

# DAM INFORMATIONAL OVERVIEW

## MCNARY DAM



July 2009

Water Quality Unit  
Reservoir Control Center, Columbia Basin Water Management Division  
U. S. Army Corps of Engineers Northwestern Division  
Portland, Oregon

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## **SECTION 1: GENERAL**

### **1.1 Project Description**

**Stream:** Columbia River (R.M. 292.0)

**Location:** Umatilla, Oregon

**Owner:** U.S. Army Corps of Engineers, Walla Walla District

**Project Authorization:** PL 79-14, 1945

**Authorized Purpose:** Power, Navigation

**Other Uses:** Fishery, Recreation, Irrigation, Water Quality

**Type of Project:** Run-of-river

**Date established:** July 1968

McNary Dam is a 1.4 mile (2.2 km) long hydroelectric dam which spans the Columbia River. It joins Umatilla County, Oregon with Benton County, Washington, 292 miles (470 km) upriver from the mouth of the Columbia at Astoria, Oregon. It is operated by the U.S. Army Corps of Engineers' McNary Lock and Dam office. The dam is located a mile (2 km) east of the town of Umatilla, Oregon, and 8 miles (13 km) north of Hermiston, Oregon. The dam was originally planned to be named Umatilla Dam, but the Flood Control Act of 1945 renamed the dam in honor of Senator Charles L. McNary of Oregon, who had died the previous year.

The dam provides for slackwater navigation, hydroelectric power generation, recreation, wildlife habitat, and incidental irrigation.

This dam has a unique feature: two additional turbines whose purpose is to power the dam itself. That is, this dam is entirely self-sustaining; and if some large event caused the entire grid to go down, McNary would be key in getting it back on. These two "station service" turbines are only capable of providing about three MW, compared to the 70 MW of the other 14 turbines. These two turbines operate alternately to provide the dam with its energy requirements.

McNary Dam is part of the Columbia River Basin system of dams.

### **1.2 Status - History**

Project authorized by House Document 704, 1945. The present project was completed in 1957. McNary Second Powerhouse is currently under design but has not been authorized for construction.

## SECTION 2: REGULATION

### 2.1 Water Surface Elevation (ft)

Maximum pool .....	357.0'
Max. flood pool (Q = 2,200,000 cfs) .....	356.5'
Max. spillway design operating pool .....	340.0'
Normal full pool .....	340.0 <sup>(1)</sup>
Min. pool .....	335.0 <sup>(1)</sup>
Max. flood tailwater (Q = 2,200,000 cfs) .....	303.0'
Minimum tailwater .....	257.0'

### 2.2 Discharge

Minimum	
December-February .....	12,500
March-November .....	50,000
Maximum rate of change per hour .....	150,000 <sup>(2)</sup>

### 2.3 Storage in Forebay

Maximum Storage .....	18.0 KSFD/ 1.0 ft
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### 2.4 Power Plant

Number of units .....	16
Number of units .....	14
Nameplate capacity .....	986 MW
Nameplate capacity (14 @ 70 MW) .....	980 MW
Overload capacity (14 @ 80.5 MW) .....	1,127 MW
Station service units .....	9.0 MW
Station service units (2 @ 3 MW) .....	6 MW
Hydraulic capacity (1% Max).....	232,000 cfs
Maximum H/K coefficient .....	5.2 MW/KCFS
Minimum H/K coefficient .....	4.9 MW/KCFS

### 2.5 Powerhouse

Turbine type	
Units 1-14.....	Kaplan automatic-adjustable blades
Units SS 1&2.....	Francis
Number of Units .....	16

Turbine capacity.....	14 @ 111,300 hp at 80 ft. head, 2 @ 4,500 hp at 80 ft. head
Normal Maximum Head .....	75'
Length .....	1,422
Spacing of units	
- Units 1-22 .....	86'
- Units SS 1&2.....	27'
Number of hydro-generating units.....	14 – 73,684 kva
Number of hydro-generating units.....	2 – 3,750 kva
Total rated capacity .....	1,567,200 hp at 80.0' head
Units 1 – 14 Kaplan type turbines.....	111,300 hp @ 80.0' head
Units SS 1&2 Francis type turbines.....	4,500 hp @ 80.0' head
Units 1-14 Discharges/turbine at rated head and full gate output .....	11,500 cfs
Units SS 1&2 Discharges/turbine at rated head and Units 1 – 14 Runner diameters.....	280"
Units SS 1&2 Runner diameters.....	63.6"

## **2.6 Navigation Lock**

Type .....	Single lift
Length .....	683'
Width .....	86'
Vertical lift .....	75'
Minimum depth over lower miter gate sill .....	15'

## **2.7 Stilling Basin**

No information

## **SECTION 3: Fish**

### **3.1 Fish Facilities**

Number .....	2
Ladder Slopes.....	1:20
Ladder Widths.....	30.0'
Flow for Adults	
Oregon side ladder .....	210 cfs
Washington side ladder.....	180 cfs
Flow in Juvenile Bypass .....	650 cfs
Auxiliary Water Supply (AWS)	
Oregon AWS.....	1000 cfs
Washington AWS .....	4200 cfs

### **3.2 Temporary Spillway Weir (TSW)**

Number of TSWs.....	Two
TSW Locations..	Spill Bays 19 and 20
TSW Flow.....	7-11 kcfs
Training Flow.....	???

The TSW was in spillbay 4 but was moved to spillbay 19 in June 17, 2009. Based on the unanimous recommendations of the regional fisheries managers the COE will be moving the spillway weir from bay 4 to bay 19. The fisheries managers have concern with the potential for high predation rates to occur with the spillway weir located in bay 4..

## **Section 4: Water Quality**

### **4.1 Spillway**

Type .....	Concrete gravity, gate controlled
Length (overall) .....	1,310'
Gates .....	22 - 50' X 51' vertical lift, (operated by either of two 200- ton cranes)
Crest elevations .....	291'
Deck elevation .....	361'
Design discharge, (cfs) .....	2,200,000

### **4.2 Flow Deflectors**

Total number of Bays.....	22
Total number of deflectors.....	22
Elevation of deflector (ft).....	256
Depth of deflector (ft).....	11.1
Length of deflector (ft).....	12.0
Toe of deflector (ft).....	0

## 4.3 Water Quality Monitoring Stations

### A) Active Gauges

#### A1. McNary Forebay (Washington Side) TDG Monitoring Station (MCNA)

**Gage Elevation:** Variable

**Latitude:** 45° 56' 28.8"

**Longitude:** 119° 17' 35.5"

**Datum:** NAD-83

**River:** Columbia

**River Mile:** 292.3

**USGS-ID:** 14019220

**Owner:** U.S. Army Corps of Engineers

**Gauge Type:** Hydrosonde

**Data Transmission:** GOES Satellite

**Dates of Operation:** Year Round

**Years of Operation:** 2005 - Present

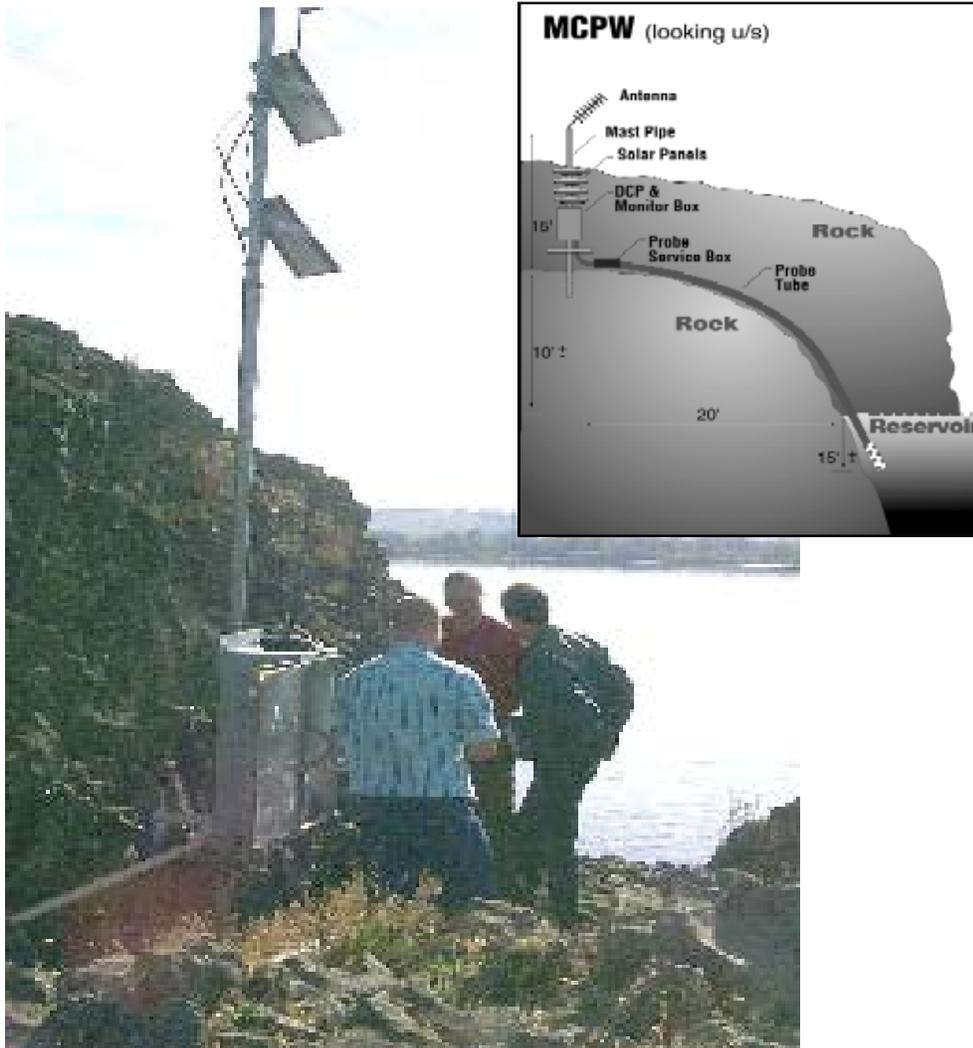
**River Conditions:** Forebay Monitor

**Location:** This gauge is located at the end of the forebay navigation lock guidewall near the Washington shoreline.

**Comment:** This gauge moved to its present location in Spring 2005. Previously, this gauge was located on the face of the dam near the Washington side of the dam (MCQW).



**Gage Elevation:** Fixed  
**Latitude:** 45° 56' 2.8"  
**Longitude:** 119° 19' 35.5"  
**Datum:** NAD-83  
**River:** Columbia  
**River Mile:** 290.7  
**USGS-ID:** 14019240  
**Owner:** U.S. Army Corps of Engineers  
**Gauge Type:** Hydrosonde  
**Data Transmission:** GOES Satellite  
**Dates of Operation:** Year Round  
**Years of Operation:** 1995 - Present  
**River Conditions:** Tailwater Monitor  
**Parameters Measured:** Barometric Pressure, Total Gas Pressure, Temperature  
**Location:** This gauge is located on a rocky outcrop on the Washington shore about 1.3 miles downstream of McNary dam and just upstream of the Highway 395 bridge.



**Figure 2:** TDG Fixed Monitoring Site at McNary tailwater.

### **A3. Pasco (PAQW)**

**Gage Elevation:** Fixed

**Latitude:** 46° 13' 26.3"

**Longitude:** 119° 06' 57.3"

**Datum:** NAD-83

**River:** Columbia

**River Mile:** 329.1

**USGS-ID:** 12514400

**Owner:** U.S. Army Corps of Engineers

**Gauge Type:** Hydrosonde

**Data Transmission:** GOES Satellite

**Dates of Operation:** April 1 – Sept. 15

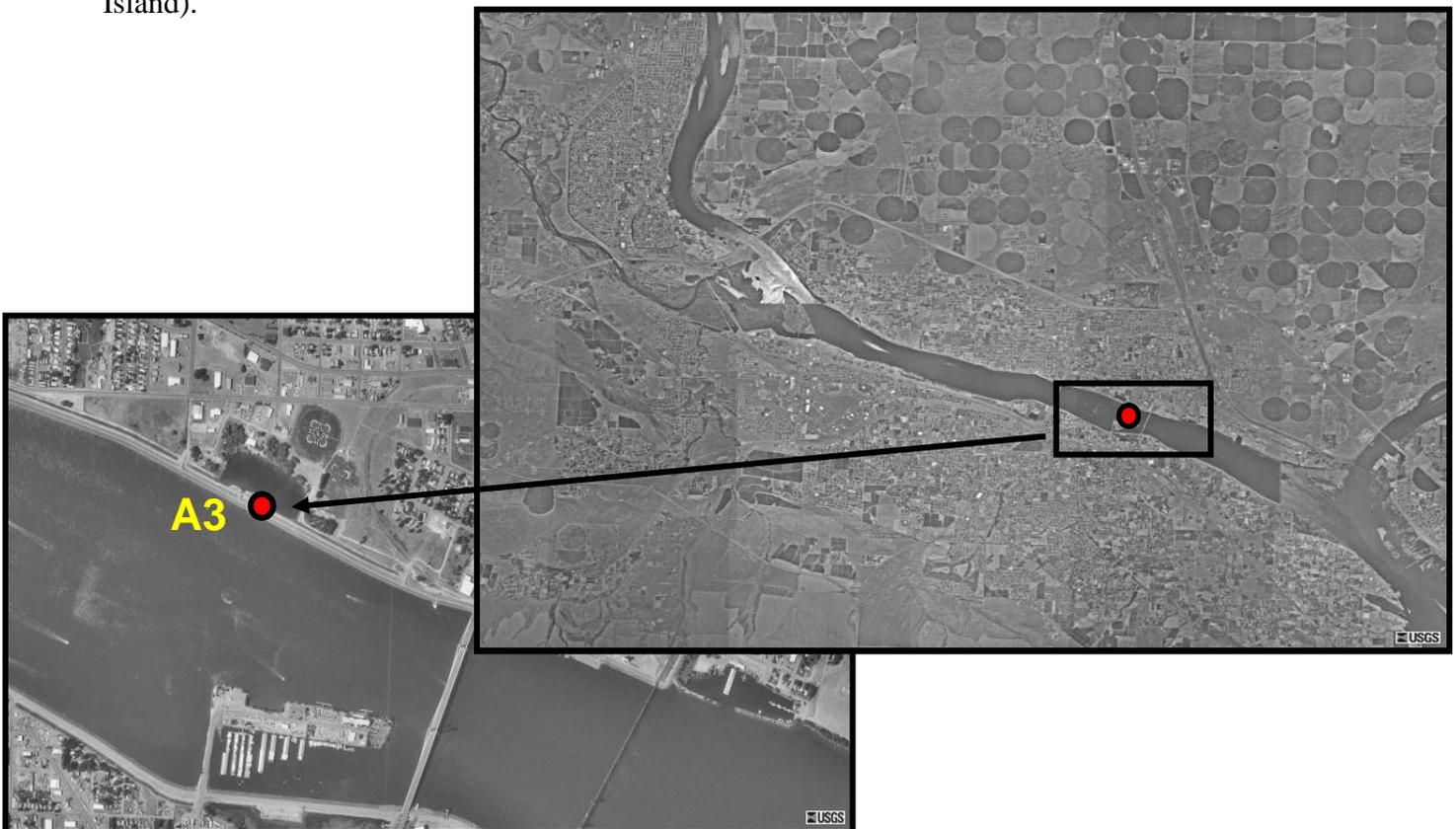
**Years of Operation:** 1999 - Present

**River Conditions:** Open River

**Parameters Measured:** Barometric Pressure, Total Gas Pressure, and Temperature.

**Location:** This gauge is located on the northern shore of the Columbia River between the S. 10<sup>th</sup> Avenue bridge and the Highway 395 bridge in Pasco, WA. It is on the levee adjacent to a wetland area near the Pasco Youth Baseball Complex. The site is within Lake Wallula approximately 5 miles upstream of the Snake River confluence.

**Note:** \*The McNary pool backwater limit is at RM 353.6, or 18.4 miles upstream of the Yakima River Confluence (335.2) (at what forebay elevation????). The Columbia / Snake confluence is at RM 324.2. The Pasco TDGMS station is at RM 329.05 (across from Clover Island).



**Figure 3:** Location of the Pasco fixed monitoring site.



**Figure 4:** Location of the McNary forebay and tailwater TDG monitoring sites

## B) Obsolete Gauges

### B1. McNary Forebay, Washington Shore (MCQW)

**Gage Elevation:** Variable

**Latitude:** 45° 56' 28.8"

**Longitude:** 119° 17' 35.5"

**Datum:** NAD-83

**River:** Columbia

**River Mile:** 292.3

**USGS-ID:** 14019220

**Owner:** U.S. Army Corps of Engineers

**Gauge Type:** Hydrosonde

**Data Transmission:** GOES Satellite

**Dates of Operation:** Year Round

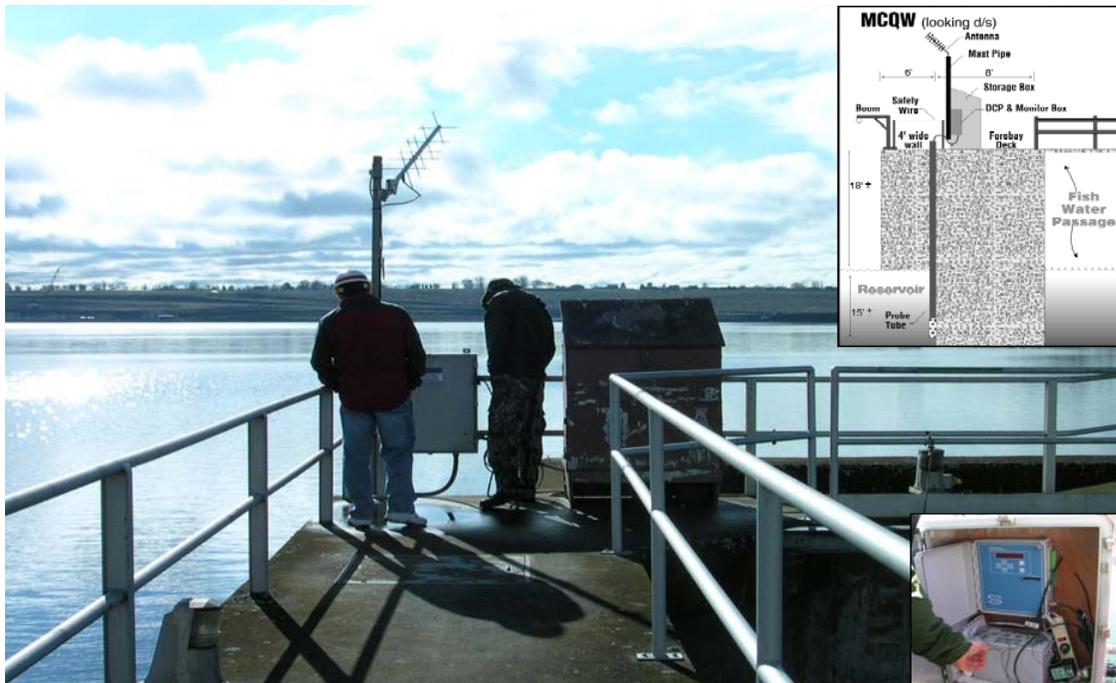
**Years of Operation:** 2005 - Present

**River Conditions:** Forebay Monitor

**Parameters Measured:** Barometric Pressure, Total Gas Pressure, Temperature

**Location:** This gauge is located at the end of the forebay navigation lock guidewall near the Washington shoreline.

**Comment:** This gauge moved to its present location in Spring 2005. Previously, this gauge was located on the face of the dam near the Washington side of the dam (MCQW). This gauge is inactive.



**Figure 5:** TDG Fixed Monitoring Station at McNary Forebay (Washington side).

## **B2. McNary Forebay (MCQO)**

**Gage Elevation:** Fixed

**Latitude:** 45° 55' 56.6"

**Longitude:** 119° 17' 48.7"

**Datum:** NAD-83

**River:** Columbia

**River Mile:** 292.0

**USGS-ID:** 14019200

**Owner:** U.S. Army Corps of Engineers

**Gauge Type:** Hydrosonde

**Data Transmission:** GOES Satellite

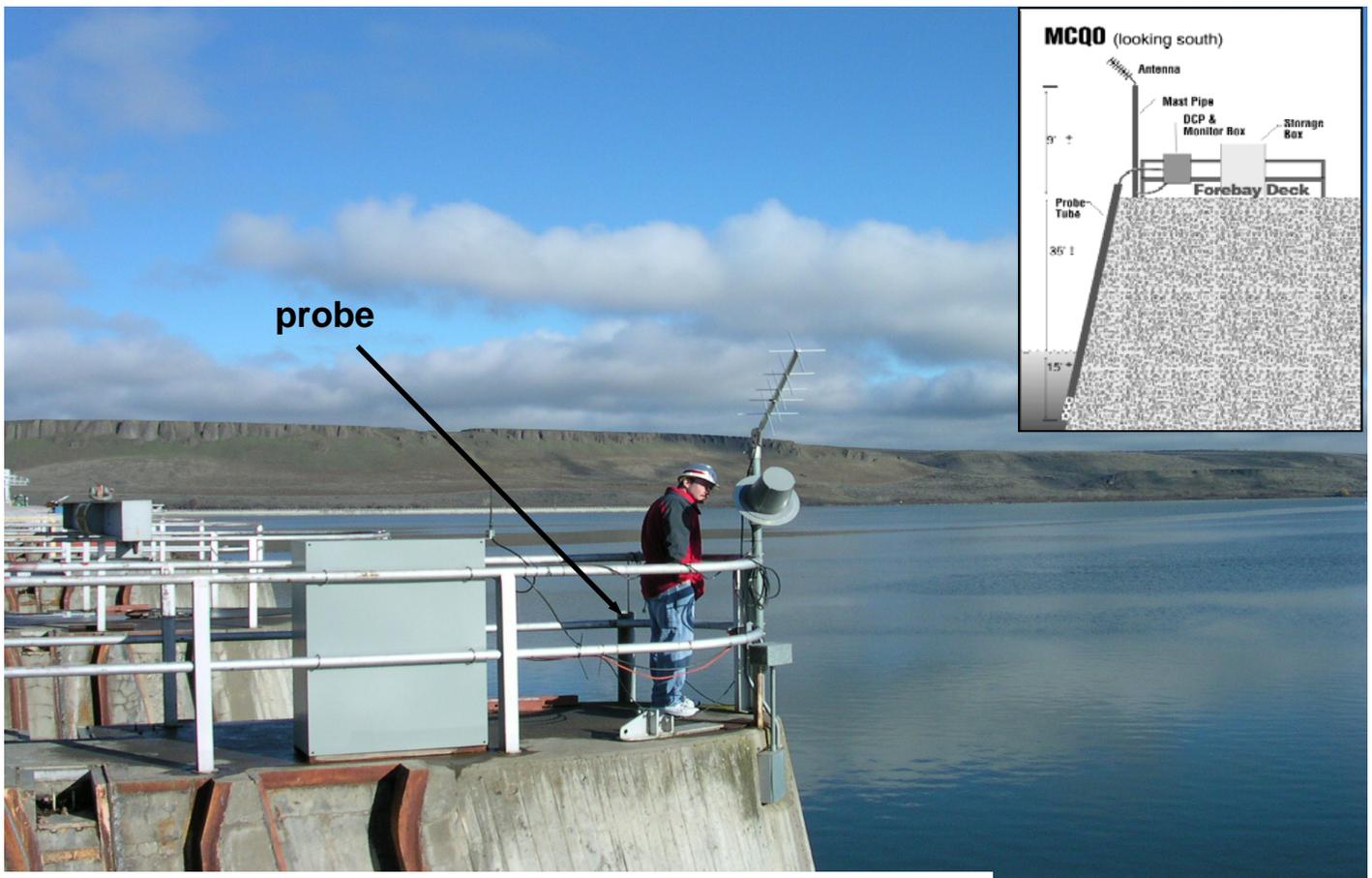
**Dates of Operation:** Year Round

**Years of Operation:** 1985 - Present

**River Conditions:** Forebay Monitor

**Parameters Measured:** Barometric Pressure, Total Gas Pressure, Temperature

**Location:** This gauge is located on the forebay of the dam on the Oregon side of the dam near Generating Unit #1.



**Figure 1:** TDG Fixed Monitoring Site at McNary Forebay (Oregon Side).

# Appendix A: Project Schematics

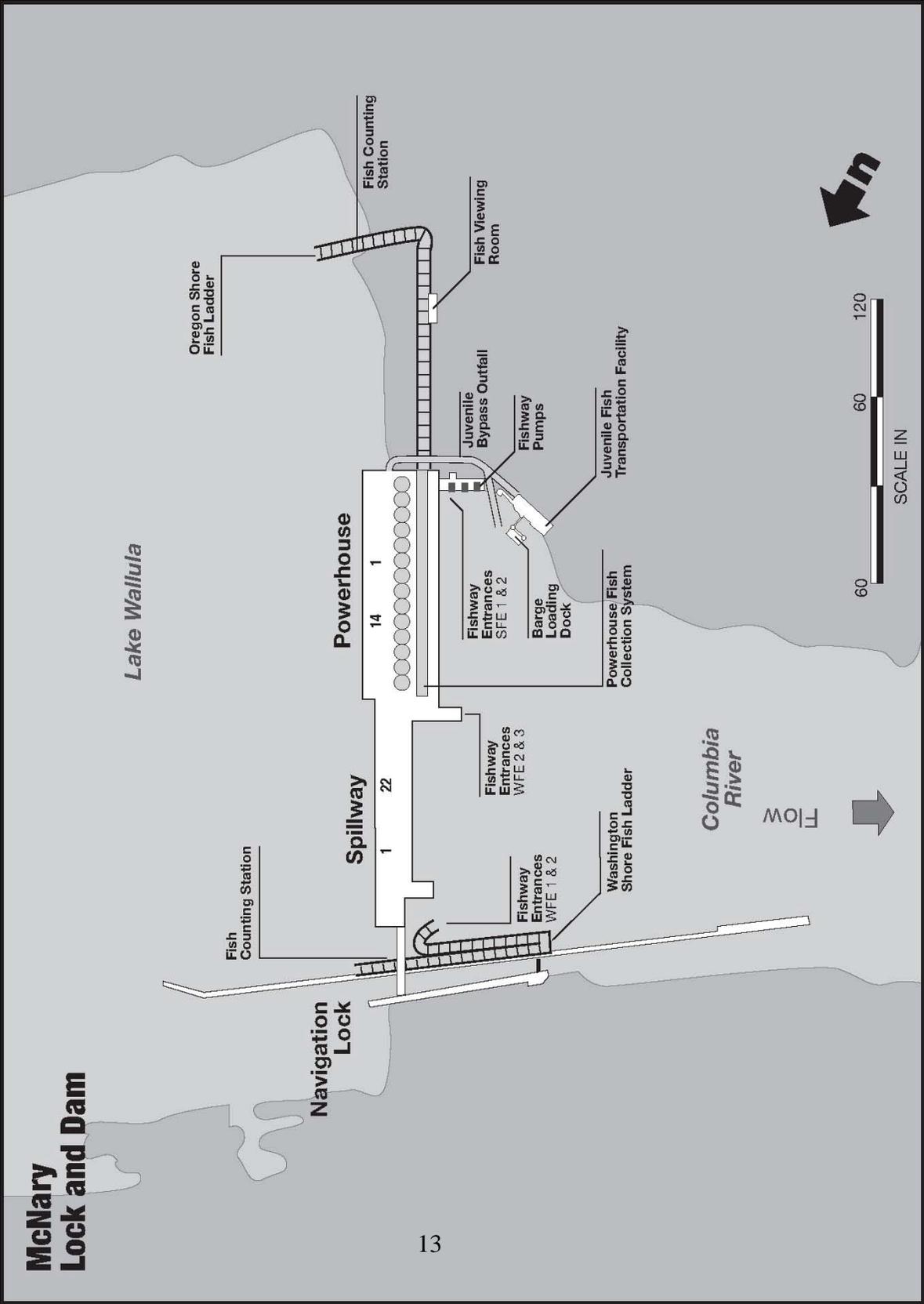


Figure 6: McNary Lock and Dam general site plan.

## Appendix B: Notes

**Lake elevation** authorized to optimize project operation.  
*House Document 704, 75th Congress, 1945.*

**Discharge:** Fisheries consideration.

**Rate of Change:** Based on 1.5 feet per hour.

Release for overflow plant output full pool and no spill.  
*DPR, McNary Dam, 6 Mar 1946, with number and size of units.*

(1) Project engineer can authorize lake to fill to elevation 340.5 or draft to 334.5 to allow for unexpected events.

(2) Based on 1.5 ft/hour change.

## Appendix C: Glossary

Forebay - The water upstream of / behind the dam.

Tailwater / Tailraise – It is the water surface immediately downstream from a dam or hydroelectric power plant.

Power Plant – It is a place where electricity is generated.

Powerhouse - The part of a hydroelectric dam where the turbine-generators are housed and where power is produced by the action of the water on the turbine blades.

Navigation Lock - A device used for raising and lowering boats between stretches of water of different levels on river and canal waterways.

Stilling Basin - A basin constructed to dissipate the energy of fast-flowing water, eg, from a spillway or bottom outlet, and to protect the river bed from erosion.

Fish Ladder - Structures on or around artificial barriers (such as dams and weirs) built to facilitate diadromous fishes' natural migration. Most fish ladders enable fish to pass around the barriers by swimming and leaping up a series of relatively low steps (hence the term ladder) into the waters on the other side.

Ice and Trash Sluiceway (IST) – It is a channel through which debris, such as ice and trash, which has collected in the dam forebay, is released into the tailraise. Juvenile fish also use this outlet to travel downstream during the spring and summer seasons.

Removable Spillway Weir (RSW) - A removable steel structure that is attached to the forebay of an existing spill bay, creating a raised overflow weir above and upstream of the existing spillway crest.

Spillway - A structure that allows release of excess water from a dam or other hydraulic structure.

Flow Deflector – It is a structure found below the spillway tiers and above the stilling basin of a dam. Its purpose is to deflect off the flow of the spill water at an angle such that the spilling water skims on the surface of the existing water elevation instead of plunging deep into the tailraise. Spill water plunging into the tailraise will increase Total Dissolved Gas (TDG) levels; the deflector serves to reduce the TDG. The flow deflector will not be as effective during high spill periods as the water will spill clear of the deflector.