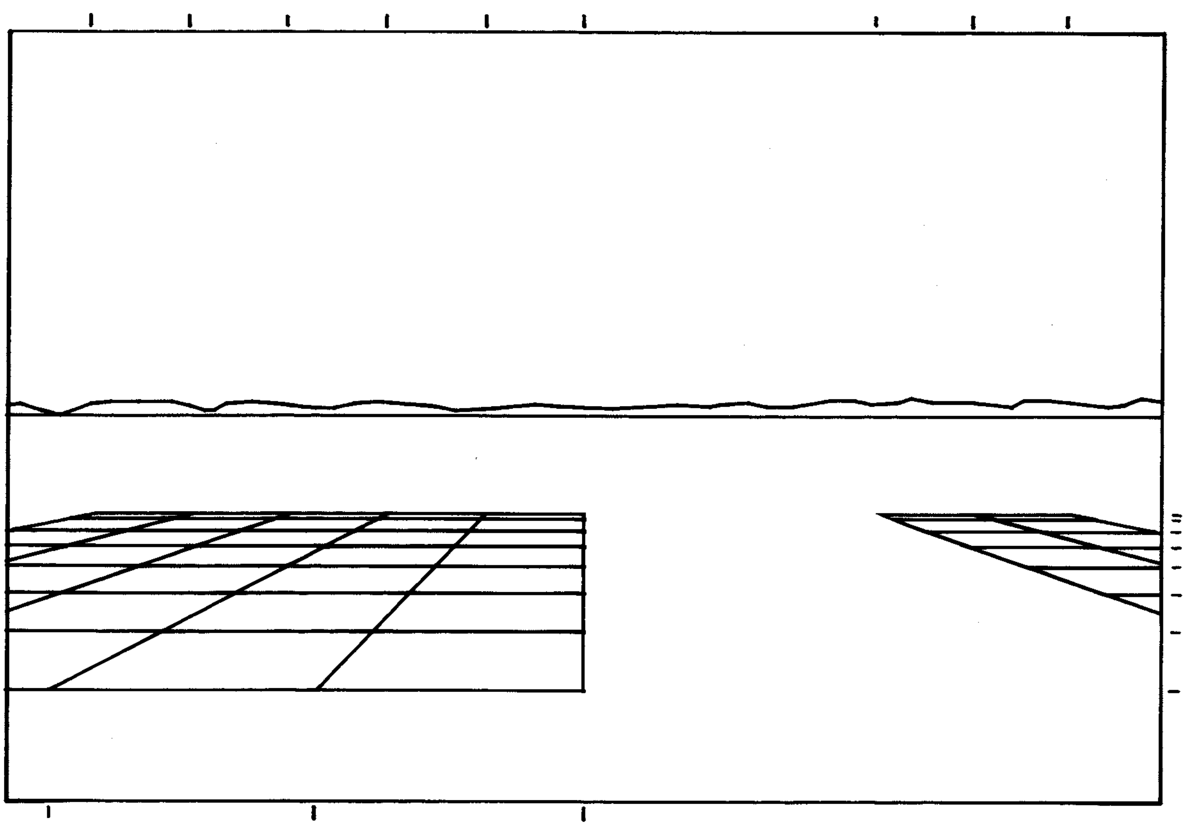
## Distance Offshore: 300 ft.
## Observer Position: 55 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 6 - Computer Simulation - View 3



5 Acres 100 ft. Grid

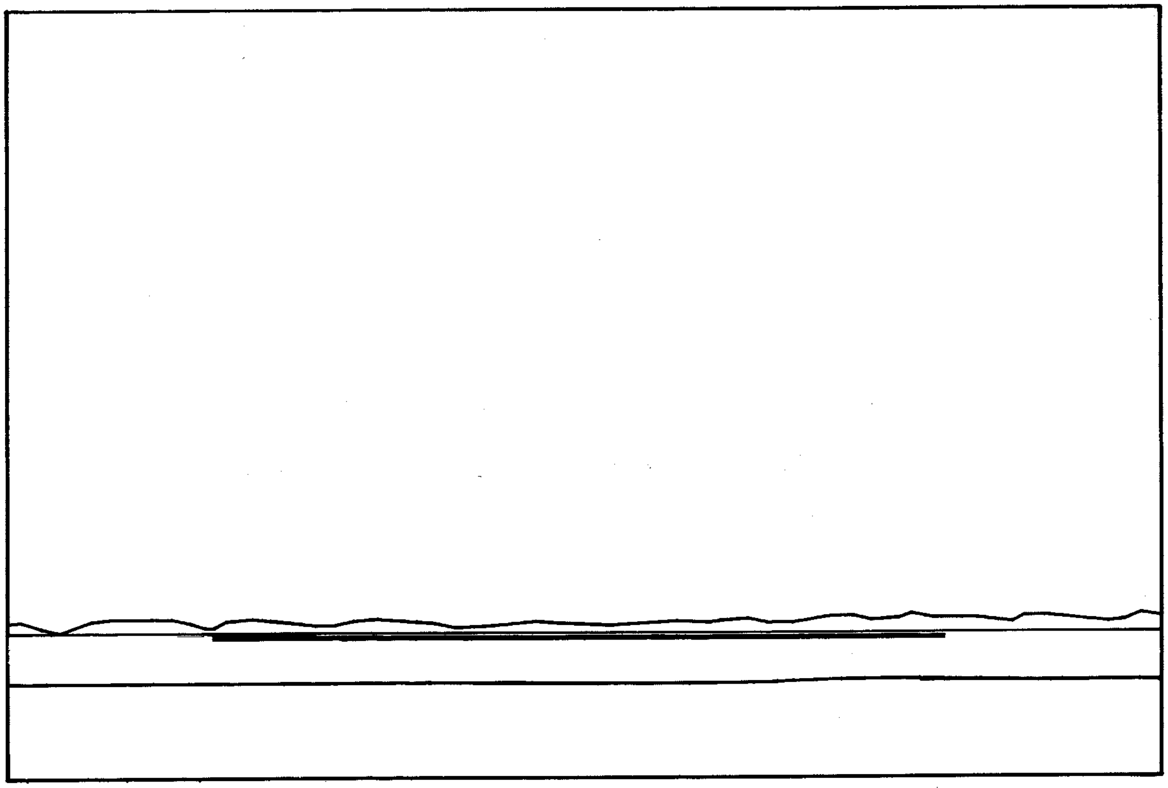


(2 Adjacent Projects)
7.5 and 3 Acres 100' Grid

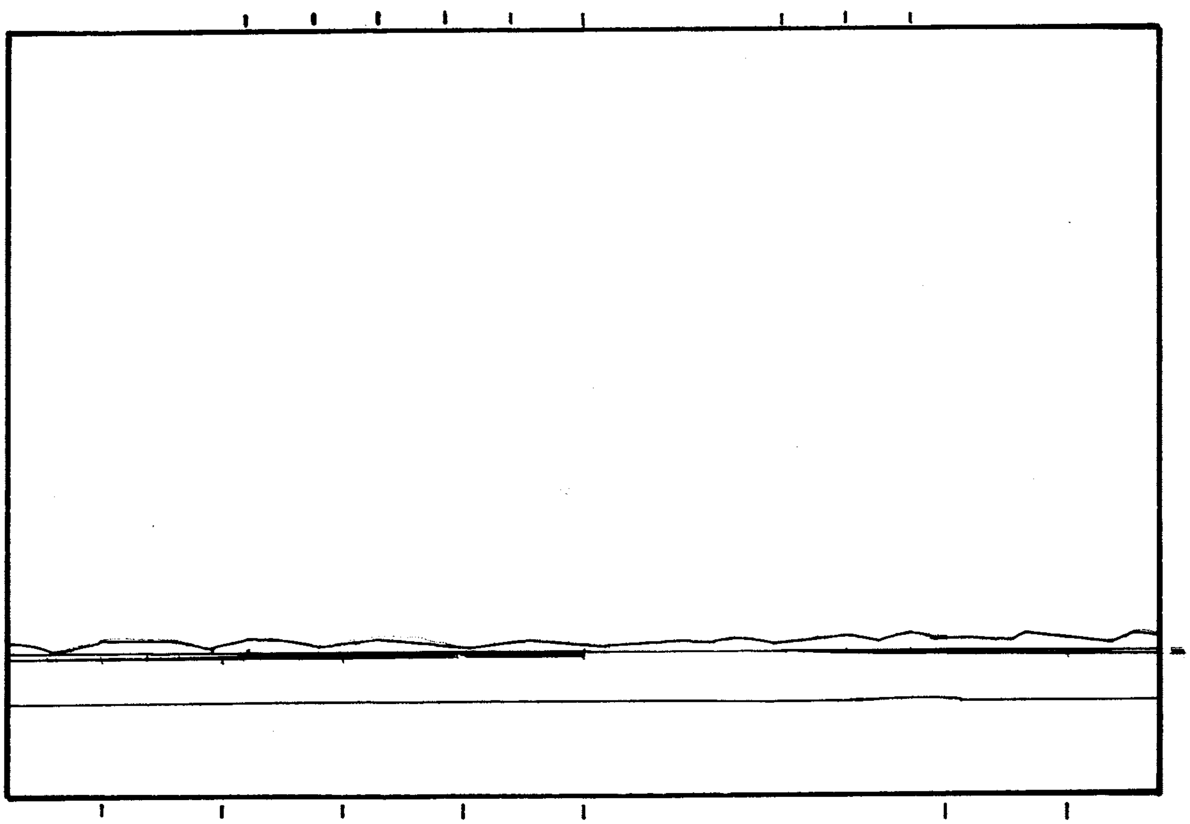
Distance Offshore: 300 ft.
Observer Position: 105 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 7 Computer Simulation - View 4



5 Acres 100 ft. Grid

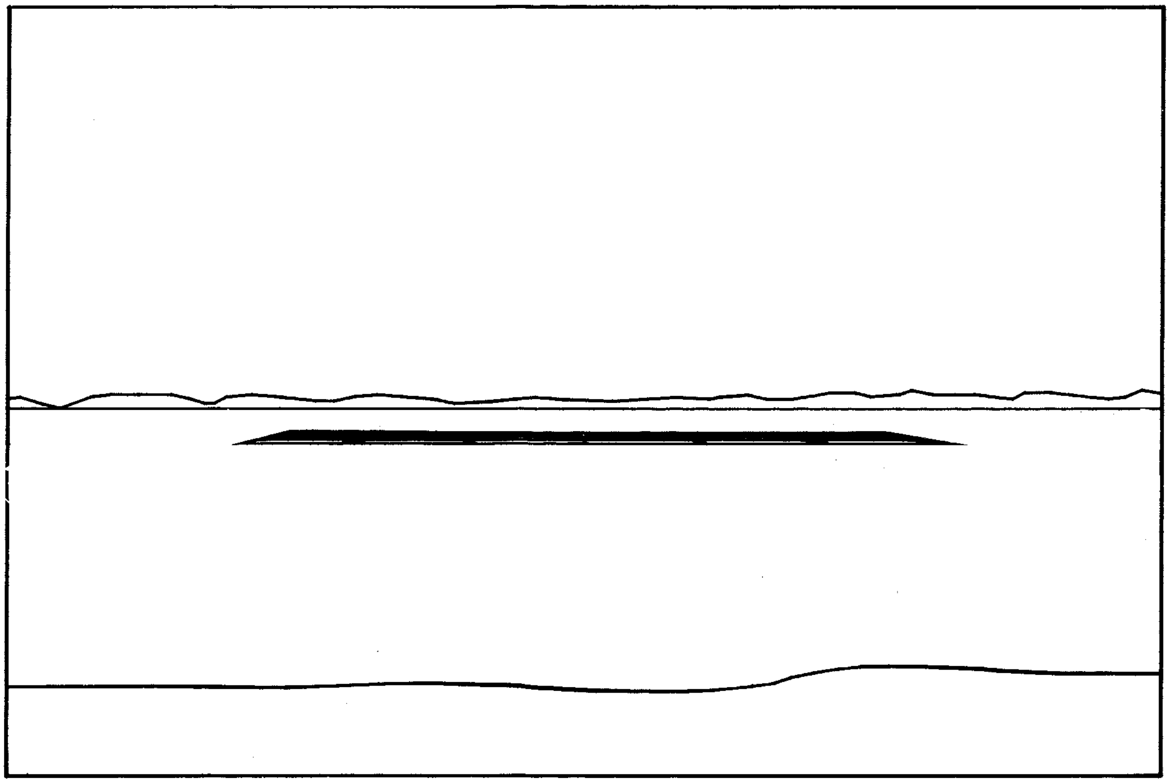


(2 Adjacent Projects)
7.5 and 3 Acres 100' Grid

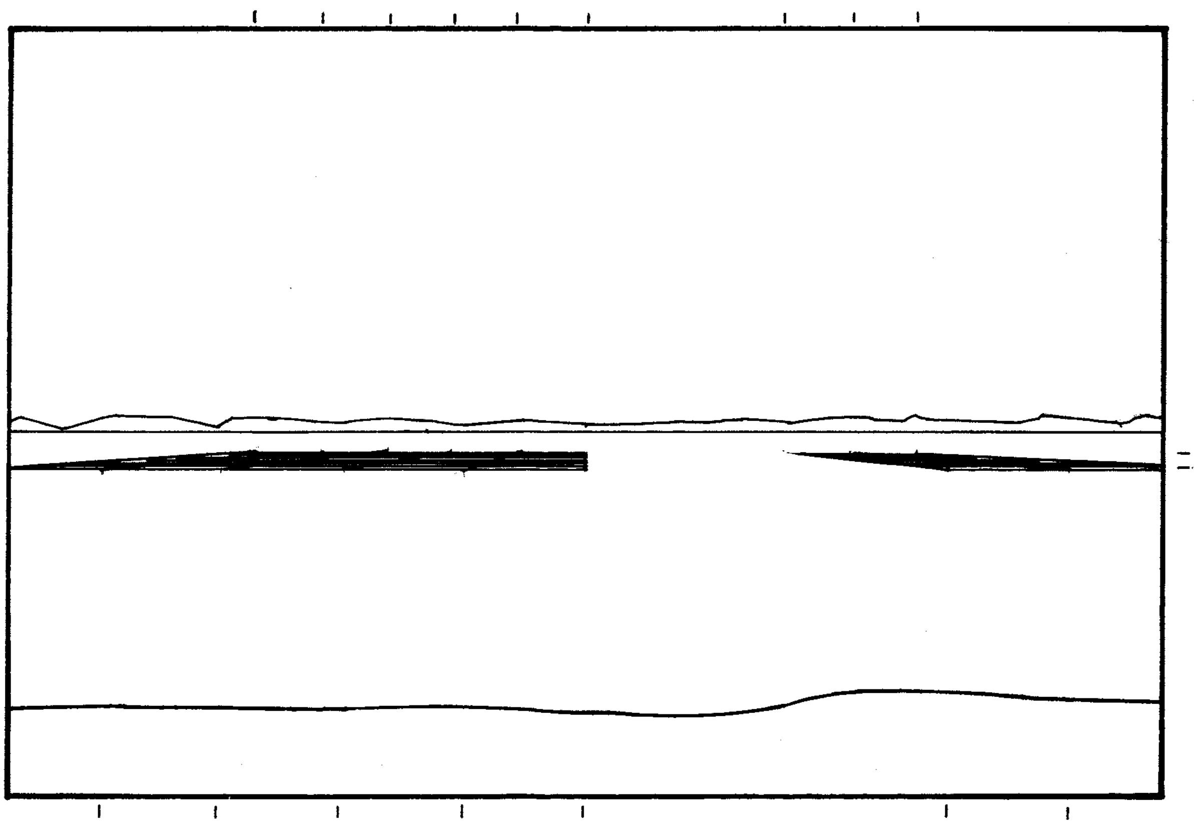
Distance Offshore: 750 ft.
Observer Position: 5 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 8. Computer Simulation - View 5



5 Acres 100 ft. Grid

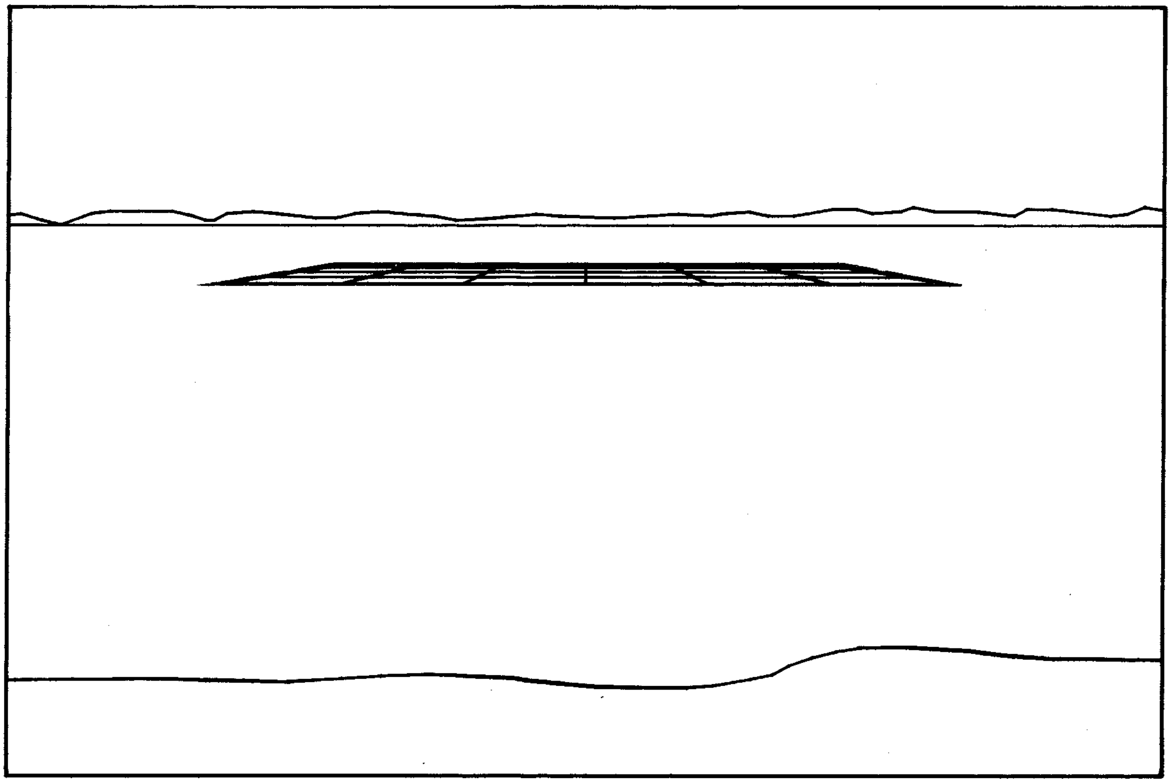


(2 Adjacent Projects)
7.5 and 3 Acres 100′ Grid

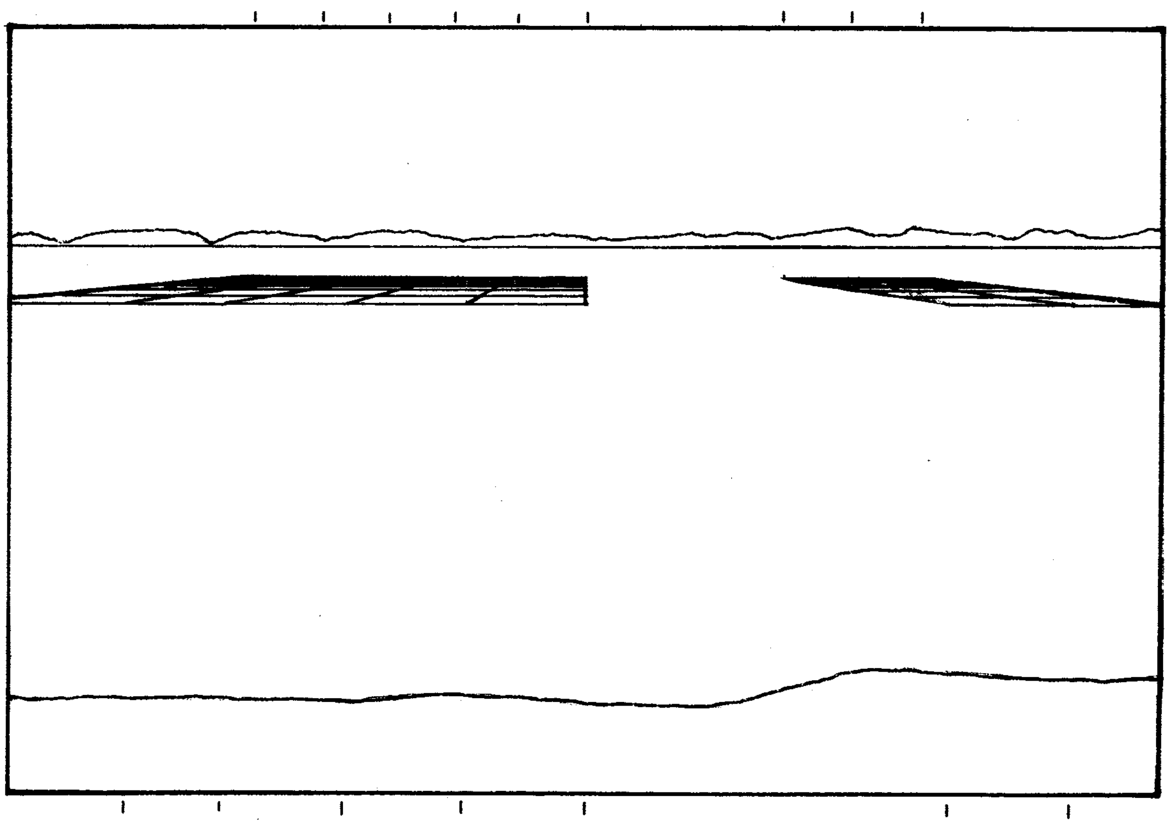
Distance Offshore: 750 ft.
Observer Position: 30 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 9 Computer Simulation - View 6



5 Acres 100 ft. Grid

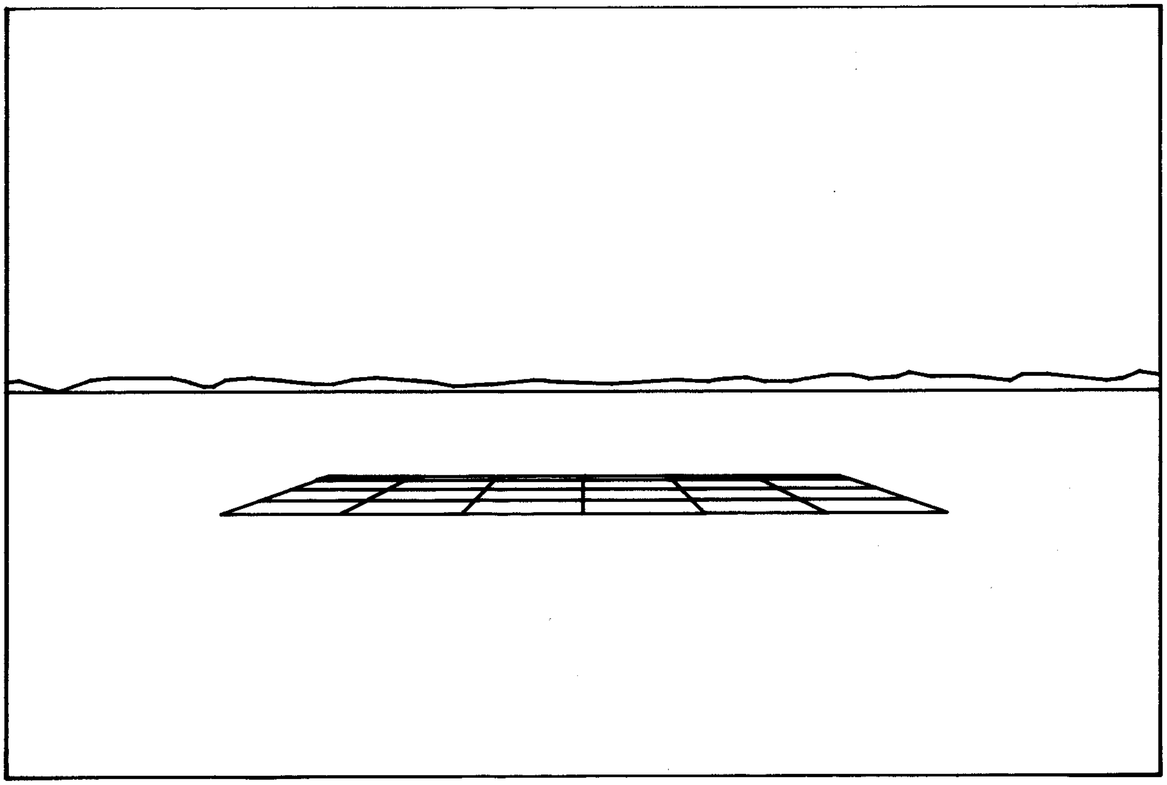


(2 Adjacent P Projects)
7.5 and 3 Acres 100' Grid

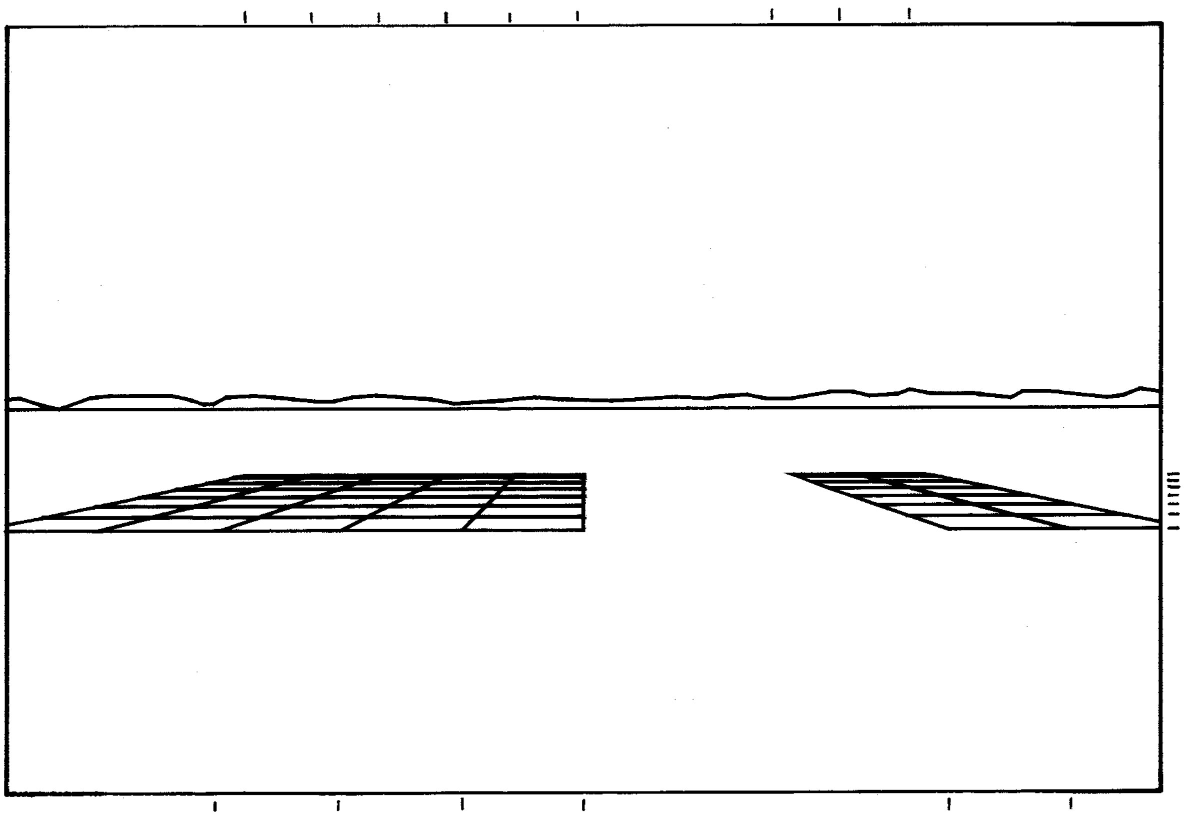
Distance Offshore: 750 ft.
Observer Position: 55 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 10' Computer Simulation - View 7



5 Acres 100 ft. Grid

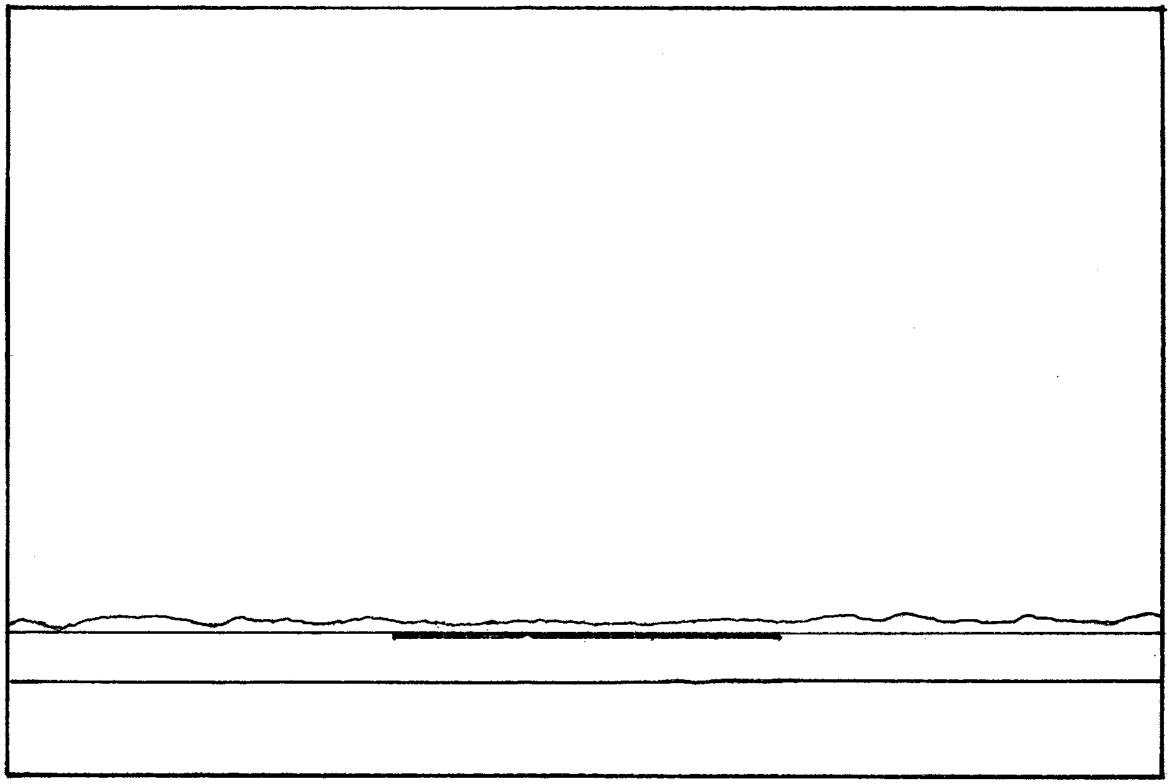


(2 Adjacent Projects )
7.5 and 3 Acres 100′ Grid

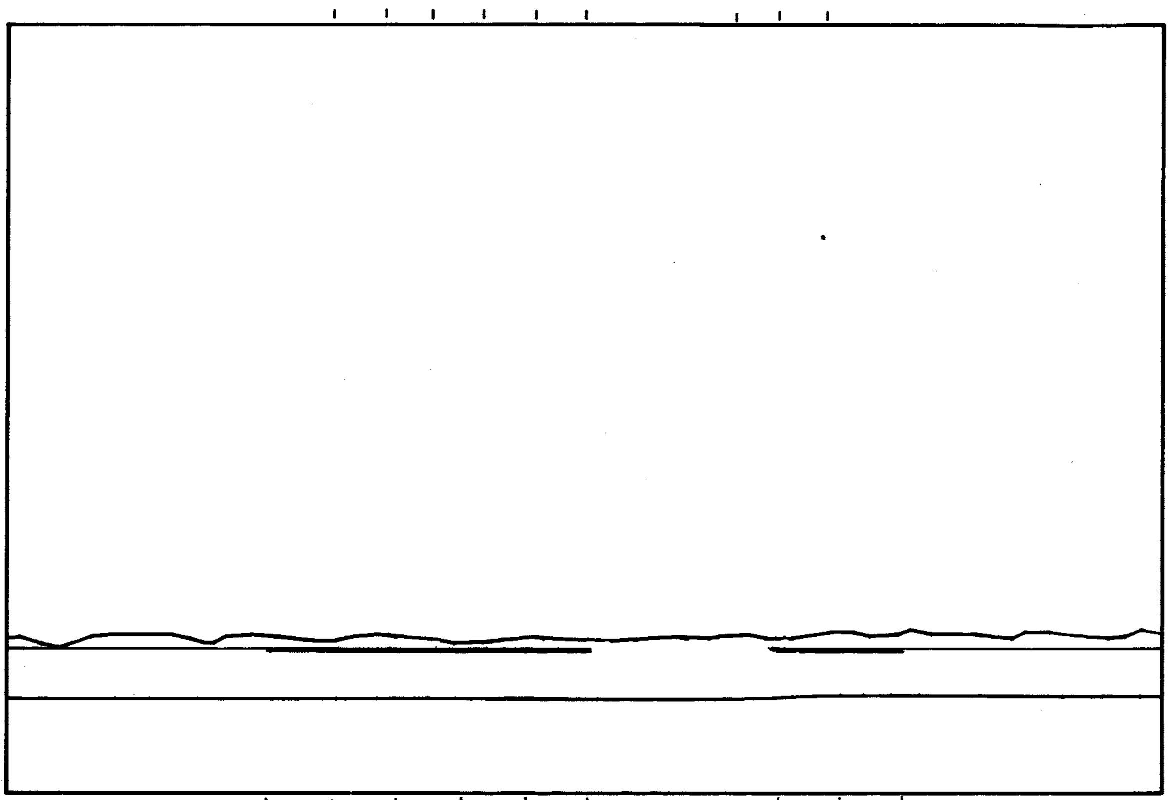
## Distance Offshore: 750 ft.
## Observer Position: 105 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 11 Computer Simulation - View 8



5 Acres 100 ft. Grid

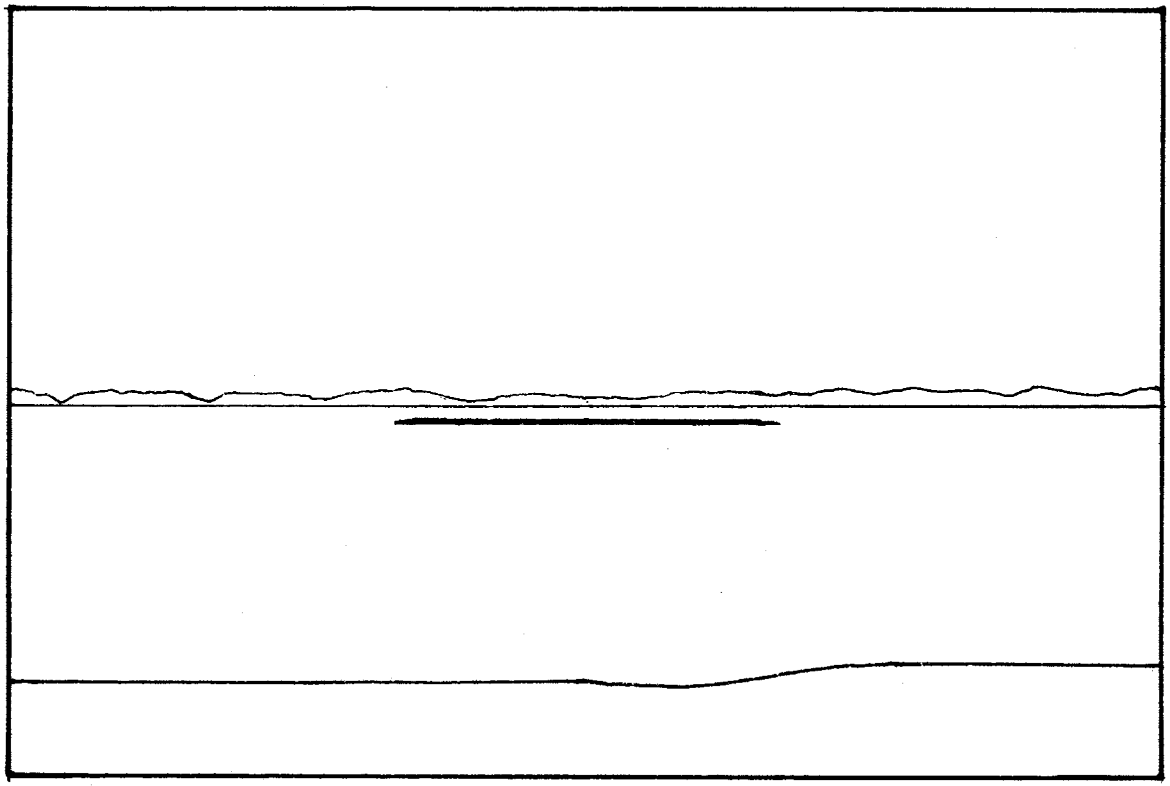


(2 Adjacent Projects)
7.5 and 3 Acres 100' Grid

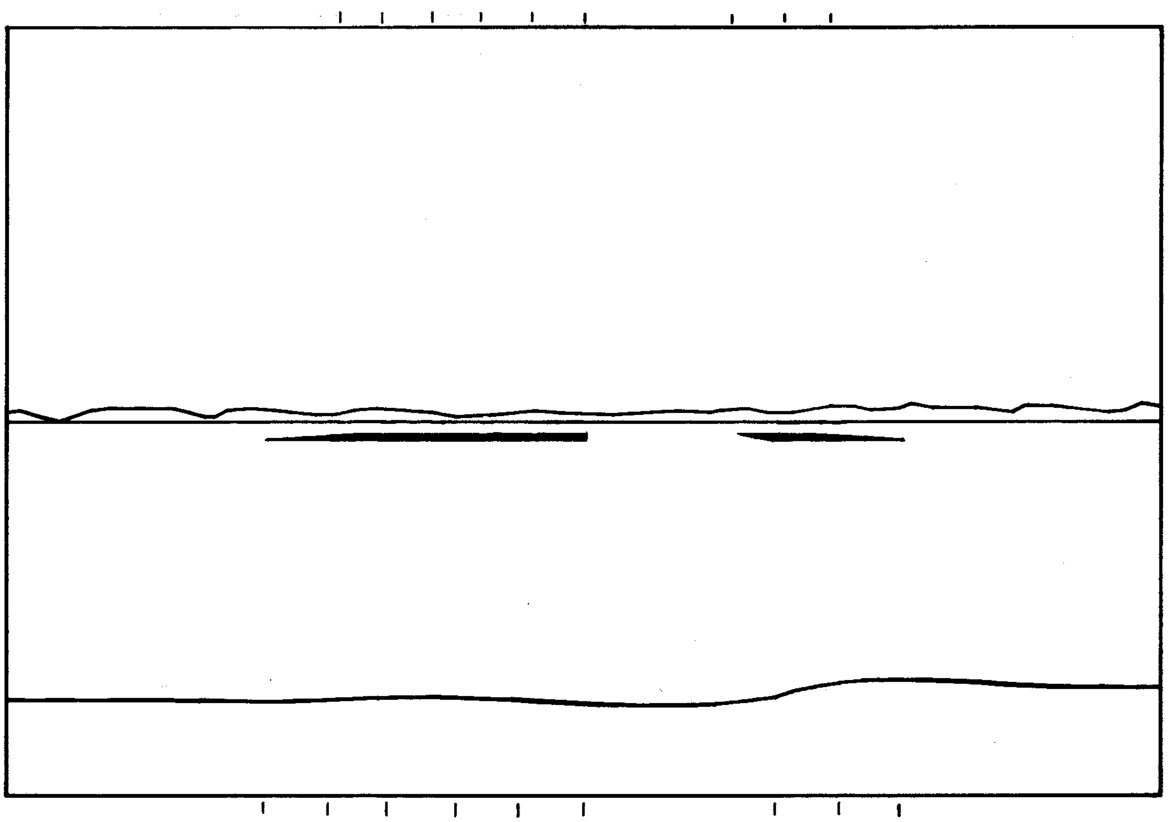
## Distance Offshore: 1,500 ft.
## Observer Position: 5 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 12' Computer Simulation - View 9



5 Acres 100 ft. Grid

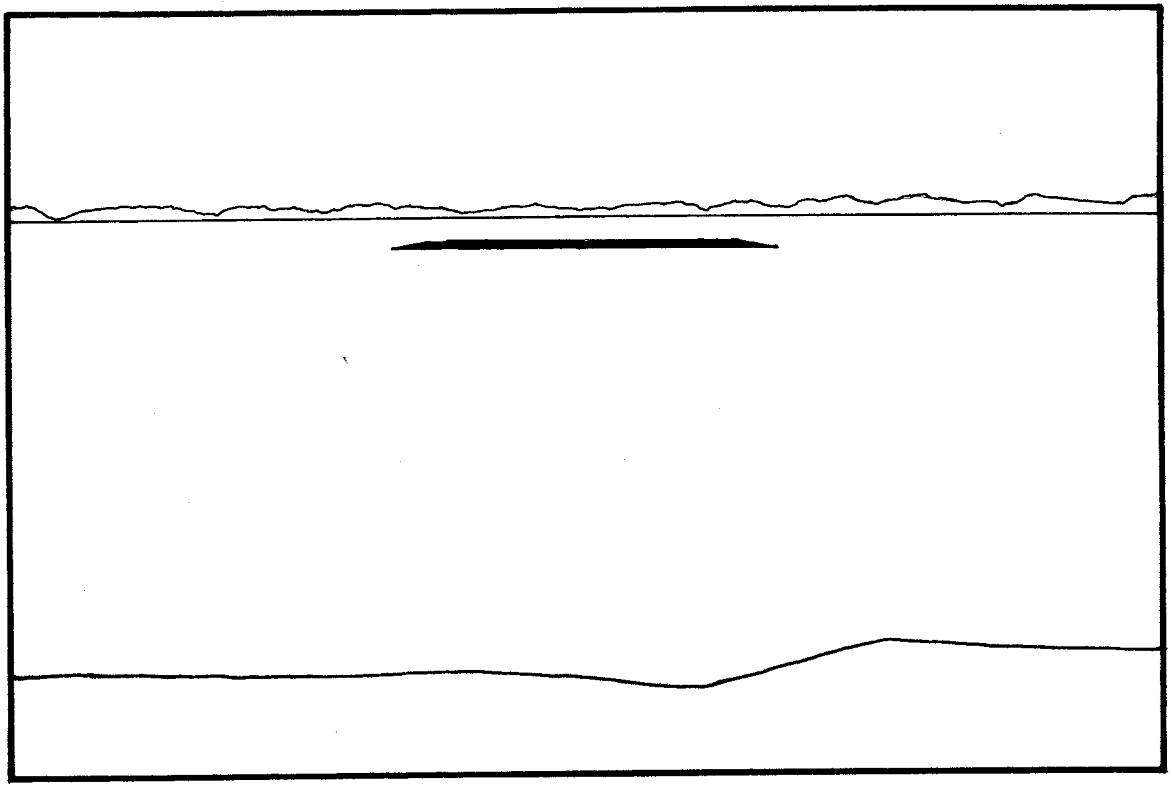


(2 Adjacent Projects)
7.5 and 3 Acres 100' Grid

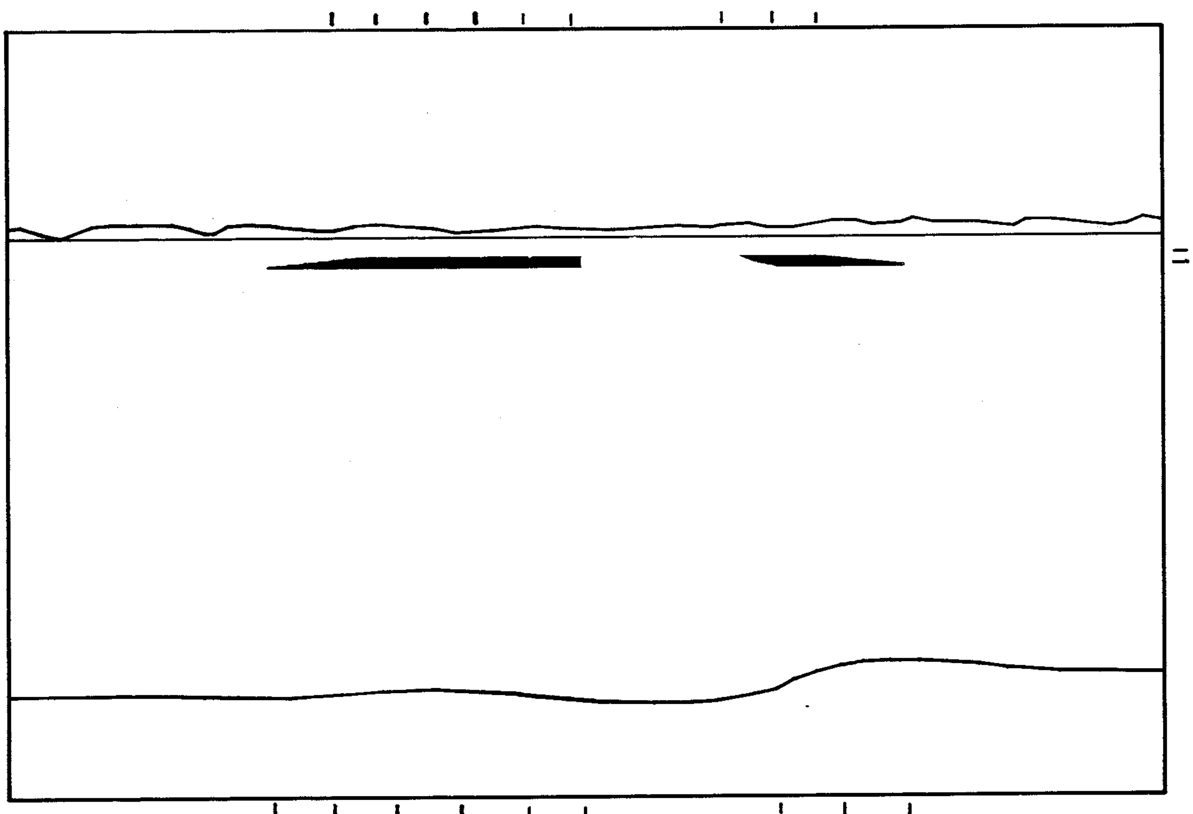
## Distance Offshore: 1,500 ft.
## Observer Position: 30 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 13 Computer Simulation - View 10



5 Acres 100 ft. Grid

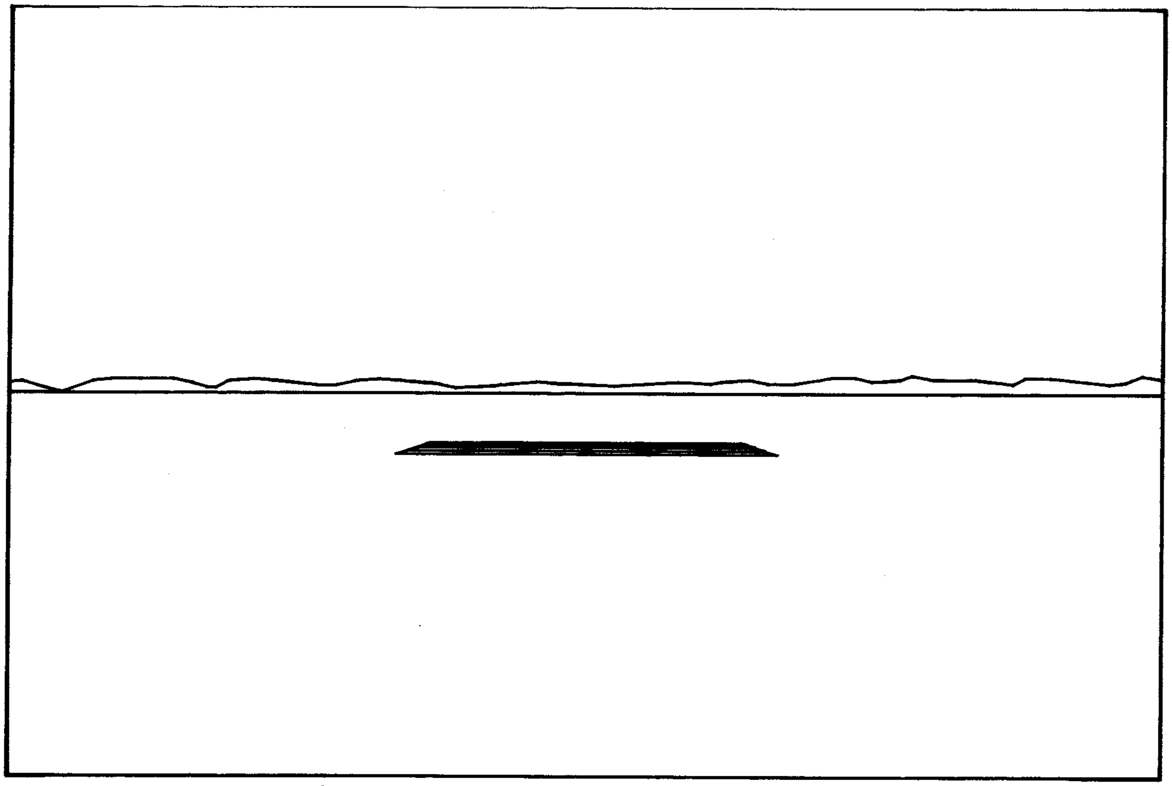


(2 Adjacent Projects)
7.5 and 3 Acres 100' Grid

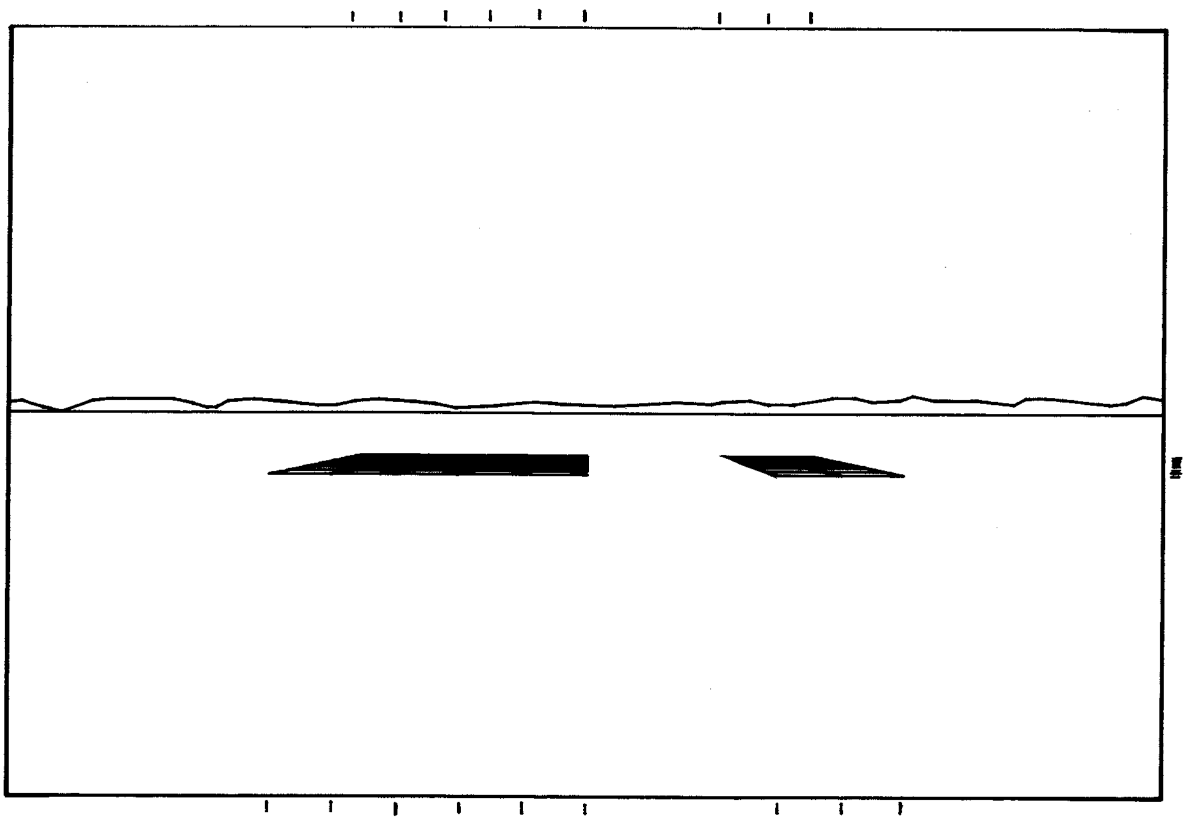
Distance Offshore: 1,500 ft.
Observer Position: 55 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 14 Computer Simulation - View 11



5 Acres 100 ft. Grid



(2 Adjacent Projects)
7.5 and 3 Acres 100' Grid

Distance Offshore: 1,500 ft.
Observer Position: 105 ft. Above Sealevel

# Typical Aquaculture Facility

Figure 15 Computer Simulation - View 12

## Photo Simulations

Twelve photo simulations illustrate an array of types, sizes, and colors of aquaculture facilities at five representative Puget Sound sites (Figure 16). They indicate that facility size, distance offshore, embayment size, the observer's height above sea level, and color determine the level of visual impact from proposed aquaculture facilities.

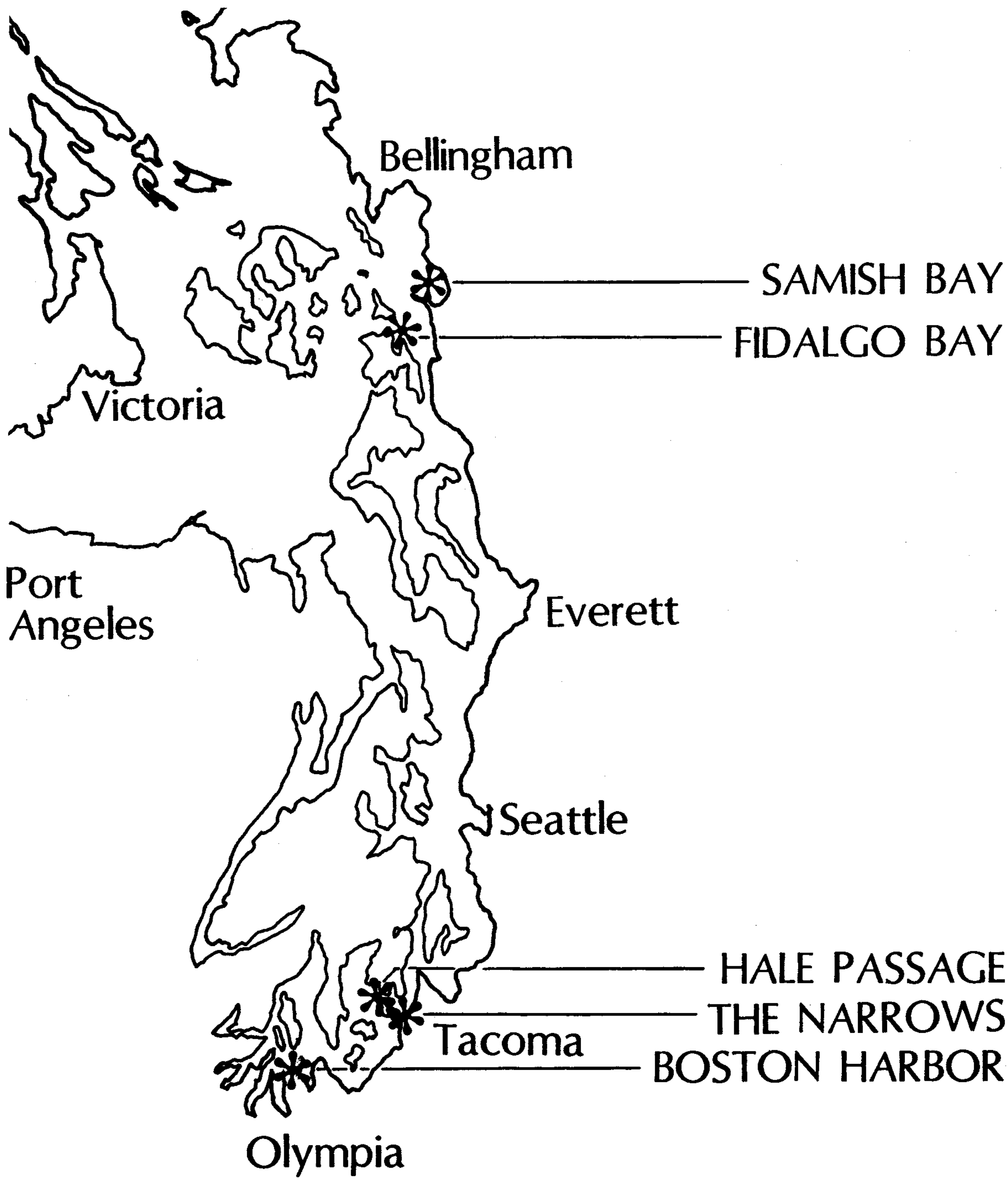



Figure 16 Representative Sites

## Methodology

The photo simulations are created through a three-step process: site selection, deployment of project sets, and photo renderings. Each is described below and shown by the accompanying black and white photographs and color slides.

Five representative Puget Sound sites provide the project settings for the photo simulations. They include Samish Bay and Fidalgo Bay in Skagit County; Hale Passage and The Narrows in Pierce County; and Boston Harbor in Thurston County. The five represent a range of landscape settings. The Narrows site is viewed only from adjacent private residences. The other four sites are visible from both public and private viewers. Samish Bay is a natural scenic environment. Fidalgo Bay is an industrial oil port. Samish Bay is wide open, over 4-1/2 miles across. Hale Passage is narrow and enclosed, less than 1/2 mile across. Samish Bay is viewed from high above and at sea level. The other four sites are viewed from intermediate heights.

Accurate dimensions for the photo simulations are established by project sets at each representative site. Marker floats outline the location of prototypical aquaculture facilities. Each project set is then photographically documented from key observation points.

Once the photographs are obtained and processed, simulation of project detail is added to the prints relying on marker locations to obtain needed accuracy. The prints are then rephotographed and converted to color slides and black and white prints.

The three types of aquaculture facilities shown in the photo renderings are shellfish longlines, mussel rafts and salmon pens. They range in size from less than one acre in surface coverage up to nearly fifteen acres in surface coverage. The following matrix summarizes the site, facility design, and observer position for each of the twelve renderings.

| | | OBSERVER POSITION | | TYPE & SIZE | | | COLOR | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SITE LOCATION | DISTANCE TO FACILITY OFFSHORE | HEIGHT ABOVE SEA LEVEL | DISTANCE FROM SHORE-LINE | MUSSEL RAFTS | SHELL-FISH LONG-LINES | SALMON PENS | LIGHT BLUE-GREEN | BLACK | WHITE | GREY OR NATURAL WOOD |
| SAMISH BAY<br>View southwest, from Windy Point, along Chuckanut Drive<br>Natural/Rural | 300' | 60' | 100' | | 5 & 8 Acres | | X | | | |
| SAMISH BAY<br>View southwest, from Windy Point, along Chuckanut Drive<br>Natural/Rural | 300' | 60' | 100' | | | 2.5 Acres | X | | | |
| SAMISH BAY<br>View southwest, from Windy Point, along Chuckanut Drive<br>Natural/Rural | 1,000'/<br>1,500' | 60' | 100' | | | 3.75 Acres | | X | | |
| SAMISH BAY<br>View northwest, from Blanchard at south end of Bay<br>Natural/Rural | 1,000' | 1' | 20' | | 15 Acres | | X | | | |
| SAMISH BAY<br>View northwest, from Blanchard at south end of Bay<br>Natural/Rural | 1,000' | 1' | 20' | | | 3.75 Acres | X | | | |
| FIDALGO BAY<br>View north, from March Point, at entrance to Bay<br>Industrial/Urban | 500'/<br>1,350' | 20' | 40' | | | 2.8 Acres | | X | | |
| HALE PASSAGE<br>View south, from Warren<br>Low Density/ Residential | 1,600' nearshore<br>500' farshore | 60' | 550' | | 5 Acres | | | X | | |
| HALE PASSAGE<br>View south from Warren<br>Low Density/ Residential | 1,600' nearshore<br>500' farshore | 60' | 550' | .25 Acre | | | | | | X |
| THE NARROWS<br>View northeast, from Hope toward Tacoma Narrows Bridge<br>Low Density/ Residential | 400' | 10' | 20' | | 4 Acres | | | | X | |
| THE NARROWS<br>View northeast, from Hope toward Tacoma Narrows Bridge<br>Low Density/ Residential | 450' | 10' | 20' | | 1.1 Acres | | | | | X |
| BOSTON HARBOR<br>View north, from DNR Marina, toward Squaxin Island<br>Low Density/ Residential | 1,000' | 10' | 20' | | | 1.25 Acres | | | | X |
| BOSTON HARBOR<br>View north, from DNR Marina, toward Squaxin Island<br>Low Density/ Residential | Attached to end of dock | 10' | 20' | | | .8 Acres | | | | X |

**Figure 17 Photo Simulations Matrix**

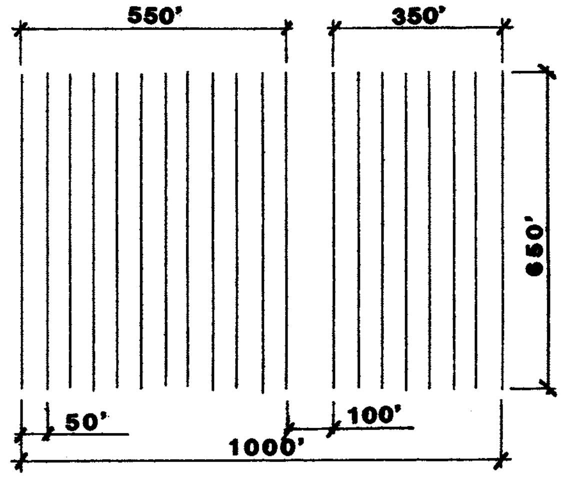
# Samish Bay

SITE
Size: 4-1/2 x 4-1/2 mile embayment
Adjacent Land Use: Natural/Rural
Access: Very public

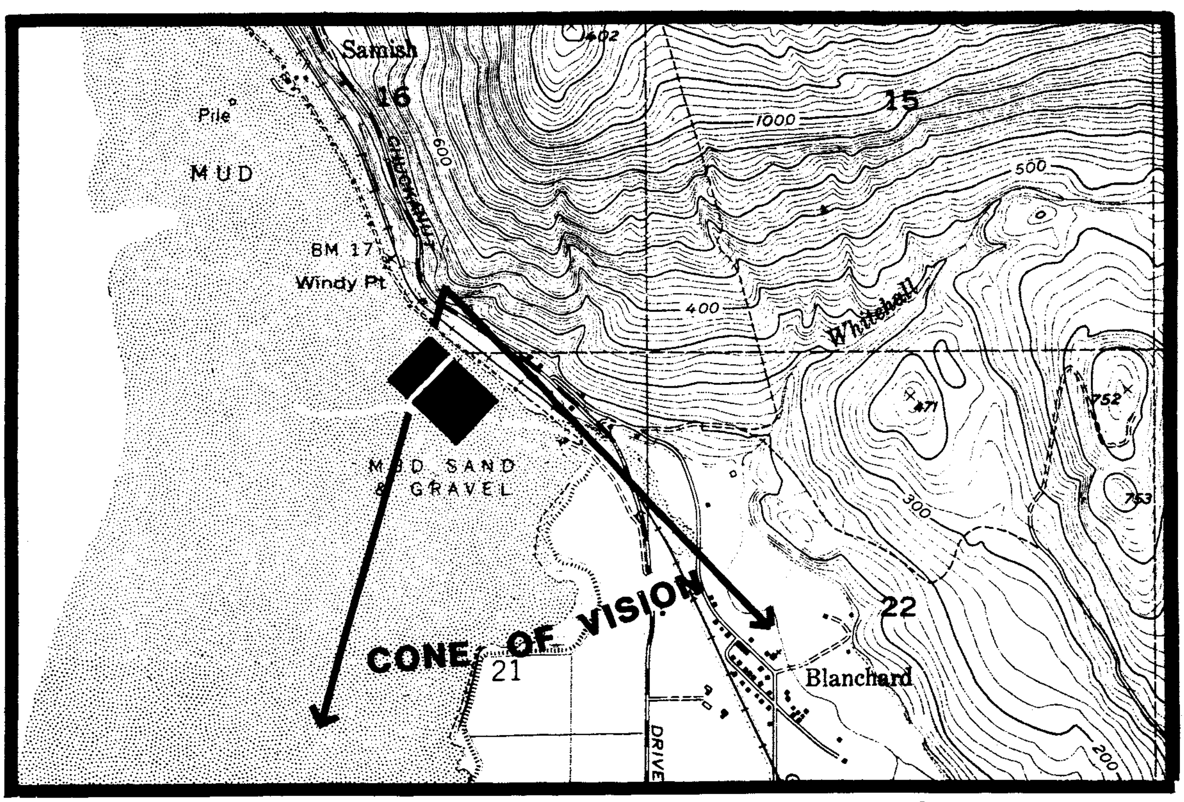
AQUACULTURE FACILITY
Type: Shellfish longlines w/ 14" dia. buoys 7 ft. o.c.
Water Surface Coverage: 8 acres 550 ft. x 650 ft. and 5 acres 350 ft. x 650 ft.

Color: Aquamarine
Distance Offshore: 300 ft.

OBSERVER POSITION
Distance from Shoreline: 100 ft.
Height Above Water: 60 ft.
Direction of View: South




Facility Configuration




Site Map

Scale:1"=2000'

Figure 18 Samish Bay (Windy Point) - Site Map

Figure 19 Samish Bay (Windy Point) - Existing Conditions

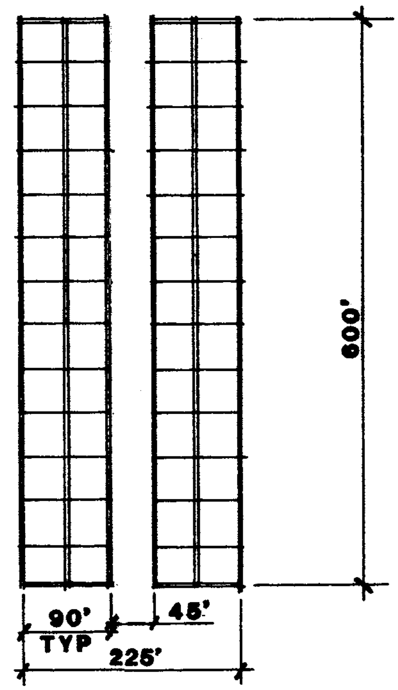
Figure 20 Samish Bay (Windy Point) - 8 and 5 Acre Shellfish Longlines (Simulation)

# Samish Bay

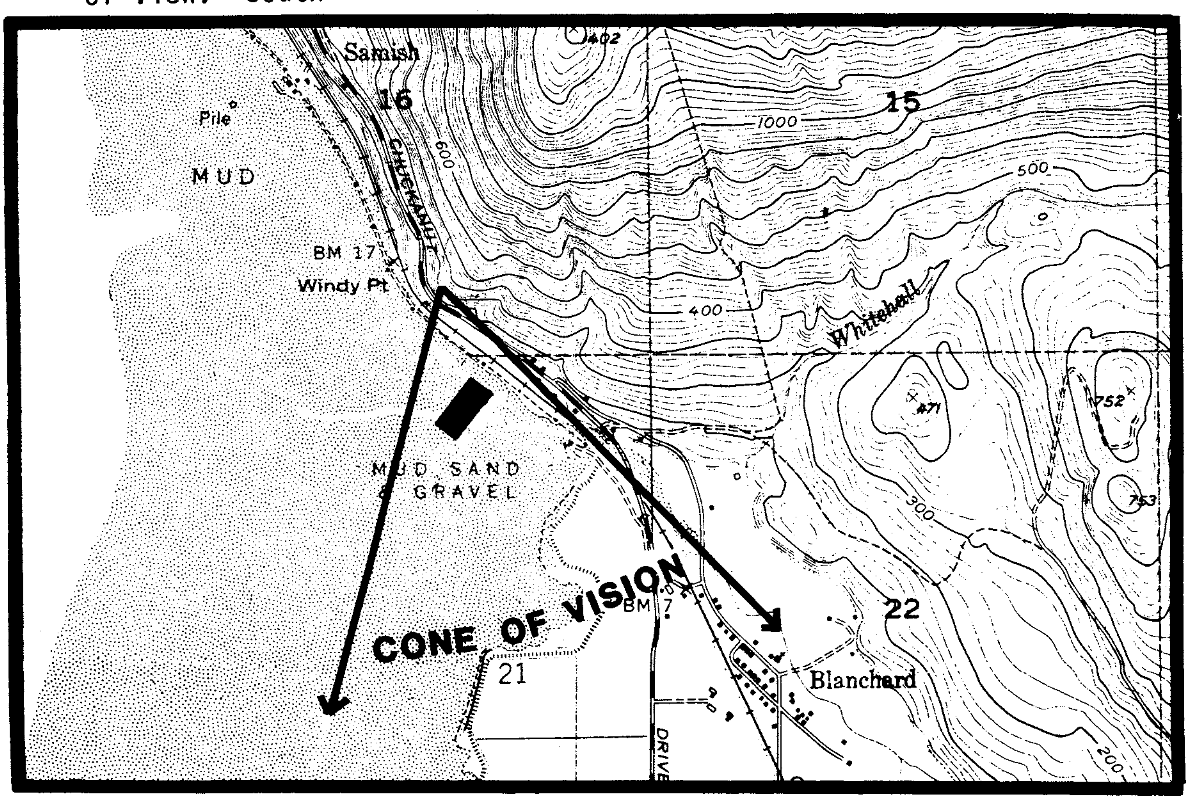
SITE
Size: 4-1/2 x 4-1/2 mile embayment
Adjacent Land Use: Natural/Rural
Access: Very public

AQUACULTURE FACILITY
Type: Salmon pens w/ plastic pipe and wood decking
Water Surface Coverage: 2.5 acres (2) 90 ft. x 600 ft., Individual pen-40 ft. x 40 ft.
Color: Aquamarine and natural wood
Distance Offshore: 300 ft.

OBSERVER POSITION
Distance from Shoreline: 100 ft.
Height Above Water: 60 ft.
Direction of View: South




Facility Configuration




Site Map

Scale: 1"=2000'

Figure 21 Samish Bay (Windy Point) - Site Map

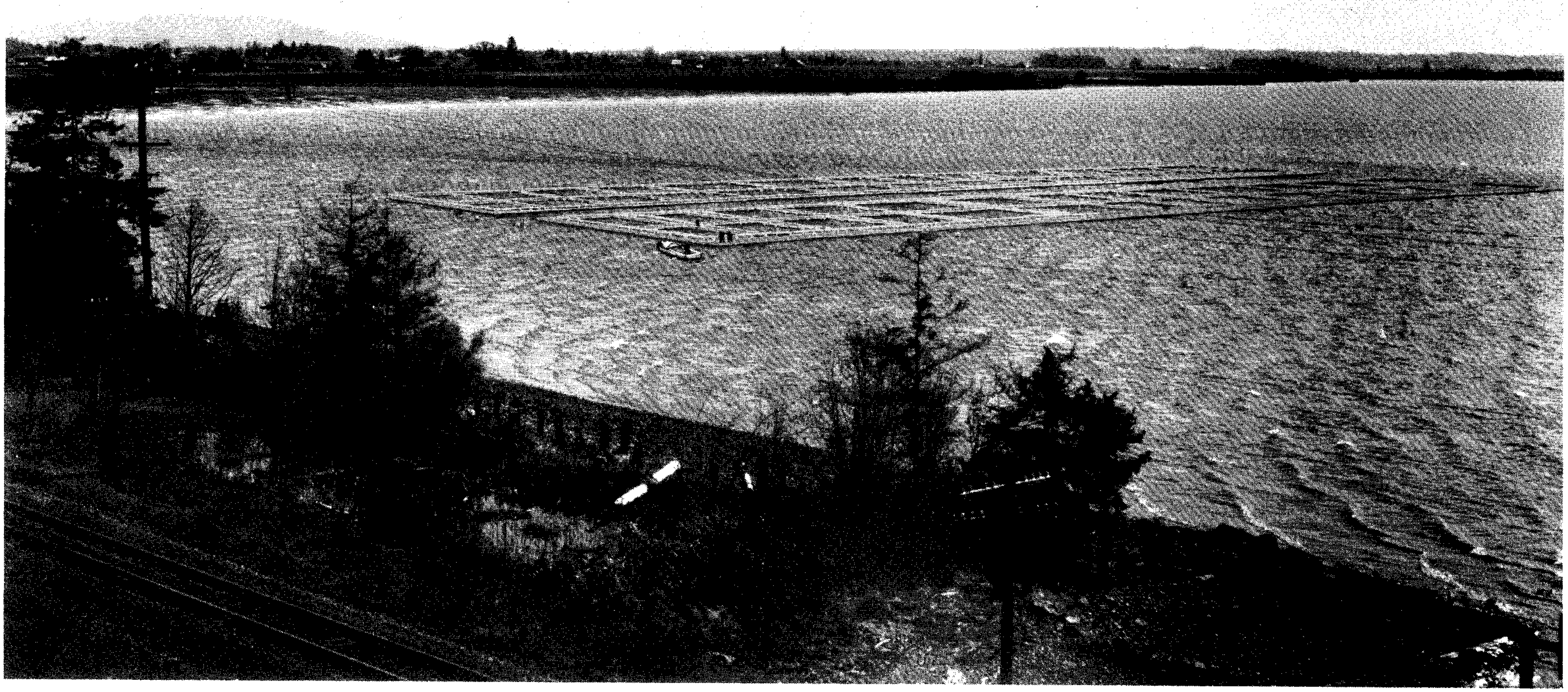


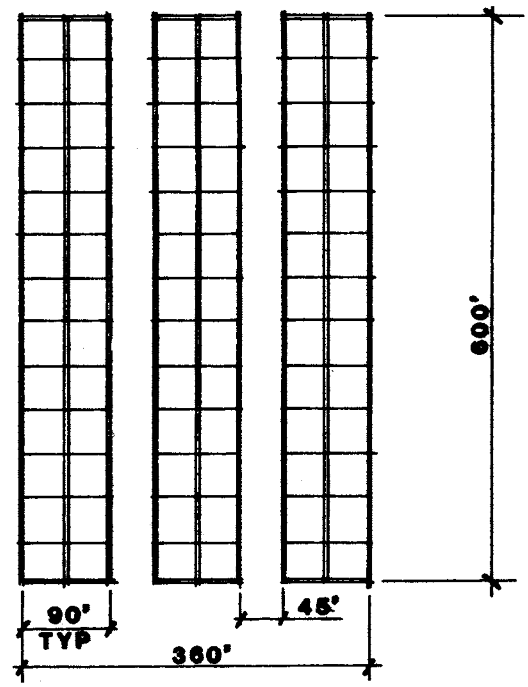
Figure 22 Samish Bay (Windy Point) - 2.5 Acre Salmon Pens (Simulation)

# Samish Bay

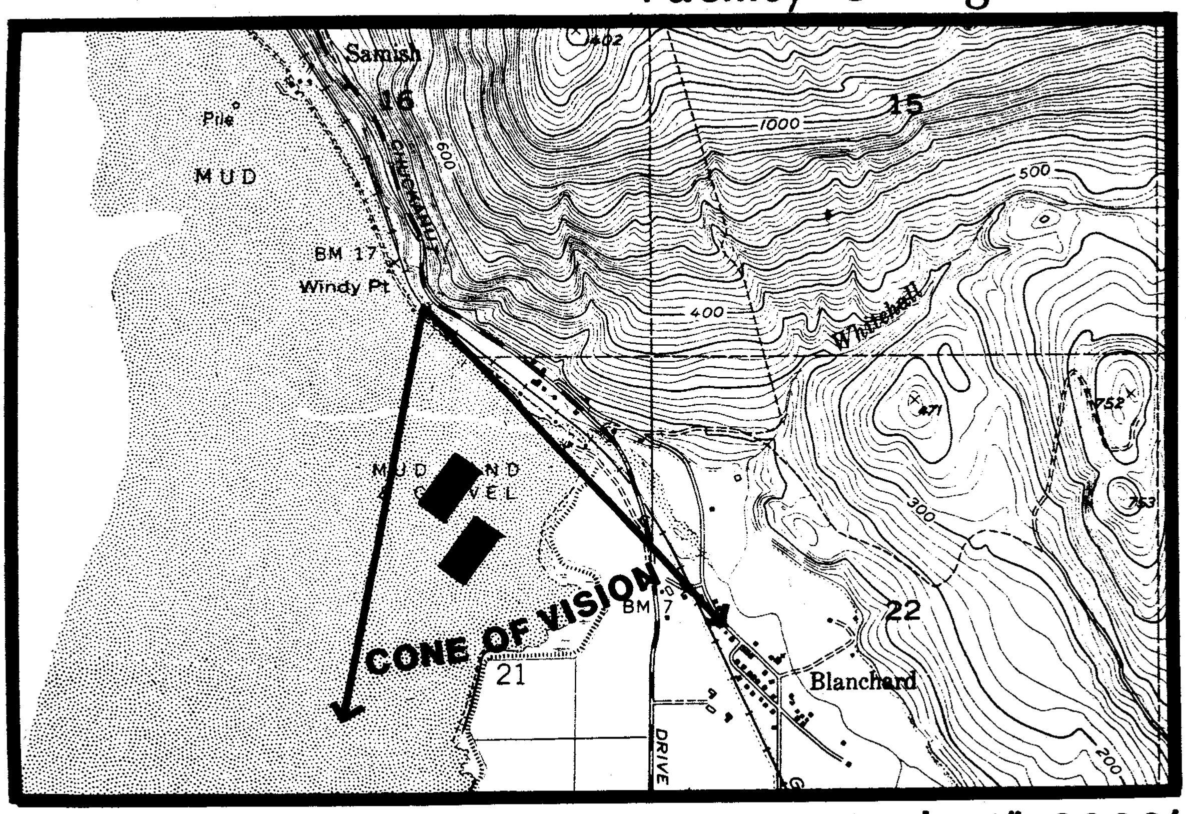
SITE
Size: 4-1/2 x 4-1/2 mile embayment
Adjacent Land Use: Natural/Rural
Access: Very public

AQUACULTURE FACILITY
Type: Salmon pens w/ plastic pipe and wood decking
Water Surface Coverage: (2) @ 3.75 Acres
Each 3 rows 90 ft. x 600 ft., separated by 200 ft. Individual pen-40 ft. x 40 ft.
Color: Black and natural wood
Distance Offshore: 1,000 ft. & 1,500 ft.

OBSERVER POSITION
Distance from Shoreline: 100 ft.
Height Above Water: 60 ft.
Direction of View: South




Facility Configuration




Site Map

Scale: 1"=2000'

Figure 23 Samish Bay (Windy Point) - Site Map

Figure 24 Samish Bay (Windy Point) - Two 3.7 Acre Salmon Pens (Simulation)

# Samish Bay

SITE

Size: 4-1/2 x 4-1/2 mile embayment

Adjacent Land Use: Natural/Rural

Access: Very public

AQUACULTURE FACILITY

Type: Shellfish longlines w/ 14" dia. buoys 7 ft.

Water Surface Coverage: 15 acres
650 ft. x 1,000 ft.

Color: Aquamarine

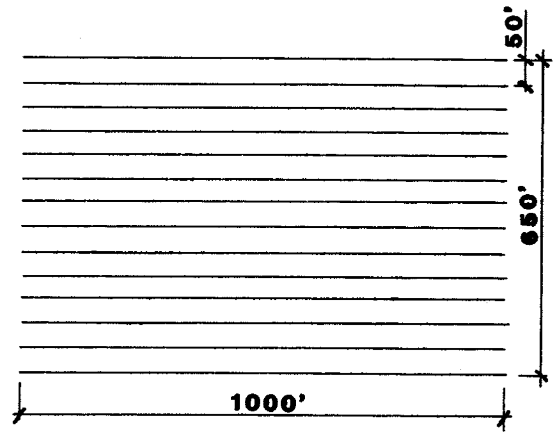
Distance Offshore: 1,000 ft.

OBSERVER POSITION

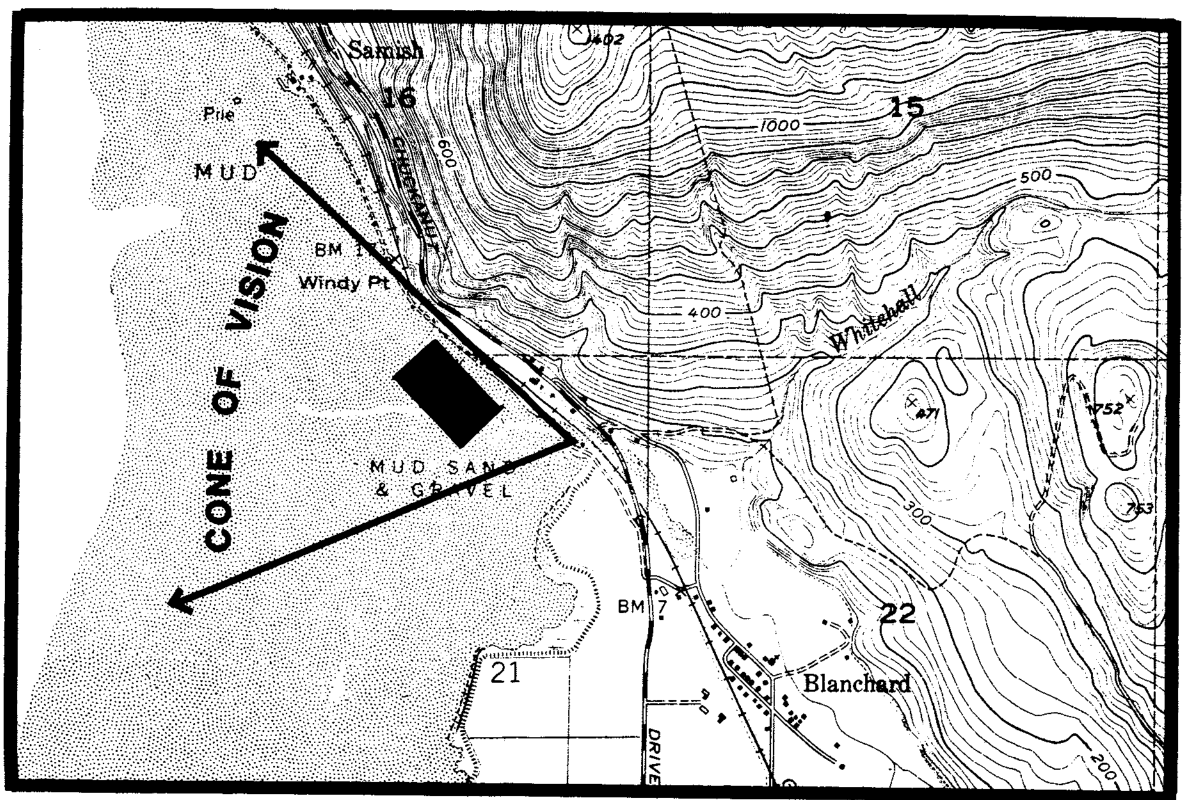
Distance from Shoreline: 20 ft.

Height Above Water: 1 ft.

Direction of View: Northwest toward Lummi Island




Facility Configuration




Site Map

Scale: 1"=2000'

Figure 25 Samish Bay (Blanchard) - Site Map

Figure 26   Samish Bay (Blanchard) - Existing Conditions

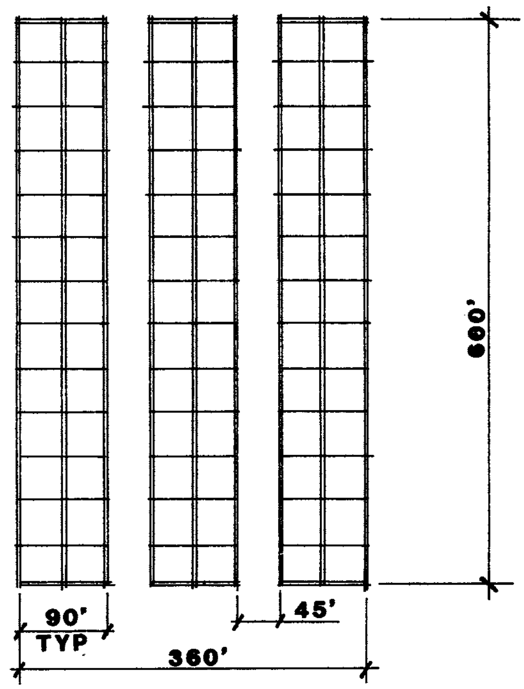
Figure 27 Samish Bay (Blanchard) - 15 Acre Shellfish Longlines (Simulation)

# Samish Bay

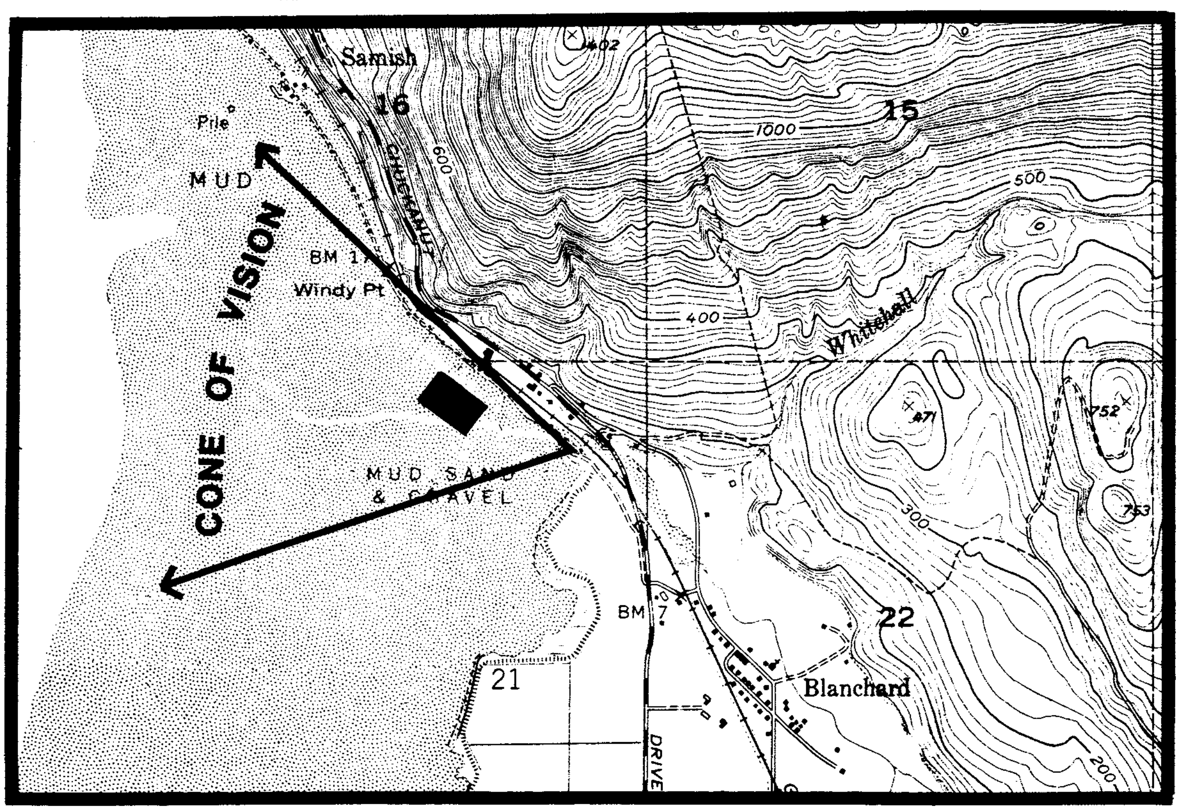
SITE
Size: 4-1/2 x 4-1/2 mile embayment
Adjacent Land Use: Natural/Rural
Access: Very public

AQUACULTURE FACILITY
Type: Salmon pens w/ plastic pipe and wood decking
Water Surface Coverage: 3.75 Acres
Each row 90 ft. x 600 ft.
Color: Aquamarine
Distance Offshore: 1,000 ft.

OBSERVER POSITION
Distance from Shoreline: 20 ft.
Height Above Water: 1 ft.
Direction of View: Northwest toward Lummi Island




Facility Configuration




Site Map

Scale: 1"=2000'

Figure 28 Samish Bay (Blanchard) - Site Map

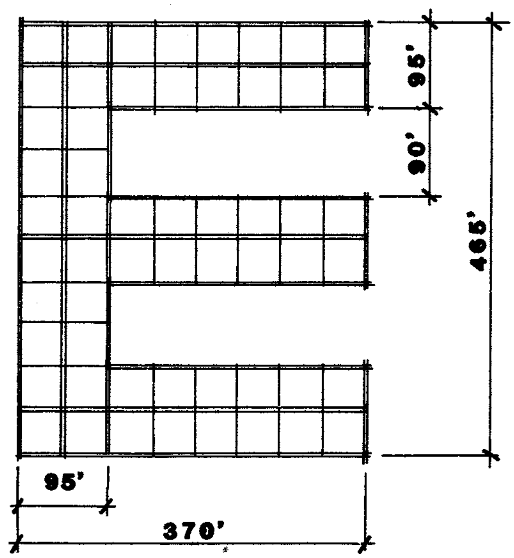
Figure 29 Samish Bay (Blanchard) - 3.75 Acre Salmon Pens (Simulation)

# Fidalgo Bay

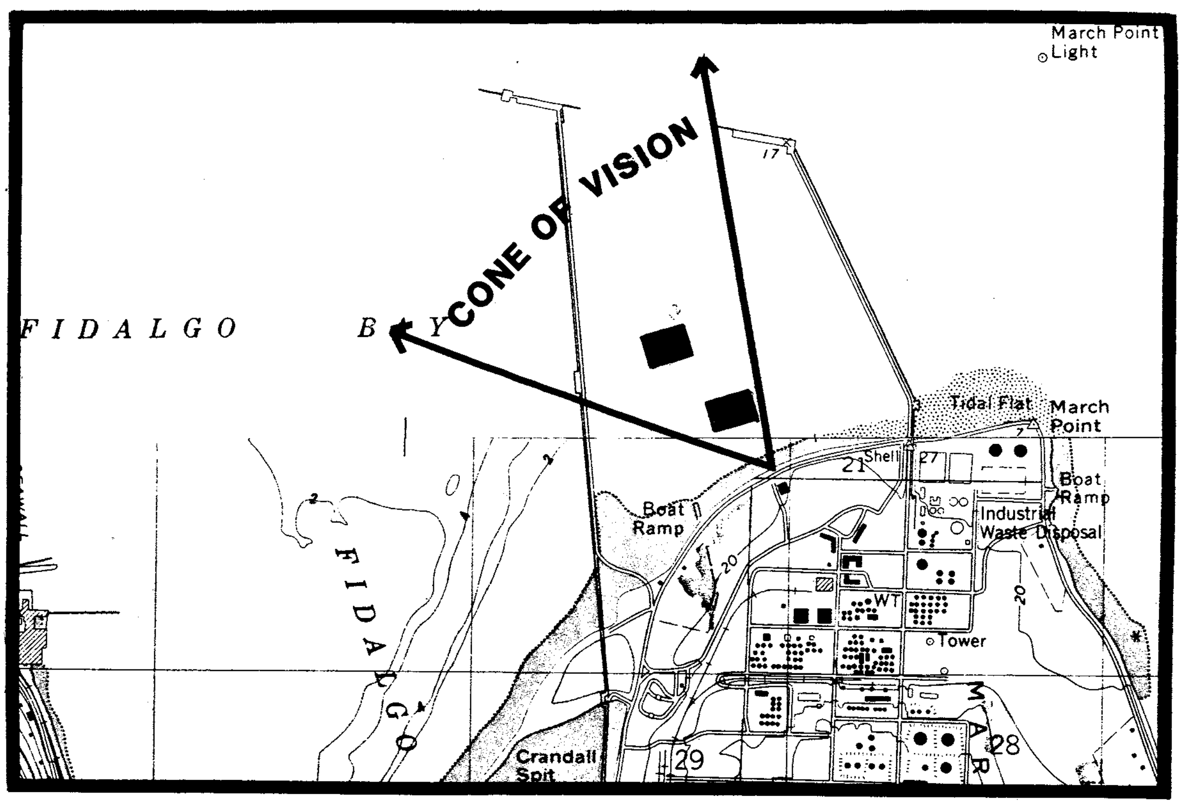
SITE
- Size: Dock enclosure - 4,000 ft. x 3,000 ft. Mouth of bay - 2 miles across
- Adjacent Land Use: Industrial foreground/Urban background
- Access: Very public

AQUACULTURE FACILITY
- Type: Salmon pens w/ plastic pipe and wood decking
- Water Surface Coverage: (2) @ 2.8 Acres Separated by 500 ft. Individual Pen - 40 ft. x 40 ft.
- Color: Black and natural wood
- Distance Offshore: 500 ft. & 1,370 ft.

OBSERVER POSITION
- Distance from Shoreline: 40 ft.
- Height Above Water: 20 ft.
- Direction of View: Northwest toward Cape Sante




## Facility Configuration




## Site Map

Scale: 1"=2000'

Figure 30 Fidalgo Bay - Site Map

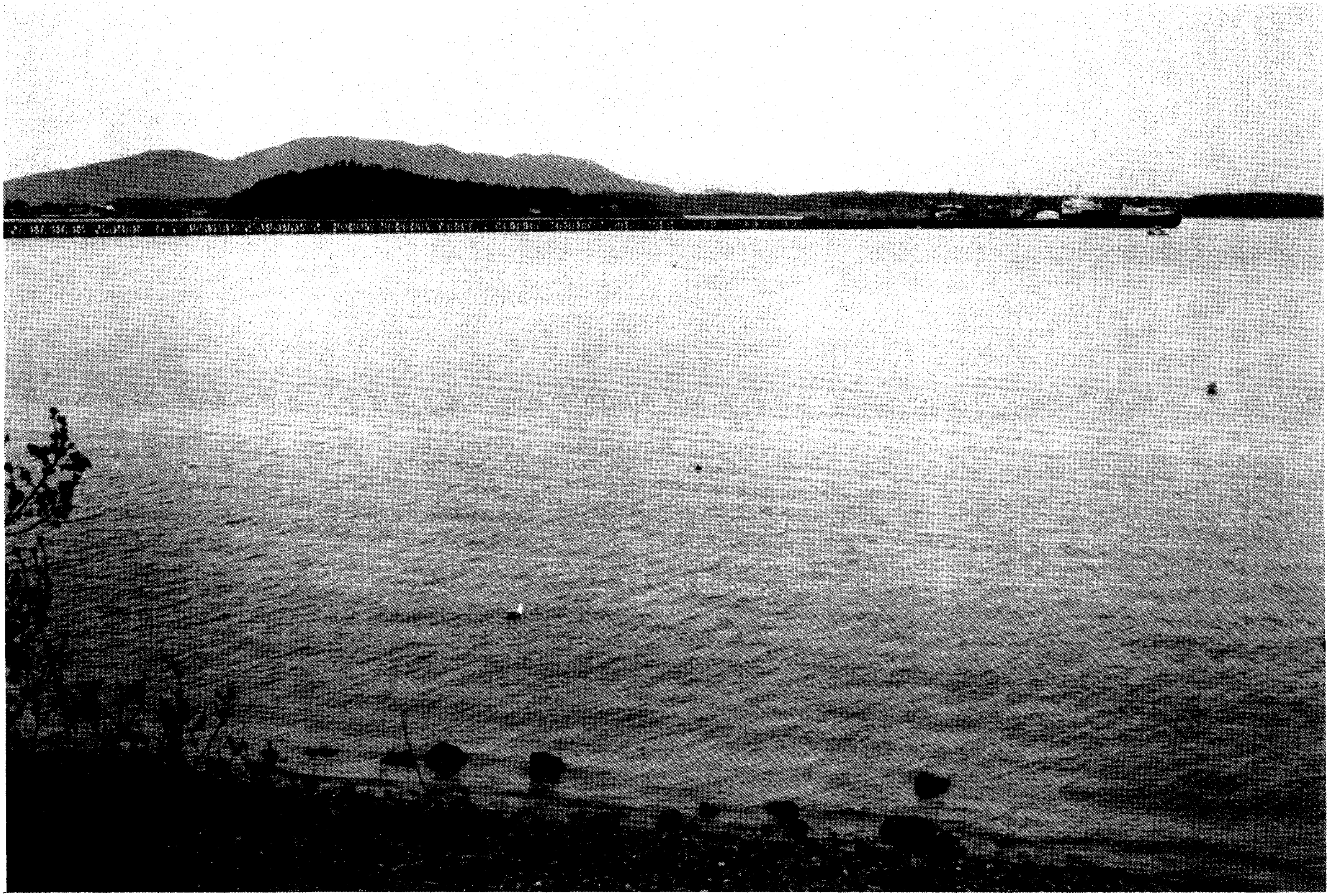


Figure 31 Fidalgo Bay - Existing Conditions

Figure 32 Fidalgo Bay - Two 2.8 Acre Salmon Pens (Simulation)

# Hale Passage

SITE

Size: 1/2 mile wide channel

Adjacent Land Use: Low density residential

Access: Very public

AQUACULTURE FACILITY

Type: Shellfish longlines w/ 2 ft. x 3-1/2 ft. buoys, 20 ft. o.c.

Water Surface Coverage: 5 Acres
485 ft. x 450 ft.

Color: Black

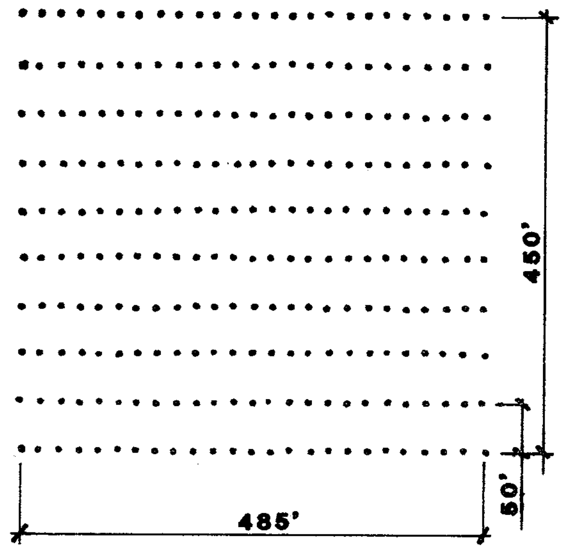
Distance Offshore: 1,600 ft. near shore
500 ft. far shore

OBSERVER POSITION

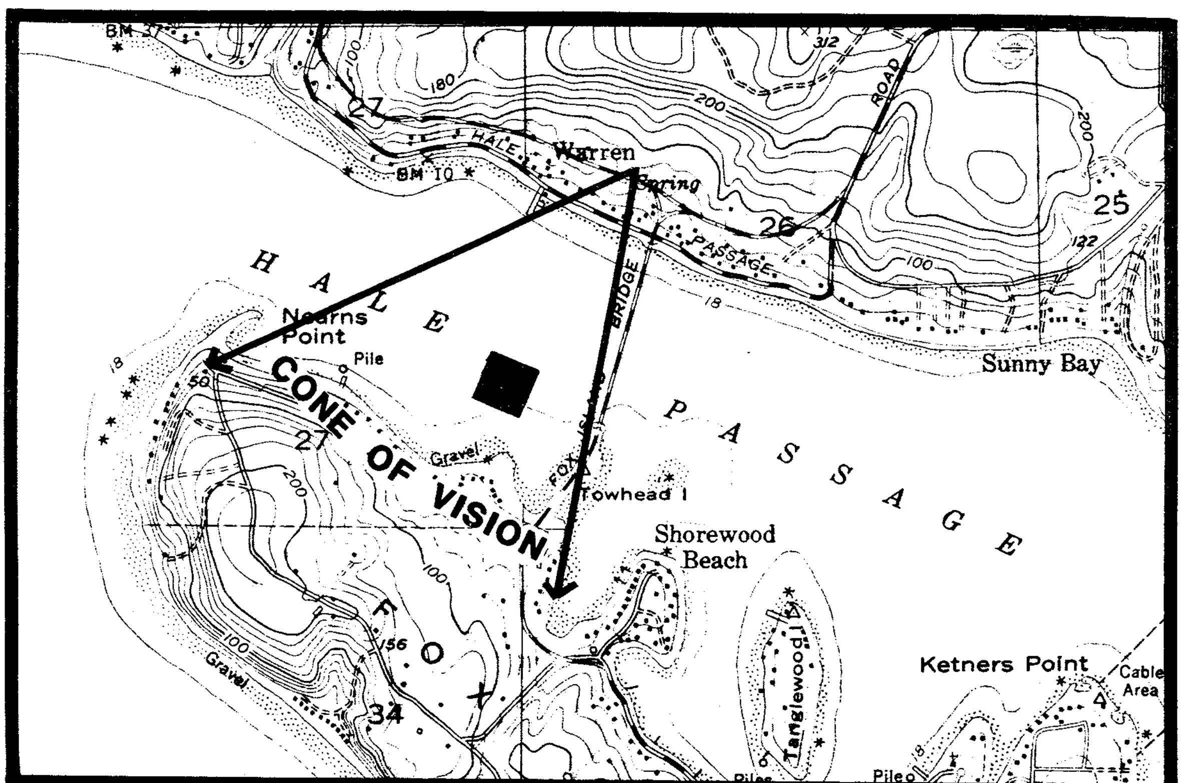
Distance from Shoreline: 550 ft.

Height Above Water: 60 ft.

Direction of View: South toward Fox Island




## Facility Configuration




## Site Map

Scale: 1"=2000'

Figure 33 Hale Passage - Site Map

Figure 34 Hale Passage - Existing Conditions

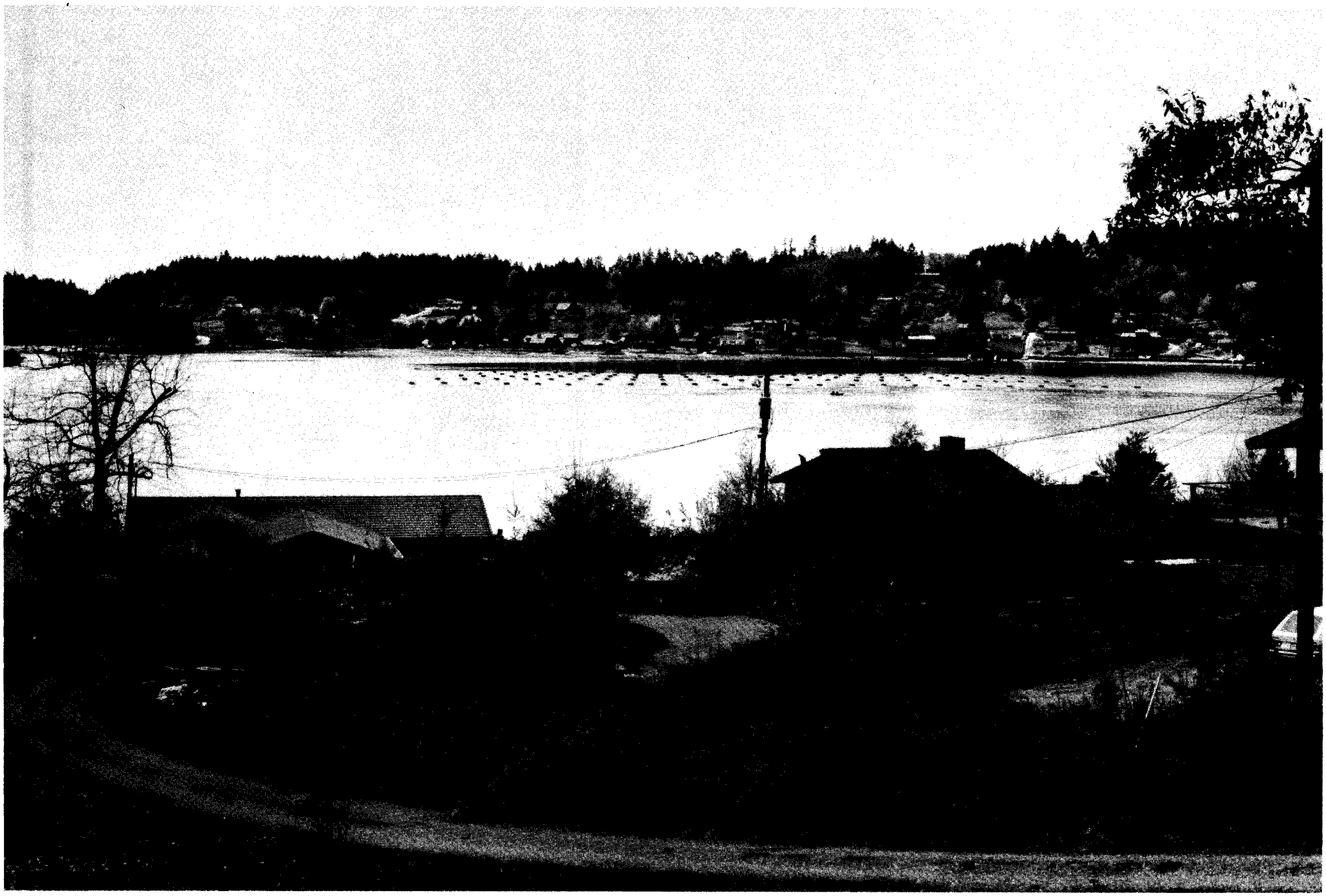


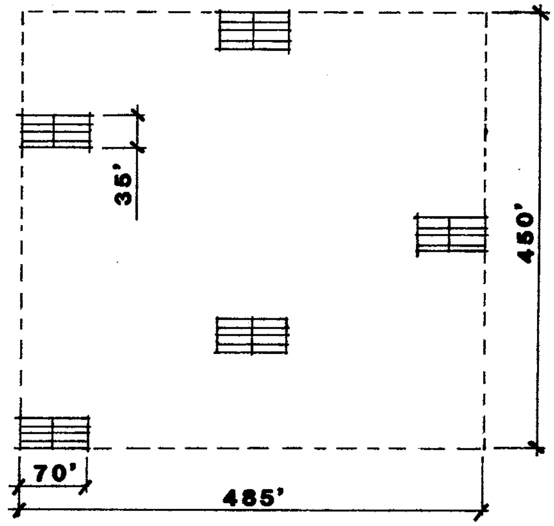
Figure 35 Hale Passage - 5 Acre Shellfish Longlines (Simulation)

# Hale Passage

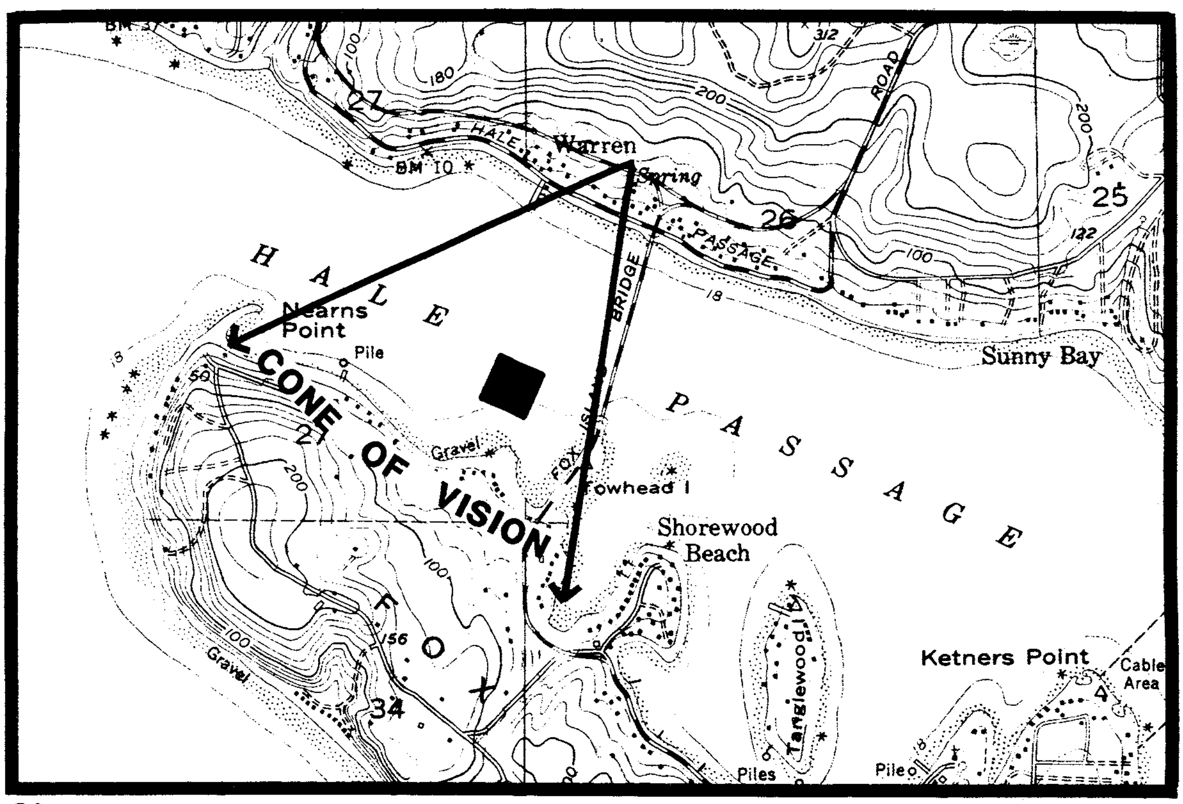
SITE
- Size: 1/2 mile wide channel
- Adjacent Land Use: Low density residential
- Access: Very public

AQUACULTURE FACILITY
- Type: Mussel Rafts
  Wood and styrofoam
- Water Surface Coverage: .25 Acres
  5 Individual rafts-
  35 ft. x 70 ft.
- Color: Natural wood
- Distance Offshore: 1,600 ft. near shore
  500 ft. far shore

OBSERVER POSITION
- Distance from Shoreline: 550 ft.
- Height Above Water: 60 ft.
- Direction of View: South toward Fox Island




Facility Configuration




Site Map

Scale: 1"=2000'

Figure 36 Hale Passage - Site Map

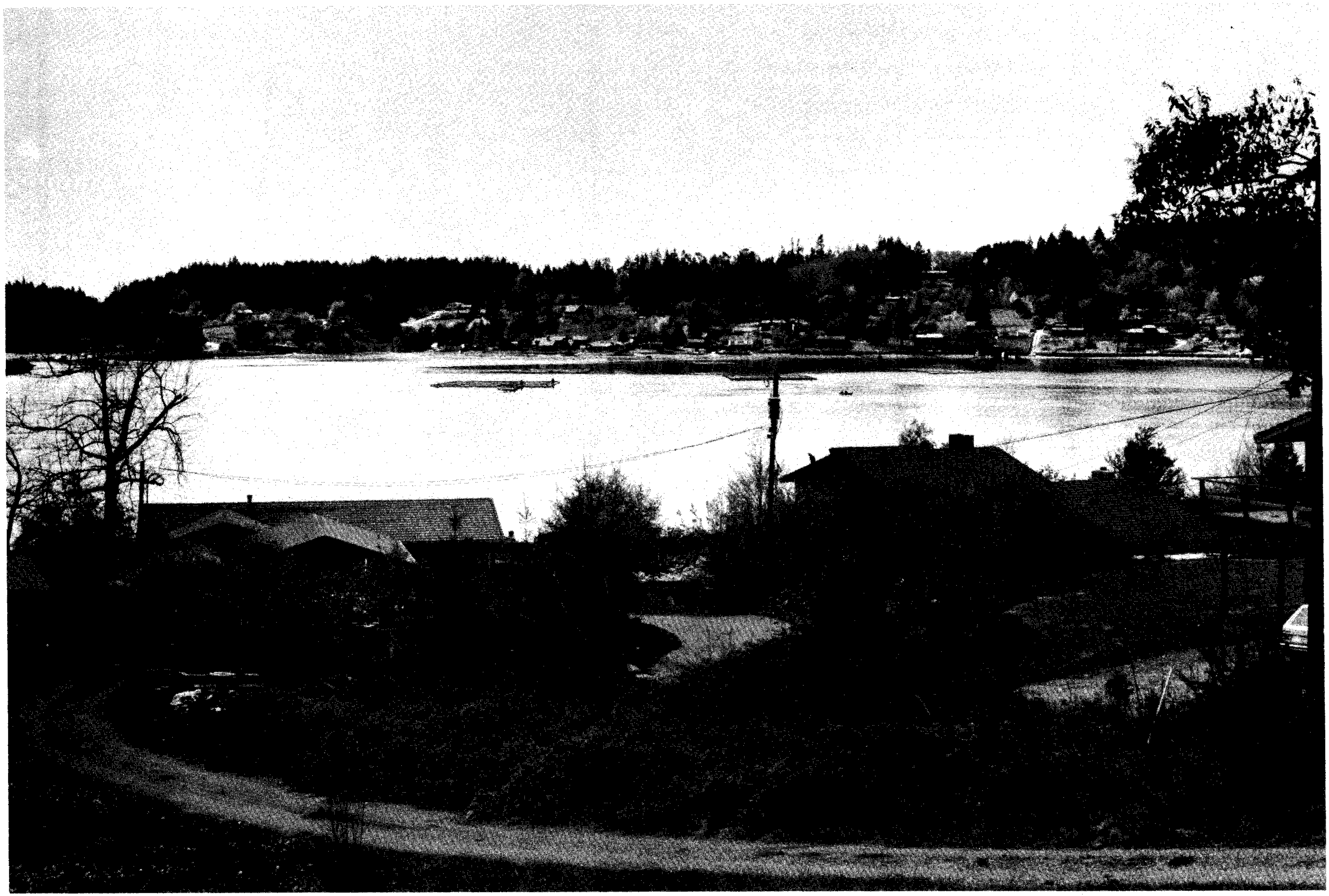


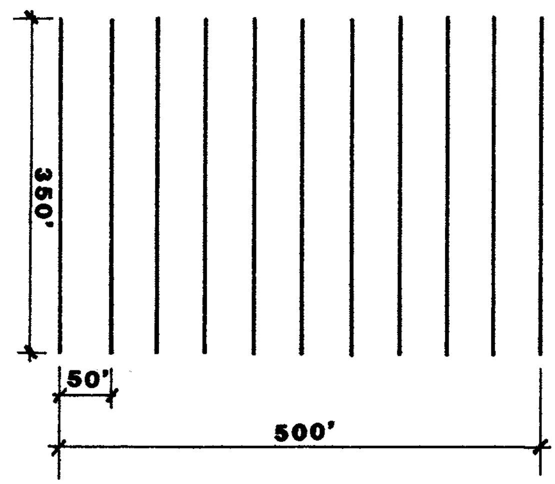
Figure 37 Hale Passage - .25 Acre Mussel Rafts (Simulation)

# The Narrows

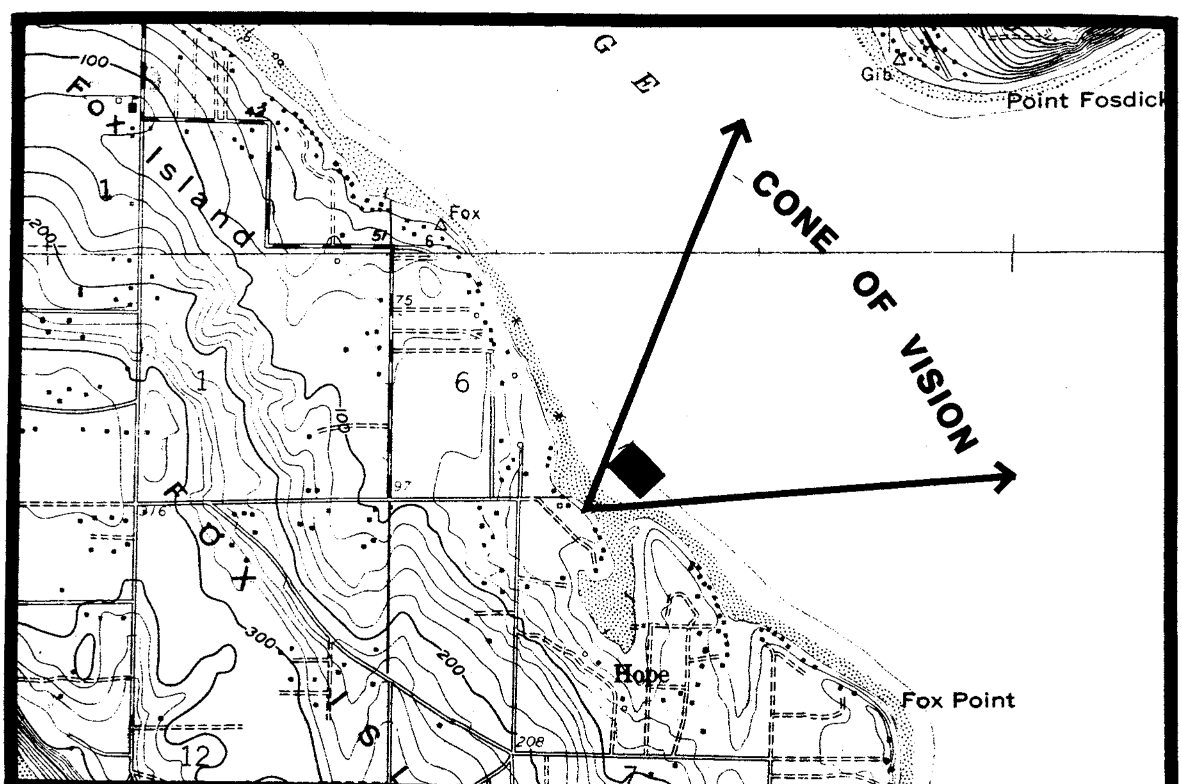
SITE
Size: 1 mile to Pt. Fosdick
3 miles to Tacoma Narrows Bridge
Adjacent Land Use: Low density residential
Access: Private

AQUACULTURE FACILITY
Type: Shellfish longlines w/ 14" dia. buoys, 7 ft. o.c.
Water Surface Coverage: 4 Acres
500 ft. x 350 ft.
Color: White
Distance Offshore: 400 ft.

OBSERVER POSITION
Distance from Shoreline: 20 ft.
Height Above Water: 10 ft.
Direction of View: Northeast toward Tacoma Narrows Bridge




Facility Configuration




Site Map

Scale: 1"=2000'

Figure 38- The Narrows - Site Map

Figure 39 The Narrows - Existing Conditions

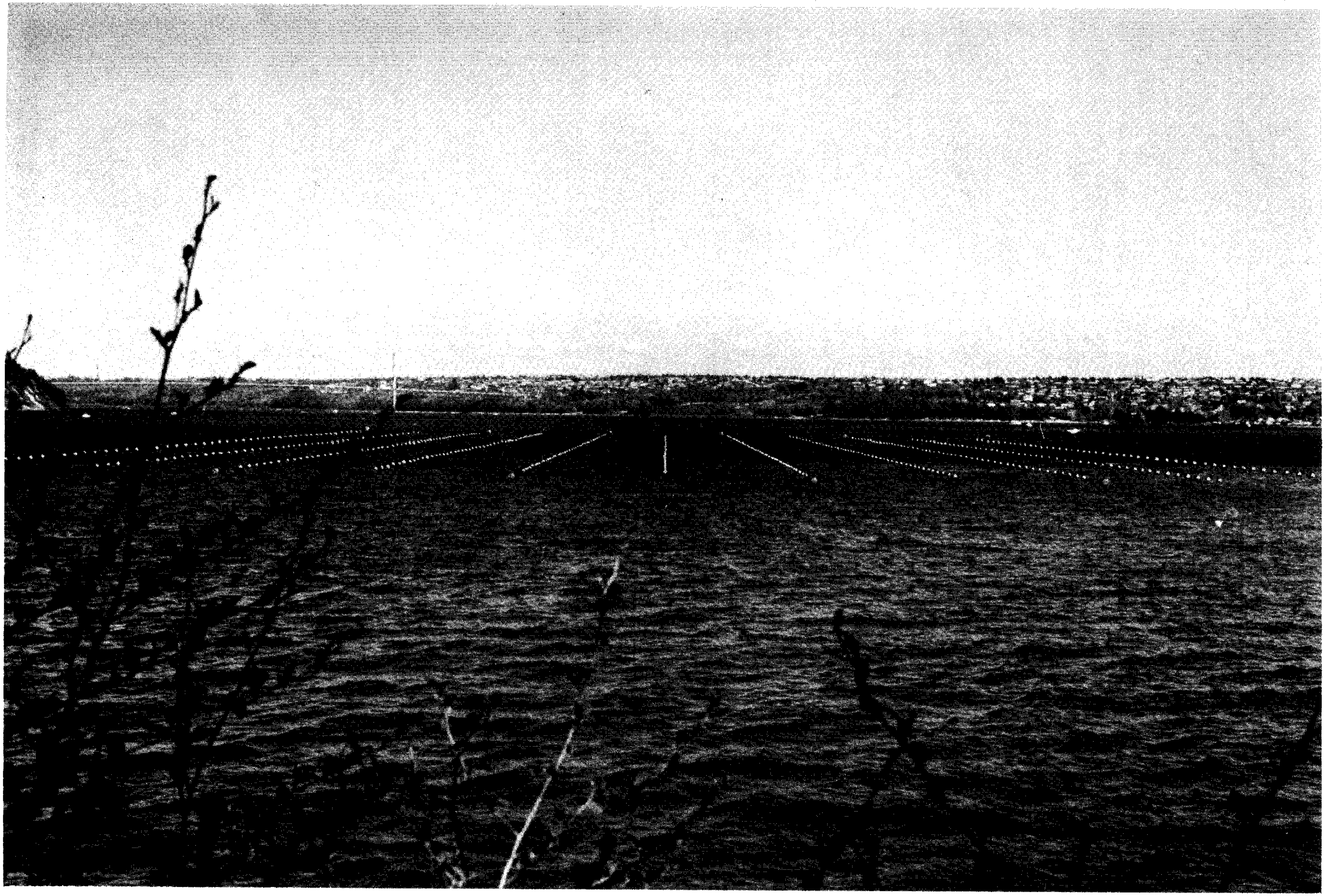


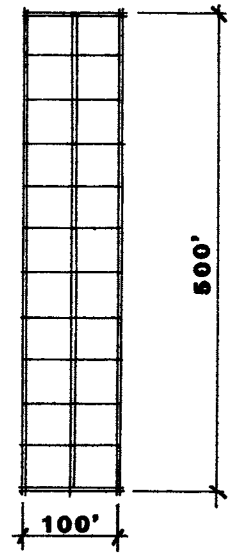
Figure 40 The Narrows - 4 Acre Shellfish Longlines (Simulation)

# The Narrows

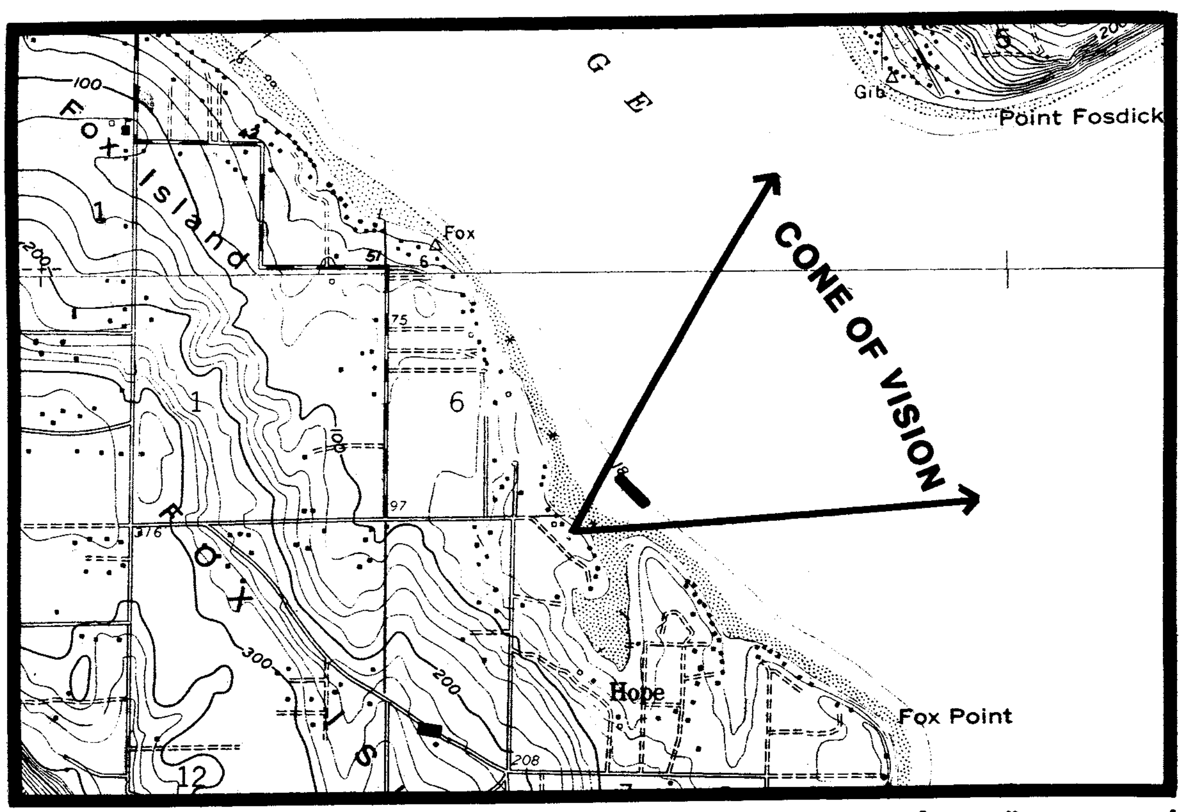
SITE
- Size: 1 mile to Pt. Fosdick; 3 miles to Tacoma Narrows Bridge
- Adjacent Land Use: Low density residential
- Access: Private

AQUACULTURE FACILITY
- Type: Salmon pens w/ plastic pipe and wood decking
- Water Surface Coverage: 1.1 Acres; 500 ft. x 100 ft.
- Color: Grey and natural wood
- Distance Offshore: 450 ft.

OBSERVER POSITION
- Distance from Shoreline: 20 ft.
- Height Above Water: 10 ft.
- Direction of View: Northeast toward Tacoma Narrows Bridge




## Facility Configuration




## Site Map

Scale: 1"=2000'

Figure 41 The Narrows - Site Map

Figure 42 The Narrows - 1 Acre Salmon Pen (Simulation)

# Boston Harbor

SITE

Size: Harbor Entrance - 2,000 ft. across
Puget Sound - 1-1/2 mile to 2 miles across

Adjacent Land Use: Low density residential/Marina

Access: Public

AQUACULTURE FACILITY

Type: Salmon pens wood

Water Surface Coverage: 1.25 Acres
Individual pens- 40 ft. x 40 ft.

Color: Natural wood

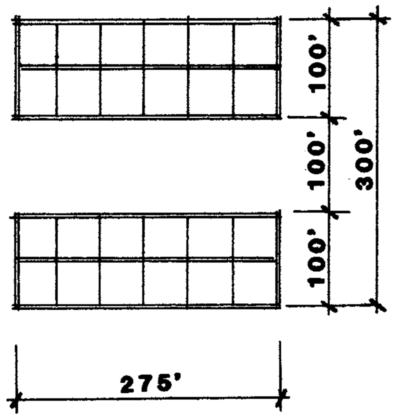
Distance Offshore: 1,000 ft.

OBSERVER POSITION

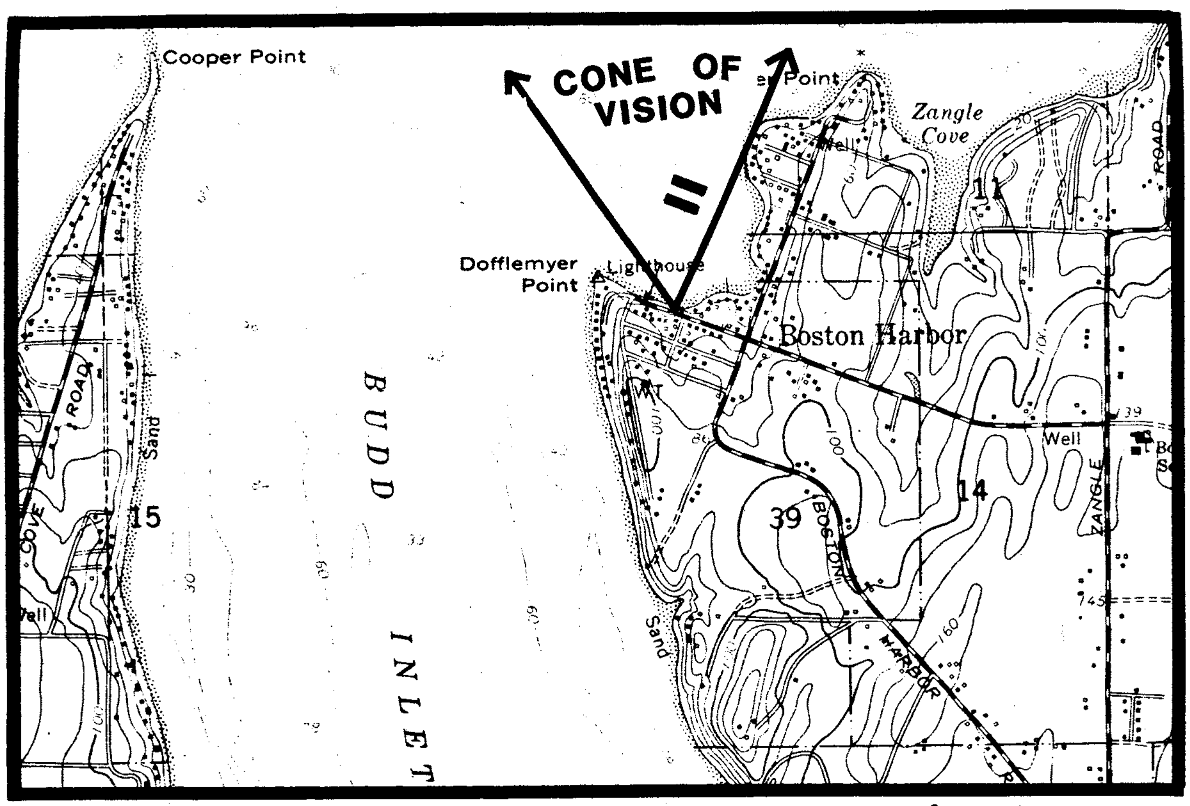
Distance from Shoreline: 20 ft.

Height Above Water: 10 ft.

Direction of View: North toward Squaxin Island




Facility Configuration




Site Map

Scale: 1"=2000'

Figure 43' Boston Harbor - Site Map.

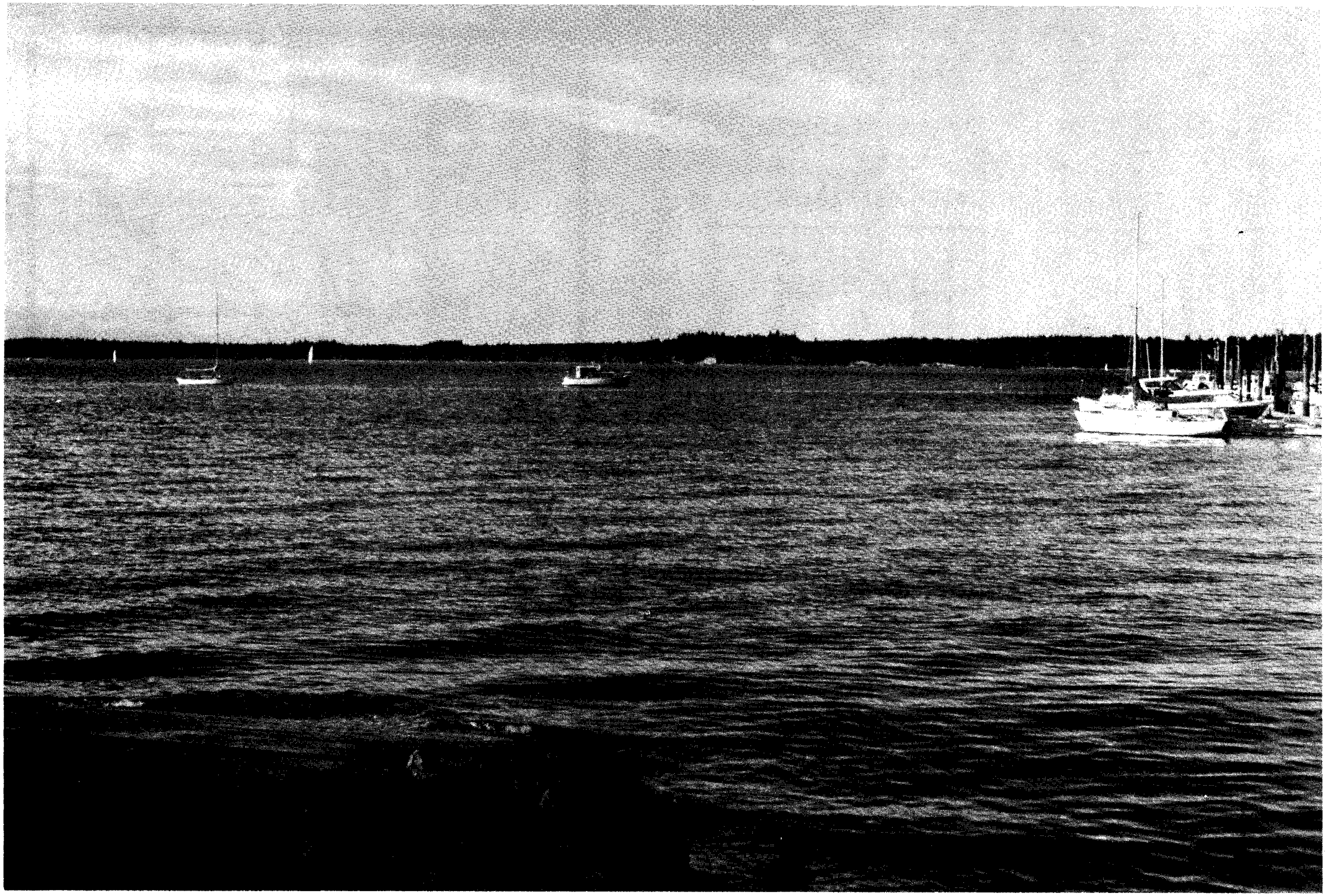


Figure 44 Boston Harbor - Existing Conditions

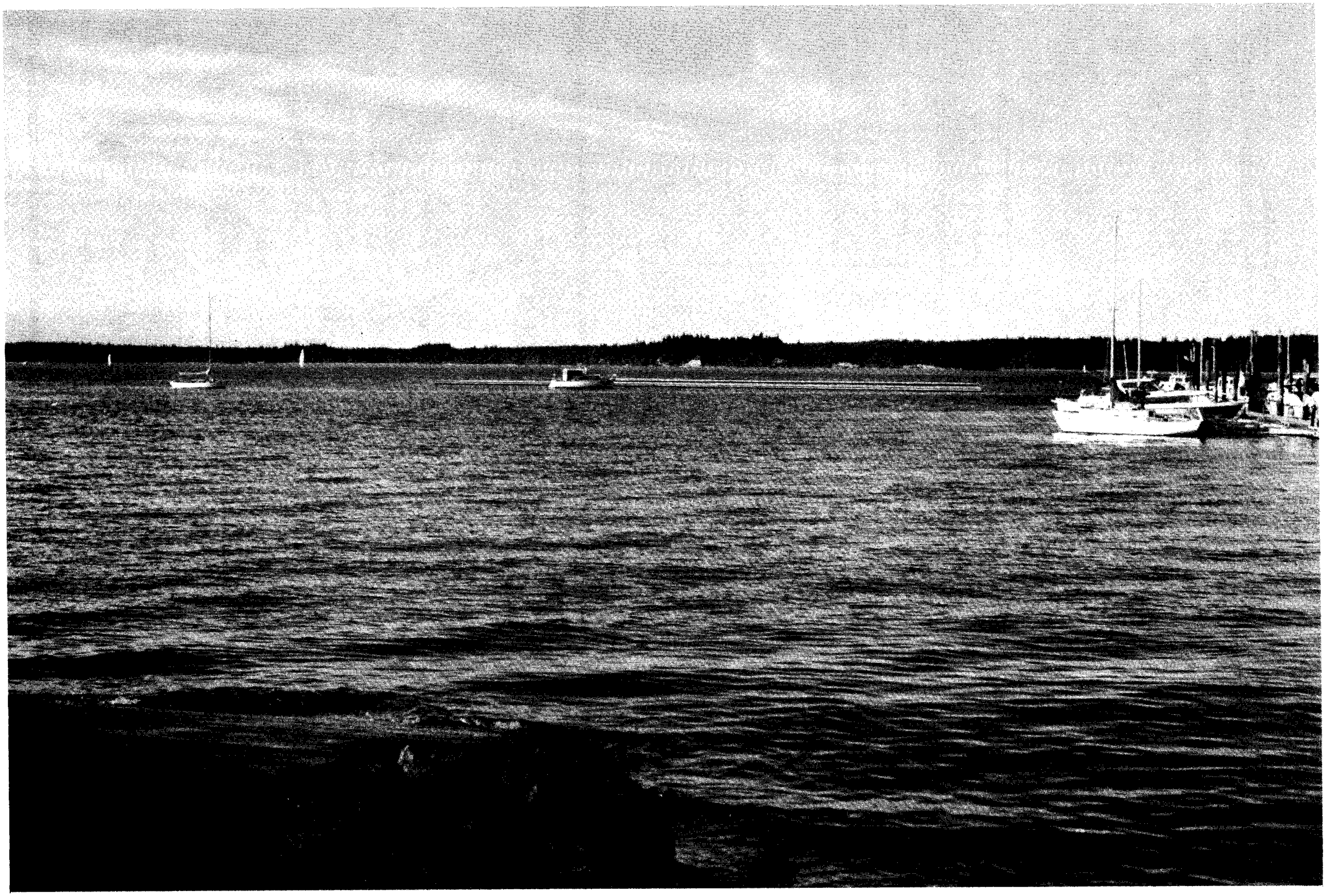


Figure 45 Boston Harbor - 1.25 Acre Salmon Pens (Simulation).

# Boston Harbor

SITE

Size: Harbor Entrance - 2,000 ft. across
Puget Sound - 1-1/2 mile to 2 miles across

Adjacent Land Use: Low density residential/Marina

Access: Public

AQUACULTURE FACILITY

Type: Salmon Pens
Wood pens attached to existing dock/marina

Water Surface Coverage: .8 Acres
Individual Pens- 40 ft. x 40 ft.

Color: Natural wood

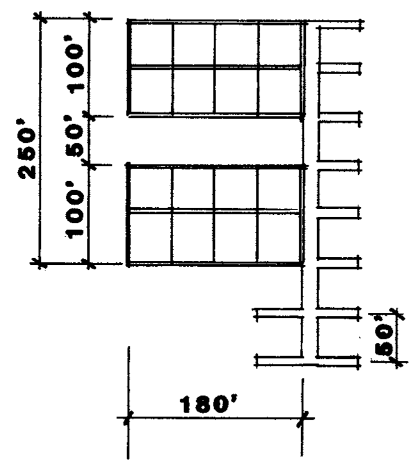
Distance Offshore: 500 ft.

OBSERVER POSITION

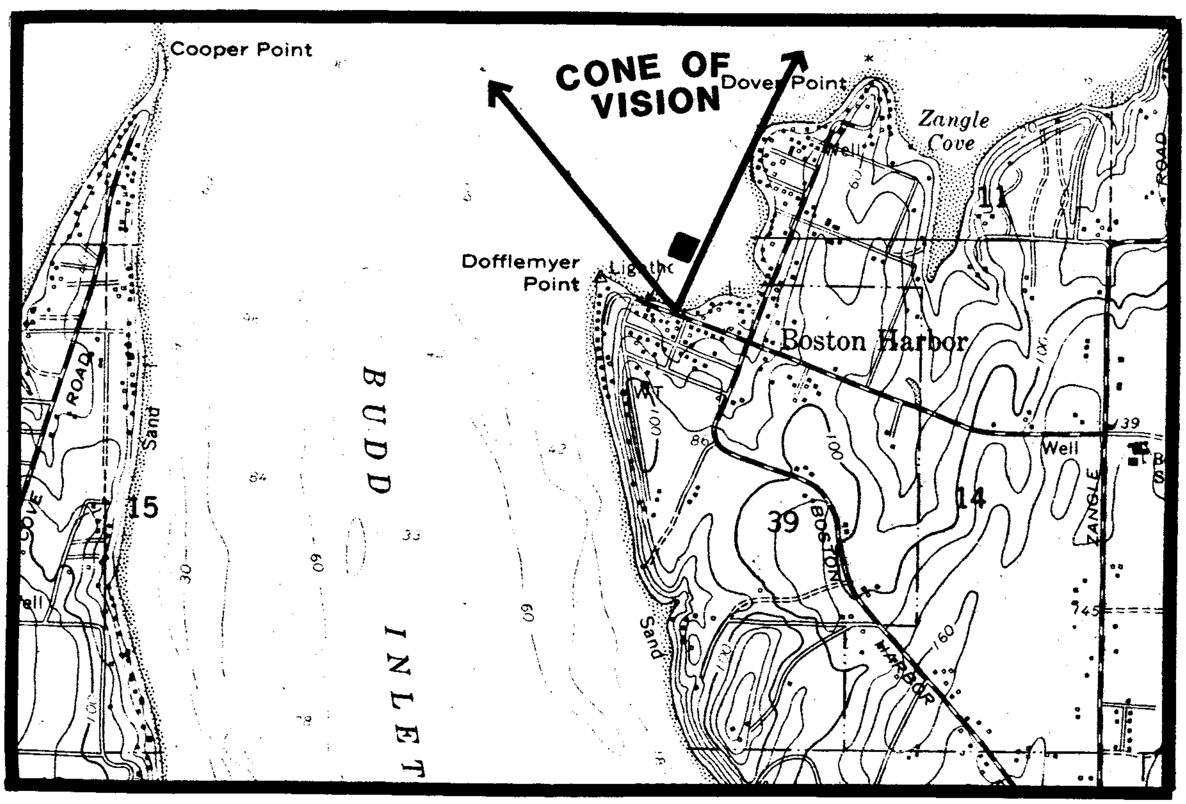
Distance from Shoreline: 20 ft.

Height Above Water: 10 ft.

Direction of View: North toward Squaxin Island




## Facility Configuration




Site Map

Scale: 1"= 2000'

Figure 46 Boston Harbor - Site Map.

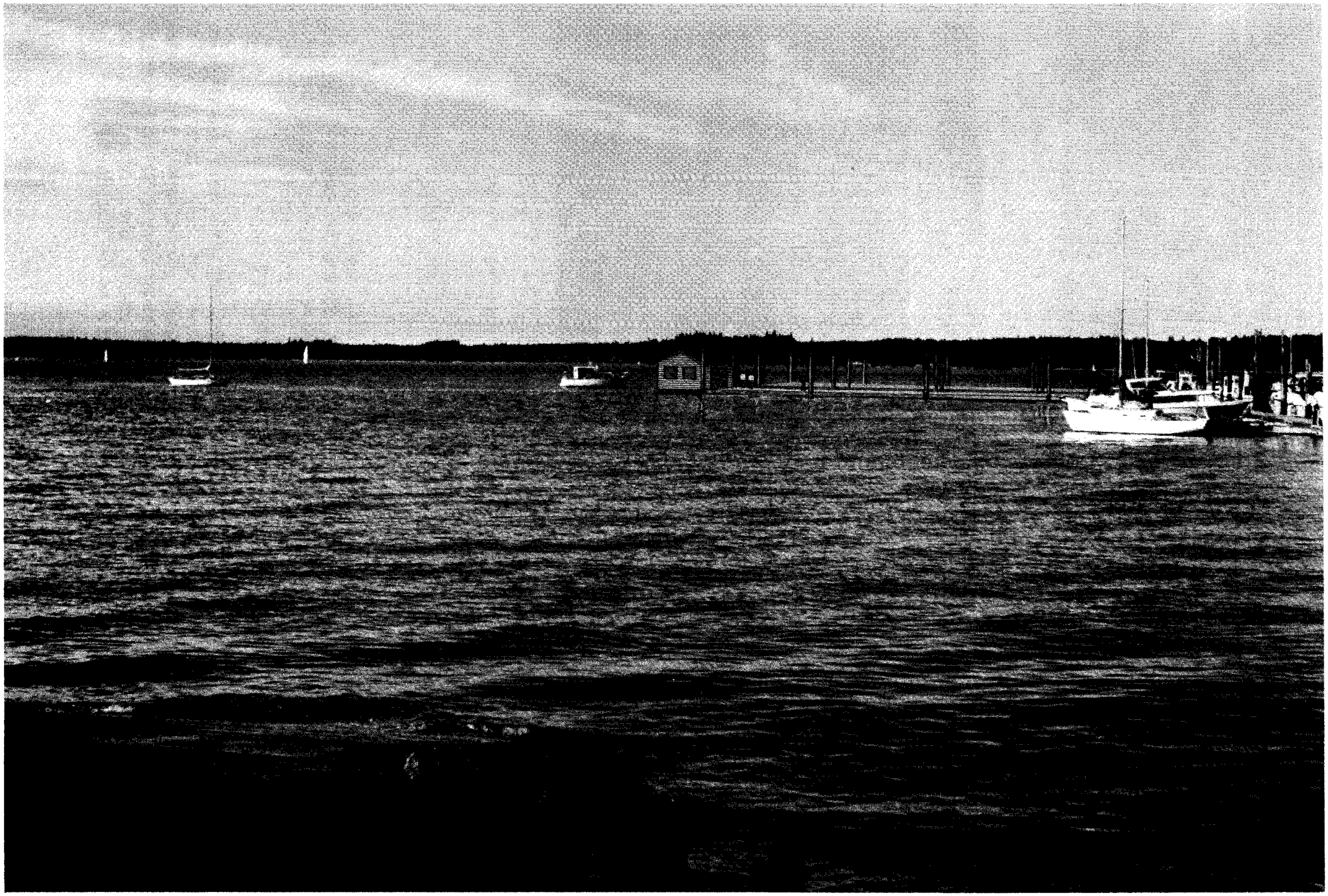


Figure 47 Boston Harbor - .8 Acre Salmon Pens (Simulation)

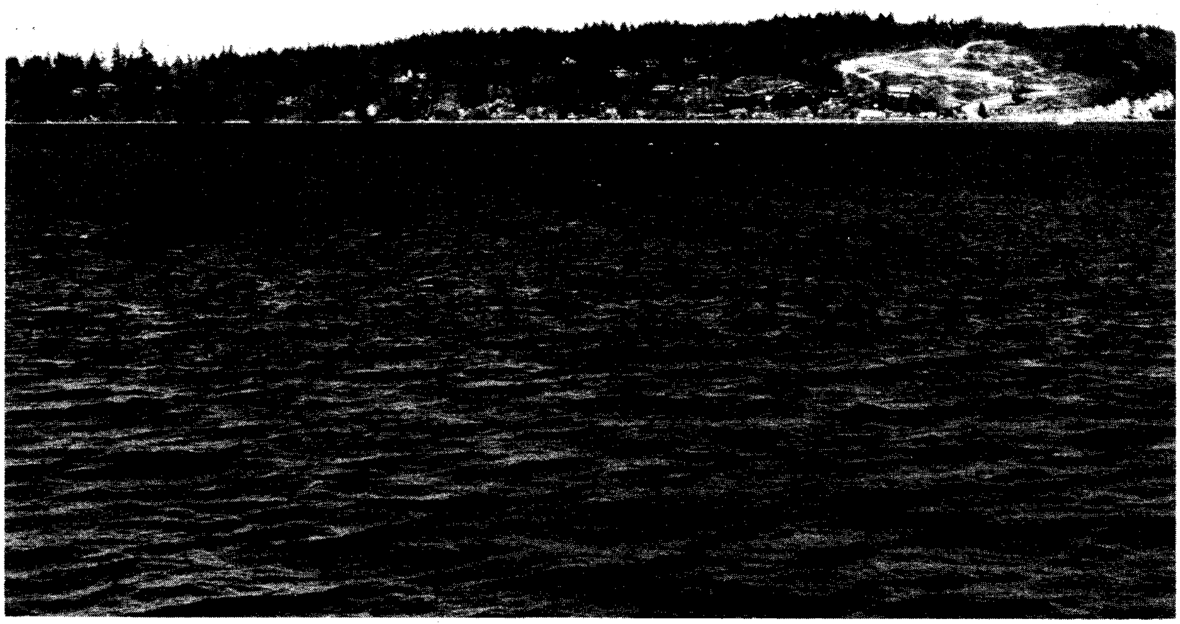


Figure 48 Hale Passage/The Narrows Pan Views

Limitations of Photo Simulations

35mm photography only approximates human vision. Each photograph, taken with a 50mm lens, represents the normal human 60-degree cone of vision. But it is an image fixed in time and space. Human vision is sequential. People constantly change their head direction and body position, providing uninterrupted views and environmental perception.

From the community of Hope, adjacent to the Narrows and Hale Passage, a single photograph cannot show the entire extent of the visible water areas. To illustrate this point, two adjacent photographs are shown above. The first view is north across Hale Passage toward Point Fosdick. The second view is northeast up The Narrows toward the Tacoma Narrows Bridge. A four acre shellfish longline facility is in the foreground.

# Visual Impact Assessment

This section provides an analysis of the components of visual impact, and proposes mitigation measures to maintain the Puget Sound's scenic quality while allowing development of its aquaculture potential.

## Visual Impact

Four interrelated variables affect visual impact from aquaculture facilities. They are the landscape, the viewer, and the location and design of the facility.

### LANDSCAPE

The four major components of the landscape which affect visual impact are environmental condition, spatial definition, adjacent scenery, and bank height.

#### Environmental Condition

Puget Sound settings vary in their capacity to accept human alteration. The addition of structures and activity along a pristine shoreline can degrade its scenic quality, while the addition of the same structures and activity along a highly industrial shoreline has only a minor visual impact.

The Nisqually National Wildlife Refuge and six other federal and state refuges, sanctuaries, or wilderness areas were created to preserve important natural environments of the Puget Sound. Aquaculture facilities, residential docks, marinas and other development in these areas are likely to be inconsistent with the established management goals and guidelines. Aquaculture facilities on Fidalgo Bay, adjacent to the existing oil refineries, would contribute little visual impact. Rural, residential and commercial shorelines lie in between these two extremes.

#### Spatial Definition

Open shorelines and large embayments are generally less susceptible to visual impact than small, enclosed embayments. Concave embayments focus the viewer's attention on the flat plane of the water. Floating aquaculture facilities disrupt this plane and are visually evident. The degree of visual impact is related to the scale of the facility. The Computer Simulations prepared as part of this study indicate that, in general, when more than ten percent of the normal cone of vision is covered, there is a high visual impact. If all other factors remain constant, a facility located on the one-half mile wide Hale Passage will have a greater visual impact than the same facility located on the four-and-a-half mile wide Samish Bay.

As the Hale Passage photo renderings indicate, visual impact within small embayments is lessened by increasing the viewing distance and by placement of the floats within the shadow cast by Fox Island.

Along uninhabited shorelines, or those with no adjacent travel routes or key observation points, small embayments can limit visual impact. Projecting headlands and forests can obstruct sightlines from opposite shorelines, or from points up and down the shoreline.

### Adjacent Scenery

Landforms and vegetation can focus and enframe views, heightening the viewer's attention. Snow-capped Olympic and Cascade mountain peaks, rock outcrops, or other areas of unusual colors, textures, and form provide a visual focus. Narrow channels, valleys and openings in the forest enframe views. Aquaculture facilities located in these areas have a higher visual impact.

### Bank Height

The potential for visual impact increases as the height of the adjacent shoreline increases. The higher the observer's position, the more perpendicular the line of sight is to the plane of the water. There is less foreshortening and the facility has higher visual impact. The computer renderings illustrate this effect. At 5 feet above sea level, a facility 300 feet offshore is a broad line on the horizon. At 105 feet above sea level, the same facility fills twenty-five percent of the view cone.

Increasing bank height can also mitigate visual impact. If the observer's position remains the same distance from the shoreline, the view of an increasing area adjacent to the shoreline is obscured by the embankment edge as the height above sea level increases (Figure 49).

## THE VIEWER

The three major components related to the viewer which affect visual impact are viewer expectations, the number of viewers, and the duration of the view.

### Viewer Expectations

The potential for visual impact is higher in those areas where a majority of residents or visitors have a high level of concern for scenic quality. Along the Puget Sound, this includes full-time and temporary residents with views of the water, those who visit public parks and use areas, and those who travel scenic highways. These people have certain scenic expectations. They generally expect to see a natural setting. The typical Puget Sound image is a combination of water, forest, and snow-capped peaks. It also typically includes evidence of maritime use -- buoys, pilings, docks, wharfs, and marinas. Intrinsically, aquaculture facilities seem compatible within this setting. Visual impact results when a facility or other maritime use is out of character or scale with the existing landscape setting.

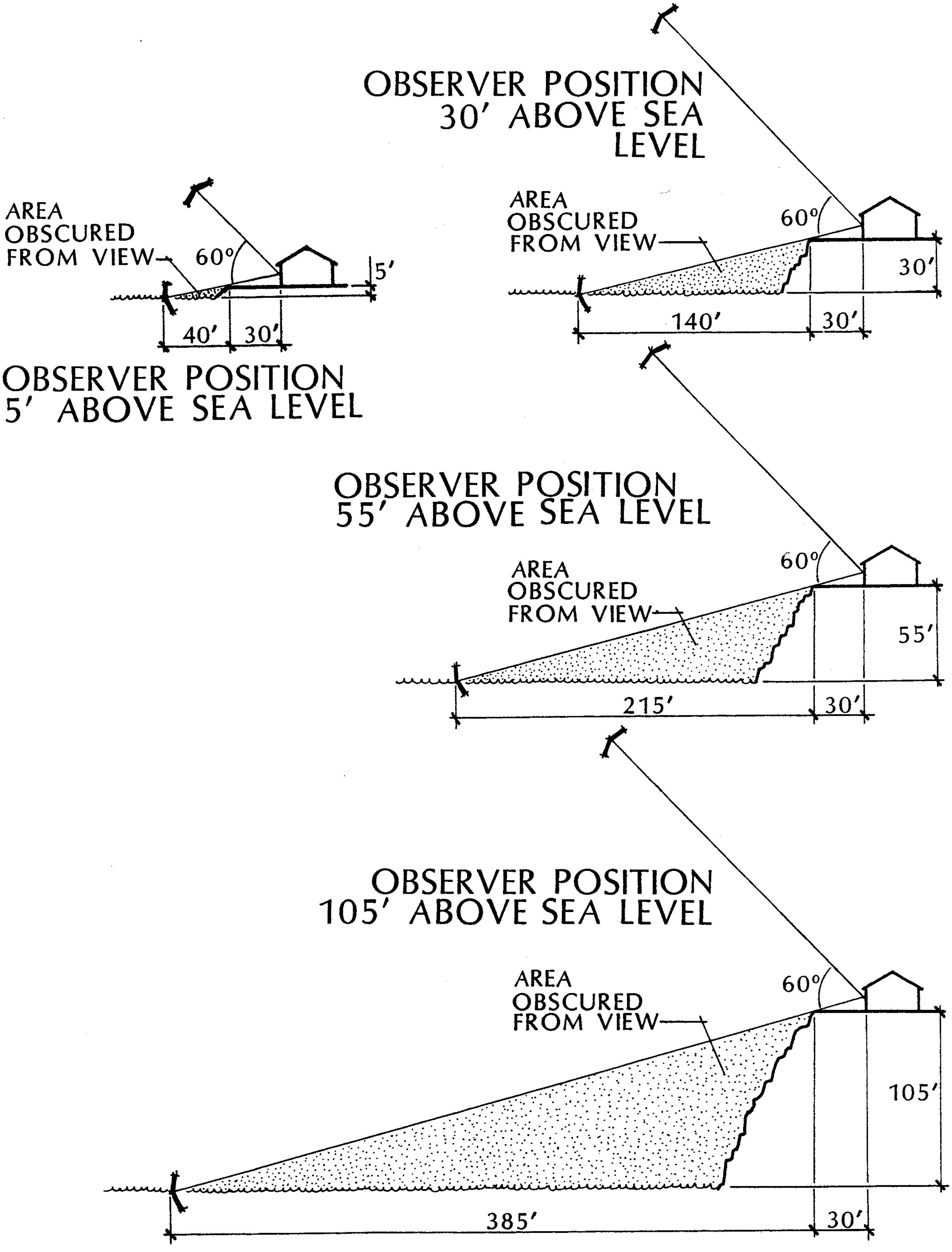



Figure 49 Bank Height/Observer Position as a Mitigating Measure

### Number of Viewers

As the number of viewers increases, the potential for visual impact increases. Aquaculture facilities offshore of high density residential developments or public parks will affect more viewers than those offshore of vacant or agricultural land uses.

### View Duration

The potential for visual impact is higher along shorelines where there are sustained views. The longer a viewer scrutinizes a scene, the greater the opportunity to perceive objects and details which are visually disruptive or out of character with the landscape setting. Viewpoints, vistas, public parks, and existing residential or commercial (i.e. restaurants) development encourage sustained viewing. Shorelines with obstructing landforms or vegetation, or shorelines with adjacent high speed travel routes, afford only quick glances.

## FACILITY SITING AND DESIGN

Eight major siting and design variables affect potential visual impact from aquaculture facilities. They are distance offshore, solar orientation, vertical profile, size, surface coverage, color, form and materials.

### Distance Offshore

Distance offshore to the aquaculture facility is a major determinant of visual impact. In general, the computer and photo renderings indicate that at distances greater than 1,500 to 2,000 feet offshore, a facility is visually evident but not obtrusive. This distance varies with the bank height. At an observer position at or near sea level, a facility 300 feet offshore is a broad line on the horizon. At an observer position 105 feet above sea level, the same facility fills twenty-five percent of the cone of vision; when moved 1,500 feet offshore, it becomes a line on the horizon.

### Solar Orientation

Although highly variable, the glare of the sun off the water, or the shadow cast by adjacent landforms, can lessen the visual impact from aquaculture facilities. Particularly when the viewer is looking toward the rising or setting sun, glare can obscure objects floating on the water. Glare increases when the sun is low on the horizon during late fall, winter, and early spring. Shadows cast by adjacent landforms can obscure objects on the water. This is most evident when the viewer is looking south toward adjacent landforms (as shown in the Hale Passage photo rendering).

### Vertical Profile

Aquaculture facilities which repeat the flat plane of the water have less of a visual impact than those which project vertically above the water surface. This is especially true when the observer position is near sea level. Without accompanying worksheds, most facilities have a low horizontal profile.

Size

The visual impact of size is highly variable. It is affected by distance offshore and the height of the observer's position above sea level. In general, if within 300 feet of the shoreline most facilities will have a visual impact; at 300 feet offshore, and an observer's position greater than 30 feet above sea level, a facility 500 feet in length covers the width of a normal 60 degree cone of vision. At distances greater than 1,500 feet to 2,000 feet, size doesn't seem to affect visual impact.

Surface Coverage

Facilities with limited surface coverage or those with dispersed buoys or rafts have less visual impact than those with a large surface area or those with continuous surface coverage. This is especially true of facilities with observer positions well above sea level. The five 35 ft. x 70 ft. rafts shown in the Hale Passage rendering are visually evident, but because of their relatively small size and the distance between them, they are unobtrusive from this observer position. The two salmon pens shown on the Samish Bay rendering have a much higher visual impact. They cover a much larger surface area and are spaced closer together.

Color

Visual impact due to the color of aquaculture facilities is highly variable. Sky conditions, sun angle, wind, and direction of view all affect color. In general, blues and greens complement the natural setting; greys and earth tones are neutral; white and black are highly variable in their response to lighting conditions; and oranges, yellows, and reds have a high visual presence.

Blues and greens complement the dominant colors of the Puget Sound waters and the surrounding forested hillsides. The Samish Bay renderings illustrate that under certain light conditions a light aquamarine color almost disappears against the water. Under different light and viewing conditions, it is visible but not obtrusive.

Greys and browns are neutral colors. Under overcast skys they would be unobtrusive colors; although the type of material has an effect on visual impact. Grey/brown weathered wood is a common and unobtrusive sight along the Puget Sound, while grey galvanized metal is highly manmade and tends to be out of place in most natural settings.

White and black are very deliberate colors. Depending on light conditions, they can be nearly invisible or stand out in sharp contrast against the water. Under overcast skies, looking into a glare, or when the wind creates a chop on the water, white tends to disappear. As the Narrows renderings illustrate, under bright sunny skies (when the sun is high in the sky), white stands out in high contrast to the blue water. Black has similar characteristics. The black buoys shown in the Hale Passage rendering disappear in the shadows cast by Fox Island and stand out against the water with a light value. The black pipe shown in the Fidalgo Bay rendering complements and repeats the oil black pilings of the existing wharf.

Oranges, yellows, and reds have the highest visual impact. All three of these colors are the visual complement of the predominant colors of water: orange/blue, yellow/violet, and red/green. To the human eye, complementary colors are the most intense when adjacent. Because of their intensity and contrast, they are highly visible against each other. Except for limited autumn color, these three colors rarely occur in the natural Puget Sound landscape. When they do occur, they tend to stand out. Because of its high visibility, orange has long been used as a warning color on marker buoys and signs.

Form and Materials

Aquaculture facilities which borrow from structures and forms already in the marine environment can minimize visual impact. Buoys, pilings, docks, and marinas are commonplace on many Puget Sound waters. The Boston Harbor rendering and the National Marine Fisheries operation at Manchester, on the Kitsap Peninsula, are incorporated into existing dock or marina facilities. In this context, the vertical element of sheds and buildings are visually compatible with the setting. Similarly, oyster stake cultures could repeat the many examples of remnant pilings from docks, buildings, and railroad trestles.

Most aquaculture facilities are visually evident and obviously manmade. In general, those with some degree of order and simplicity are positive forms. Those without order and chaotic in arrangement and type of materials have a more negative visual impact. Other variations of shape and configuration don't seem to have a significant effect on visual impact.

Alignment has only a slight effect on visual impact. Aligning rows of salmon pens perpendicular to the shoreline, instead of parallel to the shore, presents less visible structure. But only when the viewer is directly perpendicular to the rows is open water evident. When viewed from an angle, particularly from a low bank, the rows coalesce and the channels tend to disappear.

## Mitigating Measures

Depending on the level of visual impact (as well as other impacts such as biological, navigational, or shoreline access), governmental agencies may require mitigating measures as a condition of project approval.

The analysis of visual impact indicates two categories of mitigation measures for proposed aquaculture facilities: alternate site selection, and modification of site layout and facility design. All are inter-related and dependent on each other. None are absolute. Each agency would have to apply them to site-specific locations. Most apply to site locations within one-third of a mile of the shoreline. They range from general to specific.

## ALTERNATE SITE SELECTION OPTIONS

1. Identify and select those sites with the capacity to accept human alteration. Avoid sites which have been identified as unique natural environments.

2. Identify and select those sites adjacent to rural or low density development. Avoid sites offshore of existing suburban residential developments.

3. Identify and select sites adjacent to existing commercial/industrial maritime activity, when compatible with the water quality requirements of aquaculture.

4. Identify and select those sites not visible or with limited visibility from adjacent high use transportation routes and public use areas.

5. Identify and select embayments larger than one mile across. Avoid small, enclosed embayments less than one mile across (unless there is limited adjacent residential development, travel routes, or use areas).

6. Identify and select those sites with adjacent low bank shorelines. Avoid sites with adjacent high bank shorelines (must be coordinated with distance offshore).

## SITE LAYOUT AND FACILITY DESIGN OPTIONS

1. Locate, when feasible, 1,500 to 2,000 feet offshore. Distance dependent on height above sea level of key observation points.

2. Limit facility shape to horizontal forms. Discourage vertical forms such as worksheds and buildings (unless incorporated as part of dock or marina).

3. Incorporate as part of existing docks or marinas, or design to appear as boat dock, when feasible with use patterns and water quality.

4. Limit overall size and surface coverage of projects. Dependent on the degree of foreshortening created by distance offshore and height of observer position above sea level (see "Visual Impact" section discussion of facility location and design).

5. Select colors which complement or are natural to the dominant blue/green colors of the Puget Sound.

6. Require ordered design with limited variation in materials and colors.

# Visual Assessment Workbook

The Visual Assessment Workbook provides an analytical process for evaluating proposed aquaculture facilities. Regional planning agencies can use it to identify and evaluate those Puget Sound environments least (or most) susceptable to visual impact. Local planning agencies can incorporate it into their project review process. It is a general guide. Each local planning agency can modify the descriptions and rating scores to reflect local conditions, values and preferences.

The workbook adopts visual assessment techniques to Puget Sound sites and aquaculture facilities. It borrows from techniques developed by two Federal agencies -- the Bureau of Land Management (BLM) and the U.S. Forest Service (U.S.F.S.).

The U.S.F.S. identifies nine basic assumptions related to visual quality that can be used in assessing aquaculture visual impact.4 They include:

- o People have certain scenic expectations;
- o View duration is critical;
- o Number of viewers is critical;
- o Diversity increases scenic value;
- o Retention of distinctive character is desirable;
- o Each setting varies in capacity to absorb visual alteration;
- o Landmarks/focal points receive critical scrutiny;
- o Viewing angle is critical; and
- o Viewing distance is critical.

The B.L.M. identifies three basic principles concerning visual quality that can be adopted for use in assessing aquaculture visual impact. They include:

- o Landscape character is primarily determined by the four basic visual elements of <u>form</u>, <u>line</u>, <u>color</u>, <u>texture</u>. Although all four elements are present in every landscape, they exert varying degrees of influence.
- o The stronger the influence exerted by these elements, the more interesting the landscape.
- o The more visual variety in a landscape, the more aesthetically pleasing the landscape. Variety without harmony, however, is

4 USDA, USFS, p. 2-4

unattractive, particularly in terms of alterations (cultural modifications) that are made without care.5

## Methodology

The methodology has an inventory and an analysis component. The three inventory categories are scenic quality, sensitivity level, and visibility. The analysis component synthesizes these categories into four levels of visual impact.

### Inventory

The inventory of scenic quality rates the basic visual elements of the water body and the surrounding landforms. Its three variables are environmental condition, spatial definition, and adjacent scenery. The individual rating scores are compiled to determine high, moderate and low scenic quality.

The inventory of sensitivity level measures the number of potential viewers and the duration of view as high, moderate or low.

Visibility identifies key observation points and evaluates the effect of view obstruction, distance offshore/observer position, and viewshed coverage. The individual rating scores are compiled to determine high, moderate and low visibility.

### Analysis

The analysis component synthesizes the inventory data into four visual impact classes.

Class I areas include the federally designated San Juan Wilderness Areas (84 rocks, reefs, grassy and forested islands). This is an area where the earth and its community of life are untrammeled by man, where man is a visitor and does not remain. It shall be managed to retain its primeval character. Permanently visible aquaculture projects are prohibited.

In Class II areas, permanently visible aquaculture facilities will be visually obtrusive and have a high visual impact. Mitigation measures will be necessary.

In Class III areas, permanently visible aquaculture facilities will be visually evident and have a moderate visual impact. Mitigation measures may be necessary.

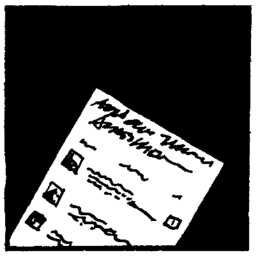
In Class IV areas, permanently visible aquaculture facilities will have little adverse visual impact. Few, if any, mitigation measures are necessary.

5 USDI, BLM, p. 13

# AQUACULTURE VISUAL IMPACT ANALYSIS

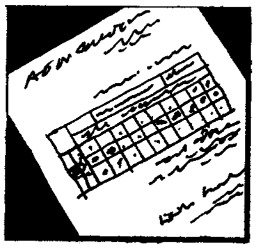
*Approach and Methodology for Analysis & Review of Project Proposals*

This work book provides an analytic process for evaluating proposed aquaculture facilities. It contains an inventory & analysis component, described below:



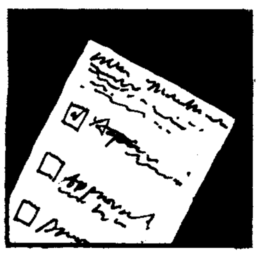
**STEP ONE**

Inventory project site for determination of Scenic Quality, Sensitivity Level, & Visibility.



**STEP TWO**

Analysis of project site inventory for determination of four classes of Visual Impact.



**STEP THREE**

Planning officials incorporate the results of Visual Impact analysis with other relevant factors into their permit review process.

## Visual Assessment Methodology

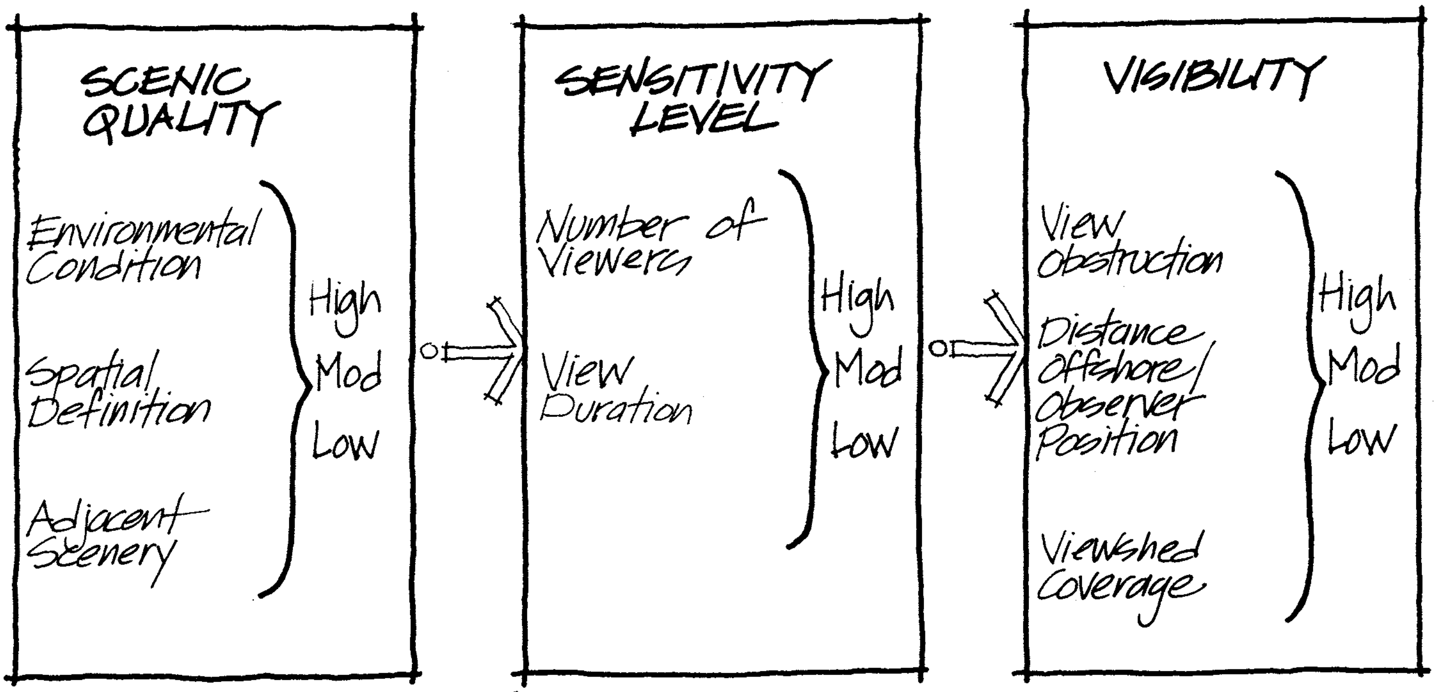
| INVENTORY | | ANALYSIS | | PROJECT EVALUATION |
|---|---|---|---|---|
| Scenic Quality<br>Sensitivity Level<br>Visibility | → | Visual Impact Classifications | → | Approval<br>Approval W/ Mitigation Measures<br>Disapproval |

# AQUACULTURE VISUAL IMPACT ANALYSIS

*Inventory*

The inventory portion of this visual assessment methodology evaluates three related components of visual impact. They are Scenic Quality, Sensitivity Level, and Visibility. Seven rating sheets provide a format for the inventory & evaluation of each component and sub category.

## Inventory Process



# AQUACULTURE VISUAL IMPACT ANALYSIS

## INVENTORY AND EVALUATION RATING SHEET

Project Name ______________________________

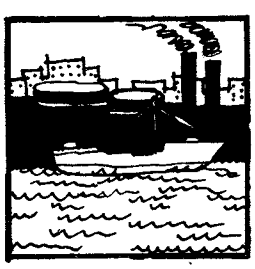
Project Location ______________________________

COMPONENT: Scenic Quality

SUB-CATEGORY: Environmental Condition

DESCRIPTION: Capacity of landscape to accept Human Alteration without losing its natural visual character.

TASK: choose category which corresponds to project site.

| Visual Attributes | Description | Value |
|---|---|---|
|  | HIGH<br>Areas of exceptional natural landscape character or habitat, or areas set aside by law to be preserved in a natural state. (Wilderness areas, National Wildlife Areas or Sanctuaries, State Habitat Management Areas, i.e. wilderness islands of the San Juans, Nisqually, Padilla Bay, or Skagit Bay). | 1 |
|  | MODERATE<br>Distinctive landscape character, public parks or use areas (views of forests and snow capped mountains; Larabee and Camano Island St. Park); or areas with visible evidence of human activity, but not at a dominating level. (residential development, docks, or piers). | 0 |
|  | LOW<br>Areas w/ human modification so extensive that natural scenic qualities are nearly eliminated or substantially reduced (Industrial harbors, oil refineries; i.e. Fidalgo Industrial Area). | -1 |

# AQUACULTURE VISUAL IMPACT ANALYSIS

## INVENTORY AND EVALUATION RATING SHEET

Project Name ______________________________

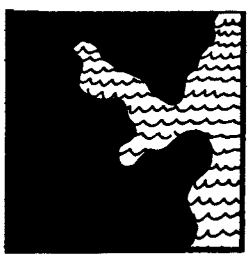
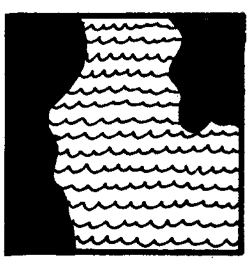
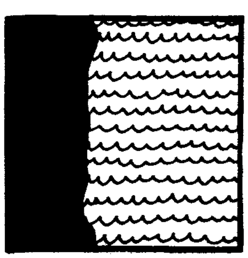
Project Location ______________________________

COMPONENT: Scenic Quality

SUB-CATEGORY: Spatial Definition

DESCRIPTION: Degree of spatial enclosure and volume created by the flat plane of the water body and the surrounding landforms.

TASK: Choose category which responds to project site.

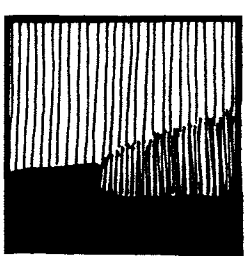
| Visual Attributes | Description | Value |
|---|---|---|
|  | **HIGH** Concave embayments, less than ½ mile across (Gig Harbor, Port Ludlow, Upper Quartermaster Harbor, Inner Port Madison). | 1 |
|  | **MODERATE** Concave embayments ½ mile to 2 miles across (Outer Port Madison); or open shoreline where far-shore is less than two miles away (Hood Canal, Budd Inlet). | 0 |
|  | **LOW** Open shoreline where far-shore is greater than 2 miles away (Carr Inlet, Skagit Bay). | -1 |

# AQUACULTURE VISUAL IMPACT ANALYSIS
## INVENTORY AND EVALUATION RATING SHEET

Project Name ______________________________
Project Location ______________________________

COMPONENT: Scenic Quality
SUB-CATEGORY: Adjacent Scenery
DESCRIPTION: Adjacent shoreline edge, landform, and vegetation which define the embayment. Influence, detail, and clarity diminish with distance. In general, impact of this variable increases as the degree of enclosure increases, or as the embayment size or the distance to the opposite shoreline decreases.

TASK: choose category which corresponds to project site.

| Visual Attributes | Description | Value |
|---|---|---|
|  | **HIGH** Rich combinations of form, line, color, & texture. Views of snow-capped peaks; adjacent slopes > 60% slope, irregular surface, exposed rock outcrops, exposed cliffs; Diverse vegetation w/ high degree of pattern & texture. Generally, most influential within 1/4 mile of key viewing points. | 1 |
|  | **MODERATE** Some variety of form, line, color, & texture. Adjacent landforms 30-60%, moderate surface variation, limited rock outcrops or exposed cliffs; mature vegetation but generally continuous pattern; or adjacent scenery 1/4 to 1 mile away. | 0 |
|  | **LOW** Little or no variety of form, line, color, & texture. Slopes < 30%, little or no surface variation, no rock outcrops or exposed banks; continuous vegetative pattern w/ little or no pattern; or adjacent scenery > 1 mile away. | -1 |

# AQUACULTURE VISUAL IMPACT ANALYSIS

## INVENTORY AND EVALUATION RATING SHEET

Project Name ______________________________

Project Location ______________________________

COMPONENT: **Scenic Quality Summary**

DESCRIPTION: Evaluation of individual scenic quality factors to determine overall site scenic quality.

TASK: Total values for each scenic quality factor and select one of the following classifications:

HIGH - Areas that combine the most outstanding characteristics of each rating factor (2 or 3 points). ☐

MODERATE - Areas with a combination of some outstanding features and some that are fairly common (-1, 0, or 1 points). ☐

LOW - Areas with features that are fairly common (-2 or -3 points). ☐

# AQUACULTURE VISUAL IMPACT ANALYSIS

## INVENTORY AND EVALUATION RATING SHEET

Project Name ______________________________

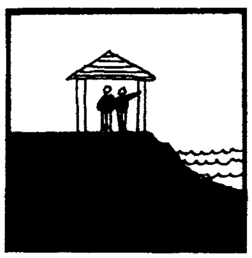
Project Location ______________________________

COMPONENT: **Sensitivity Level**

DESCRIPTION: Number of potential viewers, related to adjacent travel routes, use areas, or existing resedential development.

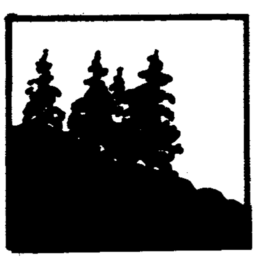
TASK: Choose category which corresponds to project site.

Visual Attributes | Description



**HIGH**
Water bodies where the potential number of viewers is high, and the opportunity exists for sustained views (shorelines with adjacent viewpoints, park and recreation sites, resorts, high density residential development.

**MODERATE**
Water bodies where the potential number of viewers is moderate, or the view duration is only a quick glance. Shorelines with adjacent travel routes or low to moderate density residential development.



**LOW**
Water bodies where the potential number of viewers is low. Shorelines with few adjacent travel routes, use areas, or very low density residential development.

# AQUACULTURE VISUAL IMPACT ANALYSIS

## INVENTORY AND EVALUATION RATING SHEET

Project Name ______________________________

Project Location ______________________________

COMPONENT: Visibility

SUB-CATEGORY: View Obstruction

DESCRIPTION: Degree of obstruction in viewing the water by vegetation, landform, or man-made objects.

TASK: Choose category which corresponds to project site.

| Visual Attributes | Description | Value |
|---|---|---|
|  | **OPEN VIEW** No view obstruction from key viewing points. | 1 |
|  | **PARTIALLY OBSTRUCTED VIEW** Some view obstruction from key viewing points. | 0 |
|  | **OBSTRUCTED VIEW** No key viewing points or all views of water obstructed by vegetation, landform, or man-made objects. | -1 |

# AQUACULTURE VISUAL IMPACT ANALYSIS
## INVENTORY AND EVALUATION RATING SHEET

Project Name ________________________________________

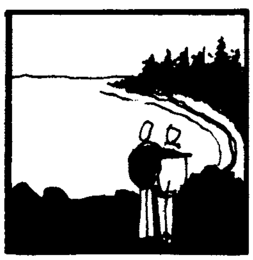
Project Location ________________________________________

COMPONENT: Visibility

SUB-CATEGORY: Distance Offshore / Observer Position

DESCRIPTION: Visibility critically related to distance offshore and height of key observation points above sea level. Influence, detail, clarity, and scale diminishes as distance offshore increases. Foreshortening and scale diminishes the nearer the observer position is to sea level.

TASK: Choose category which corresponds to project site.

| Visual Attributes | Description | Value |
|---|---|---|
|  | **HIGH**<br>< 300 ft. offshore / 5 ft. above sea level<br>0-750 ft. offshore / 30 ft. above sea level<br>0-750 ft. offshore / 55 ft. above sea level<br>300-750 ft. offshore / 105 ft. above sea level | 1 |
|  | **MODERATE**<br>750-1500 ft. offshore / 30 ft. above sea level<br>750-1500 ft. offshore / 55 ft. above sea level<br>750-2000 ft. offshore / 105 ft. above sea level | 0 |
|  | **LOW**<br>> 300 ft. offshore / 5 ft. above sea level<br>0-300 ft. offshore / 105 ft. above sea level<br>> 1500 ft. offshore / 5-55 ft. above sea level<br>> 2000 ft. offshore / 105 ft. above sea level | -1 |

# AQUACULTURE VISUAL IMPACT ANALYSIS

## INVENTORY AND EVALUATION RATING SHEET

Project Name ______________________________

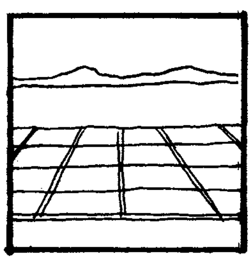
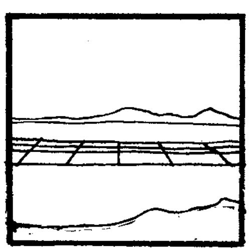
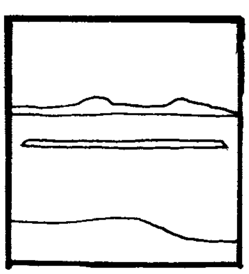
Project Location ______________________________

COMPONENT: Visibility

SUB-CATEGORY: Viewshed Coverage

DESCRIPTION: Percentage of normal cone of vision occupied by proposed aquaculture facility. Requires project sets & photographs taken with a normal lens (50 mm for a 35mm camera), or computer simulations. In general, applies to projects located less than 1500 to 2000 feet offshore.

TASK: Choose category which corresponds to project site.

| Visual Attributes | Description | Value |
|---|---|---|
|  | **HIGH**<br>Project covers >10% of cone of vision as viewed from 75% of key observation points. | 1 |
|  | **MODERATE**<br>Project covers >10% of cone of vision as viewed from 25-75% of key observation points; or covers 5-10% of cone of vision as viewed from 75% of key observation points. | 0 |
|  | **LOW**<br>Project covers < 5% of cone of vision as viewed from key observation points. | -1 |

# AQUACULTURE VISUAL IMPACT ANALYSIS

## *INVENTORY AND EVALUATION RATING SHEET*

Project Name ______________________________

Project Location ______________________________

COMPONENT: **Visibility Summary**

DESCRIPTION: *Evaluation of individual visibility factors to determine overall visibility.*

TASK: *Total values for each visibility factor and select one of the following classifications.*

*Description*

***HIGH***
*Areas that combine most of the highly visible attributes of each rating factor (2 or 3 points).* ☐

***MODERATE***
*Areas with a combination of some of the highly visible and less visible attributes of each rating factor (-1, 0 or 1 point).* ☐

***LOW***
*Areas with little or no visibility (-2 or -3 points).* ☐

# AQUACULTURE VISUAL IMPACT ANALYSIS

Project Name ______________________________

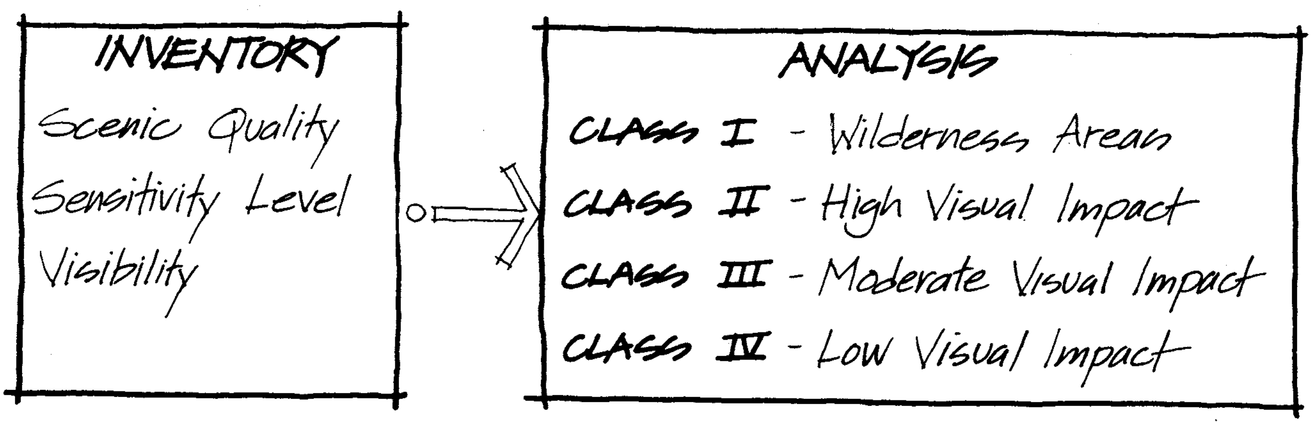
Project Location ______________________________

## ANALYSIS OF VISUAL IMPACT

DESCRIPTION: *Determination of four levels of visual impact through the synthesis of Scenic Quality, Sensitivity Level, and Visibility.*

TASK: *Use the diagram and matrix below to determine the extent of probable visual impact at the project site. Refer to the class descriptions for the level of visual impact and suggested mitigation measures.*

### Analysis Process



# AQUACULTURE VISUAL IMPACT ANALYSIS

| | | sensitivity level/visibility | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | High Sensitivity High Visibility | High Sensitivity Moderate Visibility | High Sensitivity Low Visibility | Moderate Sensitivity High Visibility | Moderate Sensitivity Moderate Visibility | Moderate Sensitivity Low Visibility | Low Sensitivity Any Visibility Category |
| scenic quality | Wilderness Areas | I | I | I | I | I | I | I |
| | HIGH | II | II | III | III | III | III | III |
| | MODERATE | II | III | III | III | III | IV | IV |
| | LOW | III | III | III | III | III | IV | IV |

## Visual Impact Classifications:

### Class I (Wilderness Areas) - **Severe Visual Impact**

Any permanently visible aquaculture facility will likely have a severe visual impact that cannot be mitigated.

### Class II - **High Visual Impact**

Areas where permanently visible aquaculture facilities will likely be visually obtrusive. To mitigate impact, project scale should be small enough not to call attention to itself or be located so not to be visually evident from key viewing points. Project design should borrow from the colors of the natural setting.

### Class III - **Moderate Visual Impact**

Areas where permanently visible aquaculture facilities will be visually evident. To mitigate impact, project should remain visually subordinate to the project setting. Project design should borrow from the colors of the natural setting. Scale should be small enough so not to cover more than 10% of the cone of vision as seen from key observation points.

### Class IV - **Low Visual Impact**

Areas where existing visual disruptions dominate (Industrial Landscapes); or areas of low sensitivity / Visibility. Most aquaculture facilities are unlikely to have an adverse visual effect. Few, if any, mitigation measures are necessary.

# CUMULATIVE IMPACT ANALYSIS

The purpose of this section is to discuss the problems and control of cumulative impacts resulting from the placement of more than one aquaculture project in a given area.

Aquaculture is a water-dependent use. It is generally permitted through local shoreline master programs in all environments except "natural," and in some places is prohibited in "urban." Typical means of regulating the placement and impacts of aquaculture is the use of performance standards found within the use regulations of the master programs. One county has created special districts which essentially permit only aquaculture. Other jurisdictions have used more or less specific performance standards.

## Cumulative Impacts

Problems can be classified into three general areas: biological, navigational, and visual and, to a lesser degree, access. Potential impacts on certain other factors (upland land use, noise, etc.) will vary in significance with the location and surrounding uses.

### Biological

Biological issues associated with intense aquaculture (esp. salmon pens) include the pollution of nearby waters resulting from digestive waste and unused fish food, the potential for disease transfer from cultured stock to free run or native stock, effects of antibiotic uses, effects on bottom habitats, and effects of predator control on wildlife.

While theoretically the issue of pollution should be self-policing due to the need by aquaculturists to have acceptable levels of water quality and a disease-free environment for their activity, it is highly probable that if a problem were to occur, its presence would be unknown until after the fact and some damage or degradation may have occurred. Also, due to the complex interaction of water chemistry, temperature and flushing, it is not a precise science to determine water quality impact from proposed new activities.

The cautious approach to dealing with the biological concerns has been to incrementally develop facilities with testing, in between increments, to detect possible impacts. This approach is one which can be translated into development controls.

### Navigational

The primary issue here is that, in certain locations and given a proliferation of aquaculture facilities, navigation may be noticeably or severely restricted. Dependent upon existing navigation routes and the alternatives available in the same vicinity, the placement of aquaculture could have a direct impact on navigation. Where alternative routes are convenient and safe, the impact is lessened, but the potential exists through facility expansion or proliferation of numbers in a given area to make navigation inconvenient or unsafe. The fact that marine charts are updated only infrequently adds to the concern that placement of aquaculture facilities be done in a controlled and predictable manner. Designating areas where impact to navigation is neglible can be handled through development controls or standards.

### Visual

The issue of cumulative impacts relative to visual assessment is an extension of the concerns dealt with in the Visual Impact Analysis. A single facility, of proper scale and properly placed, may have little visual impact. However, under certain conditions, the addition of facilities adjacent to or nearby other projects could have an obvious and negative impact. Factors such as size of the proposed project, size of the embayment, distance offshore, and viewing height all contribute to potential for cumulative impact. Pre-defining areas where probable visual impacts would be lessened can be accomplished through performance standards or other development controls that would guide projects to locations with low visual access or existing visual disruption resulting from extensive man-placed elements (piers, docks, rafts, industrial uses, etc.)

## Access

The issue of access impacts can arise if several facilities are developed by various operators in a given area and each requires land-based access. Parking, launching, and storage facilities are necessary in close proximity to supported aquaculture facilities. If several crews, representing different operators, are active in a given embayment or area, and if the loading and launching facilities are limited in capacity or otherwise not conducive to supporting the aquaculture staging requirement (such as a public boat launch), a conflict can arise as intensity of offshore development increases. The conflicts, if they occur, are probably felt more by abutting upland property owners than by the community at large. Shoreline permits for aquaculture can be conditioned to address the impacts of staging if they appear to be a concern.

# Cumulative Impact Controls

The biological impact, navigation conflicts, and visual impact all dictate varying degrees of need to separate or otherwise control the proliferation of facilities. This discussion examines techniques that might be used to effect separation of projects somewhat independently of the rationale (e.g. navigation, visual or biological) for separation. Ecology studies suggest, however, that biological impacts are unlikely to extend more than a few hundred feet from the perimeters of a project. Visual impact has the longest distance parameters associated with it. The reason for examining project separation goes beyond the paticular problems from a specific impact. It is to address concerns of upland residents that projects would be allowed to expand or increase without any control until any or all of the possible impacts would reach overwhelming proportions. A method to control density would give residents predictability concerning how much overall impact they could expect to encounter.

Several different approaches exist to control density and placement of aquaculture facilities and therefore the potential for cumulative impacts. They are discussed below in terms of their general characteristics and positive and negative aspects for dealing with aquaculture issues.

Zones/Districts

This concept is most analagous to traditional zoning. Specific, designated areas are identified in which aquaculture would be permitted. Permits would not be issued for projects falling outside the designated areas. The areas designated could be either compact or extensive dependent on criteria used to establish them. They could be described based on a set of environmental, visual and navigational criteria in combination or one of the criteria alone. With compact districts, the philosophy is to concentrate projects in certain areas and leave other areas entirely free of aquaculture.

With use of broader "zones," the general area of permitted aquaculture is identified and density standards could be applied that control the amount and/or frequency of development. This could be in the form of surface coverage of the project per unit area of water surface or it could be expressed as lineal frequency equated to the nearest shoreline (e.g. rafts/mile) or any other mechanism which limits the amount of aquaculture per some unit of measure.

To get approval of a project within the prescribed zone, the applicant needs only to show compliance with established criteria for that zone (could include density criteria or other performance criteria).

Positive Aspects:

* Provides predictability.

* Reduces conflicts at permit level.

* Dependent on criteria use, district can represent site with best aquaculture potential.

* Can provide a discrete upper limit on development.

* Enables county to protect the use, by imposing controls in surrounding development.

* Certain areas under "district" concept would not realize any negative impacts.

Negative Aspects:

* Pre-selects areas for aquaculture, independent of developer interest.

* Counties may be ill-equiped to find the best aquaculture sites biologically for districts.

* Reduces flexibility of aquaculture developer to find best biological sites or other particular characteristics.

* Concentrates biological, visual and navigational impacts.

* Cumbersome to add or change districts, especially given the developing technology of agriculture.

* May require county EIS.

Density Standards

Density standards are part of traditional zoning but represent a performance type criteria. As considered here, density standards could be the sole measure for determining aquaculture placement or they could be used in combination with zones or districts or other performance criteria. Because most jurisdictions have extensive areas (environments) where aquaculture is permitted, density requirements as a performance standard represent a primary means of control.

Density standards can be expressed in several forms. The three most obvious are:

1. Surface coverage of project per unit area of water surface (e.g. square feet/acre).

2. Lineal density of projects per length of adjacent shoreline (e.g. rafts/mile).

3. Lineal frequency of projects per length of adjacent shoreline (e.g. minimum 3,000 feet from project to project).

Density standards can be applied to all environments where aquaculture is permitted and can be tailored (via different density levels) to each type of environment or district.

Positive Aspects:

* Density standards would tend to limit the total amount of impact as in the case of total visual impact in a given area.

* Density standards are easy to administer and understand.

* Density standards can be tailored to specific environments, districts or shoreline (upland) conditions.

* The standard shoreline variance procedure could be used to adjust the standards where particular conditions justify greater density.

Negative Aspects:

* Density standards don't provide any control from a performance standpoint (amount of impact) for individual projects.

* Density standards are rigid and require use of the variance process to accommodate flexibility.

* Density standards may not be based on logical parameters.

Performance Standards

Performance standards are based on the concept that an aquaculture facility can go in essentially any location provided that the proposed facility meets certain criteria. These criteria would include values for allowable impacts for water pollution, visual impact, access, navigation, and other factors that may be important in a given area.

Performance standards, applied at varying levels of detail, are common in existing master programs. Density standards, discussed above, are considered one element of performance standards. Currently, however, no master programs have developed density performance standard for aquaculture of the type outlined in the previous section.

Performance standards can be developed for essentially any type of impact one wishes to control and, in the case of visual impact, are probably the best mechanism available. To amplify on this application, performance standards can be developed for viewer position above the water, project distance off-shore, project massing and alignment, and project height and color.

The key to making this process effective is in having clearly described criteria (or standards) by which a project proposal can be properly evaluated. It is through these criteria that expectations or control of density can occur.

Positive aspects:

* Performance standards assure limits on impacts.

* Performance standards allow siting in a potentially wider range of conditions.

* They can address a wide range of impacts.

Negative aspects:

* Performance standards are difficult and expensive to administer and often costly and time consuming to receive project approval under.

* Performance standards don't give much predictability on where facilities will locate.

* Performance standards can be vague and not precisely defined and result in varying levels of expectation.

Floating Zones

This concept represents a variation on density standards with the possible mixing of certain aspects of performance standards. It designates that a certain amount of aquaculture will be allowed within a general area without specifying where that amount will actually go (e.g. a maximum of 3 surface acres of net pens will be allowed in Hood Canal north of the floating bridge). Proposals for gaining designation can be reviewed based on performance standards, or possibly on a "first come, first served" basis. The floating zone can result in either a dispersal of projects or in their aggregation to compact areas dependent on how the criteria are written.

Positive aspects:

* Floating zones allow a high degree of flexibility.

* Floating zones provide overall density control.

Negative aspects:

* Floating zones do not allow predictability on actual location.

* Floating zones do not necessarily end up with the best sites actually getting developed.

Phasing with Monitoring

This concept can best be described as a blend of two control options, density standards and performance standards. As one approach, areas suitable for aquaculture would be described, most likely in conjunction with designations of density. However, only a portion of the designated area would be developed at one time, allowing for monitoring of impacts. Presumably, if a certain level of performance is being met, then an additional increment of aquaculture would be allowed in that zone.

The same concept could be applied where specified districts don't exist as in the case if density standards were used exclusively or when performance standards are used.

Positive aspects:

* Phasing with monitoring retains control of impacts.

* Phasing with monitoring can be used in conjunction with other control mechanisms.

Negative aspects:

* Phasing with monitoring is difficult and expensive to administer. Although payment of direct costs can be required of the applicant, the evaluation of results requires local effort.

* Phasing with monitoring does not provide predictability of project development.

<u>No Action Alternative</u>

This condition is evaluated to highlight what happens if a jurisdiction does not set up specific controls for cumulative impacts and yet faces applications for aquaculture. The concern here is the precedent setting nature of the "first" permit and how to limit the extent of that precedent.

This scenario assumes that local jurisdictions allow for aquaculture in their local program or provide for it as a substantial development or conditional use. The probability of precedent setting when aquaculture is considered a conditional use is limited as the control lies clearly with the local agency. Conditions of approval can be directed at control or limitation of cumulative impacts.

The greater concern, however, is with jurisdictions where aquaculture is approved as an outright use and there are not clear provisions for density aspects of conditioning that approval. There are a few safety valves available to aid in the control of cumulative impacts and the precedent setting nature of the first approval:

<u>SEPA</u> - The State Environmental Policy Act is one of the strongest and most pervasive laws governing land use and development. It allows decision makers to evaluate proposals and their probable impacts (including cumulative impacts)(WAC 197-11-792) and deny approval if potential impacts are felt to be too great (WAC 197-11-660). If, after granting the first aquaculture facility, the agency finds that the impacts are too severe or otherwise unmitigable, they would have every right to deny future applications that represented the same or similar impacts.

<u>Shoreline Management Act</u> - The Shoreline Management Act includes a mix of controls, first through local shoreline master programs and second by state review of local decisions made pursuant to the

program. The Shoreline Act, as reflected in local shoreline master programs and used in conjunction with SEPA, can be an effective tool in controlling cumulative impacts, especially when the local program clearly states concern for impacts from various factors (e.g. visual, biological, navigation, etc.). Where the first aquaculture project in a given area may not have a noticeable or significant impact, the second project application in the same area may, as a result of the SEPA process, be found to cause impacts of sufficient magnitude to deny approval (e.g. impact on fishing caused by net pen placement may be reason cited).

Beyond the local level, it is highly unlikely that the State would allow approval of a permit to stand for additional facilities where known impacts existed even if the local jurisdiction felt compelled to give approval. When the local program approves a permit as a conditional use, the State has the right (WAC 173-14-130/140) of final approval with specific review of cumulative impacts.

Corps of Engineers - The Corps of Engineers permits all activities on navigable waters. Their approval is somewhat removed from the considerations made at the local level and, while focusing on federal issues, is nonetheless wide- ranging. The Corps would feel no compulsion to approve a permit based on the fact that another facility had been approved in a certain area unless it met all their concerns and had an acceptable level of impacts. On matters such as this, they rely heavily on local agency concerns, and must obtain a Coastal Zone Certification from the state prior to approving a Corps permit. However, because they represent a different level of government, they can not be relied on as a mechanism for cumulative impact control.

Moratorium - Local jurisdictions have every right to declare moratoriums on certain activities where the public health, safety, or welfare may be in jeopardy or where the jurisdiction has inadequate current means for dealing with the services or impacts associated with the activity. Where a jurisdiction gets a series of applications for aquaculture with no policy or regulations in place to review these applications, they could declare a moratorium until such time as those policies and regulations were in place. This is not a permanent solution, but does allow the agency time to get on the control side of the regulation.

# Summary

To adequately regulate the cumulative impact (density) aspects of aquaculture and recognize that it presents a special set of impacts, it is desirable to have a tailored regulation mechanism.

The first issue to address should be predictability. The more an agency can describe or limit the probable areas where aquaculture can and cannot go, the less anxiety there will be from throughout the jurisdiction.

The second issue to address is performance. The control mechanism would establish acceptable limits of probable impacts that would allow projects to be implemented. This provides the needed environmental control and presumes that if problems are encountered, additional permits would be denied. As an example, in the instance of water quality, parameters would be established at the outset for acceptable impact. The project would need to show proof of meeting those parameters, initially, through submittal of background studies and projections and, as the project is in place, through periodic submittal of actual water quality analysis.

The third issue to address is conditional. The control mechanism would contain a formalized agreement for use, stating terms of performance and obligations of both the project proponent and the permitting agency. The conditions may include terms under which the permit may be revoked. On behalf of the project proponent, it may contain provisions regarding control of water quality discharged to the aquaculture site.

The approach outlined above is necessarily a little more complex than traditional zoning, but the extra degree of control is necessary to address the cumulative impact potential associated with aquaculture. For those jurisdictions wishing to control density of aquaculture projects and the resulting cumulative impacts, it is desirable to establish the necessary limits at the outset, and not as part of performance standard review or permit conditioning. The latter, while useful in the overall process, are too open-ended and lead to uncertainty for all participants.

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