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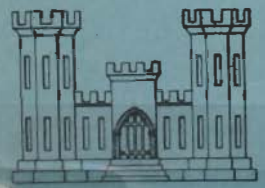
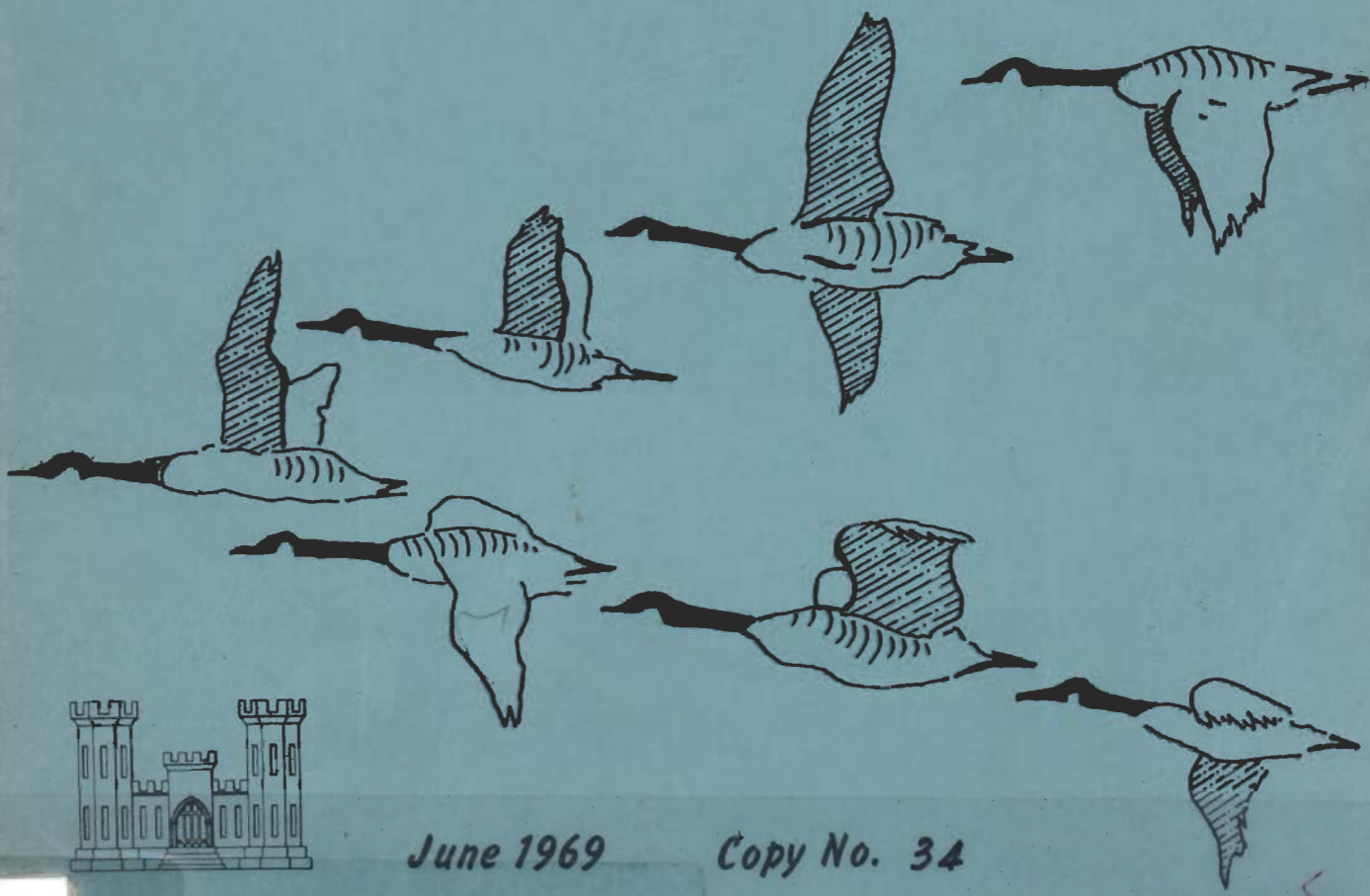
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DESIGN MEMORANDUM NO. 14.1

RECREATION FACILITIES and PUBLIC USE AREAS

Little Goose Reservoir

SNAKE RIVER, WASHINGTON



June 1969

Copy No. 34

U.S. ARMY ENGINEER DISTRICT - WALLA WALLA, WASHINGTON

TC
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1969
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DEPARTMENT OF THE ARMY
WALLA WALLA DISTRICT, CORPS OF ENGINEERS
BLDG. 602, CITY-COUNTY AIRPORT
WALLA WALLA, WASHINGTON 99362

NPWEN-DB

6 June 1969

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

Division Engineer, North Pacific

1. Forwarded separately are eight copies of subject DM for review and approval. This report is a portion of the Master Plan, DM 14, and they are being submitted simultaneously.
2. Expedited approval of this DM is essential to permit accomplishment of the underwater portion of the development prior to filling of the reservoir, which is currently scheduled for February 1970. It is requested that telephone advice of approval be given at the earliest opportunity. Contract plans and specifications are currently being prepared for advertising about 1 August 1969.
3. The Master Plan, DM 14, furnishes backup data for use influences and predicted visitor attendance on the Little Goose Reservoir. It also contains land classification of the Government-owned properties along with cost estimates of recreation development to be accomplished by non-Federal interests and future recreation development by both Corps and non-Corps interests.

1 Incl (fwd sep)
as (8 cys)

/s/ Robert J. Giesen
ROBERT J. GIESEN
Colonel, CE
District Engineer

COPY

NPDPL-RB/NPDEN-TE (6 Jun 69) 1st Ind
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, North Pacific Division, Corps of Engineers, 210 Custom House, Portland,
Oregon 97209 13 July 1969

TO: Chief of Engineers, ATTN: ENGCW-OM

Design Memorandum No. 14.1, Recreation Facilities and Public Use Areas
at Little Goose Project is recommended for approval subject to the follow-
ing:

a. On page i of Pertinent Data, revise standard project flood from
340,000 to 575,000.

b. Paragraph 4.01c(2). Information on wind directions and velocities
should be presented to permit evaluation of revetment requirements and
breakwater arrangements for the boat basins.

c. Paragraph 5.02. Accomplishment of the work as outlined for initial
development will be subject to funding and expenditure limitations.

d. Cost Estimates - Table 8.

(1) The embankment unit price of \$0.45 per cubic yard is considered
low on the basis that there is still a borrow requirement of approximately
120,000 c.y. with all excavation utilized.

(2) Revetment for the breakwaters requires about a 10-inch average
size rock based on a wave height of 2.2 feet and a 1 on 2 slope. The
cost estimate lists only rockfill as a possible revetment material. Rip-
rap items should be added and the cost estimate revised.

e. Table 9. Under item a it should be pointed out that during final
Master Plan studies it became evident that significant cost increases would
occur over the austere program previously included in the Preliminary
Master Plan. However, it was determined that cost revisions for the up-
graded design would not be submitted on a periodical basis until a more
final design for the whole program could be realized.

f. Plates 3 and 4 - Central Ferry Site.

(1) Recommend decreasing the entrance channel width between the
breakwater and island to about 100 feet at minimum pool to decrease the
potential of waves entering the boat basin.

(2) Consideration should be given to separating the boat basin and
swimming area by use of a land fill to the island. This would provide for
better equipment access to service the island development and maintain the
rock revetment. It would also prevent contamination of the swimming area
from debris and fuel spillage in the boat basin.

NPDPL-RB/NPDEN-TE (6 Jun 69) 1st Ind 18 July 1969
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

(3) Comfort stations should be provided on the day-use island. If this is impractical then consideration should be given to providing such facilities closer to the island access points.

g. Plate 9 - Boyer Site. The boat harbor entrance channel plan should be evaluated relative to currents from Lower Granite project discharges.

FOR THE DIVISION ENGINEER:

1 Incl
nc (5 cys w/d)

/s/ William M. Zink
for C. A. CARROLL
Colonel, Corps of Engineers
Deputy Division Engineer

ENGCW-PV (6 Jun 69) 2nd Ind

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, CofEngrs, Washington, D. C. 20315

12 September 1969

TO: Division Engineer, North Pacific

Design Memorandum No. 14.1 is approved subject to the comments of the
Division Engineer in the preceding 1st Indorsement and to the following:

a. 1st Indorsement, paragraph f(2) and Plate 3. Consideration also
should be given to providing a gated pipe through the proposed land fill
to the island. This would provide a flushing action and water circulation
in the swimming area. The land fill would eliminate the need for the
adjacent footbridge.

b. Paragraphs 3.04 - Willow Island Site, and 3.06 - Illia Site,
indicate that the paving of the access roads will not be included in the
initial development. Paragraph 3.08 - Roads, indicates that all entrance
roads will be surfaced with an asphaltic treatment. Since the cost for
surfacing these two entrance roads is only about \$5,000, it appears that
the surfacing should be done initially.

c. Paragraph 3.16 - Picnic Units and Shelters, indicates a corrugated
metal roof for the shelter. Such a type of roofing material could appear
artificial and inappropriate to a natural environment. An alternative for
the metal roof, such as wood shakes proposed for the comfort station,
should be considered.

FOR THE CHIEF OF ENGINEERS:

1 Incl
wd

/s/ Louis G. Feil
LOUIS G. FEIL
Chief, Planning Division
Civil Works Directorate

NPDPL-RB/NPDEN-TE (6 Jun 69) 3rd Ind

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, North Pacific Division, Corps of Engineers, 210 Custom House, Portland,
Oregon 97209 25 September 1969

TO: District Engineer, Walla Walla

1. Forwarded to note the conditioned approval of the preceding correspondence.
2. Information as to the action to be taken by your office with respect to the approval comments is requested.

/s/ John M. Ansley
JOHN M. ANSLEY
Colonel, Corps of Engineers
Acting Division Engineer

NPWEN-PL (6 Jun 69) 4th Ind

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, Walla Walla District, Corps of Engineers, Building 602, City-County
Airport, Walla Walla, Washington 99362 28 July 1970

TO: Division Engineer, North Pacific

1. Revised sheets for copies 1 through 8 of the DM are inclosed. Answers to comments contained in the preceding 1st and 2nd Indorsements are as follows:

a. 1st Indorsement.

(1) Revised pertinent data sheets are inclosed showing the standard project flood as 575,000 cfs.

(2) Drawings of wind wave studies for Central Ferry and Boyer Sites are included on new Plate 4 and show expected wave heights. The currents could be analyzed by model studies; however, the change in stage and the mean sectional velocity at River Mile 105.4 for the initial hydraulic capacity at Lower Granite 10,000 cfs, and the future hydraulic capacity 120,000 cfs are as follows:

0 - 120,000	1.0 feet change in elevation
0 - 60,000	0.2 feet change in elevation

Using 25,000 sq. ft. as the cross sectional area,
 $V = 1.7$ ft/sec for 60,000 cfs, and
 $V = 3.4$ ft/sec for 120,000 cfs.

(3) As a result of the delay in funding, a complete redesign of the Central Ferry Site was necessary because construction conditions have changed completely since the reservoir was filled. Foundation conditions at Central Ferry consist of approximately 3 to 16 feet of sandy silt overlying sandy gravel. Before the reservoir filling, excavation of the silts to the various slopes and configurations, placing beach sand and wave protection materials, constructing footings for structures, and similar work would have been done in the dry. The silts are now inundated and to have attempted construction of the facilities as originally planned would have required special design and construction techniques for "soupy materials." Moving the facilities within the area to where gravels intercept the reservoir at elevation 638 was necessary to reduce costs and make construction possible. The new layout permits excavation of silts in the dry and sandy gravel below the water surface. Coordination of the new layout with personnel from the State of Washington Parks and Recreation Commission has been effected and the Commission is satisfied

NPWEN-PL (6 Jun 69) 4th Ind 28 Jul 70

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation Facilities and Public Use Areas, Little Goose Reservoir

with the layout as shown on revised Plate 3. Because of this redesign and construction of facilities with a full reservoir, the cost estimate has increased from \$1,025,000 to \$1,450,000, as shown on revised Table 4.

(4) Redesign of the Penawawa Site was necessitated by filling of the reservoir prior to construction. The new layout is shown on revised Plate 7. Prior to impoundment, the Port of Whitman County had considerable grading work accomplished by hired labor forces. The work included excavation of the boat basin to below the 629 elevation, construction of a concrete launching ramp, partial construction of the silt dike, grading of the parking area, and raising of the old road to above reservoir level. This work was accomplished so some facilities would be available to the local citizens until the Corps construction was accomplished. As compensation for the work performed by the Port of Whitman, the Corps agreed to construct some tieup docks at this site. The value of the tieup docks to be constructed by the Corps is \$13,200. The cost to construct underwater is \$40,000 and was accomplished by the Port of Whitman. The revised cost estimate shown on Table 6 reflects redesign of the site and savings for work accomplished by the Port.

(5) At Boyer, a small change was made in the breakwater design after wind wave studies were completed. At this site the port of Whitman County also performed considerable grading work by constructing about one-half of the breakwater, grading the boat basin, and constructing the launching ramp. The estimated cost for the Corps to construct this work under reservoir conditions is \$158,000. To balance this work, the Corps will construct a portion of the tieup dock for this site at an estimated cost of \$132,000. Revised cost estimate is shown in Table 8. As reflected in the revised cost estimate, the cost of each section and reasons for variance in cost are:

(a) Access roads decrease \$1,000. - The length of protection downstream of the boating area was reduced.

(b) Parking areas increase \$16,000. - Excavation in the marina area parking lot is now in this feature. In the original DM, this was charged to the boating area. Adjustment in unit prices did not affect overall cost.

(c) Picnicking and swimming areas increase \$134,000. - Excavation has increased 8,000 yards in quantity due to readjustment at some grades and the cost per yard has increased. Embankment has decreased about 9,000 yards, but the price has increased four-fold because random materials cannot be placed under water and the borrow source for the gravels is about 1/2 mile from the work. Previous rockfill material has been changed to riprap because of construction to steeper slopes under water. Also, beach sand placement under water has caused this cost to rise.

NPWEN-PL (6 Jun 69) 4th Ind 28 Jul 70

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation Facilities and Public Use Areas, Little Goose Reservoir

(d) Boating Area increase \$220,000. - Excavation and embankment quantities have reduced considerably due to the work performed by the Port of Whitman County. In return for the work accomplished by the Port, the Corps will install tieup docks in the marina. This trade results in a savings of \$26,000. Because of construction under water the cost of placing material has risen as reflected in Table 8.

(e) Camping Area increase \$1,000. - Increase is due to adjustment in quantities of asphaltic paving which were in error in the original DM.

(f) Comfort stations increase \$15,000. - Building size has been increased because of the large marina and camping area which will utilize this facility.

(g) Pumphouse increase \$16,000. - Due to modifications in the mechanical equipment, modification of the building design, and anticipated drilling cost.

(h) Landscaping increase \$6,000. - Addition of some materials and increase in unit prices.

(i) Miscellaneous Items increase \$1,000. - Due to change in length of culvert installations.

(j) Contingencies increase \$36,000. - Due to rise in overall estimate. Percentage was reduced because accuracy of quantities is equal to contract takeoff.

(6) Revised Table 9 is inclosed which indicates updating of the cost estimate was not made on a piecemeal basis due to the anticipated large increase in cost. Changes of such magnitude should have good backup before cost estimates are revised.

b. 2nd Indorsement.

(1) The redesign of the Central Ferry Site precludes the use of culverts for flushing of the swimming area. The two water entrances into the area and fluctuation of the reservoir surface should provide adequate water circulation.

(2) Paving of all access roads and parking areas will be included as part of the initial work.

NPWEN-PL (6 Jun 69) 4th Ind 28 Jul 70

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

(3) Redesign of the comfort stations and picnic shelters has been accomplished. Roofs of all buildings will be the same. At Central Ferry they will be cedar shakes, while at all other sites they will be simulated shake shingles of baked enamel on aluminum.

2. Our correspondence to Division Engineer dated 9 July 1969, subject: "Funding of Little Goose Project, FY 70", stated in paragraph 4f that delay of construction of recreation facilities until after reservoir filling would at least double the \$780,000 of estimated underwater construction cost. Redesign at the sites has been accomplished to more nearly balance materials at Central Ferry and Penawawa, and breakwaters at Boyer were redesigned to adequately protect the boat basin. Total increase in construction cost as reflected by the revised site layouts is \$941,000.

3. Comparison of the cost estimates at Boyer and Central Ferry with the drawings will indicate a relatively minor inconsistency in number of shrubs and trees. Since these factors are small as compared with contingencies and would be further modified in final design, they have not been reconciled for this revision.

4. Errata sheets for revised pages are inclosed for insertion in copies of Design Memorandum previously forwarded to Division.

1 Incl
Added 1 incl
2. Revised Sheets (8 sets)

/s/ Harold L. Matthias
HAROLD L. MATTHIAS
Major, CE
Deputy District Engineer

NPDPL-RB/NPDEN-TE (6 Jun 69) 5th Ind

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, North Pacific Division, Corps of Engineers, 210 Custom House, Portland,
Oregon 97209 21 September 1970

TO: District Engineer, Walla Walla

1. Subject Design Memorandum, as revised, is approved in concept, and as a basis for proceeding with plans and specifications for recreation development subject to the following:

a. Proposed developments may be provided to the extent they can be funded within prior appropriated funds. The FY 1971 Congressional presentation was for completion of funding for Little Goose Project. In this regard, cost estimates reflected in Tables 1 through 8 reveal an increase of \$941,000 for feature 14 costs over the \$1,950,000 program reflected for this feature in the FY 1971 budget. This cost increase will, therefore, need to be funded either from available contingency funds or construction under-runs. If sufficient funds are not available to complete the initial program, the remaining work should be proposed for completion under a future Code 710 program.

b. Plates 3 and 5, Central Ferry:

(1) Plate 3 dated 27 May 1969 indicated 120 units in 2 future camp areas. No future units are shown on the revised plan. If such units are planned for the future, their tentative location should be shown on the revised plates 3 and 5.

(2) Clarify whether the existing comfort station at approximately N485,550-E2,675,450 is to be removed or retained.

(3) The redesign necessitated by changed site conditions is recognized. However, justification should be furnished for additional scope revisions noted as follows:

(a) Vehicle parking in excess of that shown on original plans.

(b) Provision of two comfort stations in the day-use area in lieu of one shown previously.

(c) The estimate includes \$60,500 for a comfort station in the "picnic" area while the original estimate included \$19,500 for a "day use" comfort station. If a new larger building is contemplated (assumed State of Washington requirement) concept plans should be forwarded for review and approval.

NPDPL-RB/NPDEN-TE (6 Jun 69) 5th Ind 21 September 1970
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

(d) Provision of additional boating facilities including boat launching and boating areas. In the case of the latter, it appears that substantial cost reduction could be realized by eliminating the upstream boating area and breakwater protection and concentrating boating activities at the downstream portion of the site. This action might also permit readjustment of the proposed swimming area with opportunity for decreasing costs.

(4) Wave data presented on Plate 4 suggests slope protection may be necessary along the camping area shoreline. Evaluation of erosion under present pool conditions would provide information on revetment requirements.

(5) Recommend reorientation of the breakwaters for the downstream boating area to an East-West alignment with sufficient overlap to prevent direct entry of waves into the protected area. Refer to diffraction diagram on Plate 4.

c. Plate 7 and revised paragraph 3.05, Penawawa Site: Provide justification for the small tie-up dock not previously included in prior approved plans.

d. Plate 9, Boyer Site:

(1) The plan and narrative in paragraph 3.07b indicate moorage docks will be provided by the Port of Whitman County, yet a total of \$110,000 is included in Table 8 for tie-up docks. Paragraph 1a(5) of the preceding 4th Ind indicates the Corps will construct a portion (\$132,000) of the tie-up docks. These separate cost estimates should be coordinated, and the agreement developed with the county to build a portion of these docks should be fully explained and furnished this office for review.

(2) The pumphouse and well location are not shown on the drawing.

FOR THE DIVISION ENGINEER:

w/d incl

/s/ John M. Ansley
JOHN M. ANSLEY
Colonel, Corps of Engineers
Deputy Division Engineer

AIR MAIL

M



DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION, CORPS OF ENGINEERS
210 CUSTOM HOUSE
PORTLAND, OREGON 97209

NPDPL-RB/NPDEN-TE

21 September 1970

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

Chief of Engineers, ATTN: ENG CW-EZ

PV

1. References:

a. ENG CW-PV 2nd Ind dated 12 September 1969 to basic NPWEN-DB letter
of 6 June 1969, above subject.

b. ER 1110-2-1150, paragraph 19b.

2. In compliance with reference 1b, four copies of revised sheets for
Design Memorandum 14.1, Little Goose Project together with approval
correspondence are forwarded. The subject Design Memorandum was previously
approved by correspondence referenced in paragraph 1a.

FOR THE DIVISION ENGINEER:

- 2 Incl (4 cys)
- 1. Revised sheets
- 2. Cy 4th & 5th Ind ref 1a

A handwritten signature in cursive script, reading "John M. Ansley".

JOHN M. ANSLEY
Colonel, Corps of Engineers
Deputy Division Engineer

AIR MAIL

ENGW-EZ (NPDPL-RB/NPDEN-TE, 21 Sep 70) 1st Ind
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Area, Little Goose Reservoir

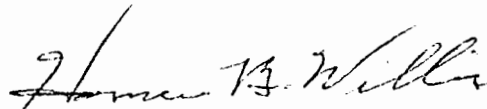
DA, Office of the Chief of Engineers, Washington, D.C. 20314 21 December 1970

TO: Division Engineer, North Pacific, ATTN: NPDPL-RB/NPDEN-TE

1. The information furnished by the District Engineer in the inclosed 4th indorsement is satisfactory, subject to the comments of the Division Engineer in the 5th indorsement and the following comments.
2. Plate 3, downstream boating area, and 5th indorsement, paragraph 1b(5). A diffraction diagram is required to evaluate the need for overlapping and realigning the breakwaters.
3. Plate 4. Wave heights shown do not agree with design wave heights of 3.0 feet at Central Ferry and 2.2 feet at Boyer in Design Memorandum 14.1, pages 4-3 and 4-6. Clarification is required. Riprap may require redesign as a result of reanalysis of wave heights.
4. Plate 9, Boat Marina at Boyer. Consideration should be given to extending the end of the proposed main breakwater another 25 to 50 feet to reduce wave action within the marina. The diffraction analysis for Boyer, on revised Plate 4, indicates that waves larger than 1.0 feet will enter the harbor area. When reflected from the harbor side of the main breakwater, an unsatisfactory wave climate will probably result in the moorage area.

FOR THE CHIEF OF ENGINEERS:

wd all incl



HOMER B. WILLIS
Acting Chief, Engineering Division
Civil Works Directorate

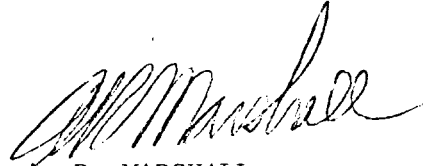
NPDPL-RB/NPDEN-TE (21 Sep 70) 2d Ind
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Area, Little Goose Reservoir

DA, North Pacific Division, Corps of Engineers, 210 Custom House, Portland,
Oregon 97209 29 January 1971

TO: District Engineer, Walla Walla

For your information and action.

FOR THE DIVISION ENGINEER:

A handwritten signature in cursive script, appearing to read "A. R. Marshall".

A. R. MARSHALL
Colonel, Corps of Engineers
Deputy Division Engineer

NPWEN-DB (21 Sept 70) 3rd Ind
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, Walla Walla District, Corps of Engineers, Bldg. 602, City-County
Airport, Walla Walla, Washington 99362 8 April 1971

TO: Division Engineer, North Pacific

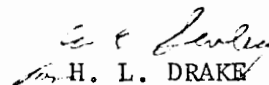
1. Comments of the 1st Indorsement were considered in preparing the answers to the 5th Indorsement on DM #14.1. Specific answers to the questions raised in the 1st Indorsement are:

a. Plate 3. - Diffraction diagram for the downstream breakwater are shown on Plate 4. The alignment is the best that can be obtained considering the shallow underwater areas that exist near the inlet. Winds that would create waves in excess of one foot inside of the marina as shown on the diffraction diagrams have not occurred in a ten year record at Ice Harbor Dam. Velocities from the southeast in excess of 20 miles per hour occur only 0.01 percent of the time, or less than 1 hour per day.

b. Wave heights used for the diffraction diagrams are computed for wind velocities of 60 miles per hour. While wave heights for riprap design are based on the computed waves which are exceeded 100 times a year and weighted according to headlands protection and depth of water.

c. The wave entering the Boyer Marina is computed to be a maximum of one foot when a 60-mile-an-hour wind occurs for 20 minutes or longer. Wind speeds at Little Goose Dam in excess of 20 miles per hour occur only 0.01 percent of the time and during the record time have not reached the 60 miles per hour velocity.

FOR THE DISTRICT ENGINEER:


H. L. DRAKE
Chief, Engineering Division

NPDEN-GS/NPDEN-TE (21 Sep 70) 4th Ind

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, North Pacific Division, Corps of Engineers, 210 Custom House,
Portland, Oregon 97209 16 April 1971

TO: District Engineer, Walla Walla

Information presented in the preceding indorsement is satisfactory
subject to the following comment:

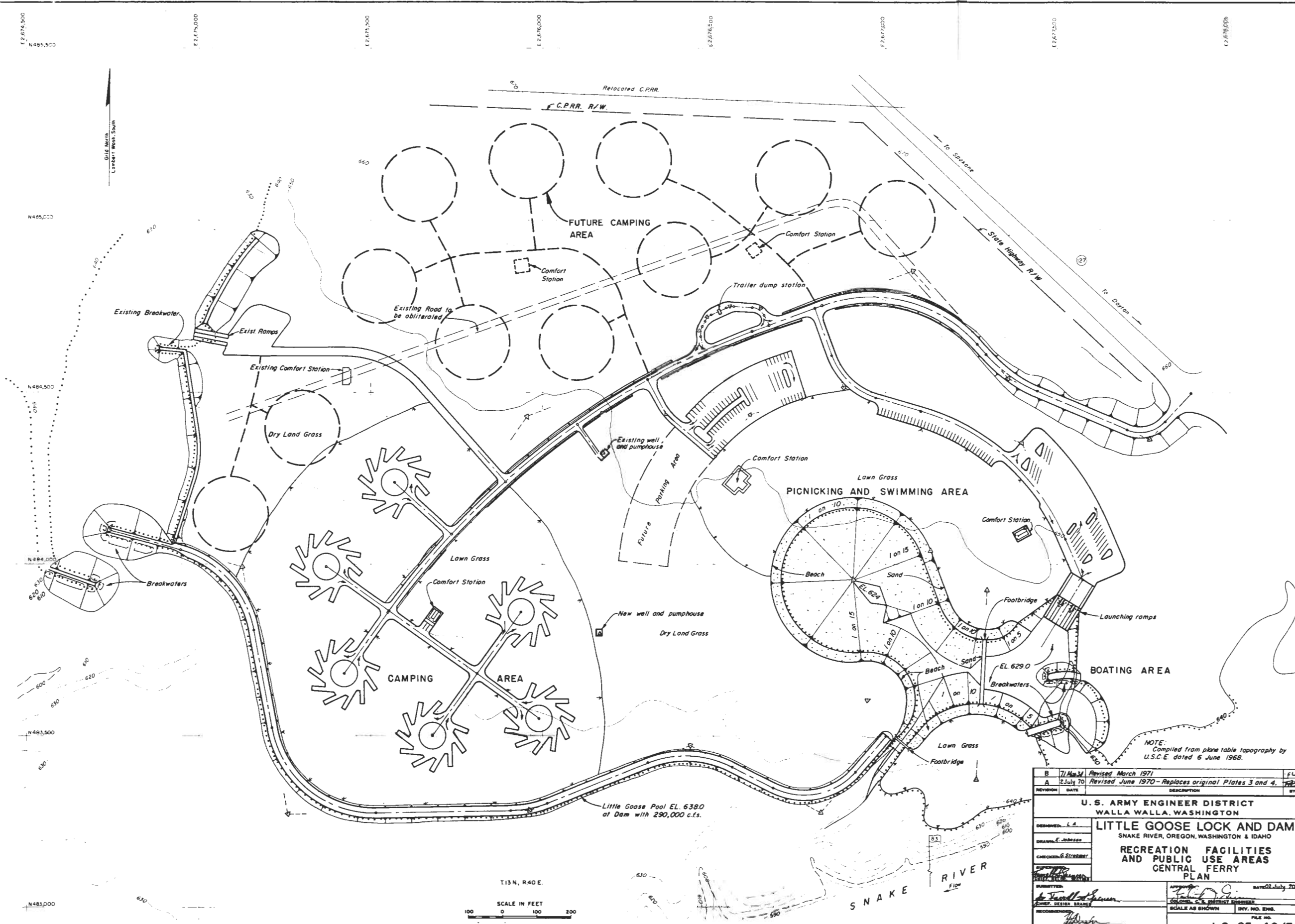
Paragraphs 1a and 1c. Reference is made to Note 2, Plate 4, DM No.
14.1 which lists wind data and design assumptions. Information presented
does not appear to be based on the same design assumptions. District
should review design data to be assured the proposed breakwater plans
will provide the designed protection.

FOR THE DIVISION ENGINEER:



GORDON H. FERNALD, Jr.
Chief, Engineering Division





Grid North
Lambert Wash. South

Relocated C.P.R.R.
C.P.R.R. R/W

State Highway R/W
To Spokane
To Dorton

Existing Breakwater
Exist Ramps
Existing Comfort Station
Dry Land Grass
Existing well and pumphouse
Future Parking Area
New well and pumphouse
Dry Land Grass
Lawn Grass
CAMPING AREA
Future Camping Area
Comfort Station
Trailer dump station
Picnicking and Swimming Area
Beach
Sand
Footbridge
Launching ramps
Breakwaters
Little Goose Pool EL. 638.0 at Dam with 290,000 c.f.s.

NOTE:
Compiled from plane table topography by
U.S.C.E. dated 6 June 1968.

T13N, R40E.

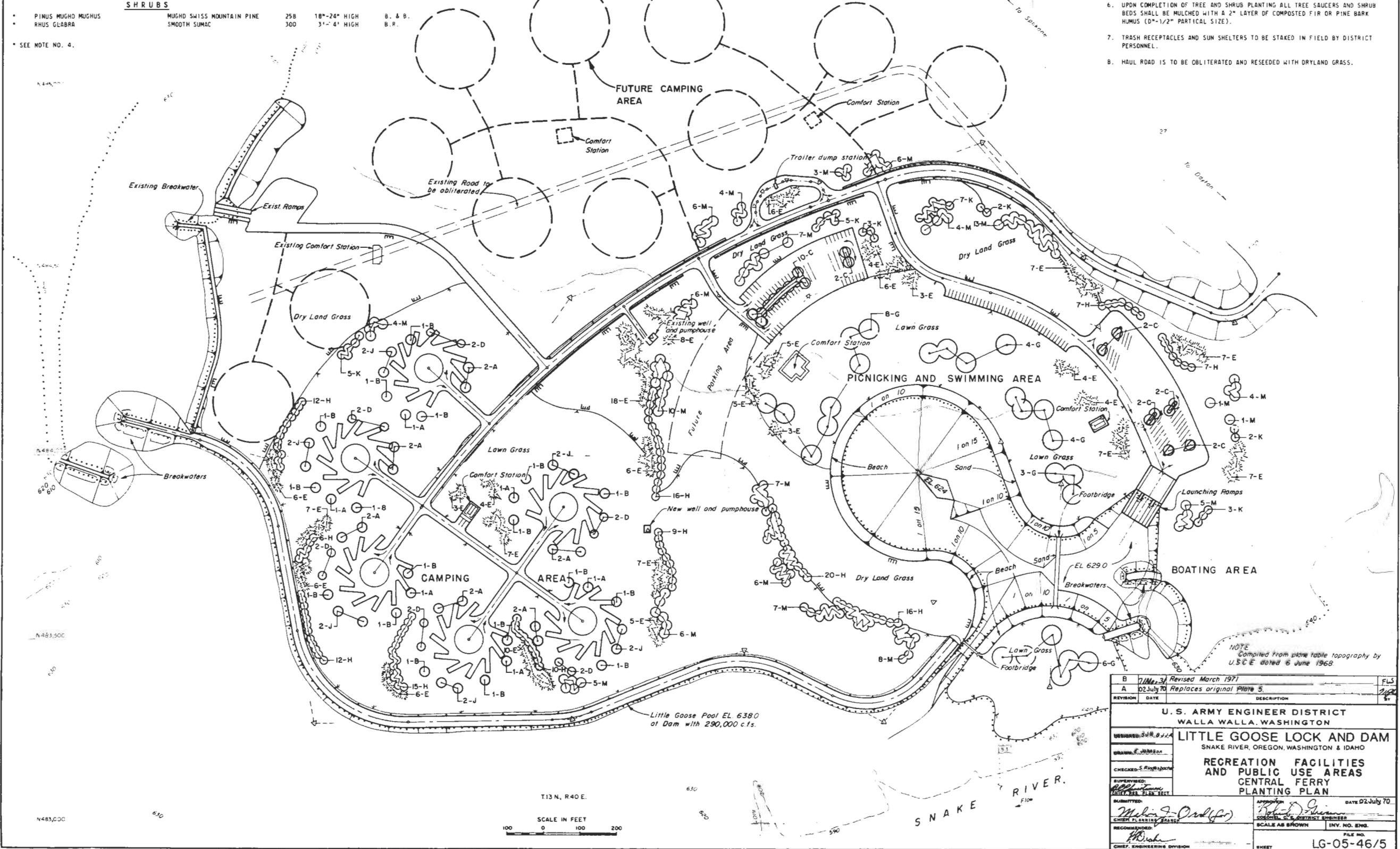
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B	7/14/70	Revised March 1971	FLS
A	2 July 70	Revised June 1970 - Replaces original Plates 3 and 4.	FLS
REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON LITTLE GOOSE LOCK AND DAM SNAKE RIVER, OREGON, WASHINGTON & IDAHO RECREATION FACILITIES AND PUBLIC USE AREAS CENTRAL FERRY PLAN			
DESIGNED: L.A.			DATE: 02 July 70
DRAWN: E. Johnson			COLONEL, U.S. DISTRICT ENGINEER
CHECKED: G. STEINBERG			SCALE AS SHOWN
SUPERVISOR: [Signature]			BY: NO. ENGR.
APPROVED: [Signature]			FILE NO.
RECOMMENDED: [Signature]			LG-05-46/3
GROUP ENGINEER: [Signature]			

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	NO. OF PLANTS	SIZE	HOW FURNISHED
TREES					
A	ACER PLATANOIDES	NORWAY MAPLE	18	8'-10' HIGH	B. R.
B	FRAXINUS PENNSYLVANICA LANCEOLATA	GREEN ASH	18	8'-10' HIGH	B. R.
C	GLADISTIA TRIACANTHOS SHADMMASTER	SHADMMASTER HONEYLOCUST	20	8'-10' HIGH	B. R.
D	LIGUIDAMBAR STYRACIFLUA	AMERICAN SWEETGUM	12	6'-8' HIGH	CONTAINER
E	PINUS NIGRA	AUSTRIAN PINE	158	4'-5' HIGH	B. & B.
G	PLATANUS ACERIFOLIA	LONDON PLANE TREE	25	8'-10' HIGH	B. R.
H	POPULUS NIGRA LOMBARDY	LOMBARDY POPLAR	130	8'-10' HIGH	B. R.
J	QUERCUS BOREALIS	RED OAK	12	8'-10' HIGH	CONTAINER
K	ROBINIA PSEUDACACIA	BLACK LOCUST	27	8'-10' HIGH	B. R.
M	ELAEAGNUS AUGUSTIFOLIA	RUSSIAN OLIVE (MULTI-TRUNK FORM)	113	6'-10' HIGH	B. R.
SHRUBS					
*	PINUS MUGHO MUGHUS	MUGHO SWISS MOUNTAIN PINE	258	18"-24" HIGH	B. & B.
*	RHUS GLABRA	SMOOTH SUMAC	300	3'-4" HIGH	B. R.

- NOTES:**
- APPROXIMATELY 12 ACRES OF DRYLAND GRASS.
 - APPROXIMATELY 21 ACRES OF LAWN GRASS.
 - AFTER TREE LOCATIONS HAVE BEEN STAKED AND MARKED WITH PLANT LIST KEY IDENTIFICATIONS BY THE CONTRACTOR, THEY ARE TO BE APPROVED BY A DISTRICT LANDSCAPE ARCHITECT PRIOR TO PLANTING.
 - SHRUBS HAVE NOT BEEN LOCATED ON THE PLAN, HOWEVER, THEIR NUMBER HAS BEEN INDICATED IN THE PLANT LIST. SHRUBS ARE TO BE STAKED IN THE FIELD BY THE DISTRICT LANDSCAPE ARCHITECT.
 - PLANTING WILL NOT BE DONE UNTIL COMPLETION OF ALL STRUCTURAL, ELECTRICAL AND MECHANICAL WORK IN OR IMMEDIATELY ADJACENT TO THE PLANTING AREAS.
 - UPON COMPLETION OF TREE AND SHRUB PLANTING ALL TREE SAUCERS AND SHRUB BEDS SHALL BE MULCHED WITH A 2" LAYER OF COMPOSTED FIR OR PINE BARK HUMUS (0.75-1.25" PARTICAL SIZE).
 - TRASH RECEPTACLES AND SUN SHELTERS TO BE STAKED IN FIELD BY DISTRICT PERSONNEL.
 - HAUL ROAD IS TO BE OBLITERATED AND RESEEDED WITH DRYLAND GRASS.



NOTE
Compiled from plane table topography by
U.S.C.E. dated 6 June 1968

REVISION	DATE	DESCRIPTION
B	7/1/68	Revised March 1971
A	02 July 70	Replaces original Plate 5.

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

LITTLE GOOSE LOCK AND DAM
SNAKE RIVER, OREGON, WASHINGTON & IDAHO

**RECREATION FACILITIES
AND PUBLIC USE AREAS
CENTRAL FERRY
PLANTING PLAN**

DESIGNED: S. R. B. J. L. A.
DRAWN: S. J. B. B. B. B. B.
CHECKED: S. J. B. B. B. B. B.
SUPERVISED: S. J. B. B. B. B. B.
SUBMITTED: S. J. B. B. B. B. B.
APPROVED: S. J. B. B. B. B. B.
RECOMMENDED: S. J. B. B. B. B. B.
DATE: 02 July 70

SCALE AS SHOWN
FILE NO. ENG.
INVT. NO. ENG.
SHEET: LG-05-46/5

NPWEN-DB (6 Jun 69) 6th Ind

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation Facilities and Public Use Areas, Little Goose Reservoir

DA, Walla Walla District, Corps of Engineers, Bldg. 602, City-County Airport, Walla Walla, Washington 99362 8 April 1971

TO: Division Engineer, North Pacific

1. The Fiscal Year 1971 budget was made on the basis of the DM submitted in June 1969 which showed a cost for development of recreation facilities of \$1,950,000. Due to inadequate funding to complete work prior to reservoir filling, some sites had to be redesigned and a considerable amount of work will be required to be placed under water. These circumstances have led to the increase in construction costs for this project. Funds for this construction are to be made available from current FY 1971 funds and scheduled FY 1972 funds, in accordance with NPWEN-PD letter to the Division Engineer dated 29 March 1971, subject, "Funds for Recreation Facilities, Little Goose L & D (Lake Bryan)", copy inclosed. It is strongly recommended that funds be made available from FY 1972 budget in order that construction can be completed. This would also help relieve public opinion adverse to the Corps for its failure to live up to statements made concerning the development of the reservoir for public use. Construction of facilities under the 710 program is not proposed.

a. Central Ferry

(1) Plates 3 and 5 have been revised to show location of the future camp sites. Revised copies are inclosed for insertion in your copies of the design memorandum.

(2) The existing comfort station will remain in place and would serve the two future camp sites and the future marina area.

(3) Additional scope is included in this revised layout to meet minimum sized facility as requested by the State of Washington.

a. The parking area layouts had been increased from the original design memorandum layout in order to comply with State of Washington requirements. This revised capacity is reflected in revised Plate 3.

b. Because of the shape of the area for the new layout, one comfort station will not provide less than maximum foot traffic distances as established for swimming areas. On the original DM plan an additional comfort station was to be added on the large island.

c. The larger comfort station was included in this layout because of the State of Washington's criteria. Sheets 12 and 14 of the contract drawings are inclosed and show the building layout.

NPWEN-DB (6 Jun 69) 6th Ind 8 Apr 71
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

d. The upstream boating area is included to provide the day-use area with a sheltered boat area. There will be no tie-up docks provided for boats because the State of Washington does not want to get into the marina business. The boats can be beached as the area is intended only to be used during visitors short stays in the park. The downstream boating area is provided with two short breakwaters that will protect the shoreline from erosion. It is anticipated that fishermen who are only using the area for boat launching will utilize the ramp and unimproved parking lot at this area. By providing the breakwaters now these will protect the land area and if the State desires marina facilities in the future the area will be available.

(4) The dike indicated along the shoreline is a gravel fill with a 30 foot top width to allow for some scarping. With the shallow offshore water and the width of the dike the scarp should not encroach on the grassed area.

(5) The alignment of the breakwaters for the lower boating area are the best that can be obtained considering the shallow underwater areas. The prevailing wind is the southwest winds shown in the upper diagram of Plate 4. The winds from the southeast that would cause damage inside the boat basin occur infrequently in this Snake River area. Based on wind occurrences at the Ice Harbor and Little Goose Dams wind velocities from the southeast in excess of 20 miles per hour occur only 0.01 percent of the time, or less than 1 hour per year.

b. Penawawa Site

Paragraph 1.a.(4) of the 4th Indorsement explains the reason that the Corps is providing the small amount of tie-up docks at the Penawawa Site.

c. Boyer Site

(1) The narrative in paragraph 3.07b was written as the project was developed and was to be constructed on the original plan. It was not revised in the resubmittal of the design memorandum but the 4th Indorsement, paragraph 1.a.(5) and 1.a.(5)(d), explains that the docks are to be included as a Corps cost because the Port of Whitman County invested their funds in developing part of the initial facilities at the site. These include the launching ramp, part of the breakwaters and some parking. These features were scheduled to be placed as part of the Corps' responsibility but, due to lack of money prior to pool raising, it was necessary to curtail construction. In order that some initial

NPWEN-DB (6 Jun 69) 6th Ind 8 Apr 71

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

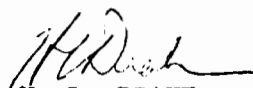
facilities would be available, the Port asked the Corps if they could spend their money to provide something for the people to use until the Corps received funds. Through verbal agreements with the Port, the Corps agreed that because of the economical situation, the Port could provide the breakwaters and boat ramp and that the Corps would include dock facilities in the marina up to the value of the work placed by the Port. As stated in 4th Indorsement, the trade resulted in a \$26,000 savings to the Government.

(2) The well and pumphouse are located at the south end of the camping area between the north shore access road and the camping area road.

2. It is recommended that review comments on the plans and specifications for this project that were forwarded your office in September 1970, be furnished so that any corrections can be made prior to the time of advertising.

FOR THE DISTRICT ENGINEER:

- 3 Incls
- Added 3 incls
- 3. Plates 3 & 5 (8 cys)
- 4. Sheets 12 & 14 (dupe)
- 5. Ltr dtd 29 Mar 71



H. L. DRAKE
Chief, Engineering Division

NPDPS (29 Mar 71) 1st Ind

SUBJECT: Funds for Recreation Facilities, Little Goose L&D, (Lake Bryan)

DA, North Pacific Division, Corps of Engineers, 210 Custom House, Portland,
Oregon 97209 16 April 1971

TO: District Engineer, Walla Walla, ATTN: NPWEN-PD

1. The transfer of \$1,800,000 from Little Goose to Lower Granite was approved subject to the return of a like amount to Little Goose from Lower Granite early in FY 1972. This adjustment will be effected at the time FY 1972 funds are allocated. No funds are presently available for return of the FY 1971 savings and slippage assessment applied to Little Goose; therefore, funds to become available to the Little Goose project in FY 1972 will initially be limited to the return of the \$1,800,000 and FY 1971 carryover. The additional funds required to complete work at the project will need to be sought for FY 1973 unless Congress should choose to provide funds in FY 1972 via the capability route. A capability of \$7,800,000 has been reported for this project.
2. Since the amounts to be included in the FY 1972 Appropriation Bill are not expected to be known prior to November 1971, the proposed recreation development should now be re-scoped to contract work which can be accomplished within available funds. The remaining recreation development should then be ready for award early in Calendar Year 1973 in the event that additional FY 1972 funds are provided by Congress.
3. The limited progress to date in accomplishing recreation development at Little Goose and the extent of Congressional interest so far generated in this regard, dictate that all necessary action should be taken to effectively utilize the above indicated funds at the earliest date they become available.
4. Comments from our review of plans and specifications for Little Goose Lock and Dam, Recreation Facilities and Public Use Areas, which were informally forwarded to your office in October 1970 (prior to deferment of advertising) will be confirmed by separate correspondence.

FOR THE DIVISION ENGINEER:

A. R. MARSHALL
Colonel, Corps of Engineers
Deputy Division Engineer

NPDPL-RB/NPDEN-TE (6 Jun 69) 7th Ind
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, North Pacific Division, Corps of Engineers, 210 Custom House, Portland,
Oregon 97209 18 May 1971

TO: District Engineer, Walla Walla

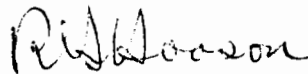
1. References:

a. NPDPB 1st Ind dated 16 April 1971, subject: "Funds for Recreation
Facilities, Little Goose L&D, (Lake Bryan)" (copy inclosed).

b. NPDEN-TE 1st Ind dated 11 May 1971, subject: "Little Goose Lock
and Dam - Plans and Specifications, Recreation Facilities and Public Use
Areas."

2. Formal review comments on the plans and specifications for subject
work were transmitted to your office by reference 1b above. Subject to
these comments and to the funding information presented in reference 1a,
the provision of recreation facilities on Little Goose Project should
proceed in the most expeditious manner possible.

FOR THE DIVISION ENGINEER:



R. G. HOOSON
Acting Executive Assistant

1 Incl
3-5. w/d
Added
6. NPDPB 1st Ind
dtd 16 Apr 71

67.10

NPWEN-DB (6 June 1969) 8th Ind
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, Walla Walla District, Corps of Engineers, Building 602, City-County
Airport, Walla Walla, Washington 99362 10 July 1972

TO: Division Engineer, North Pacific

1. The DM has been revised to reflect changes which have been made during the preparation of design plans and specifications.

2. Design for the Central Ferry site has been revised because of problems being encountered at other semi-enclosed swim areas, and possible contamination of the swim area from adjacent sewage drain fields. The main revisions are as follows:

a. The swim area has been relocated so that it is essentially a river beach where circulation is much improved. Protection will be provided by construction of a floating breakwater.

b. Sewage disposal has been changed so that no possible contamination can occur in the swim area. The lagoon system proposed in the revised layout is preferred by the State of Washington who will operate the site.

c. Boat launching has been moved so that all of this activity will be carried on in one location; however, tie-up facilities have been retained adjacent to the day use and picnic area. An existing low area has been shaped for use as the tie-up area and will add to the desirability of the site.

d. Plates 3 and 5 have been revised to show the current layout for the Central Ferry site.

3. Development at the Penawawa site has been dropped, as explained in DM paragraph 3.05.

4. Costs have been revised to cover the pertinent design changes and to show estimated costs at current price levels.

5. Replacement pages for the text, tables, and Plates 3 and 5 are inclosed for DM copies 1 through 8.

FOR THE DISTRICT ENGINEER:

2 Incl
Added 1 Incl
7. Revised sheets (8 sets)



H. L. DRAKE
Chief, Engineering Division

NPDEN-TE (6 Jun 69) 9th Ind

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, North Pacific Division, Corps of Engineers, 210 Custom House,
Portland, Oregon 97209 25 August 1972

TO: District Engineer, Walla Walla

The DM revisions furnished by your 8th Indorsement are approved subject
to action required by the following comments:

a. Para. 3.07. It should be noted that the Boyer Site development
is complete and the area placed in operation by the Port of Whitman County.
(Para. 1.02c should also be revised to reflect this stage of development.)

b. Para. 3.10. This paragraph states that signs based upon Corps
plans will be used at all sites on the project. It further indicates that
the State of Washington will furnish all signs for the Central Ferry site.
Since all development is being provided at Corps expense, we question the
role of the State in providing Corps standard signs. If the state is
providing its own signs, we should assure that the signs recognize the role
of the Corps in developing the park facility.

c. Table 5 - Willow Island Site. An error is noted for Item 5 - vault
toilets. The unit price should read \$1,250.00 in lieu of \$250.00.

d. Plate 3.

(1) Design principles, calculations and notes for the proposed
floating breakwater should be furnished to this office for review prior to
completion of plans and specifications. Assuming the floating breakwater
is proposed to reduce wave action and subsequent deterioration of the sand
swimming beach, a design attenuation factor approaching unity must be ob-
tained. Based upon the design wave stated in DM 14.1 and the possible
wave periods for this location, a relatively massive structure will be
required. The cost estimate appears low for such a structure. Your atten-
tion is directed to Technical Report H-71-3, April 1971, published by W.E.S.
which furnishes information on wave transmission and mooring force character-
istics of floating breakwaters. Consideration should be given to a beach
nourishment program which may be a more economical method of maintaining
the beach than the proposed breakwater. Separation of the swimming beach
from the main river channel could be accomplished with a simple line and
float barrier.

(2) The beach sand quantity shown in Table 4 for the Central Ferry
site does not appear adequate to form a beach in the swimming area. Sand
loss due to mixing with the base material could exceed the quantity shown.
It may be advisable to place a sand and gravel mix in the area to cap the
underlying material and to reduce wave wash.

NPDEN-TE (6 Jun 69) 9th Ind

25 August 1972

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

(3) Diffraction diagrams should be prepared for the day use boating area. The entrance gap width may be too large and wave attenuation in the basin through diffraction may not be adequate for waves from the SSW. The gap width could be reduced by overlapping the westerly breakwater with the south shoreline land spur.

(4) The need for revetment protection for the head of the upstream land spur that forms the entrance to the day use boating area should be investigated.

e. Table 9. Comparison of Previous and Current Estimates. It is noted that the current construction cost estimate exceeds that shown in the PB-2a, dated 1 January 1972. The advertising documents should be developed to permit a reduced project scope and award within present obligation authority.

FOR THE DIVISION ENGINEER:

2 Incl
7 sets Incl 7 wd


GORDON H. FERNALD, Jr.
Chief, Engineering Division

h

NPDPB (29 Mar 71) 1st Ind

SUBJECT: Funds for Recreation Facilities, Little Goose L&D, (Lake Bryan)

DA, North Pacific Division, Corps of Engineers, 210 Custom House, Portland,
Oregon 97209 16 April 1971

TO: District Engineer, Walla Walla, ATTN: NPWEN-PD

1. The transfer of \$1,800,000 from Little Goose to Lower Granite was approved subject to the return of a like amount to Little Goose from Lower Granite early in FY 1972. This adjustment will be effected at the time FY 1972 funds are allocated. No funds are presently available for return of the FY 1971 savings and slippage assessment applied to Little Goose; therefore, funds to become available to the Little Goose project in FY 1972 will initially be limited to the return of the \$1,800,000 and FY 1971 carryover. The additional funds required to complete work at the project will need to be sought for FY 1973 unless Congress should choose to provide funds in FY 1972 via the capability route. A capability of \$7,800,000 has been reported for this project.

2. Since the amounts to be included in the FY 1972 Appropriation Bill are not expected to be known prior to November 1971, the proposed recreation development should now be re-scoped to contract work which can be accomplished within available funds. The remaining recreation development should then be ready for award early in Calendar Year 1973 in the event that additional FY 1972 funds are provided by Congress.

3. The limited progress to date in accomplishing recreation development at Little Goose and the extent of Congressional interest so far generated in this regard, dictate that all necessary action should be taken to effectively utilize the above indicated funds at the earliest date they become available.

4. Comments from our review of plans and specifications for Little Goose Lock and Dam, Recreation Facilities and Public Use Areas, which were informally forwarded to your office in October 1970 (prior to deferment of advertising) will be confirmed by separate correspondence.

FOR THE DIVISION ENGINEER:



A. R. MARSHALL
Colonel, Corps of Engineers
Deputy Division Engineer

14

NPWEN-DB (6 Jun 69) 10th Ind
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, Walla Walla District, Corps of Engineers, Bldg. 602, City-County
Airport, Walla Walla, Washington 99362 18 October 1972

TO: Division Engineer, North Pacific

1. The following information is forwarded in response to questions raised and additional information requested of the previous indorsement.
2. Pages 1-1, 3-1 through 3-4, and Table 5 are forwarded for insertion in DM copies 1 through 8.
3. The design of the floating units that separate the swim area from the reservoir will be changed to use the same type as planned for the boat tie-up areas with only a minor modification needed. Anchorage will be by piling. Complete wave attenuation is not a requirement in the area and it is considered that the floating units should be installed at Central Ferry for the following reasons:
 - a. Wave action inside the swim area will be reduced and beach erosion is expected to be of minor extent. This change will make the annual maintenance cost for replacing the sand small enough that the sponsor will be able to fund this amount.
 - b. Just upstream of this site is located a public port site with considerable barge traffic. Oil spills and other wastes will very likely be generated from this area and will float downstream along the shoreline. The floating dock system will deflect this type of waste and keep it out of the swim area. Other types of floating markers will not provide this protection.
 - c. If for some unforeseen reason the floating units do not prove successful, they will be removed and placed in operation at other recreation areas as boat tie-up facilities and the only cost that would be lost is the piling system used to anchor the units. A considerable cost reduction will be realized with the change to the standard floating unit instead of conventional breakwater design.
4. The beach sand at Central Ferry is proposed to be placed one foot deep and above the 638' level as stated in paragraph 3.03.c. Below 638' elevation, 3/4-inch minus river gravel will be used to prevent the erosion of the swim area. Increasing the sand depth to two feet will insure a longer life for the initial installation.

NPWEN-DB (6 Jun 69) 10th Ind 18 October 1972
 SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
 Facilities and Public Use Areas, Little Goose Reservoir

5. The table inclosed as Inclosure #8 shows wave heights and directions of travel for the Central Ferry site. The waves that would cause any damage to tied-up boats occur for such a small percentage of the time and are generally in the winter months when very little use is made of the area. The breakwater and upstream land protection at the entrance are built on high natural ground. Any extension of this protection would require fill in about 60 feet of water. It is considered that for the small amount of occurrence that would happen during periods when boats are moored here that the extra cost is not warranted. Should additional protection be needed after the area has been put into operation, it is considered that some type of floating protection could be provided.

6. The land spur that creates the upstream protection for the entrance will be constructed of gravel fill on a 1V on 2H. From a point just inside the floating breakwater to where the entrance widens out for the moorage areas will have an 18-inch section of rockfill.

7. As shown below, the monetary scope has slightly reduced if price level increases from 1 July 1971 to 1 July 1972 on the unobligated work is taken into consideration.

	PB 2a dated <u>1 Jan 72</u> (1 July 71)	Revised PB 2a <u>Estimate</u> (1 July 72)	DM 14.1 Table 9 <u>13 Jun 72</u> (1 July 72)
Feature 14.	\$3,222,000	\$3,475,000	\$3,400,285

8. We have experienced several low bids on recreation contracts in the last 18 months, possibly establishing a current trend. It is, therefore, our recommendation that the proposed plan of development remain unchanged until bids are received.

FOR THE DISTRICT ENGINEER:


 H. L. DRAKE
 Chief, Engineering Division

4 Incls
 Added 2 incls
 8. Wind wave data
 9. Revised sheets (8 sets)

NPDEN-TE (6 Jun 69) 11th Ind

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, North Pacific Division, Corps of Engineers, 210 Custom House,
Portland, Oregon 97209 31 October 1972

TO: District Engineer, Walla Walla

1. Action proposed in the preceding indorsement is concurred in subject
to the following comments:

a. We do not concur in construction of the floating breakwater plan
described in paragraph 3 of the 10th Indorsement for the following reasons:

(1) Adequate data are not available to weigh the effectiveness of, or
to prepare an economic design for the proposed floating breakwater. This
type of breakwater may be desirable from an esthetic, safety and petroleum
product spill diversion standpoint but before it can be indorsed, further
justification and information should be developed for this expensive system.

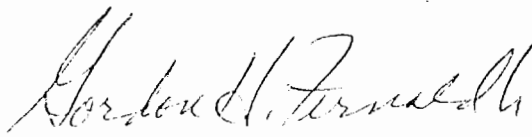
(2) We do agree that the proposed breakwater would reduce the wave
action inside the swim area. However, the significance of the reduction on
beach erosion is questioned as the degree of attenuation for waves in the
3 second range can be as much as 40% or as little as 5%. Without model
tests of the specific structure and mooring system proposed, an attenuation
of 5% should be assumed and a corresponding reduction in beach erosion
should be anticipated.

(3) A pile mooring system that will reduce stresses between units enough
to allow tying floatation units together can probably be designed. Limited
data available in the form of attenuation ranges that might be expected,
and forces developed from that degree of attenuation, indicate a proto-
type force per foot of structure in the range of 4,000 pounds.

2. It is recommended that a line and float system be utilized to separate
the swim area and tolerate the possibility of pollution from occasional
petroleum product pollution. A system that provides the desired bather
protection, but is less costly than that proposed, based on initial installa-
tion and maintenance costs, should be provided.

FOR THE DIVISION ENGINEER:

4 Incl
nc


GORDON H. FERNALD, Jr.
Chief, Engineering Division

NPWEN-DB (6 Jun 69) 12th Ind
SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

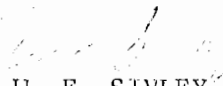
DA, Walla Walla District, Corps of Engineers, Building 602, City-County
Airport, Walla Walla, Washington 99362 19 December 1972

TO: Division Engineer, North Pacific

1. The contract drawings will be completed showing only a floating buoy on a nylon line to mark the swim area. Piling will be driven at about 80 foot spacing to keep the buoys positioned.
2. Should excessive erosion or contamination of the swim area occur during actual operation that becomes detrimental to maintaining the quality of the swim area, or the repairs are unreasonably high, additional protection will be provided after model studies are performed.
3. It is considered that if this work is required it should be the Government's obligation and that participation by the State will not be required.

FOR THE DISTRICT ENGINEER:

4 Incl
nc


W. E. SIVLEY
Acting Chief, Engineering Division

NPDEN-TE (6 Jun 69) 13th Ind

SUBJECT: Little Goose Project, Design Memorandum No. 14.1, Recreation
Facilities and Public Use Areas, Little Goose Reservoir

DA, North Pacific Division, Corps of Engineers, 210 Custom House,
Portland, Oregon 97209 26 December 1972

TO: District Engineer, Walla Walla

The action you propose in the preceding indorsement is approved.

FOR THE DIVISION ENGINEER:

4 Incl
nc


GORDON H. FERNALD, Jr.
Chief, Engineering Division

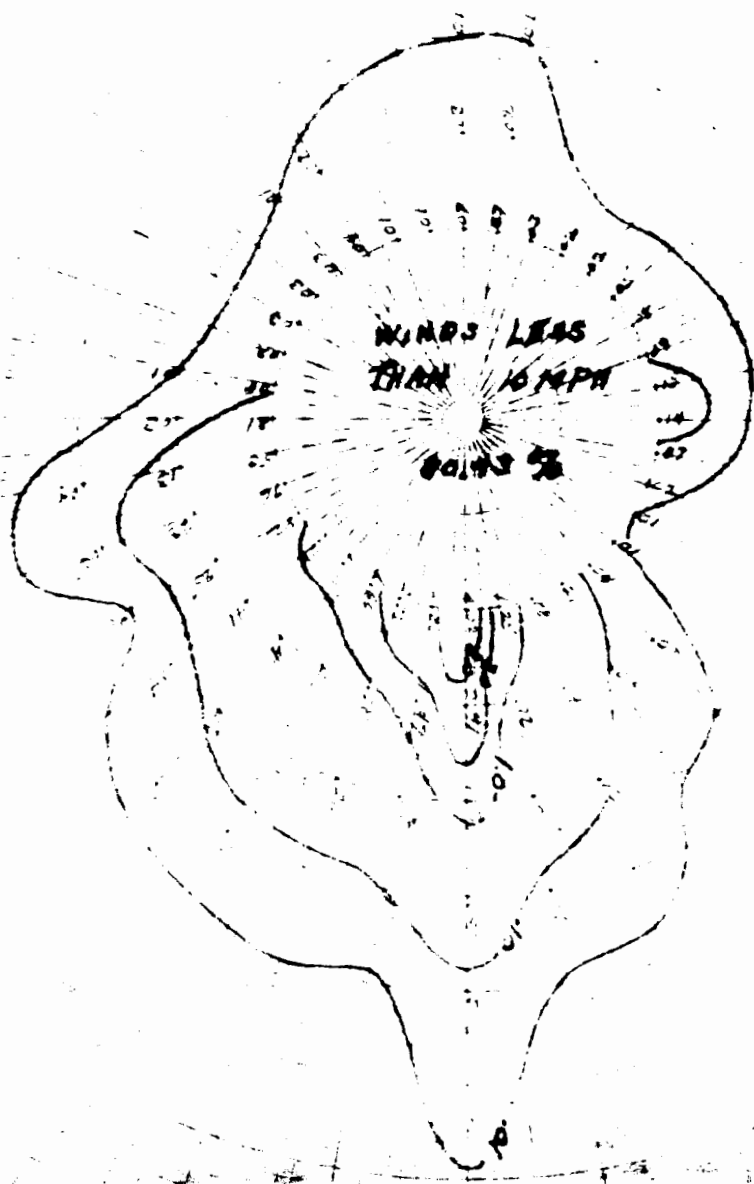
Central Ferry - Floating Breakwater
(Wave Height and Period)

Azimuth (°)	Radial Length (1,000 ft)	Effective Fetch (Mi)	Wind-Wave (60 MPH Wind)		
			Period (Sec)	Height H_s (Ft) (Significant)	Height H_{max} (Ft) (Maximum)
48	11.3	0.62	2.6	2.1	3.5
54	9.8				
60	8.2	0.69	2.7	2.3	3.8
66	5.8				
72	4.6	0.71	2.7	2.3	3.8
78	3.6				
84	3.0	0.70	2.7	2.3	3.8
90	2.6				
96	2.3	0.60	2.6	2.1	3.5
102	2.0				
108	1.8	0.52	2.5	2.0	3.3
114	1.7				
120	2.0	0.50	2.4	1.9	3.2
126	2.5				
132	3.0	0.50	2.4	1.9	3.2
138	4.0				
144	5.6	0.49	2.4	1.9	3.2
150	4.7				
156	3.9	0.48	2.4	1.9	3.2
162	2.1				
168	1.9	0.46	2.4	1.9	3.2
174	1.7				
180	1.7	0.42	2.3	1.8	3.0
186	1.7				
192	1.7	0.37	2.2	1.7	2.8
198	1.7				
204	1.8	0.39	2.3	1.7	2.8
210	1.9				
216	2.0	0.53	2.5	2.0	3.3
222	2.2				
228	2.5	0.82	2.8	2.4	4.0
234	3.0				
240	3.8	1.01	3.0	2.7	4.5
246	6.1				
252	9.0	1.14	3.1	2.9	4.8
258	9.6				
264	16.9	1.15	3.1	2.9	4.8
270	13.0				
276	8.5	1.07	3.0	2.8	4.7
282	5.6				
288	5.0	.91	2.9	2.6	4.3
294	4.0	.80	2.8	2.4	4.0

and B'

~~Present time wind speed~~
~~Wind speed~~
~~Wind speed~~

Mean 20 minute
Wind Speeds
Little Goose Dam site



Sheet 8

CENTRAL FERRY - FLOATING BREAKWATER

Direction Mean Wind Speeds for 20 minute interval - Little Goose
 Wind from Fe 10-14 15-19 20-24 25-29 30-34 35-39
 (° Azimuth) (miles) (MPH) (MPH) (MPH) (MPH) (MPH) (MPH)

Direction	Fe (miles)	10-14 (MPH)	15-19 (MPH)	20-24 (MPH)	25-29 (MPH)	30-34 (MPH)	35-39 (MPH)
45-104	0.7	361 0.4 1.3 9 0.561	7 0.6 1.6 13 0.011				
105-224	0.5	4624 0.4 1.2 7 7.185	3098 0.5 1.4 10 4.814	1443 0.7 1.6 13 2.242	367 0.8 1.7 15 0.570	32 1.0 1.9 18 0.050	11 1.2 2.0 20 0.017
225-294	1.1	1711 0.5 1.5 11 2.639	590 0.8 1.8 17 0.917	96 1.0 2.0 20 0.149	6 1.2 2.2 25 0.039		
295-44 (from shore)	---	183 0.284	48 0.074	14 0.022			

No. of occurrences
 H_s (ft) for mid-interval
 Period (sec)
 Length (ft)
 % of time per year

0- 9 MPH 80.435% of time

% Time

hours/year

0.01	0.88
0.10	9.00
0.20	18.00
0.50	44.00
1.00	88.00
2.00	175.00
5.00	438.00
7.00	613.00
10.00	876.00

Incl 8³

Little Goose Design Memorandum No. 14.1
RECREATION FACILITIES AND PUBLIC USE AREAS

SECTION 1 - INTRODUCTION

1.01. SCOPE.

This portion of the master plan describes the proposed development of public use and recreation facilities along Lake Bryan, consisting of access roads, boat launching facilities, boat docks, shoreline protection, sanitary facilities, picnic and overnight camping facilities, parking areas, signs, swimming beaches, water supply, sewer line, site grading, seeding, and planting areas.

1.02. COORDINATION WITH LOCAL AGENCIES.

a. Section 5 of the Master Plan, DM 14, describes in detail the status of coordination with various local agencies of government.

b. The staff of the Washington State Parks and Recreation Commission investigated the recreation potentials of the various locations on Lake Bryan and determined that Central Ferry is the only location on which a State Park could possibly be developed.

* c. The Port of Whitman County has consummated a lease at the Boyer site to operate and maintain the area.

d. The reservoir frontages in Columbia and Garfield Counties are remote from population centers. These counties and local agencies have indicated no desire to lease or operate recreation facilities on Lake Bryan.

SECTION 3 - DESIGN FEATURES

3.01. GENERAL.

The proposed recreation facilities are designed to be above back-water for the 10-year regulated flood for Lake Bryan. Water surface elevations for the various Snake River discharges are shown on Plate 14.

3.02. LITTLE GOOSE SITE (Plate 2).

The primary function of this location will be boat launching for fishermen. Approximately 1.3 miles of road connecting the Little Goose site with the Little Goose south shore access road will be improved and graveled. An asphaltic treatment will be added in the future when use of the site increases sufficiently to warrant dust control. A launching ramp, handling pier, parking area and 2 vault-type comfort stations will be constructed. Shade trees will be the limit of plantings at this site.

*3.03. CENTRAL FERRY SITE (Plates 3, 4 and 5).

a. This location will be developed as the major recreation site on the lake. Initial development will include facilities for boating, camping, picnicking, and swimming. A paved entrance road will be constructed from Washington State Route 127 which borders the site on the eastern boundary. The boating area will consist of 4 launching ramps, handling deck, and a parking area. The excavated material from the swimming area and sewage lagoon will be used to raise the camping area above the influence of high ground water caused by close proximity to the lake and poor foundation conditions.

b. The camping area will be equipped to handle both single and group parties. A comfort station with laundry facilities will be included. Other items to be provided are water, sewer, and electrical outlets, shelters, picnic tables, garbage cans, fireplaces, and a trailer dump station.

c. A picnicking and swimming area will be provided with a comfort station containing change areas and showers, picnic shelters, tables, fireplaces, and a parking area. The swimming area will have a sanded beach above elevation 638 and gravel below that elevation, and will be protected by a floating breakwater. Other developments will include a pump house, irrigation system, foot paths, historical displays, interpretive markers, and information and guidance signs.

d. Lawn grass will be planted in all heavy traffic day use and camping areas. In all other areas, a dryland grass mixture, basically of hard fescue, will be planted as a means of soil stabilization. A foundation planting of evergreen shrubs will be provided around the

comfort stations. Trees will be grouped in random patterns throughout the areas to provide protection from wind and sun and to provide an overall aesthetic relief from the surrounding arid countryside.

3.04. WILLOW ISLAND SITE (Plate 6).

Development of this site will be limited to providing access to the lake for boating and fishing enthusiasts. A short entrance road from the adjacent Garfield County Road will be constructed. Facilities provided at this site are launching ramps, a handling dock, parking area, and vault-type comfort stations. Tree planting on low ground will provide a wind break and shade and screen the comfort stations from the parking area. Irrigation is not proposed. Paving of the access road will be accomplished as a future development item when the use of the site increases sufficiently to warrant dust control.

*3.05. PENAWAWA SITE.

This site is on Penawawa Creek about one half mile from the lake. Development at this site has been dropped because sedimentation has made access to the area impossible under normal operating conditions.

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The primary function of this site is to provide a launching area for residents of the south shore in the upstream portion of the lake and for visitors to the Lower Granite damsite. The south shore access road passes very near this site and the road into the launching ramp is only about 1/8 mile in length. Facilities to be provided include a launching ramp, a crib dock, a parking area, and 2 vault-type comfort stations. Paving of the road will not be included as part of the initial development but will be added at a future date. Tree planting will be included to provide some shade in the area.

**3.07. BOYER SITE (Plate 9).

a. This site has been developed as a boat marina area with associated camping and day use. The Port of Whitman County will operate and maintain this site; design coordination in the layout of the site was conducted with them. Initial development includes facilities for boating, camping, picnicking, and swimming. The Port is constructing a concession building which includes a restaurant, marina sales area, and motel units, and has built a gas dock and boat sewage pumpout station. Access to this site will be directly from the Lower Granite north shore access road. The access road and interior roads will be surfaced with 1 1/2" asphaltic paving as part of the initial work.

b. The boating area consists of 2 launching ramps, a handling dock, boat docks, parking area, space for a concessionaire's building and breakwaters to protect the boat moorage and launching area.

c. The camping area will be equipped to handle single camp groups only. Trailer, water, and sanitary facilities, comfort stations, picnic tables, garbage cans, fireplaces, and landscaping will be provided.

d. A picnicking and swimming area will be provided with a comfort station including changehouse, picnic shelters, tables, fireplaces, and a sanded beach protected by a riprapped breakwater.

e. Other developments will include a pumphouse, lawn irrigation system, foot paths, and information and guidance signs.

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Main access roads to all sites and entrance roads will be 20 feet wide, will have 2-foot shoulders, and will be surfaced with an asphaltic treatment. Interior camping roads will be 20 feet wide and will be surfaced with 2 inches of leveling course.

3.09. PARKING AREAS.

a. Parking areas are delineated on the plans. Parking stalls will be 10 feet wide with markings provided on pavement when installed. Arrows painted on the pavement will direct the flow of traffic through the parking and launching areas.

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Signs based on Corps of Engineers plans, adopted by the Walla Walla District for recreation areas, will be used on all the sites on this project except Central Ferry. Standard design signs for the Lower Snake River are shown in the Master Plan. The State of Washington will furnish all the signs for the Central Ferry site, and the Government contractor will install them.

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Areas of heavy pedestrian traffic will have surfaced paths and walks. Surface will consist of 1½ inches of asphaltic pavement on a 2-inch base of select gravel placed without forms. Less frequently used foot paths

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Launching ramps will be 12 feet wide and extend from elevation 640 to elevation 629 at all sites except Boyer where the upper limit will be raised to elevation 644. The ramps will be a 6-inch wire mesh reinforced slab on 12 inches of select gravel base and will be placed on a 14 percent slope. The surface will be tractionized to improve traction.

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Two types of handling docks are proposed for these sites; floating type and a crib type made from used ties. Units for the floating type will be 5'-10" wide and 20 feet in length. The number of units at each site will depend upon the length required to reach minimum launching elevation. The units will be of expanded polystyrene encased in corrugated metal pipe with galvanized steel grating decks and equipped with fenders and tie-down cleats. The crib type will be constructed of used railroad ties and will be stepped down at various levels to better facilitate boat launching.

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b. Short sections of floating type boat docks similar to the units used for the handling piers will be placed at Little Goose, Willow Island, Penawawa, and Illia.

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Four types of comfort stations will be used at the Little Goose recreation areas:

a. Camping type, large flush-type with laundry, shower, lavatories, and storage space included.

b. Day-use type for picnicking and swimming areas, large flush-type with wash basins, showers, lavatories, and storage space.

Little Goose Lock and Dam
DESIGN MEMORANDUMS

	<u>Title</u>	<u>Cover Date</u>
1	Site Selection and Upper Pool Determination	13 February 1961
2	General Design Memorandum (4 Volumes)	20 October 1961
3	Preliminary Report of Concrete Aggregate Investigations	17 September 1962
	Supp. 1 - Final Report	5 December 1963
	Supp. 2 - Additional Investigations	5 January 1967
4.1	South Shore Access Road	8 November 1962
	Supp. 1 - Design and Cost Revisions	11 April 1963
4.2	North Shore Access Road	
5	Camas Prairie Railroad Relocations (2 Volumes)	31 August 1965
	Supp. 1 - Design and Cost Revisions	August 1966
	Supp. 2 - Revised Alignment, Central Ferry Area	9 October 1968
6	Garfield County Road Relocations	22 November 1965
	Supp. 1 - County Road 375, Part 1	13 July 1967
	Supp. 2 - County Road 375, Hastings Hill	11 October 1968
7-Part 1	Real Estate - Damsite Construction Area, North and South Shore Access Roads, Relocated Borrow Areas, Partial Relocation of the Camas Prairie Railroad, Partial Flowage and Public-Use Areas, and Project Housing Area	19 April 1962
7-Part 2	Real Estate - Remainder of Project, Remainder of Camas Prairie Railroad Relocation, State Highway and County Road Relocations, Remainder of Public-Use Areas, and Flowage Requirements	12 April 1963
8	Spillway	16 August 1963
	Supp. 1 - Design and Cost Revisions	16 September 1964
9	Navigation Facilities	23 May 1963
	Supp. 1 - Design and Cost Revisions	11 May 1964
10	Fish Facilities	16 July 1964
11	Washington State Highway No. 3	17 July 1967
12	Relocation of Power and Telephone Facilities	18 October 1967
13	First Step Cofferdam	20 February 1963
14A	Preliminary Master Plan	30 March 1962
14	Master Plan	
14.1	Recreation Facilities	
15	Concrete Non-overflows	23 January 1964
16	North Abutment Embankment and Second Step Cofferdam	6 August 1964
17.1	Powerhouse Architectural Design	October 1963
17.2	Powerhouse Structural Design	February 1964
17.3	Powerhouse Mechanical Design	

	<u>Title</u>	<u>Cover Date</u>
17.4a	Powerhouse Lighting Design	March 1964
17.4b	Powerhouse Grounding System	March 1964
17.4c	Powerhouse Auxiliary Electrical Systems	March 1964
17.4d	Powerhouse Control and Emergency D-C and Preferred A-C Sources	March 1964
18	Domestic Water Supply System	10 June 1964
19	100-Ton Combined Spillway & Powerhouse Intake Gantry Crane (see John Day DM 15.8)	
20	Foundation Grouting and Drainage	17 April 1964
21	South Shore Temporary Project Office	24 August 1962
22	Relocation of Penawawa Cemetery Final Report	3 May 1965 11 October 1966
23	Permanent Operators' Quarters	16 September 1965
24	Aircraft Landing Strip	2 June 1965
25	Whitman County Road Relocations Supp. 1 - Necessity for Relocation, Roads 800 and 810 Supp. 2 - County Road 819	13 April 1966 13 October 1966 16 October 1968
26	Landscaping and Visitor Facilities	
27	Isolated Burials near Penawawa	21 May 1968
28	Reservoir Clearing	14 January 1969

Little Goose Lock and Dam
Snake River, Washington

PERTINENT DATA

GENERAL

River Mile	70.3
Drainage area, square miles	103,900
Normal hydraulic height, feet	98
Maximum structural height, feet, powerhouse	226
Overall length at crest, feet	2,655
Discharges, cfs:	
Minimum of record, 1937	9,000
Mean annual	48,950
Standard project flood	575,000*
Maximum of record (1894)	409,000
Spillway design flood	850,000
First power on line	26 March 1970
Gravel-fill embankment, cubic yards (estimated)	1,750,000
Concrete, cubic yards (estimated)	1,400,000
Reinforcing steel, pounds (estimated)	52,500,000

ESTIMATED COST

1 July 1969 \$152,000,000

RESERVOIR

Elevations:	
Maximum	646.5
Normal operating range	638-633
Length, miles	37.2
Area at normal pool, acres	10,025
Relocations, miles:	
Camas Prairie Railroad	36
State Highways	2.8
County Roads	21.5
Access Roads	11.8
Drawdown for power, feet	5
Capacity, power pondage, acre-feet	49,000
Recreational Developments:	
Existing	0
Proposed	6

LITTLE GOOSE PERTINENT DATA (Continued)

NAVIGATION LOCK

Type	Single Lift
Maximum lift, feet	101
Clear width, feet	86
Net clear length, feet	675
Minimum depth over sills, feet	15
Upstream gate	86' x 22' Tainter
Downstream gate	86' x 118' Miter
Downstream navigation channel	16' minimum x 250'
Guide wall lengths, feet:	
Upstream	705
Downstream	736

SPILLWAY

Deck elevation	651
Crest elevation	581
Overall length, feet	512
Maximum structural height, feet	200
Number of Bays	8
Control gates:	
Type	Tainter
Size	50' x 59'
Maximum design capacity, cfs	850,000
Stilling basin length, feet	200
Stilling basin elevation	471.5
Crane capacity, tons (joint-use with powerhouse)	100

POWERHOUSE

Initial installation:	
Number of units	3
Nameplate rating, kilowatts:	
Each	135,000
Total	405,000
Ultimate installation:	
Number of units	6
Nameplate rating, kilowatts:	
Each	135,000
Total	810,000
Intake deck elevation	651
Tailrace deck elevation	558
Unit spacing, feet	90
Length erection bay, feet	110
Length overall, feet	656

LITTLE GOOSE PERTINENT DATA (Continued)

POWERHOUSE (Continued)

Turbines:

Type	Kaplan
Runner diameter, inches	305
Revolutions per minute	90
Horsepower rating	212,400
Crane capacities, tons:	
Intake deck (joint-use with spillway)	100
Bridge, powerhouse interior	600
Tailrace deck	50

ABUTMENTS

Left	90' Concrete Gravity
Right	880' Gravel Fill with Impervious Core

FISH FACILITIES

Number of ladders	1
Ladder slope	1 on 10
Ladder width, feet	20
Water supply,	3 pumps = 2,550 cfs
Maximum design river flow, cfs	225,000

Little Goose Design Memorandum No. 14.1
RECREATION FACILITIES AND PUBLIC USE AREAS

TABLE OF CONTENTS

<u>Paragraph</u>		<u>Page</u>
SECTION 1 - INTRODUCTION		
1.01	Scope	1-1
1.02	Coordination with Local Agencies	1-1
SECTION 2 - GENERAL CONDITIONS		
2.01	Description	2-1
2.02	Location and Use Influences	2-1
2.03	Real Estate	2-1
SECTION 3 - DESIGN FEATURES		
3.01	General	3-1
3.02	Little Goose Site	3-1
3.03	Central Ferry Site	3-1
3.04	Willow Island Site	3-2
3.05	Penawawa Site	3-2
3.06	Illia Site	3-2
3.07	Boyer Site	3-2
3.08	Roads	3-3
3.09	Parking Areas	3-3
3.10	Signs	3-3
3.11	Footpaths and Walks	3-3
3.12	Launching Ramps	3-4
3.13	Handling Docks	3-4
3.14	Boat Docks	3-4
3.15	Sanitary Facilities	3-4
3.16	Picnic Units and Shelters	3-5
3.17	Water Supply	3-5
3.18	Sewage Disposal	3-5
3.19	Heating and Ventilating	3-6
3.20	Plumbing	3-6
3.21	Electrical Service	
	a. General	3-6
	b. Lights and Receptacles	3-7
	c. Load Requirements	3-7
	d. Buildings	3-7
	e. Recreation Lighting	3-8
	*f. Campsite Receptacles	3-8
3.22	Seeding and Planting	
	a. Objectives and Criteria	3-9
	b. Grading and Soil Conditioning	3-9
	c. Type of Plant Materials	3-9

TABLE OF CONTENTS (Continued)

<u>Paragraph</u>		<u>Page</u>
SECTION 4 - EARTHWORK		
4.01	Little Goose	4-1
4.02	Central Ferry-Peyton	4-2
4.03	Willow Island	4-3
4.04	Penawawa	4-4
4.05	Illia	4-4
4.06	Boyer	4-5

SECTION 5 - DISCUSSION, CONSTRUCTION SCHEDULE, AND RECOMMENDATION

5.01	Discussion	5-1
5.02	Construction Schedule	5-1
5.03	Recommendation	5-2

COST ESTIMATE TABLES

1	Summary	
2	Contracts	
Detailed Estimates:		
3	Little Goose Site	
4.	Central Ferry Site	
5	Willow Island Site	
6	Penawawa	
7	Illia Site	
8	Boyer Site	
9	Comparison of Previous and Current Estimates	

PLATES

1	Location Map and Index to Drawings
2	Little Goose
3	Central Ferry
4	Diffractioned Wave Patterns *
5	Central Ferry - Planting Plan
6	Willow Island
7	Penawawa
8	Illia
9	Boyer
10	Explorations, Road Section and Slope Protection Details
11	Comfort Stations - Central Ferry
12	Comfort Stations - Boyer
13	Vault Toilets
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Little Goose Design Memorandum No. 14.1
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1.01. SCOPE.

This portion of the master plan describes the proposed development of public use and recreation facilities along Little Goose Reservoir, consisting of access roads, boat launching facilities, boat docks, shoreline protection, sanitary facilities, picnic and overnight camping facilities, parking areas, signs, swimming beaches, water supply, sewer line, site grading, seeding, and planting areas.

1.02. COORDINATION WITH LOCAL AGENCIES.

a. Section 5 of the Master Plan, DM 14, describes in detail the status of coordination with various local agencies of government.

b. The staff of the Washington State Parks and Recreation Commission investigated the recreation potentials of the various locations on Little Goose Reservoir and determined that Central Ferry is the only location on which a State Park could possibly be developed.

c. The Port of Whitman County expressed interest in obtaining a lease at the Boyer Site and indicated their intent to file application for lease of this area.

d. The reservoir frontages in Columbia and Garfield Counties are remote from population centers. These counties and local agencies have indicated no desire to lease or operate recreation facilities on Little Goose Reservoir.

SECTION 2 - GENERAL CONDITIONS

*2.01. DESCRIPTION.

The five locations presented in this DM for initial development are at Little Goose, Central Ferry, Willow Island, Illia, and Boyer. Future expansion of these sites and development is contemplated at 2 other sites; New York Bar and Ridpath are contemplated and are treated in Chapter 7 of the Master Plan. Design of these sites and expansion of the initial sites will be developed after the shoreline is stabilized and need for additional recreation sites arises.

2.02. LOCATION AND USE INFLUENCES.

a. Little Goose Dam is located in Washington on the Snake River at River Mile 70.3. The reservoir extends upriver to Lower Granite Lock and Dam at River Mile 105.5 between Columbia and Garfield Counties on the south bank and Whitman County on the north bank.

b. The lake is long and narrow and bordered by continuous rugged, high basalt cliffs on both sides except at infrequent points where small tributaries enter the Snake River. Tree growth is lacking except at scattered points. A few benches contain grass, bitter brush, and sagebrush. Talus slopes occur all along the river below the basalt bluffs, and windblown sand dunes are prevalent in some areas. Population centers and their influence on the various recreation sites are discussed in Section 4 of the Master Plan.

2.03. REAL ESTATE.

The Little Goose project boundary includes all the lands required for the construction of the recreation facilities proposed herein. No additional land is required.

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The proposed recreation facilities are designed to be above back-water for the 10-year regulated flood for Lake Bryan. Water surface elevations for the various Snake River discharges are shown on Plate 14.

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The primary function of this location will be boat launching for fishermen. Approximately 1.3 miles of road connecting the Little Goose site with the Little Goose south shore access road will be improved and graveled. An asphaltic treatment will be added in the future when use of the site increases sufficiently to warrant dust control. A launching ramp, handling pier, parking area and 2 vault-type comfort stations will be constructed. Shade trees will be the limit of plantings at this site.

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- c. Vault-type, small individual type, no washing facilities.
- d. At Central Ferry, buildings designed by the State Park and Recreation Commission.

3.16. PICNIC UNITS AND SHELTERS.

Picnic units will be installed at all sites. The units will consist of a portable picnic table, garbage can, and fireplace. Shelters will also be installed at each area. The shelter is 12 feet by 20 feet in dimension with corrugated metal roof. A fixed position picnic table is to be installed under each shelter.

3.17. WATER SUPPLY.

a. Water at Central Ferry and Boyer will be supplied from a drilled well to serve the irrigation system, comfort stations, and the camping area utilities. The system will be designed in accordance with the applicable portions of Engineering Manual 1110-2-4201, "Potable Water Supply Systems."

*b. A pumping plant at the Boyer site will consist of a 170-gpm deep well turbine-type pump, discharging into an 1,800-gallon pneumatic pressure tank after being chlorinated. At the Central Ferry site, the pumping plant will consist of a 230-gpm deep well turbine-type pump, discharging into a 2,500-gallon pneumatic pressure tank after being chlorinated. This well will serve all the domestic water demand and irrigation requirements for the beach area. A second well, with a 450-gpm deep well turbine-type pump, will serve irrigation requirements. Irrigation for future expansion of the camping and picnicking areas will be provided by the first well. The proper air-water volume ratio in the pressure tanks will be maintained by the well pump and an air compressor controlled by a combination pressure and float control.

*c. An automatic underground sprinkling system will be installed in all lawn-grass areas using pop-up sprays and pop-up rotary heads. Shrubbery heads will be used in the shrubbery beds. The systems will place 2 inches of water on the ground per week when operating 48 hours per week. The heads will be located to avoid throwing water on the building and roadways. In addition, water hydrants will be placed in the remote areas to hand-water the outlying trees and occasionally sprinkle the dryland grass. The hydrants will be spaced approximately 300 feet apart.

**3.18. SEWAGE DISPOSAL.

a. The sewage system at Boyer will include septic tanks and drain fields designed in accordance with the applicable portions of Technical Manual 5-814-3, "Sewage Treatment Plants," and the "Manual of Septic

Tank Practice," U.S. Department of Health, Education, and Welfare. The system will serve the comfort stations, camp sites, and the trailer dump station.

b. At Central Ferry, it was originally proposed to install septic tanks at each comfort station and at each group of campsites, then pipe the effluent to a central lift station; however, a 5- to 6-foot layer of nearly impervious material would create problems for the subsurface effluent at the lower elevations. It is now proposed, therefore, to construct a sewage lagoon on the north side of the Camas Prairie RR track. The sewage will be pumped from the camping and day-use areas to the lagoon for treatment. The treatment area will be fenced to prevent the entrance of the public and animals.

c. The capacity of the sewage system for the picnic area comfort stations will be based on the number of installed plumbing fixtures and a 12-hour day. The camping area will be sized on 100 gallons per day per camp site.

3.19. HEATING AND VENTILATING.

The comfort stations at Central Ferry and Boyer will be equipped with electric heaters to prevent freeze-up during extreme winter temperatures and to provide visitor comfort during moderate outdoor temperatures. Exhaust ventilation will be provided in each comfort station.

3.20. PLUMBING.

All plumbing will be in accordance with the applicable portions of Technical Manual 5-810-5, "Plumbing," and the National Plumbing Code. A 55-gallon electric water heater will supply hot water to the lavatories in the comfort station at the picnic area. A 250-gallon storage tank with 15-KW heater will be installed in the comfort station for the camping area to serve the lavatories, laundry trays, and showers.

3.21. ELECTRICAL SERVICE.

a. General.

The local utility company will serve the Central Ferry and Boyer areas on wooden poles generally following the routing of the access road. All expected electrical loads for both initial and future development will be served from the primary source. No prepayment charge for electrical service will be required. For reasons of safety and appearance, service to the individual structures, area lighting, and other branch loads will be served via underground cable and/or conduit runs. Meter loops will be provided for each connection to the commercial source.

b. Lights and Receptacles.

Lighting will be by incandescent fixtures in buildings and either mercury or incandescent fixtures out-of-doors.

*c. Load Requirements.

CENTRAL FERRY

Potable Water and Irrigation Pumphouse	20 KW
Day-use area comfort station	13 KW
Camping area comfort station/laundry	40 KW
Pumphouse	26 KW
Day-use area lighting	3 KW
Camping area lighting	3 KW
Lift station	18 KW ^{1/}
Campsite receptacles	<u>56 KW</u>
TOTAL CONNECTED LOAD	179 KW

^{1/} This portion is being designed by an A/E and load will vary, depending on whether one or two lift stations are provided.

BOYER

Potable Water and Irrigation Pumphouse	15 KW
Day-use area comfort station	13 KW
Camping area comfort station	40 KW
Day-use area lighting	3 KW
Camping area lighting	<u>3 KW</u>
TOTAL CONNECTED LOAD	74 KW

d. Buildings.

(1) The buildings involved on the project include two variations of comfort station facilities and pumphouses. Standard practice will be used throughout the design of the facilities, using the latest revisions of the National Electrical Code and following precedents set for similar facilities elsewhere.

(2) Panelboards, of solid neutral construction, will have mains sized to meet the needs of both initial and future loads. For maintenance use, each interior area of the comfort stations, including pipe chases and pumphouses, will be provided with one receptacle. In addition, one weatherproof-lockable receptacle will open to the exterior of comfort stations. Receptacles will be 120-volt, 15 ampere, and of the combination turn-locking and parallel blade construction.

(3) Electrical energy requirements for each type of building proposed for use are as follows:

(a) Day-use area comfort station:

Lighting load	2.4 KW
Water heater	3.0 KW
Electric furnace	<u>8.0 KW</u>
TOTAL CONNECTED LOAD	13.4 KW
USE	13 KW

(b) Camping area comfort station with laundry:

Lighting load	2.4 KW
Receptacle load	4.0 KW
Heaters (water)	15.0 KW
Electric furnace	12.0 KW
Washer load	0.5 KW
Dryer load	<u>6.0 KW</u>
TOTAL CONNECTED LOAD	39.9 KW
USE	40 KW

(c) Pumphouse:

Heater load	3.0 KW
Pump motor	20.0 KW
Lighting, receptacles, and chlorinator	<u>3.0 KW</u>
TOTAL CONNECTED LOAD	26.0 KW

e. Recreation Lighting.

Recreation lighting applies to parking, swimming, boat launching ramp, and dock areas. It has been found by experience at Ice Harbor sites that actual footcandle levels are not of highest significance for such lighting. Minimal illumination of these areas is very well accepted and justified from standpoints of security and evening boat-return guidance and recovery. The actual designs of lighting installations will generally include incandescent PAR unit floodlighting or larger weather-proof floodlights and mercury area luminaires on hinged metal standards of galvanized steel or wooden distribution poles.

*f. Campsite Receptacles.

Recreation receptacles will be provided for the vehicle campsites as authorized by EM 1110-2-400 and in conformance with the requirements of Article 551, Part B, "Recreational Vehicle Parks" of the 1971

National Electrical Code. In order to balance the load on the 480-volt system, 3 transformers, each feeding 2 camping wheels, will be used. Each transformer will serve 20 campsites, and a demand factor of 26 percent will be used.

3.22. SEEDING AND PLANTING.

a. Objectives and Criteria.

Lake Bryan is located in a semi-arid and desert-like climatic zone. The area has low rainfall, hot, dry summers, and frequent winds which are sometimes accompanied by dust storms. Because of the environment, the effective use of plant materials for enhancement of the recreation facilities becomes quite important. Natural cover on undisturbed areas is dominated by small native shrubs and various types of native bunchgrass. Recently disturbed or burnt-over areas, if not replanted or stabilized by some means, often present troublesome blow-sand problems. The nature of the area requires that (1) the amount of planting be kept to a minimum and concentrated at points of intensive visitor use, (2) only vigorous-growing and hardy trees and shrubs be used, and (3) plant growth should be arranged to provide reasonable relief from the hot, dry climate without creating excessive maintenance problems.

b. Grading and Soil Conditioning.

Soil conditioning will be required in all planting areas, except in large areas of dryland grass seeding, which would be impractical. Special soil treatment will be required in all planting areas involving a cut or fill. In cut or fill areas new topsoil from a selected location may be required. Areas from which the soil is borrowed may require a gravel blanket or some other type of stabilization to avoid creation of blowsand hazards. Because of the stabilization problem, grading will be kept to a bare minimum in construction of recreation sites and adjacent lands.

c. Type of Plant Materials.

In areas where lawn grass is specified, a mixture of standard Kentucky Bluegrass, Merion Bluegrass, and Creeping Red Fescue will be used. Dryland grasses, including hard fescue, will be used for stabilization purposes on all disturbed and construction scar areas in and around recreation sites, and for stabilization of newly created land forms such as the island and peninsula at the Central Ferry site. All trees and shrub varieties have been chosen because of their hardiness and adaptability to climatic conditions of the Little Goose project area. Consideration was given in the selection to plant varieties of trees and shrubs that would form a habitat for non-game birds, as requested by the Fish and Wildlife Service. Plant lists are included on the plates, giving both botanical and common names, size, number, and manner furnished.

SECTION 4 - EARTHWORK

4.01. LITTLE GOOSE - R.M. 71.5 (Plate 2).

a. Foundations and Materials.

The existing access road which parallels the lake is surfaced with gravelly sand or sandy gravel. Natural ground in the recreation area consists of approximately three feet of sandy silt overlying sandy gravel or gravelly sand.

b. Borrow Sources.

Borrow materials exist as shown in the following tabulation:

<u>Material</u>	<u>Source</u>	<u>Quantity Available</u>	<u>Below Pool</u>	<u>Above Pool</u>
Gravel	1,500' U/S of launch ramp	50,000 CY	X	
Riprap	Existing quarry, 3½ miles D/S	5,000 CY		X

c. Design.

(1) General design values applicable to all areas are listed in this paragraph. Values which are controlled by materials should be obtained by referring to the materials description for each individual site. Since any site may be modified in scope or location of facilities in the future, design values will thus be available.

<u>Material</u>	<u>Bearing Value</u>	<u>Estimated CBR</u>
SILT or Sandy SILT	3,000 lbs/sq.ft.	15
Silty SAND or SAND	3,000 lbs/sq.ft.	20
Gravelly SAND	5,000 lbs/sq.ft.	35
Sandy GRAVEL	8,000 lbs/sq.ft.	50

Place exterior footings at least two feet and utility lines at least three feet below finished grade for protection against frost action.

(2) Riprap size can be obtained from the following tabulation using the design wave height and the riprap slope which will provide a suitable facility and yet not exceed the rock sizes available in the vicinity. The tabulation is based on results of riprap studies for the John Day Dam relocations by the Waterways Experiment Station at Vicksburg, Mississippi. The design wave is based on the computed wave which is exceeded 100 times a year and weighted according to headlands protection and depth of water.

<u>Wave Height</u>	<u>Slope</u>				
	<u>1 on 2</u>	<u>1 on 3</u>	<u>1 on 4</u>	<u>1 on 5</u>	
1.5'	6	2	2	2	Riprap
2.0'	8	4	3	2	Sizes
2.5'	10	6	5	3	in
3.0'	12	8	7	4	Inches

*(3) Riprap will have a minimum thickness of 18 inches. If riprap is placed on a fine-grained embankment or natural ground, the slope to receive riprap will be covered by a minimum of 12 inches of sandy gravel to serve as a transition zone.

(4) Asphaltic surfacing for roads will consist of 1½ inches of hot-mix asphaltic concrete. Base course will consist of 3-inch minus select sandy gravel and leveling course will consist of crushed gravel.

(5) The base and leveling course thicknesses for roads and parking areas for the Little Goose recreation sites shall be as follows:

<u>Location</u>	<u>Estimated Subgrade CBR</u>	<u>Thickness of Course</u>	
		<u>Base</u>	<u>Leveling</u>
Existing access road	35	6" existing	2"
New road and parking area	15	5"	2"

(6) Design wave height is 2.5 feet (2.6 feet computed).

4.02. CENTRAL FERRY-PEYTON - R.M. 82 (Plates 3, 4 and 5).

a. Foundations and Materials.

The area is covered by five to eight feet of silt overlying sandy gravel.

*b. Borrow Sources.

Borrow materials exist as shown in the following tabulation:

<u>Material</u>	<u>Source</u>	<u>Quantity Available</u>	<u>Below Pool</u>	<u>Above Pool</u>
Gravel	North of CPRR at Central Ferry Site	15,000 CY		X
	2,000 Ft. D/S of site	50,000 CY	X	
Riprap	Existing stockpile at Central Ferry	1,200 CY		X
Beach Sand	1½ Mi. U/S at Colyear Farm	4,000 CY	X	
	7 Mi. U/S (south shore) near R.M. 90	6,000 CY		X
		7,000 CY		X

Beach sand must be processed from sand strata, gravelly sand, and sandy gravel deposits at the above site.

c. Design.

(1) The base and leveling course thickness for roads and parking areas shall be as follows:

<u>Location</u>	<u>Estimated Subgrade CBR</u>	<u>Thickness of Course</u>	
		<u>Base</u>	<u>Leveling</u>
Entire area	15	5"	2"

(2) Design wave height is 3.0 feet (2.8 feet computed).

(3) Percolation tests were attempted at a three-foot depth at the two following locations; however, the initial filling of one foot of water would not drain during an eight-hour work day so readings were not obtained for a one-inch drop.

<u>Test Number</u>	<u>Location - Lambert Coordinates</u>	
1	N-483,820	E-2,675,608
2	N-483,879	E-2,676,723

Gravel was encountered at a six-foot depth in the first hole and at a five-foot depth in the second. Dry wells or tile fields should be taken into gravel.

4.03. WILLOW ISLAND - R.M. 88 (Plate 6).

a. Foundations and Materials.

The area is covered by at least five feet of sandy silt.

*b. Borrow Sources.

Borrow materials exist as shown in the following tabulation:

<u>Material</u>	<u>Source</u>	<u>Quantity Available</u>	<u>Below Pool</u>	<u>Above Pool</u>
Gravel	1,000' riverward of recreation area	500,000 CY	X	
Riprap	2 miles D/S at Hasting's Hill Quarry	5,000 CY		X
Sand	1 mile U/S near R.M. 90	7,000 CY		X

c. Design.

(1) The base and leveling course thicknesses for roads and parking areas shall be as follows:

<u>Location</u>	<u>Estimated Subgrade CBR</u>	<u>Thickness of Course</u>	
		<u>Base</u>	<u>Leveling</u>
Entire area	15	5"	2"

(2) Design wave height is 2.5 feet (same as computed).

*4.04. PENAWAWA.

Development at this site has been dropped. See paragraph 3.05.

4.05. ILLIA - R.M. 103 (Plate 8).

a. Foundations and Materials.

The area is covered by three to eight feet of sandy silt overlying sandy gravel. Active sand dunes traverse the center portion of the terrace and in turn cover the sandy silt to depths of 5 to 25 feet.

b. Borrow Sources.

Borrow material exists as shown in the following tabulation:

<u>Material</u>	<u>Source</u>	<u>Quantity Available</u>	<u>Below Pool</u>	<u>Above Pool</u>
Gravel	1,500' U/S, landward of Lower Granite Dam Access Road	25,000 CY		X
Riprap	1 mile upstream	10,000 CY		X

c. Design.

(1) The base and leveling course thicknesses for roads and parking areas shall be as follows:

<u>Location</u>	<u>Estimated Subgrade CBR</u>	<u>Thickness of Course</u>	
		<u>Base</u>	<u>Leveling</u>
Entire area	15	5"	2"

(2) Design wave height is 1.5 feet (2.5 feet computed).

(3) Percolation tests were made at a depth of three feet for the future housing area and for the original recreation site location with the following results:

<u>Test No.</u>	<u>Location - Lambert Coordinates</u>		<u>Log of Material</u>	<u>Time to Drop 1"</u>
1	N-512,283	E-2,758,970	0.0-6.0+ Si.Sand	30 Sec
2	N-512,359	E-2,759,163	0.0-5.0+ Si.Sand	2 Min
3	N-511,768	E-2,757,577	0.0-3.0 Sa.Silt at 3.0 Si.Gravel	8 Min
4	N-511,693	E-2,757,445	0.0-3.5 Sa.Silt at 3.5 Si.Gravel	5Min 30Sec

4.06. BOYER - R.M. 105.5 (Plate 9).

a. Foundations and Materials.

The area is covered by 15 to 25 feet of sandy silt and silty sand.

b. Borrow Sources.

Borrow materials exist as shown in the following tabulation:

<u>Material</u>	<u>Source</u>	<u>Available</u>	<u>Below Pool</u>	<u>Above Pool</u>
Gravel	1½ miles U/S, Log Cabin Island	50,000 CY	X	
	2,000 feet U/S (riverward of old railway line)	25,000 CY	X	
Riprap	6,000 feet U/S and 2,000 feet up the canyon opposite RM 107 (undeveloped quarry)	35,000 CY		X
Rockfill	Waste pile behind Boyer	5,000 CY		X
Undersize Riprap	From quarry stripping	7,000 CY		X
Beach Sand	Adjacent to riprap source	Unknown		X
	Two miles U/S, mouth of Bush Ranch Canyon	Unknown		X
	7.2 miles U/S (4,000 feet D/S of Granite Point)	Unknown		X

Beach sand must be processed from sand strata, gravelly sand, and sandy gravel deposits in the area. Peter Kiewit Sons' Co., which is constructing a portion of the Camas Prairie Railroad and the north abutment of Lower Granite Dam, is borrowing sand from the riprap source canyon and is looking for additional sources to use as filter material in the dam.

c. Design.

(1) The base and leveling course thicknesses for roads and parking areas shall be as follows:

<u>Location</u>	<u>Estimated Subgrade CBR</u>	<u>Thickness of Course</u>	
		<u>Base</u>	<u>Leveling</u>
All areas	14	5"	2"

(2) Design wave height is 2.2 feet (same as computed).

(3) Percolation tests were made at a depth of three feet with the following results:

<u>Test No.</u>	<u>Location - Lambert Coordinates</u>		<u>Log of Material</u>	<u>Time to Drop 1"</u>
1	N-505,900	E-2,766,585	0.0-5.0+ Sa.Silt	7 Min
2	N-507,320	E-2,766,175	0.0-5.0 Si.Sand at 5.0 Silt	3 Min

(4) Where the silt overburden will be exposed to wave action, it will be flattened to a 4:1 slope, covered with 12 inches of sandy gravel for a transition zone, and protected by 18 inches of 5-inch average size rock.

SECTION 5 - DISCUSSION, CONSTRUCTION SCHEDULE, AND RECOMMENDATION

**5.01. DISCUSSION.

a. Lake Bryan has formed a new shoreline with a large potential for development of water-oriented recreation. The proposed recreational facilities, in turn, should attract visitation by the public to the new lake.

b. The proposed facilities will be adequate for anticipated use during the early years of the project operation. As demand justifies, additional facilities will be provided. The exact nature, extent, and design of the future development will be determined through coordination with the agencies involved at the time. Plans for some of the future work are shown in this design memorandum to indicate how the initial development relates to a layout for complete park development and use.

c. The development of the five recreational areas is considered essential to give the public the best opportunity to utilize and enjoy the vast beauty and natural resources created by Lake Bryan. The five areas will provide easy access to the lower, middle, and upper reaches of the lake.

*5.02. CONSTRUCTION SCHEDULE.

a. Work Prior to Lake Filling.

(1) Grading of access road and parking area and installation of launching ramp at Little Goose site.

(2) Breakwater to protect launching ramp and marina area, install ramp, comfort station, and well at Central Ferry site.

(3) Work at Penawawa by Port of Whitman including grading of beach and boat basin, breakwater, and installation of boat ramp.

(4) Work at Boyer by Port of Whitman including excavation of the marina area, construction of breakwaters, riprap, and placement of the launching ramp.

**b. Completion Contract.

All remaining items of work specified in this DM at Little Goose, Central Ferry, Willow Island, and Illia. The contract will be advertised for construction during F.Y. 1973.

***5.03. RECOMMENDATION.**

It is recommended that the construction for the Little Goose, Central Ferry, Willow Island, Illia, and Boyer sites, as outlined herein at a development cost of \$3,400,285, be approved, and that authority be granted to continue construction plans and specifications as outlined in the construction schedule.

Little Goose DM 14.1

TABLE 1 - SUMMARY COST ESTIMATE

COMPLETED WORK (Table 2)

Federal	\$1,112,285
Non-Federal, Port of Whitman	<u>198,000</u>
	1,310,285

COMPLETION CONTRACT (Tables 3 thru 8; 1 July 1972 price level)

Little Goose	\$ 123,000
Central Ferry	2,033,000
Willow Island	67,000
Penawawa (see para. 3.05)	0
Illia	<u>65,000</u>
	\$2,288,000

TOTAL ESTIMATED FEDERAL COST	\$3,400,285
TOTAL NON-FEDERAL COST	<u>\$ 198,000</u>
TOTAL FEATURE COST	\$3,598,285

Little Goose DM 14.1

TABLE 2 - COST ANALYSIS

WORK COMPLETED BY PORT OF WHITMAN

Penawawa:		
Grading, breakwater, launching ramp		\$ 40,000
Boyer:		
Grading, breakwater, launching ramp, riprap		<u>158,000</u>
	TOTAL	\$198,000

WORK COMPLETED BY CORPS OF ENGINEERS

Before lake filling:		
Little Goose Site:		
Access road, parking area, boat ramp		\$ 8,000
Central Ferry Site:		
Ramp, comfort station, well		67,000
Breakwaters		<u>20,000</u>
		95,000
Since lake filling:		
Boyer Site (Table 8)		<u>1,017,285</u>
	TOTAL	\$1,112,285

WORK TO COMPLETE

Little Goose (Table 3)		\$ 123,000
Central Ferry (Table 4)		2,033,000
Willow Island (Table 5)		67,000
Penawawa (Deleted, see para. 3.05)		0
Illia (Table 7)		<u>65,000</u>
	Total Estimated Completion Cost	\$2,288,000

SUMMARY

Work Completed:		\$1,310,285
By Port of Whitman	\$ 198,000	
By Corps of Engineers	1,112,285	
Work to Complete:		
By Corps of Engineers		<u>2,288,000</u>
	TOTAL FEATURE COST	\$3,598,285

Little Goose DM 14.1

TABLE 3 - LITTLE GOOSE SITE

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
1. Access Road				
a. Excavation	1,460	CY	\$ 1.35	\$ 1,971
b. Embankment	1,100	CY	1.15	1,265
c. Base course	400	CY	4.75	1,900
d. Leveling course	960	CY	6.50	6,240
e. 1-1/2" A.C. paving	14,000	SY	1.90	26,600
f. Guardrail	265	LF	3.25	<u>861</u>
Subtotal				\$ 38,837
2. Parking Area				
a. Excavation	3,940	CY	1.35	\$ 5,319
b. Embankment	950	CY	1.15	1,093
c. Base course	540	CY	4.75	2,565
d. Leveling course	220	CY	6.00	1,320
e. 1-1/2" A.C. paving	3,800	SY	1.90	<u>7,220</u>
Subtotal				\$ 17,517
3. Ramp				
a. Excavation	840	CY	1.35	\$ 1,134
b. Ramp	1	Job		3,275
c. Handling dock	1	Job		2,400
d. Tie-up dock	1	Job		<u>6,500</u>
Subtotal				\$ 13,309
4. Vault toilets	2	Ea	1,250.00	2,500
5. Picnic Units	1	Job		475
6. Trees	33	Ea	19.00	627
7. Sign, minor	1	Ea	300.00	<u>300</u>
Subtotals				\$ 73,565
Contingencies 20%				<u>14,435</u>
				\$ 88,000
Cost Increase April 1969 to July 1970				8,000
Cost Increase July 1970 to July 1972				<u>27,000</u>
TOTAL ESTIMATED COMPLETION COST				\$123,000

TABLE 3
Revised 2 July 1970
and 13 June 1972

Little Goose DM 14.1

TABLE 4 - CENTRAL FERRY SITE

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
1. Access Roads				
a. Excavation	4,940	CY	\$ 1.30	\$ 6,420
b. Embankment	7,270	CY	0.65	4,725
c. Base course	2,660	CY	4.70	12,500
d. Top course	1,120	CY	5.25	5,880
e. A.C. paving, 1-1/2"	16,850	SY	2.10	35,385
f. Beam guardrail	800	LF	4.30	<u>3,440</u>
Subtotal				\$ 68,350
2. Parking Areas				
a. Excavation	11,570	CY	1.30	\$ 15,040
b. Embankment	410	CY	0.65	265
c. Base course	2,890	CY	4.70	13,585
d. Top course	1,170	CY	5.25	6,145
e. A.C. paving, 1-1/2"	21,260	SY	2.10	44,645
f. Pavement striping	6,850	LF	0.25	1,715
g. Concrete curb	3,165	LF	4.40	<u>13,925</u>
Subtotal				\$ 95,320
3. Picnicking & Swimming Areas				
a. Excavation	90,600	CY	1.70	\$154,020
b. Embankment	26,600	CY	0.65	17,290
c. Beach sand	1,430	CY	4.80	6,865
d. Topsoil	3,500	CY	2.65	9,275
e. Gravel	8,420	CY	1.95	16,420
f. Lawn grass	9.1	Ac	1,800.00	16,380
g. Irrigation (sprinkler)	9.1	Ac	3,500.00	31,850
h. Concrete curb	1,100	LF	4.40	4,840
i. Floating breakwater	1,500	LF	120.00	<u>180,000</u>
Subtotal				\$436,940

TABLE 4
 Revised 2 July 1970
 and 13 June 1972
 Sheet 1 of 4

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
4. Boating Areas				
a. Excavation	46,100	CY	1.70	78,370
b. Gravel fill	49,790	CY	1.90	94,600
c. Bank protection (gravel)	1,000	CY	2.15	2,150
d. Topsoil	3,850	CY	2.65	10,200
e. Lawn grass	2.5	Ac	1,800.00	4,500
f. Irrigation (sprinkler)	2.5	Ac	3,500.00	8,750
g. Boat ramp & handling dock	1	Job		30,000
h. Boat tie-up docks	1	Job		35,500
i. Boat sanitary dump dock	1	Job		3,500
j. Sewage disposal (dock)	1	Job		16,000
k. Water supply	1	Job		2,300
l. Rock protection	160	CY	4.50	720
m. Rock fill	2,420	CY	3.50	8,470
n. Spalls	770	CY	4.00	3,080
o. Riprap	1,180	CY	6.00	<u>7,080</u>
Subtotal				\$305,220
5. Camping Area				
a. Excavation	2,300	CY	1.70	3,910
b. Embankment (50% borrow)	140,950	CY	1.10	155,045
c. Base course	1,750	CY	5.25	9,190
d. Top course	1,190	CY	5.80	6,900
e. A.C. paving, 1-1/2"	12,570	SY	2.10	26,395
f. Gravel bank protection	2,360	CY	1.95	4,600
g. Gravel, 1/4" minus	430	CY	5.00	2,150
h. Topsoil	47,880	CY	2.65	126,882
i. Lawn grass	22.7	Ac	1,800.00	40,860
j. Irrigation (sprinkler)	22.7	Ac	3,800.00	86,260
k. Domestic water	1	Job		16,600
l. Sewage disposal	1	Job		26,400
m. Concrete walk, 5 ft. width	3,270	SF	0.90	2,945
n. Camp unit	60	Ea	305.00	<u>18,300</u>
Subtotal				\$526,437

TABLE 4
Sheet 2 of 4

	<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
6.	Comfort Station (picnic)				
	a. Building (2,000 SF)	1	Job		\$ 60,000
	b. Water supply	1	Job		6,500
	c. Sewage disposal	1	Job		<u>19,500</u>
	Subtotal				\$ 86,000
7.	Comfort Station (boating) (Deleted)				
8.	Comfort Station (camping)				
	a. Building (730 SF)	1	Job		\$ 27,500
	b. Water supply	1	Job		4,400
	c. Sewage disposal	1	Job		<u>21,500</u>
	Subtotal				\$ 53,400
9.	Pumphouse				
	a. Building	1	Job		\$ 10,550
	b. Well	1	Job		<u>13,650</u>
	Subtotal				\$ 24,200
10.	Trailer Dump Station				
	a. Base course	130	CY	4.70	\$ 610
	b. Top course	50	CY	5.25	260
	c. A.C. paving, 1-1/2"	900	SY	2.10	1,890
	d. Concrete curb, Type "B"	38	LF	4.40	170
	e. Water supply	1	Job		4,200
	f. Sewage disposal	1	Job		<u>8,300</u>
	Subtotal				\$ 15,430
11.	Landscaping				
	a. Dryland grass	56	Ac	700.00	\$ 39,200
	b. Trees - deciduous	593	Ea	33.00	19,570
	- coniferous	113	Ea	36.00	4,070
	c. Shrubs	640	Ea	3.75	<u>2,400</u>
	Subtotal				\$ 65,240

TABLE 4
Sheet 3 of 4

	<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
12.	Signs, install only (includ. posts & rubble masonry)	1	Job		\$ 3,000
13.	Exterior electrical	1	Job		23,000
14.	Shade shelter	6	Ea	3,000.00	18,000
15.	Fire circle	1	Job		1,000
16.	Picnic units	1	Job		10,850
17.	Navigation buoy (Deleted)				
18.	Piling, channel marker	9	Ea	350.00	3,150
19.	Sewage lagoon	1	Job		<u>32,600</u>
	Subtotal				\$1,768,137
	Contingencies 15%				<u>264,863</u>
	TOTAL				\$2,033,000

Little Goose DM 14.1

TABLE 5 - WILLOW ISLAND SITE

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
1. Access Road				
a. Excavation	60	CY	\$ 2.50	\$ 150
b. Embankment	140	CY	1.70	238
c. Base course	70	CY	5.00	350
d. Leveling course	30	CY	6.50	195
e. 1-1/2" A.C. paving	1,100	SY	2.00	<u>2,200</u>
Subtotal				\$ 3,133
2. Parking Area				
a. Excavation	520	CY	2.50	\$ 1,300
b. Embankment	230	CY	1.70	391
c. Base course	920	CY	5.00	4,600
d. Leveling course	410	CY	6.50	2,665
e. 1-1/2" A.C. paving	4,400	SY	2.00	8,800
f. Parking rail	230	LF	2.15	<u>495</u>
Subtotal				\$ 18,251
3. Ramp				
a. Excavation	410	CY	2.50	\$ 1,025
b. Embankment	10	CY	1.70	17
c. Ramp	1	Job		3,700
d. Handling dock	1	Job		2,900
e. Tie-up dock	1	Job		<u>7,000</u>
Subtotal				\$ 14,642
4. Vault Toilets	2	Ea	250.00	\$ 2,500
5. Picnic Units	1	Job		\$ 500
6. Trees	36	Ea	19.00	\$ 684
7. Sign, Minor	1	Ea	300.00	<u>\$ 300</u>
Subtotal				\$ 40,010
Contingencies 20%				<u>7,990</u>
				\$ 48,000
Cost Increase April 1969 to July 1970				4,000
Cost Increase July 1970 to July 1972				<u>15,000</u>
TOTAL ESTIMATED CONSTRUCTION COST				\$ 67,000

TABLE 5

Revised 2 July 1970
and 13 June 1972

Little Goose DM 14.1

TABLE 6 - PENAWAWA SITE

Development at the Penawawa Site has
been dropped. See paragraph 3.05.

TABLE 6
Revised 2 July 1970
Deleted 13 June 1972

Little Goose DM 14.1

TABLE 7 - ILLIA SITE

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
1. Access Road				
a. Excavation	740	CY	\$ 1.25	\$ 925
b. Embankment	130	CY	0.80	104
c. Base course	170	CY	5.00	850
d. Leveling course	70	CY	6.50	455
e. 1-1/2" A.C. paving	1,000	SY	2.00	<u>2,000</u>
Subtotal				\$ 4,334
2. Parking Area				
a. Excavation	4,920	CY	1.25	\$ 6,150
b. Embankment	3,160	CY	0.80	2,528
c. Rockfill	290	CY	2.75	798
d. Base course	310	CY	5.00	1,550
e. Leveling course	120	CY	6.50	780
f. 1-1/2" A.C. paving	2,350	SY	2.00	4,700
g. Guardrail	210	LF	3.50	<u>735</u>
Subtotal				\$ 17,241
3. Ramp				
a. Excavation	1,340	CY	1.25	\$ 1,675
b. Embankment	680	CY	0.80	544
c. Ramp	1	Job		1,675
d. Crib dock	1	Job		3,675
e. Tie-up dock	1	Job		<u>6,500</u>
Subtotal				\$ 14,069
4. Vault Toilets	2	Ea	1,250.00	2,500
5. Picnic Units	1	Job		475
6. Trees	13	Ea	20.00	260
7. Sign, Minor	1	Ea	300.00	<u>300</u>
Subtotals				\$ 39,179
Contingencies 20%				<u>7,821</u>
				\$ 47,000
Cost Increase April 1969 to July 1970				4,000
Cost Increase July 1970 to July 1972				<u>14,000</u>
TOTAL ESTIMATED CONSTRUCTION COST				\$ 65,000

TABLE 7
Revised 2 July 1970
and 13 June 1972

Little Goose Dam 14.1

TABLE 8 - BOYER SITE

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
1. Access Roads				
a. Excavation	900	CY	\$ 1.10	\$ 990
b. Embankment	900	CY	0.55	495
c. Base course	330	CY	4.00	1,320
d. Leveling course	180	CY	4.50	810
e. 1-1/2" A.C. paving	2,640	SY	1.95	5,148
f. Riprap	540	CY	8.00	4,320
g. Guardrail	200	LF	3.75	<u>750</u>
Subtotal				13,833
2. Parking Areas				
a. Excavation	16,800	CY	1.10	18,480
b. Embankment	2,500	CY	0.55	1,375
c. Base course	2,150	CY	4.00	8,600
d. Leveling course	800	CY	4.50	3,600
e. 1-1/2" A.C. paving	14,560	SY	1.95	28,392
f. Precast curbs	800	LF	2.70	2,160
g. Handrail	1,200	LF	7.00	8,400
h. Traffic stripes	6,000	LF	0.26	1,560
i. Concrete curbs	2,300	LF	3.40	<u>7,820</u>
Subtotal				80,387
3. Picnicking and Swimming Area				
a. Excavation	46,000	CY	1.10	50,600
b. Gravel fill	66,000	CY	1.75	115,500
c. Riprap	4,700	CY	8.00	37,600
d. Beach sand	3,900	CY	4.25	<u>16,575</u>
Subtotal				220,275
4. Boating Area				
a. Excavation	37,500	CY	2.00	75,000
b. Gravel fill	93,300	CY	1.75	163,275
c. Riprap	3,500	CY	8.00	28,000
d. Handling dock	1	Job		9,000
e. Area lighting	1	Job		2,500
f. Tie-up docks	1	Job		110,000
g. Crib dock	140	LF	60.00	<u>8,400</u>
Subtotal				\$396,175

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
5. Camping Area				
a. Base course	500	CY	4.00	2,000
b. Leveling course	200	CY	4.50	900
c. 1-1/2" A.C. paving	2,600	SY	1.95	5,070
d. Precast curbs	270	LF	2.70	729
e. Camp units	27	Ea	400.00	10,800
f. Domestic water	1	Job		4,700
g. Sewage disposal	1	Job		<u>14,500</u>
Subtotal				38,699
6. Comfort Station (Day-use)				
a. Building	1	Job		18,500
b. Water supply	1	Job		1,800
c. Sewage disposal	1	Job		<u>7,450</u>
Subtotal				27,750
7. Comfort Station (Camping)				
a. Building	1	Job		33,350
b. Water supply	1	Job		5,250
c. Sewage disposal	1	Job		<u>8,100</u>
Subtotal				46,700
8. Pumphouse				
a. Building	1	Job		16,500
b. Well	1	Job		20,000
c. Electrical	1	Job		<u>2,000</u>
Subtotal				38,500
9. Landscaping				
a. Trees	316	Ea	18.00	5,688
b. Shrubs	37	Ea	10.00	370
c. Lawn grass	8.5	Ac	1,600.00	13,600
d. Dryland grass	5.3	Ac	700.00	3,710
e. Irrigation	1	Job		<u>21,250</u>
Subtotal				44,618

TABLE 8
Sheet 2 of 3

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
10. Sign, Minor	5	Ea	\$ 125.00	\$ 625
11. Picnic units	1	Job		880
12. Shade shelters	3	Ea	1,650.00	4,950
13. Fire circle	1	Job		950
14. Culverts				
24" CMP, 14 Ga	712	LF	9.00	6,408
30" CMP, 14 Ga	242	LF	13.00	<u>3,146</u>
Feature Subtotal				923,896
Contingencies 15%				<u>138,104</u>
TOTAL ESTIMATED COMPLETION COST				\$1,062,000
LUMP-SUM BID FOR SITE COMPLETION *				\$1,017,285

* Added 13 June 1972
TABLE 8
Sheet 3 of 3

TABLE 9

COMPARISON OF PREVIOUS AND CURRENT ESTIMATES

<u>Site</u>	<u>Preliminary Master Plan March 1962 (1 Jul 61)</u>	<u>PB-2a Dated 1 Jan 1972 (1 July 71)</u>	<u>This Design Memo (1 July 72)</u>
Little Goose	\$ 0	\$ 107,000	\$ 131,000 <u>1/</u>
Ridpath	0	0	0
New York Bar	26,000	0	0
Central Ferry (Peyton)	95,000	1,622,000	2,120,000 <u>2/</u>
Willow Island	63,000	58,000	67,000
Penawawa	45,000	100,000	0 <u>3/</u>
Illia	46,000	57,000	65,000
Boyer	<u>86,000</u>	<u>1,278,000</u>	<u>1,017,285</u> <u>4/</u>
Total	\$361,000	\$3,222,000	\$3,400,285

1/ Includes \$8,000 already spent by C of E.

2/ Includes \$87,000 already spent by C of E.

3/ Exclusive of \$40,000 already spent by Port of Whitman.

4/ Exclusive of \$158,000 already spent by Port of Whitman; reflects actual low bid.

a. In the June 1969 submission of this DM, a total cost of \$1,950,000 was compared to a cost of \$470,000 carried in the PB-3 dated 27 May 1968. That low original PB-3 cost was based on preliminary master plan estimates made in 1962 under the austere program then in effect; therefore, updating of costs other than for price levels between 1962 and 1969 was not deemed advisable.

b. The quality and scope of the Corps' recreation development have been substantially upgraded, consistent with OCE directives since preparation of the preliminary master plan. Particularly in line with implementation of Public Law 89-72 as set forth in letter dated 5 August 1965, initial development to a level of at least "2/3 ultimate potential" has been provided at the Central Ferry and Boyer sites, each considered "Primary Areas."

c. In some cases, significant increases in cost are associated with the provision of erosion protection features, found by experience to be required on the Columbia and Snake River projects, and because underwater grading was not accomplished prior to lake filling.

Little Goose Site.

The work originally scheduled to be accomplished at New York Bar was transferred to this site because of the need for launching facilities near the damsite. Development planned at New York Bar was limited to that needed with boat access only. Main cost increases resulted from addition of access road, ramp, and parking area. Increase from \$107,000 to \$131,000 is price level only.

Central Ferry Site.

In the preliminary master plan this area was named Peyton. The Washington State Parks and Recreation Commission has indicated its desire to lease this site as a state park. The facilities to be provided have been completely redesigned and expanded from the previous submissions of this DM to bring the development up to a level acceptable to the state and to eliminate possible contamination of the swimming beach and Snake River. The cost increase from \$1,622,000 to \$2,120,000 indicated above is attributable to the required redesign of the site due to necessity for construction under full lake conditions, a change in comfort station construction to the buildings as designed by the State of Washington, additional site work, change in sewage treatment, and addition of some facilities at the boating and camping areas.

Willow Island Site.

Development at this site consists of a boat launching area only because of its proximity to the Central Ferry site. At one time, when relocation of the county road from Central Ferry to this site was considered infeasible, this site was dropped as an initial area; thus no initial development cost was shown on the 1968 PB-3. It was reinstated into the program when it was determined that relocation of the road was possible via Hastings Hill. (See Supplement No. 2 to Design Memorandum No. 6, approved 8 March 1968). Cost increase from \$58,000 to \$67,000 is price level only.

Penawawa.

This site has been dropped; see paragraph 3.05.

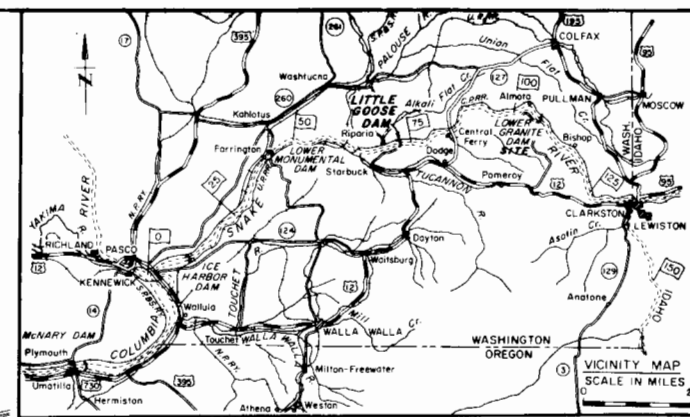
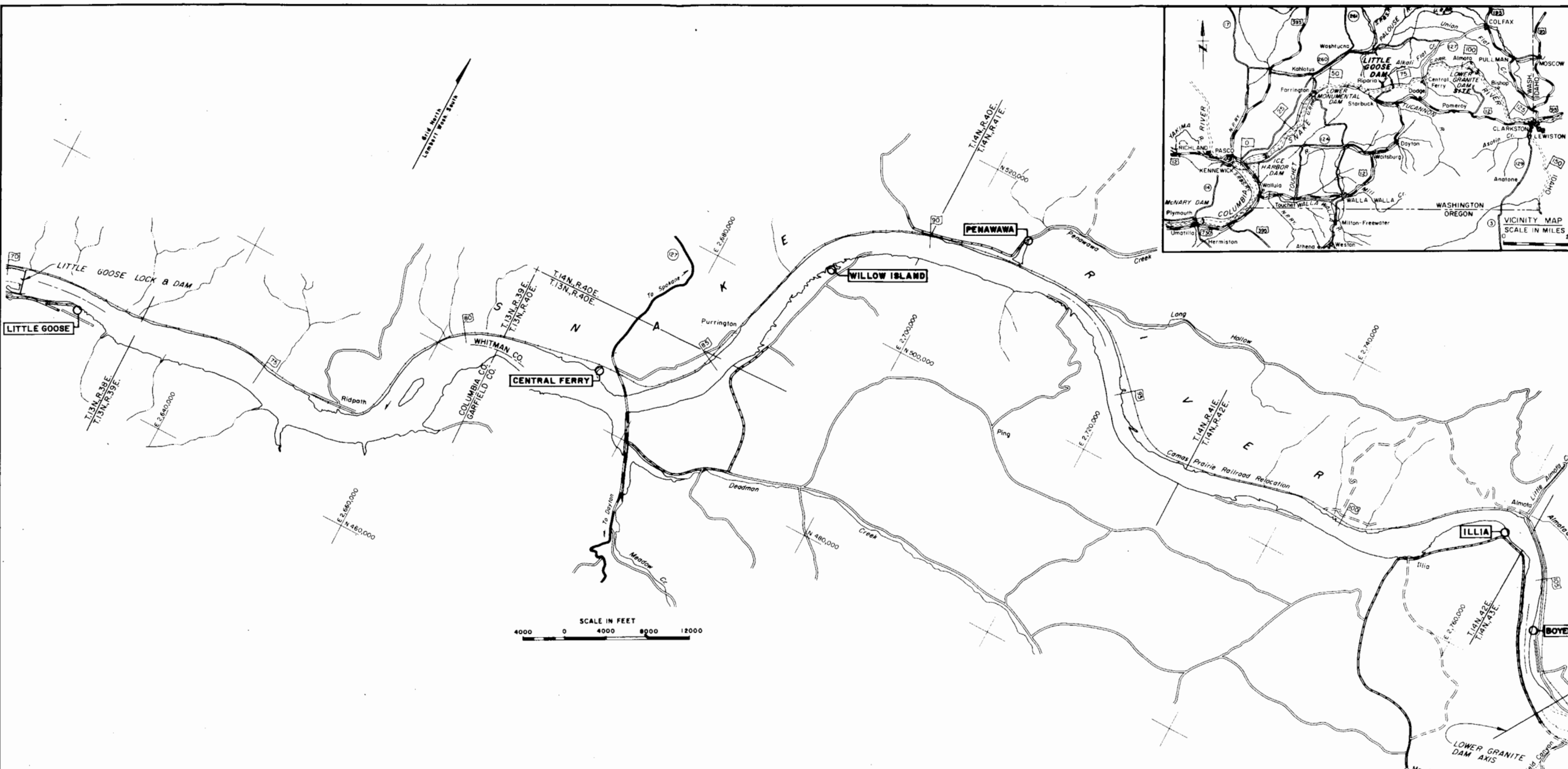
Illia.

Cost increase from \$57,000 to \$65,000 is price level only.

Boyer.

Planning studies and arguments presented at the Little Goose Public Hearing have demonstrated major increases in recreation use projections and scope of needed development at Boyer. Essentially all

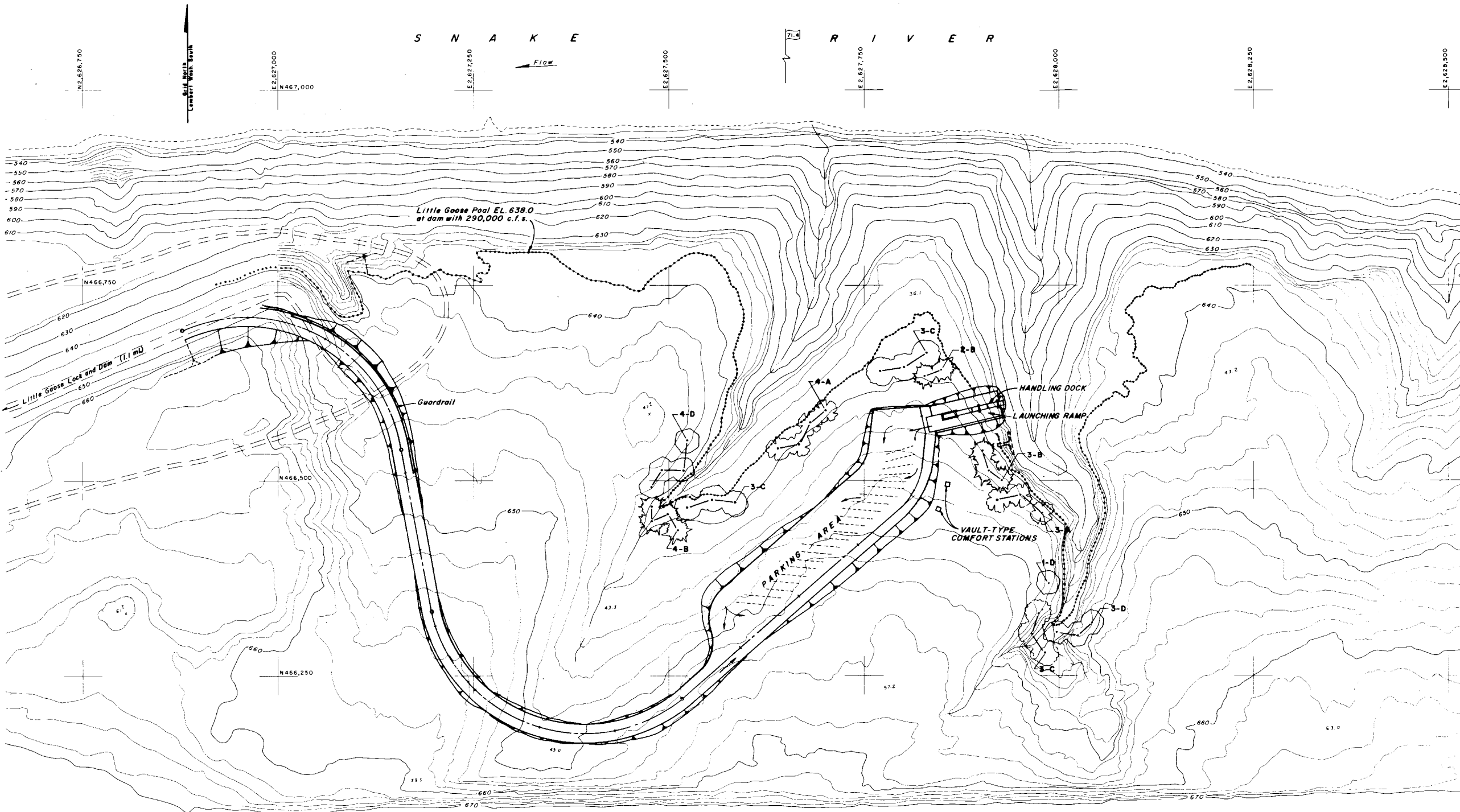
of the north shore use - Colfax, Pullman, Moscow - must be served at Boyer, since it has been found impractical to undertake any significant development at Wawawai. The Port of Whitman County desires to lease the Boyer site as developed, and to further develop, operate, and maintain the area as a public park and marina. Development was expanded to accommodate boating, camping, and picnicking. Also, because of damage experienced at other lakes and the fine-grained materials at the site, a complete dike is planned around the boating and swimming facilities. All items were increased in development cost several times because of the expansion and the erosion protection. The cost of \$1,017,285 reflects the actual low bid.



INDEX TO DRAWINGS		
FILE NO.	PLATE NO.	TITLE
LG-05-46/1	1	LOCATION MAP AND INDEX TO DRAWINGS
LG-05-46/2	2	LITTLE GOOSE
LG-05-46/3	3	CENTRAL FERRY
LG-05-46/4	4	CENTRAL FERRY - PLANTING PLAN
LG-05-46/5	5	CENTRAL FERRY - PLANTING PLAN
LG-05-46/6	6	WILLOW ISLAND
LG-05-46/7	7	PENAWAWA
LG-05-46/8	8	ILLIA
LG-05-46/9	9	BOYER
LG-05-46/10	10	EXPLORATIONS, ROAD SECTION AND SLOPE PROTECTION DETAILS
LG-05-46/11	11	COMFORT STATIONS - CENTRAL FERRY
LG-05-46/12	12	COMFORT STATIONS - BOYER
LG-05-46/13	13	VAULT TOILETS
LG-05-46/14	14	RESERVOIR BACKWATER PROFILES - 638 AND 633 FOOT POOL ELEVATIONS AT DAM

- LEGEND**
- PRIMARY HIGHWAYS
 - PRIMARY HIGHWAYS RELOCATION
 - OTHER ROADS (PAVED AND GRAVELED)
 - OTHER ROADS RELOCATION
 - - - UNIMPROVED ROADS
 - ILLIA RECREATION SITES
 - 85 RIVER MILES

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON			
LITTLE GOOSE LOCK AND DAM SNAKE RIVER, OREGON, WASHINGTON & IDAHO			
RECREATION FACILITIES AND PUBLIC USE AREAS			
LOCATION MAP AND INDEX TO DRAWINGS			
DESIGNED BY: R. Wadler	APPROVED: [Signature] DATE: 69 May 27		
DRAWN BY: T. Richardson	COLONEL, C. E. DISTRICT ENGINEER		
CHECKED BY: S. Streamer	SCALE AS SHOWN HWY. NO. 898		
SUBMITTED BY: [Signature]	FILE NO. LG-05-46/1		
RECOMMENDED BY: W. E. [Signature]	SHEET		



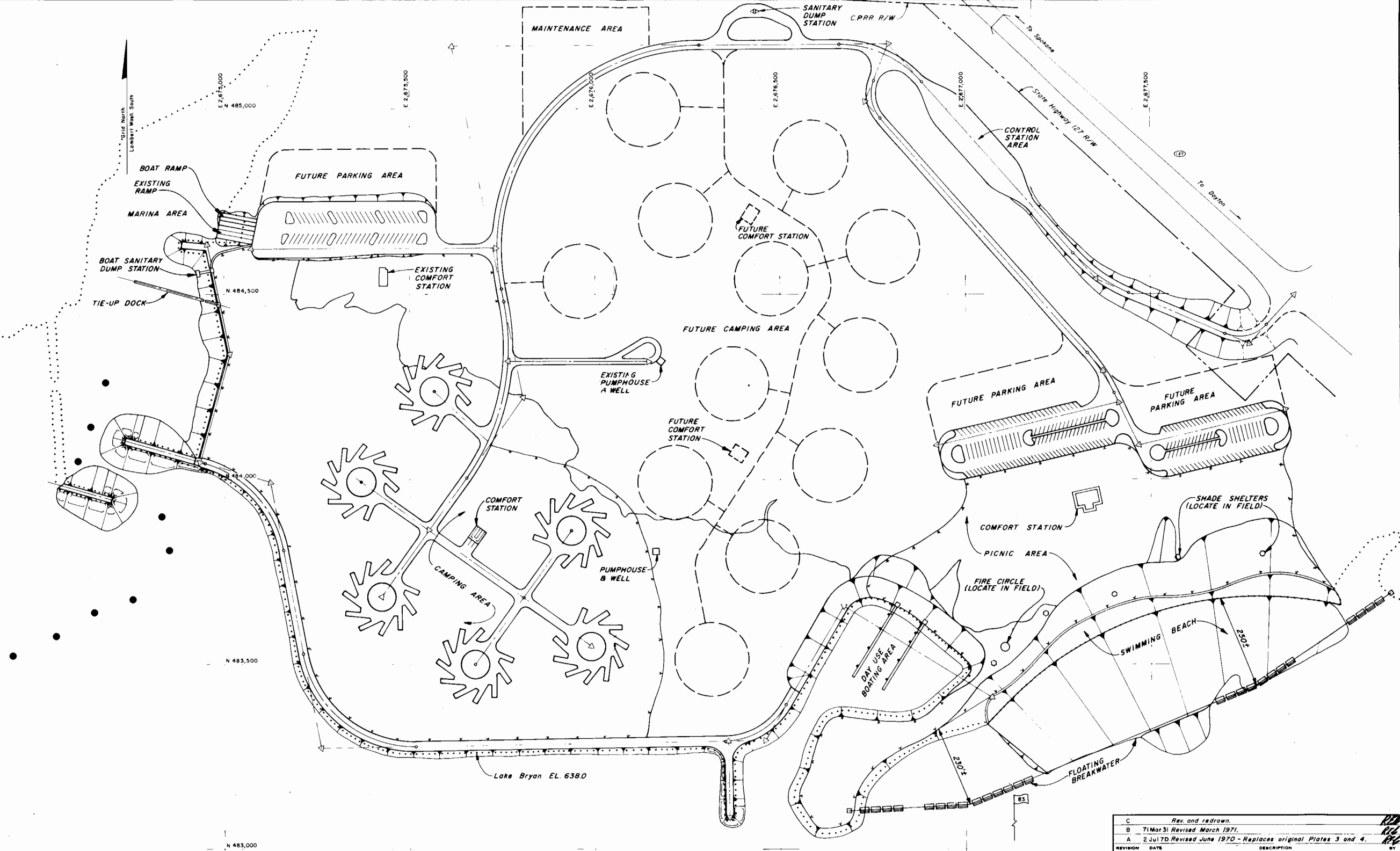
T. 13N, R. 38E.



PLANT LIST					
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HOW FURN.
TREES					
A	ELAEAGNUS ANGUSTIFOLIA	RUSSIAN OLIVE	7	6'-8' HIGH	BR.
B	PINUS NIGRA	AUSTRIAN PINE	9	3'-4' HIGH	B&B
C	POPULUS EUGENEI	CAROLINA POPLAR	9	8'-10' HIGH	BR.
D	ROBINIA PSEUDOACACIA	BLACK LOCUST	8	8'-10' HIGH	BR.

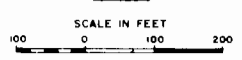
NOTE:
Contour interval 2' @ 10'

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON			
LITTLE GOOSE LOCK AND DAM SNAKE RIVER, OREGON, WASHINGTON & IDAHO RECREATION FACILITIES AND PUBLIC USE AREAS LITTLE GOOSE			
DESIGNED BY <i>R. Clayton / B. Ferguson</i>	APPROVED BY <i>Robert J. [Signature]</i> DATE: 27 May 27		
DRAWN BY <i>T. Rickerhagen</i>	RECOMMENDED BY <i>W. S. [Signature]</i>		
CHECKED BY <i>B. Streamer</i>	CHIEF OF DIVISION <i>[Signature]</i>		
SCALE AS SHOWN		INV. NO. ENG. FILE NO. LG-05-46/2	
SHEET		DESIGN MEMORANDUM NO. 14.1	

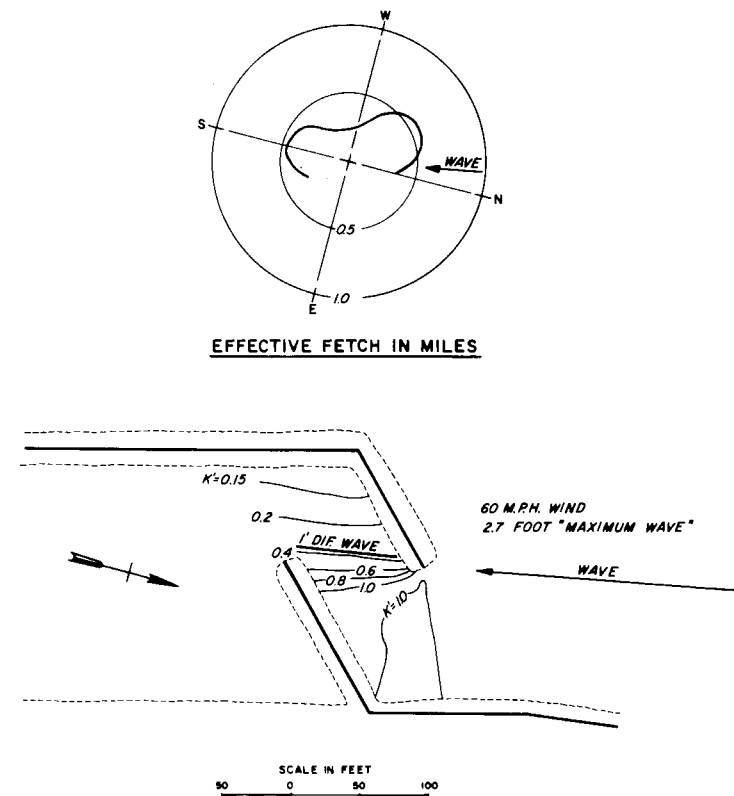
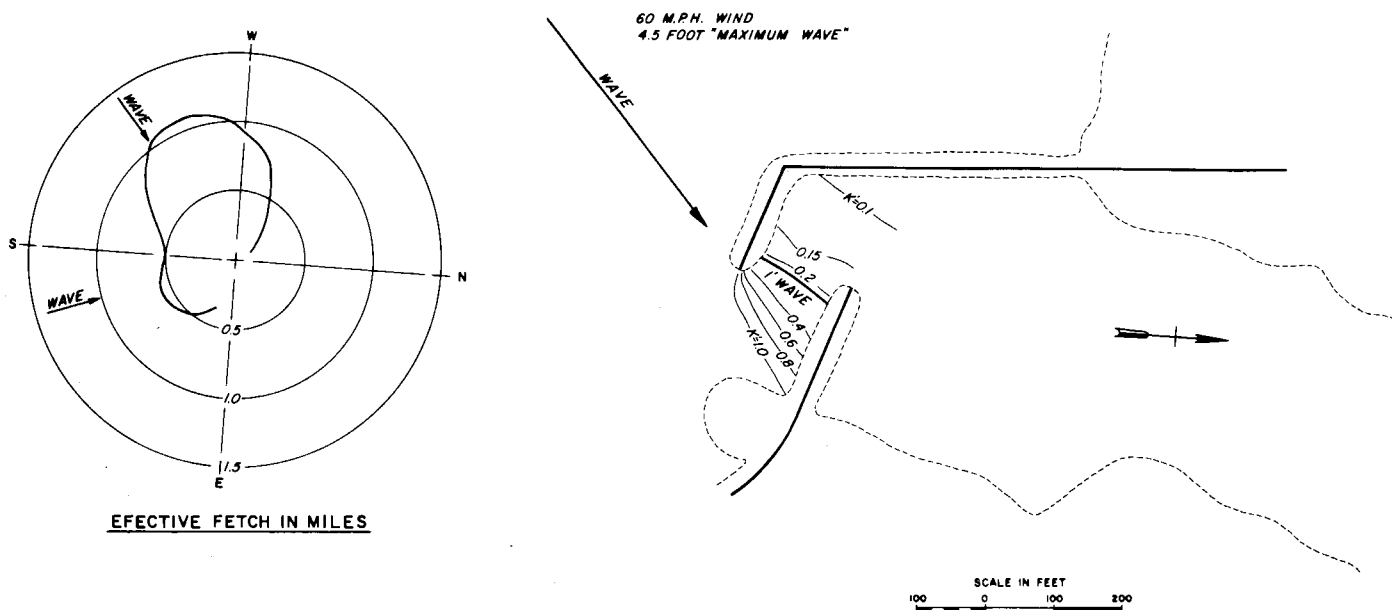


S N A K E R I V E R

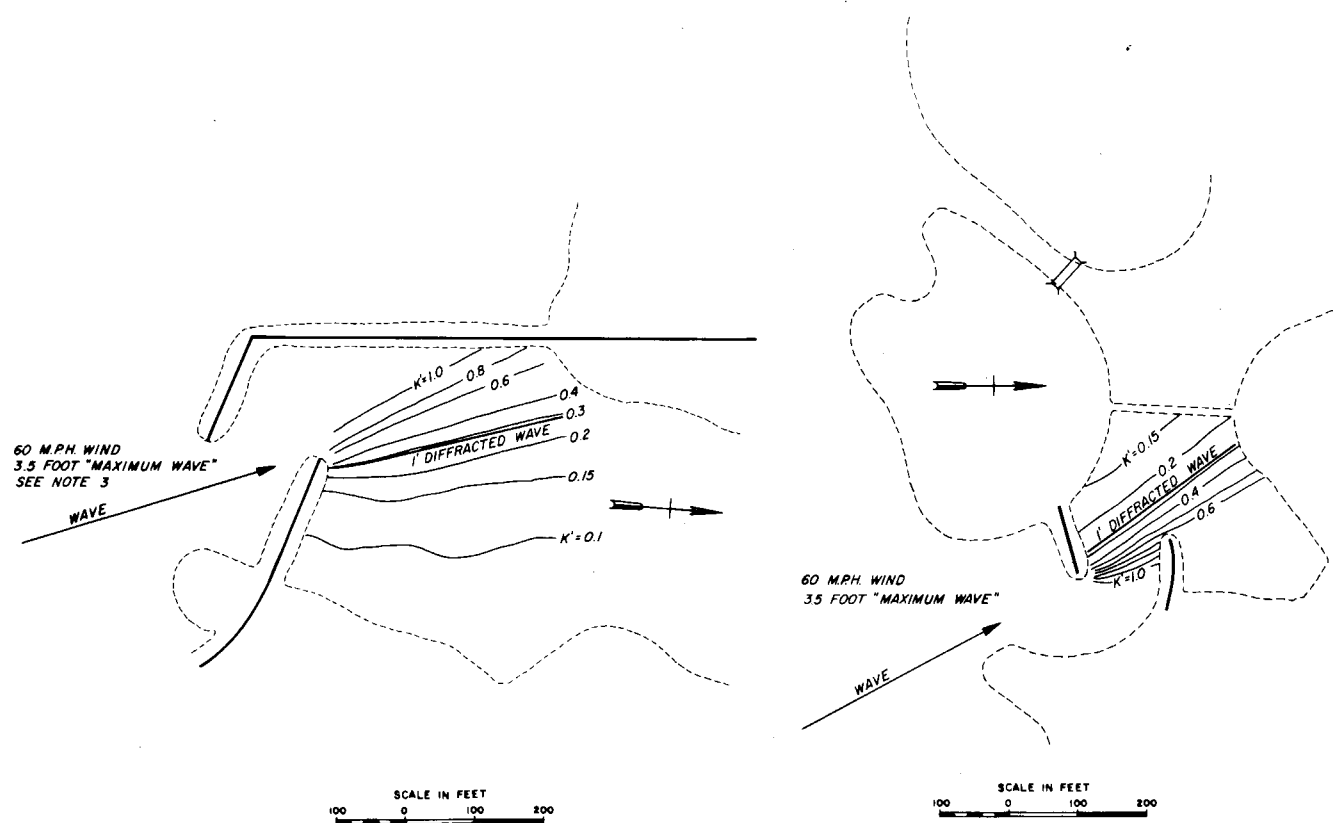
PLAN



C	Rev. and redrawn.	
B	71 Mar 31 Revised March 1971.	
A	2 Jul 70 Revised June 1970 - Replaces original Plates 3 and 4.	
REVISION	DATE	DESCRIPTION
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON		
LITTLE GOOSE LOCK AND DAM (LAKE BRYAN) SNAKE RIVER, OREGON, WASHINGTON AND IDAHO RECREATION FACILITIES AND PUBLIC USE AREAS CENTRAL FERRY PLAN		
DESIGNED: W. Clayton		
DRAWN: A. Fiedler		
CHECKED: G. Streamer		
SUPERVISED: <i>George Stammers</i> CHIEF, SELOC SEC.		
SUBMITTED: <i>R.E. Buckler</i> CHIEF, DESIGN BRANCH	23 Jan 72	DATE
SCALE AS SHOWN	INV. NO.	FILE NO.
SHEET	LG-05-46/3	



BOYER



CENTRAL FERRY

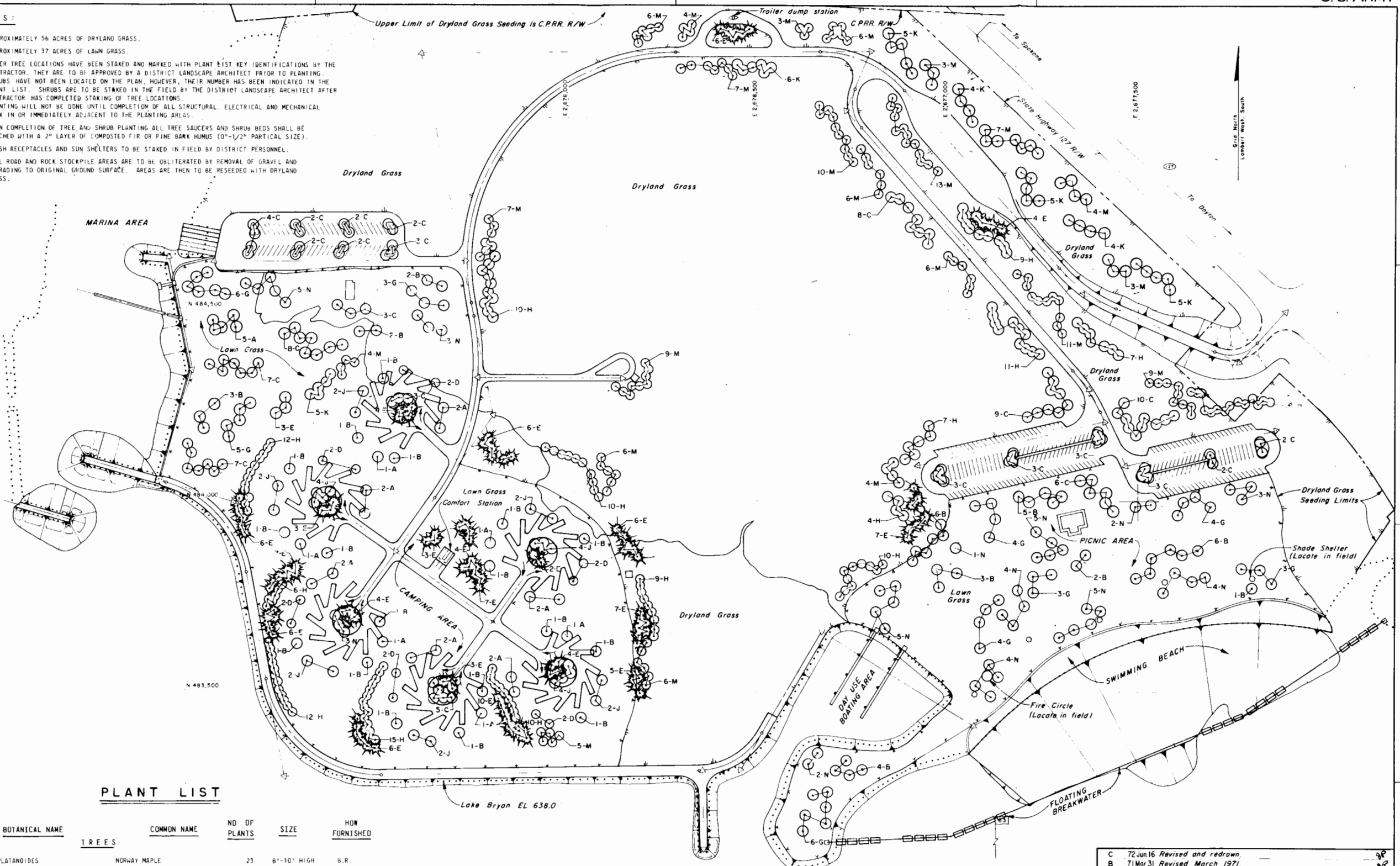
NOTES :

1. K' IS THE DIFFRACTION COEFFICIENT. FOR EXAMPLE, ALONG THE $K' = 0.2$ LINE, WAVE HEIGHTS ARE 0.2 OF THEIR INCIDENT VALUE.
2. WIND SPEEDS OF 40 M.P.H. HAVE BEEN MEASURED FOR 20 MINUTE DURATION AT THE ICE HARBOR PROJECT AND LITTLE GOOSE PROJECT. THE POLICY HAS BEEN TO USE 60 M.P.H. AS THE DESIGN WIND FOR OVER WATER FETCHES. THE WIND IS ASSUMED TO COME FROM ANY DIRECTION FOR VALLEY WINDS ARE UNPREDICTABLE.
3. THE WAVE INCIDENT ON THE INNER BREAKWATER WAS DIFFRACTED WITHOUT CONSIDERING THE OUTER BREAKWATER. THIS DIFFRACTION GIVES ONLY AN INDICATION OF WAVE HEIGHTS.
4. TECHNICAL REPORT NO. 4 3RD ED., 1966, SHORE PROTECTION, PLANNING AND DESIGN, BY U. S. ARMY, COSTAL ENGINEERING RESEARCH CENTER, WAS THE SOURCE OF DIFFRACTION DIAGRAMS.
5. ETL 1110-2-B, 1 AUGUST 1966 WAS USED FOR EFFECTIVE FETCH AND WAVE HEIGHT.

REVISION	DATE	DESCRIPTION	BY
A	02 July 70	Replaces original Plate 4	gpp
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON			
DESIGNED: L.C. Latham		LITTLE GOOSE LOCK AND DAM SNAKE RIVER, OREGON, WASHINGTON & IDAHO	
DRAWN: V. Henry			
CHECKED: L.C. Latham		RECREATION FACILITIES AND PUBLIC USE AREA DIFFRACTED WAVE PATTERN	
SUPERVISED: [Signature]			
SUBMITTED: [Signature]		DATE: 02 July 70	
RECOMMENDED: [Signature]		SCALE AS SHOWN	
CHIEF, ENGINEERING DIVISION		INV. NO. 2488	
		FILE NO. LG-05-46/4	

NOTES :

1. APPROXIMATELY 56 ACRES OF DRYLAND GRASS.
2. APPROXIMATELY 37 ACRES OF LAWN GRASS.
3. AFTER TREE LOCATIONS HAVE BEEN STAKED AND MARKED WITH PLANT LIST KEY IDENTIFICATIONS BY THE CONTRACTOR, THEY ARE TO BE APPROVED BY A DISTRICT LANDSCAPE ARCHITECT PRIOR TO PLANTING.
4. SHRUBS HAVE NOT BEEN LOCATED ON THE PLAN, HOWEVER, THEIR NUMBER HAS BEEN INDICATED IN THE PLANT LIST. SHRUBS ARE TO BE STAKED IN THE FIELD BY THE DISTRICT LANDSCAPE ARCHITECT AFTER CONTRACTOR HAS COMPLETED STAKING OF TREE LOCATIONS.
5. PLANTING WILL NOT BE DONE UNTIL COMPLETION OF ALL STRUCTURAL, ELECTRICAL AND MECHANICAL WORK IN OR IMMEDIATELY ADJACENT TO THE PLANTING AREAS.
6. UPON COMPLETION OF TREE AND SHRUB PLANTING ALL TREE SAUCERS AND SHRUB BEDS SHALL BE MULCHED WITH A 2" LAYER OF COMPOSTED FIR OR PINE BARK HUMUS (0"-1/2" PARTICUL SIZE).
7. TRASH RECEPTACLES AND SUN SHELTERS TO BE STAKED IN FIELD BY DISTRICT PERSONNEL.
8. HAUL ROAD AND ROCK STOCKPILE AREAS ARE TO BE OBLITERATED BY REMOVAL OF GRAVEL AND REGRADING TO ORIGINAL GROUND SURFACE. AREAS ARE THEN TO BE RESEEDED WITH DRYLAND GRASS.



PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	NO. OF PLANTS	SIZE	HOW FURNISHED
TREES					
A	ACER PLATANOIDES	NORWAY MAPLE	23	8'-10' HIGH	B. R.
B	FRAXINUS PENNSYLVANICA LANCEOLATA	GREEN ASH	52	8'-10' HIGH	B. R.
C	GLIEDISIA TRIACANTHOS & SHADMASTER	SHADMASTER HONEYLOCUST	99	8'-10' HIGH	B. R.
D	LIGUIDAMBAR STYRACIFLUA	AMERICAN SWEETGUM	12	6'- 8' HIGH	CONTAINER
E	PINUS NIGRA	AUSTRIAN PINE	113	4'- 5' HIGH	B. & B.
G	PLATANUS ACERIFOLIA	LONDON PLANE TREE	38	8'-10' HIGH	B. R.
H	POPULUS NIGRA & LOMBARDY	LOMBARDY POPLAR	146	8'-10' HIGH	B. R.
J	QUERCUS BOREALIS	RED OAK	24	8'-10' HIGH	CONTAINER
K	ROBINIA PSEUDACACIA	BLACK LOCUST	58	8'-10' HIGH	B. R.
M	ELAEAGNUS ARGUSTIFOLIA	RUSSIAN OLIVE (MULTI-TRUNK FORM)	139	8'-10' HIGH	B. R.
N	ACER SACCHARUM	SILVER MAPLE	45	8'-10' HIGH	B. R.
SHRUBS					
*	JUNIPERUS CHINENSIS PFITZERIAN	PFITZERS JUNIPER	190	3 GAL.	CONTAINER
*	PINUS MUGHO MUGHUS	MUGHO SWISS MOUNTAIN PINE	150	18"-24" HIGH	B. & B.
*	RHUS GLABRA	SMOOTH SUMAC	300	3'- 4' HIGH	B. R.

PLAN

SCALE IN FEET
100 0 100 200

C 72Jun16 Revised and redrawn.
 B 71Mar31 Revised March 1971.
 A 02Jul70 Replaces original Plate 5.

DESIGNED: S.J.R.B./J.A.
 DRAWN: A.Fiedler
 CHECKED: L.Turner
 SUPERVISED: [Signature]
 SUBMITTED: 23 Jun 72

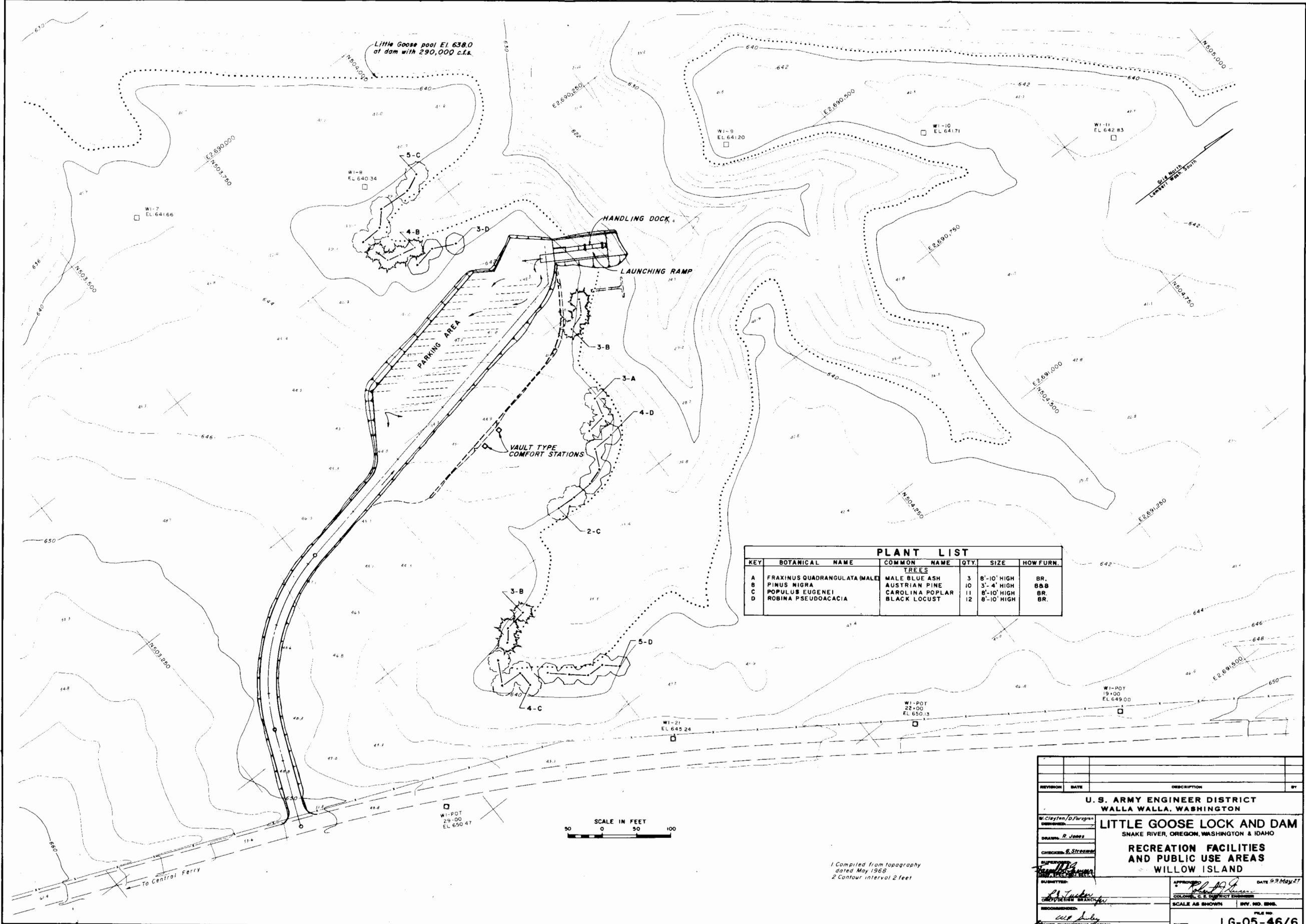
U. S. ARMY ENGINEER DISTRICT
 WALLA WALLA, WASHINGTON

LITTLE GOOSE LOCK AND DAM
 (LAKE BRYAN)
 SNAKE RIVER, OREGON, WASHINGTON AND IDAHO
 RECREATION FACILITIES
 AND PUBLIC USE AREAS
 CENTRAL FERRY
 PLANTING PLAN

DATE: _____
 SCALE AS SHOWN INV. NO. _____
 SHEET: _____ FILE NO. _____

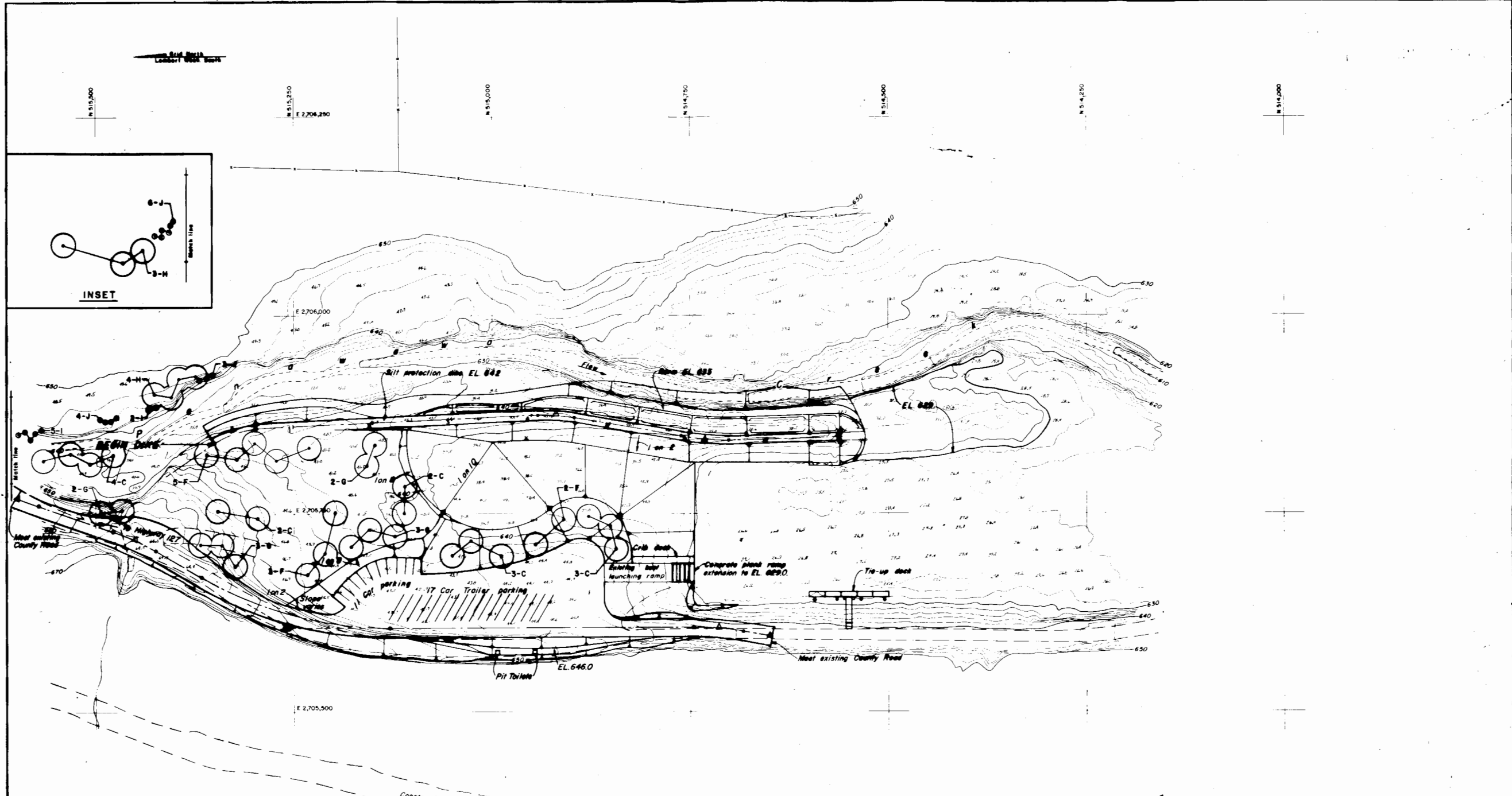
D.M. 14.1 LG-05-46/5

* SEE NOTE NO. 4



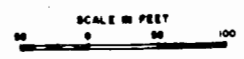
PLANT LIST						
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HOW FURN.	
TREES						
A	FRAXINUS QUADRANGULATA (MALE)	MALE BLUE ASH	3	8'-10' HIGH	BR.	
B	PINUS NIGRA	AUSTRIAN PINE	10	3'-4' HIGH	BBB	
C	POPULUS EUGENEI	CAROLINA POPLAR	11	8'-10' HIGH	BR.	
D	ROBINA PSEUDOACACIA	BLACK LOCUST	12	8'-10' HIGH	BR.	

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON			
LITTLE GOOSE LOCK AND DAM SNAKE RIVER, OREGON, WASHINGTON & IDAHO RECREATION FACILITIES AND PUBLIC USE AREAS WILLOW ISLAND			
DESIGNED BY <i>W. Clayton/D. Jorgensen</i>	APPROVED BY <i>[Signature]</i> DATE 6.9 May 27		
DRAWN BY <i>R. Jones</i>	SCALE AS SHOWN		
CHECKED BY <i>S. Strassner</i>	REV. NO. ENG.		
SUPERVISOR <i>[Signature]</i>	FILE NO.		
ENGINEER <i>[Signature]</i>	SHEET		

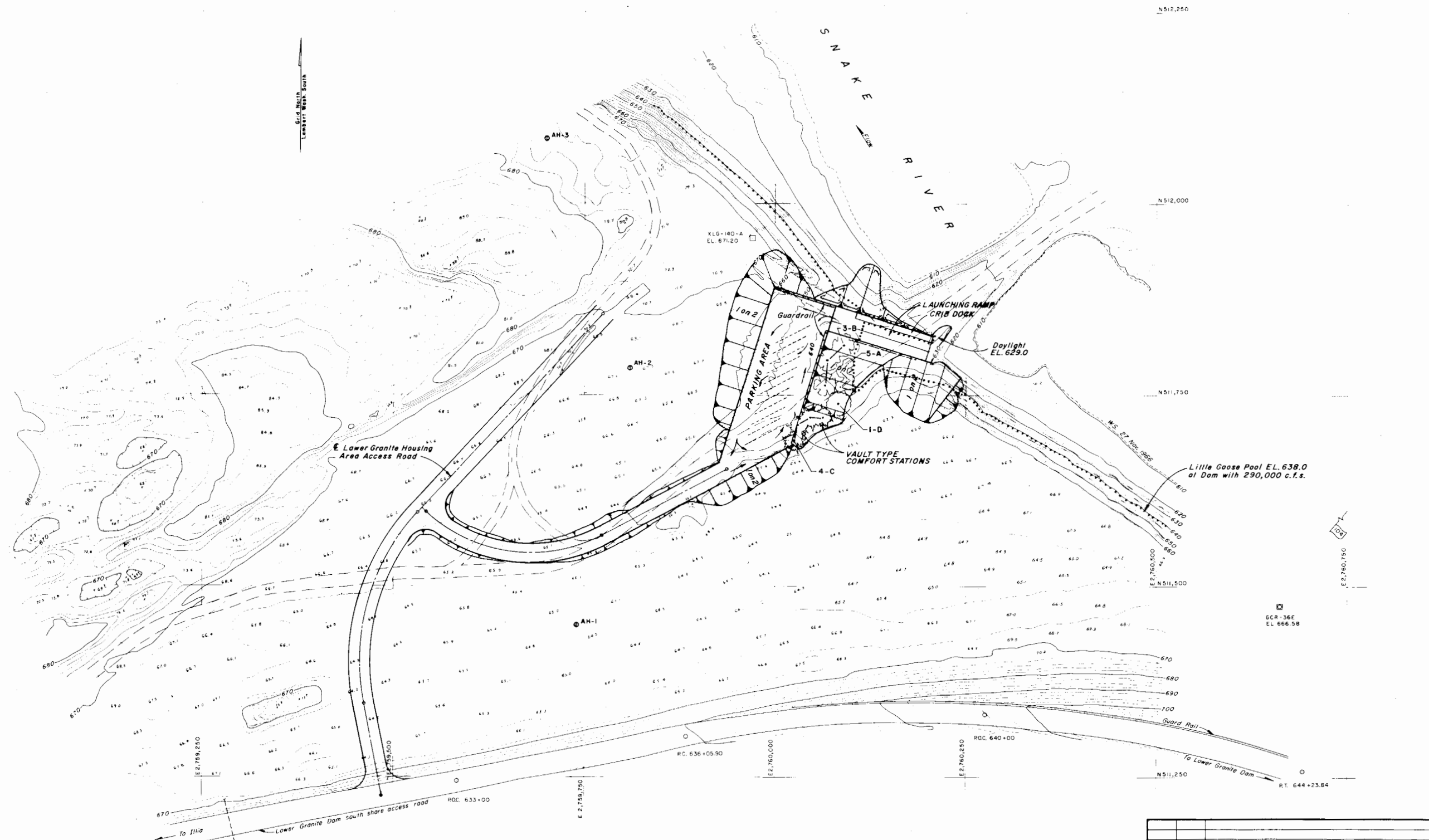


PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	NO. OF PLANTS	SIZE	NO. FURNISHED
		TREES			
C	FRAXINUS QUERCIFOLIA (HALE)	HALE BLUE ASH	64	8'-10' HIGH	B.R.
F	MORUS ALBA	WHITE MULBERRY	10	8'-10' HIGH	B.R.
G	ROBINIA PSEUDOACACIA	BLACK LOCUST	10	8'-10' HIGH	B.R.
H	SALIX NIGRA	BLACK WILLOW	7	8'-10' HIGH	B.R.
		SHRUBS			
I	CORNUS STOLONIFERA	REDOSIER DOGWOOD	7	2'-3' HIGH	B.R.
J	SAMBUCUS CANADENSIS	AMERICAN ELDER	13	2'-3' HIGH	B.R.



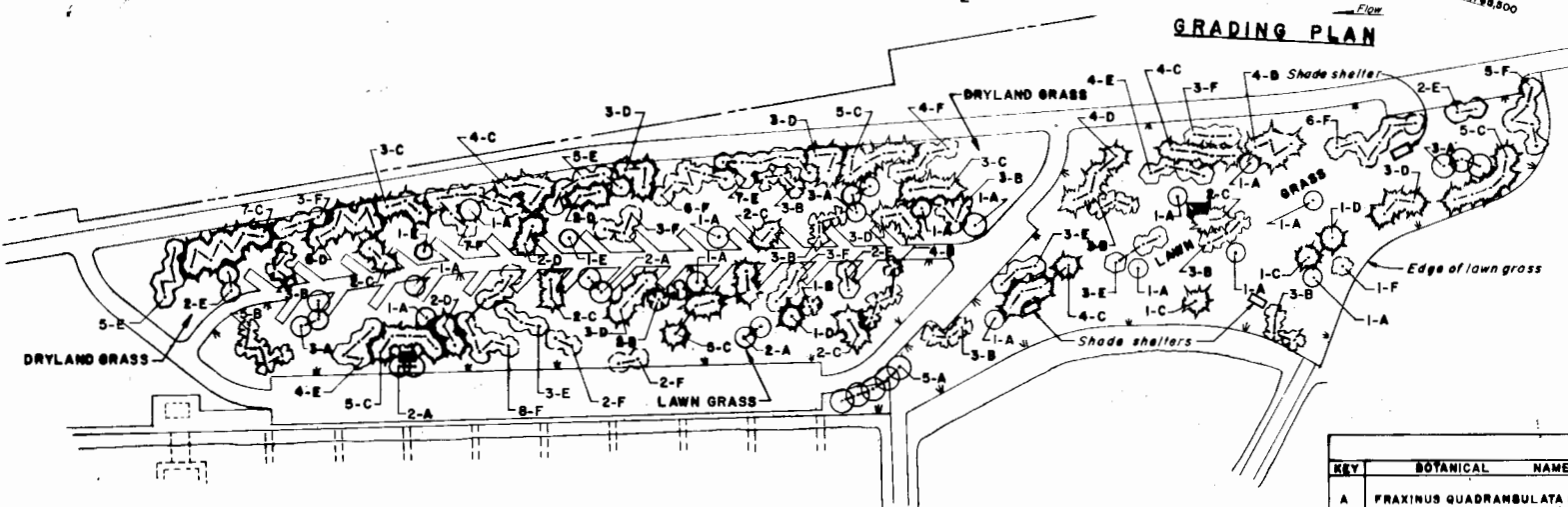
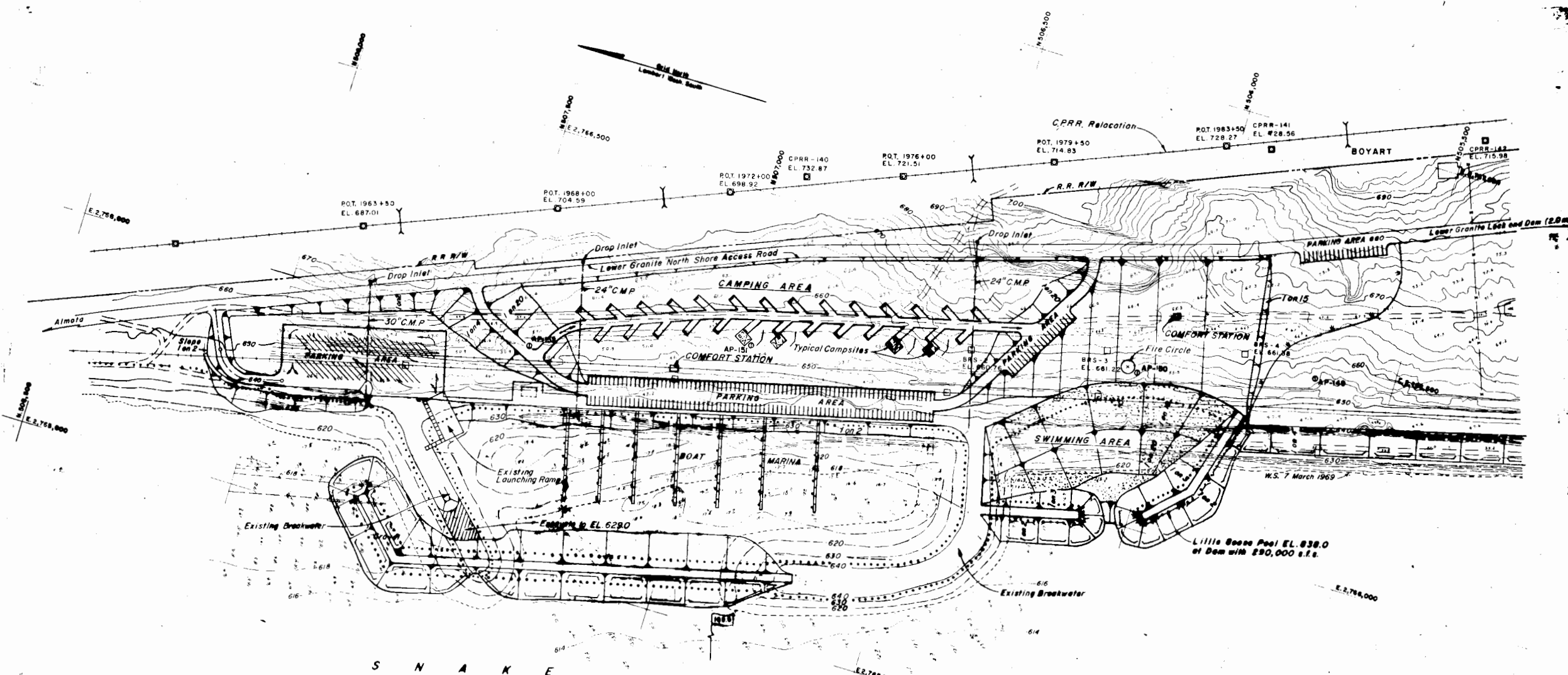
REVISION	DATE	DESCRIPTION
A	02 July 70	Revised June 1970
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON LITTLE GOOSE LOCK AND DAM SNAKE RIVER, OREGON, WASHINGTON & IDAHO RECREATION FACILITIES AND PUBLIC USE AREAS PENAWAWA GRADING AND PLANTING PLAN		
DESIGNED BY	DATE	SCALE AS SHOWN
CHECKED BY	DATE	FILE NO.
APPROVED BY	DATE	LG-05-46/7



PLANT LIST						
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HOW FURN.	
TREES						
A	ALNUS GLUTINOSA	EUROPEAN ALDER	5	6'-8' HIGH	BR.	
B	FRAXINUS QUADRANGULATA (MALE)	MALE BLUE ASH	3	8'-10' HIGH	BR.	
C	PINUS NIGRA	AUSTRIAN PINE	4	3'-4' HIGH	BBB	
D	POPULUS EUGENI	CAROLINA POPLAR	1	8'-10' HIGH	BR.	

T.14 N. R. 42 E.
SCALE IN FEET
0 50 100

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON			
DESIGNED:		LITTLE GOOSE LOCK AND DAM	
DRAWN:		SNAKE RIVER, OREGON, WASHINGTON & IDAHO	
CHECKED:		RECREATION FACILITIES AND PUBLIC USE AREAS	
SUPERVISOR:		ILLIA	
APPROVED:		DATE: 29 May 51	
RECOMMENDED:		SCALE AS SHOWN	
FILE NO.		INV. NO. 5808	
SHEET		LG-05-46/8	



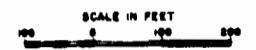
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HOW PLANT
PLANT LIST					
TREES					
A	FRAXINUS QUADRANGULATA (MALE)	MALE BLUE ASH	34	8'-10" HIGH	BR.
B	QLEDITSIA TRIACANTHOS & SKYLINE	SKYLINE HONEYLOCUST	36	8'-10" HIGH	BR.
C	PINUS NIGRA	AUSTRIAN PINE	57	3'-4" HIGH	BBB
D	PINUS SYLVESTRIS	SCOTCH PINE	37	3'-4" HIGH	BBB
E	POPULUS ALBA & BOLLEANA	BOLLEANA POPLAR	42	8'-10" HIGH	BR
F	ROBINIA PSEUDOACACIA	BLACK LOCUST	53	8'-10" HIGH	BR

NOTES:
 1. Approximately 8.5 acres of lawn grass.
 2. Approximately 3.5 acres of dryland grass.

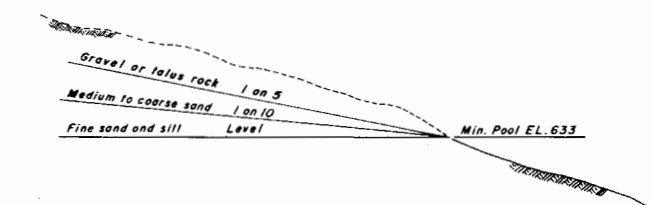
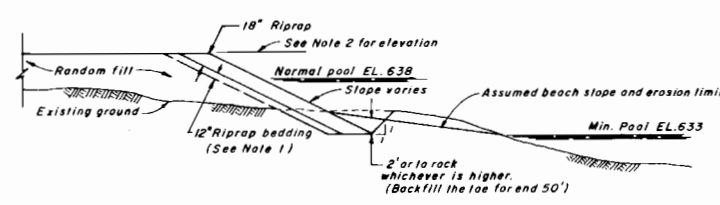
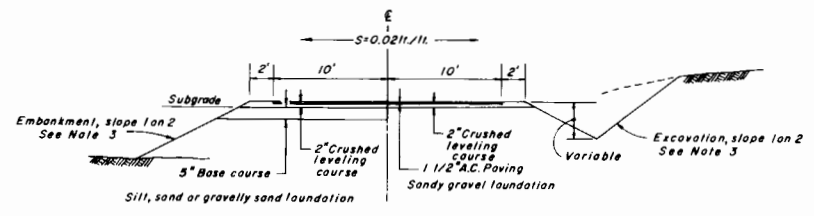
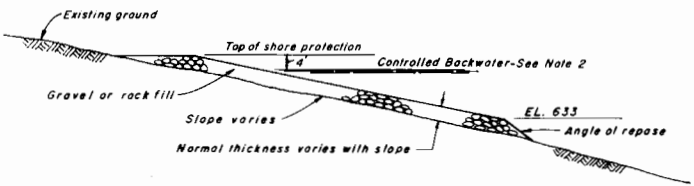
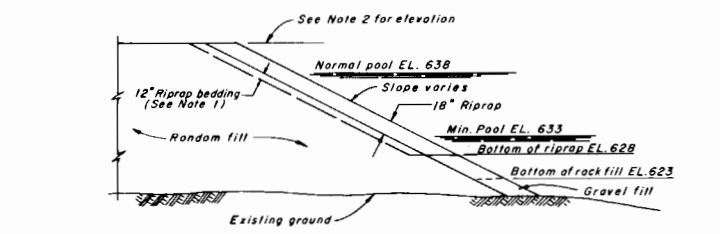
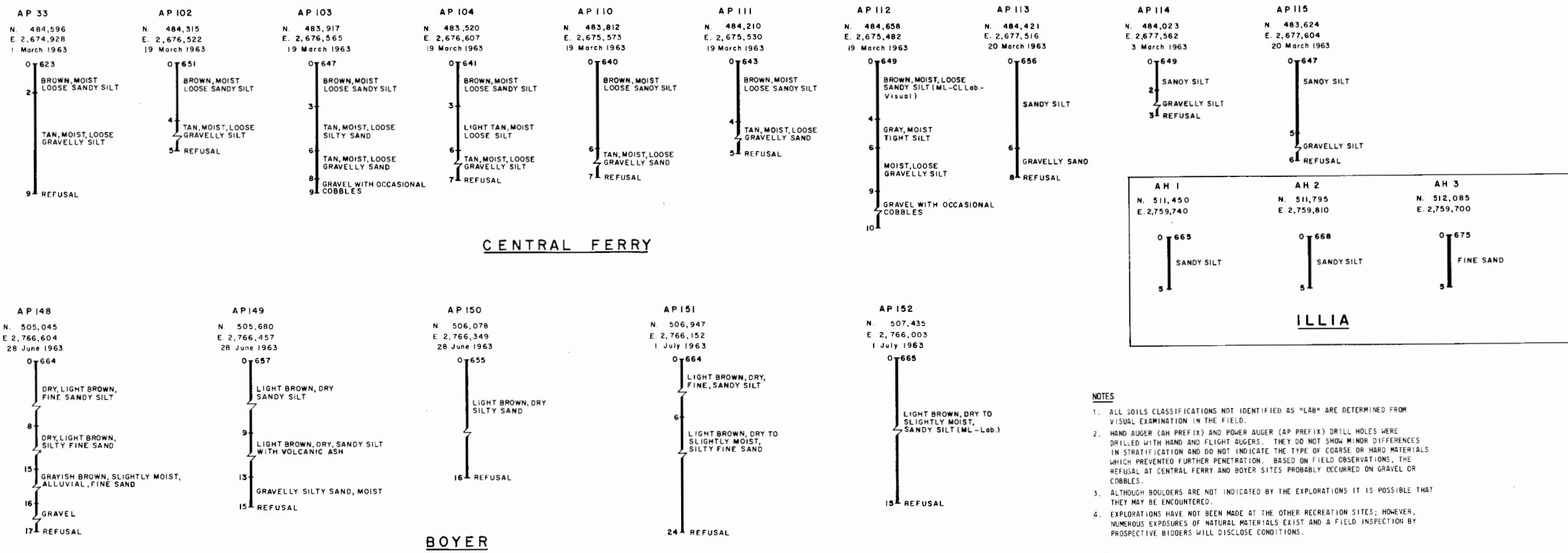
NOTE:
 1. Hydrographic survey for underwater contours dated 7 March 1969.
 2. Sheet No. 68-115 and 68-115, 1 combined.

PLANTING PLAN

GRADING PLAN



REVISION	DATE	DESCRIPTION
A	02 July 69	Revised April 1970
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON		
LITTLE GOOSE LOCK AND DAM		
SNAKE RIVER, OREGON, WASHINGTON & IDAHO		
RECREATION FACILITIES AND PUBLIC USE AREAS		
BOYER		
GRADING AND PLANTING PLAN		
DESIGNED BY T. Nicholas	CHECKED BY G. Streamer	APPROVED BY [Signature]
SCALE AS SHOWN	BYV. NO. 100	FILE NO.
		LG-05-46/9

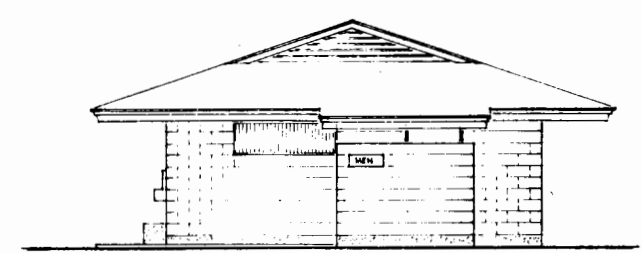
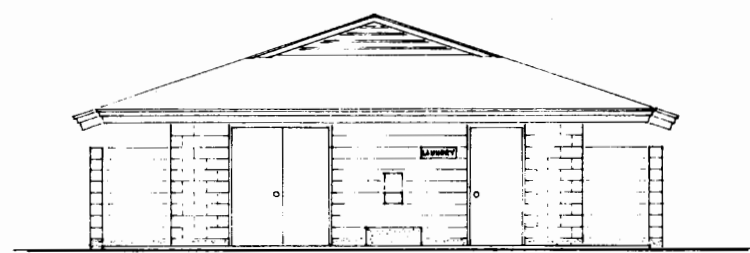
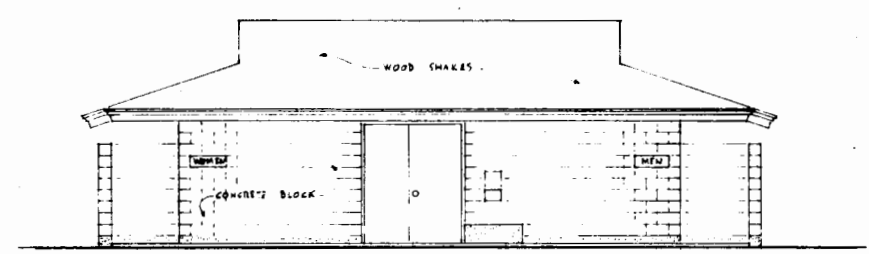
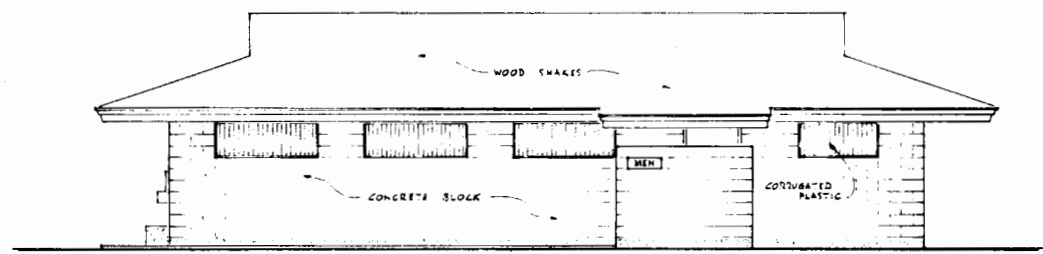
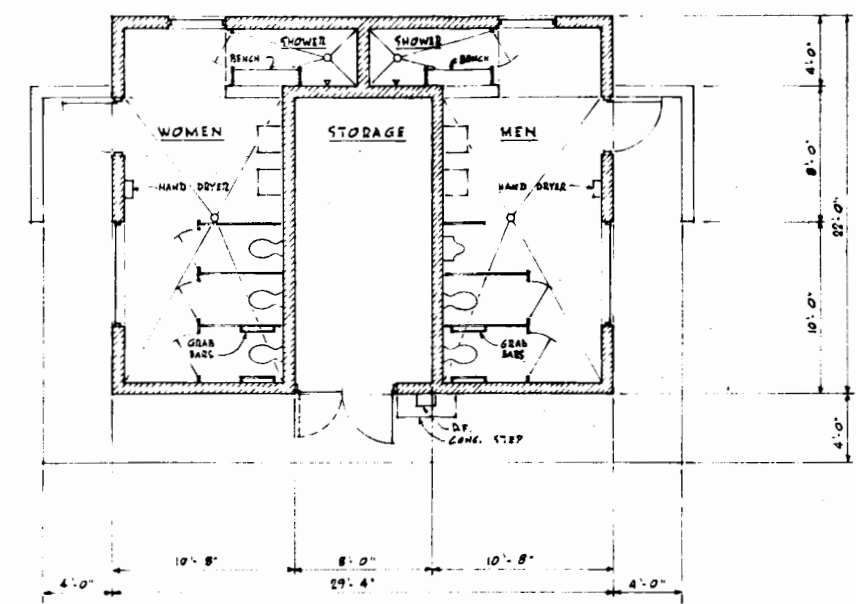
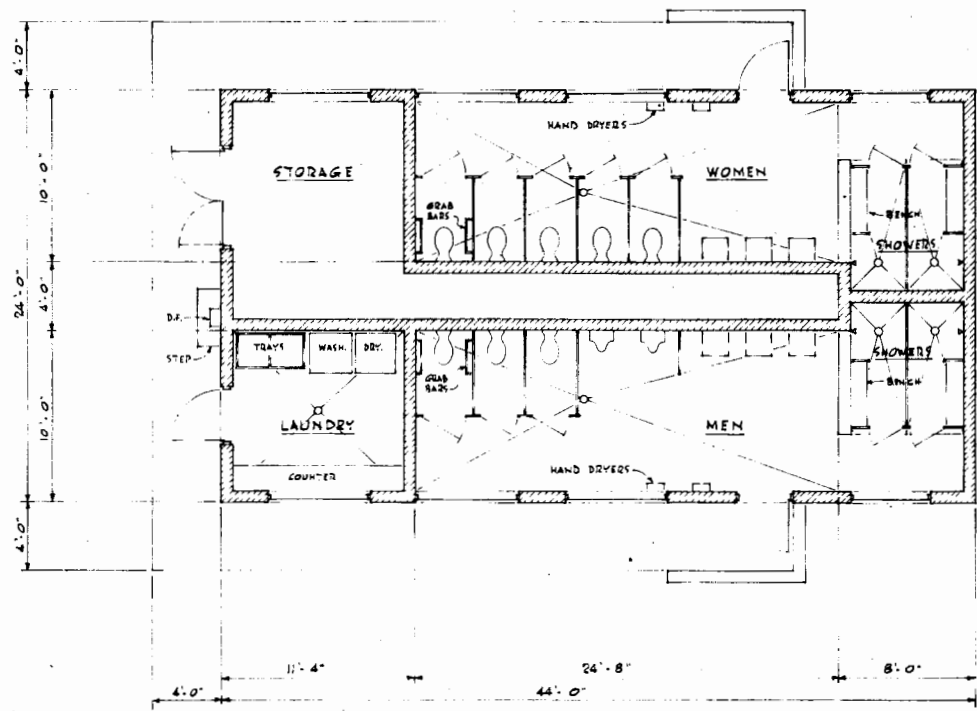


- NOTES**
- RIPRAP BEDDING IS REQUIRED WHEN PROTECTED MATERIAL IS FINE GRAINED.
 - ELEVATION OF TOP OF RIPRAP IS 643 AT CENTRAL FERRY AND 642 OR 2 FEET ABOVE BACKWATER FOR 340,000 C.F.S. WITH EL. 638 AT THE DAM, WHICHEVER IS HIGHER. AT BOYER BACKWATER FOR 290,000 C.F.S. IS USED AS CONTROL.
 - SLOPES OF SANDY SILT OR SILTY SAND WILL BE STABILIZED WITH 4 INCHES OF GRAVEL OR ROCK.

TYPICAL RIPRAP PROTECTION METHODS

NOT TO SCALE

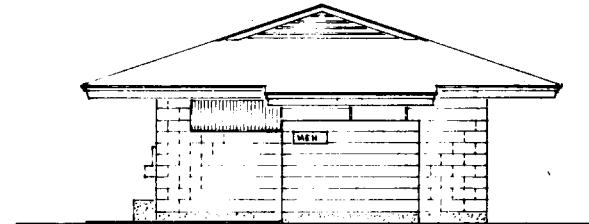
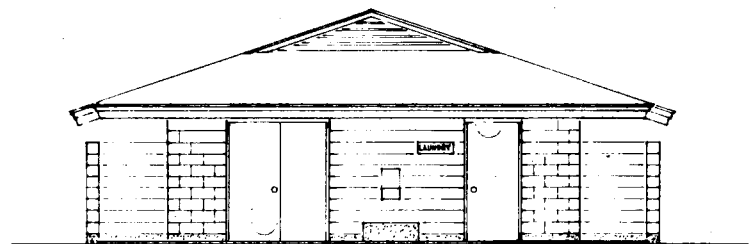
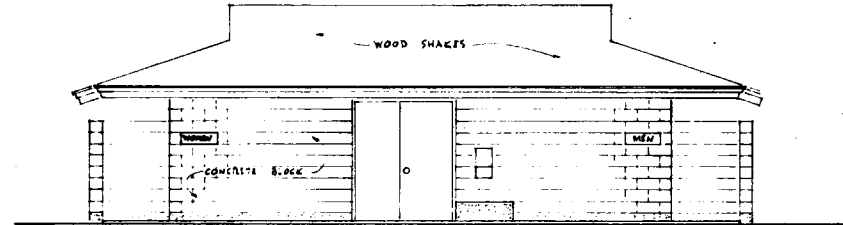
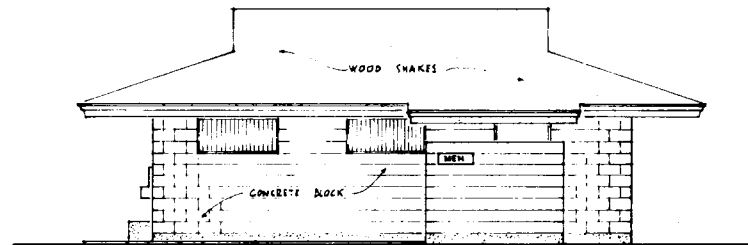
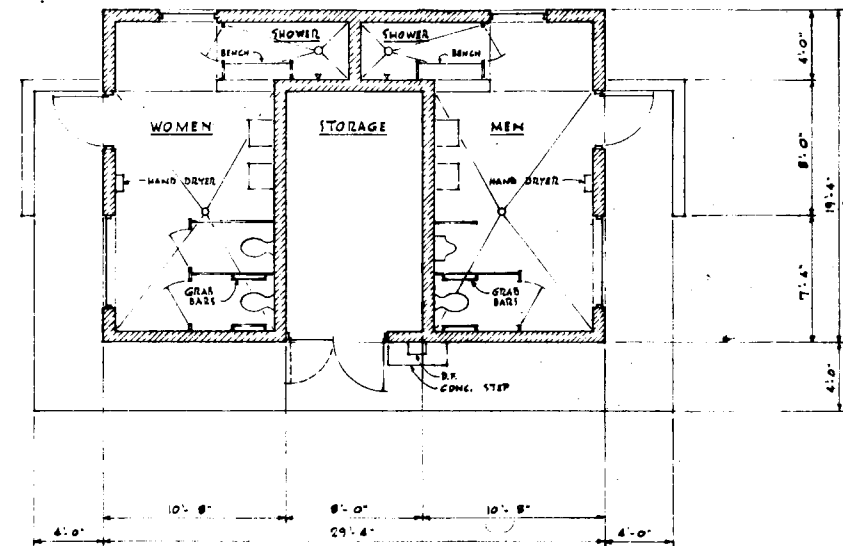
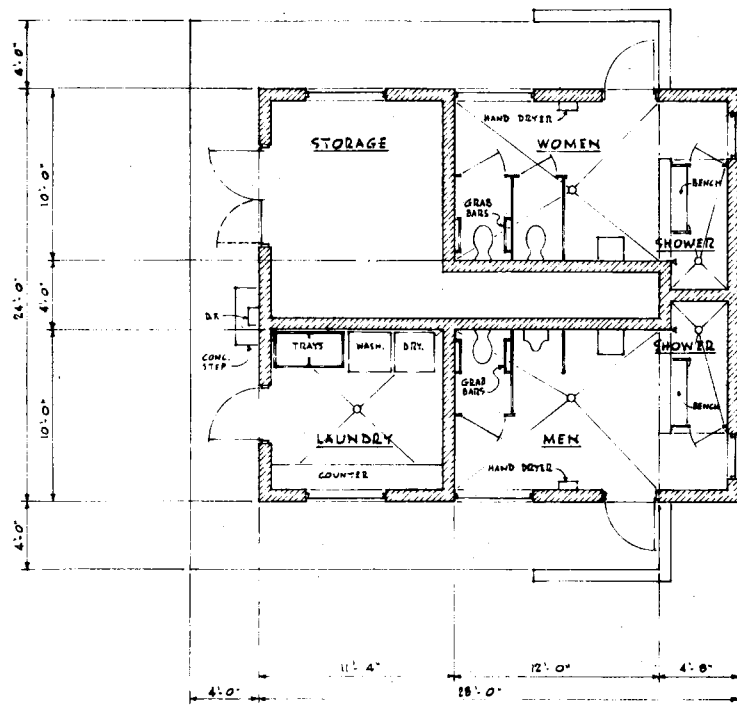
REVISION	DATE	DESCRIPTION	BY
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DESIGNED:	W.L. Kelly		
DRAWN:	T. Richerzhagen		
CHECKED:	W.L. Kelly		
SUBMITTED:	R.D. Mack		
APPROVED:	[Signature]	DATE: 6/9 May 27	
RECOMMENDED:	W.E. Sully	SCALE AS SHOWN	INV. NO.
			FILE NO.
			LG-05-46/10



COMFORT STATION FOR CAMPING AREA

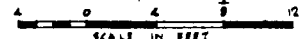
COMFORT STATION FOR SWIMMING AREA

REVISION	DATE	DESCRIPTION	BY
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON			
LITTLE GOOSE LOCK AND DAM SNAKE RIVER, OREGON, WASHINGTON & IDAHO			
RECREATION FACILITIES AND PUBLIC USE AREAS COMFORT STATIONS - CENTRAL FERRY			
DESIGNED: <i>Rosenfeld</i>	DATE: May 27		
DRAWN:	APPROVED: <i>[Signature]</i> COLONEL, U. S. ARMY ENGINEER DISTRICT		
CHECKED: <i>Rosenfeld</i>	SCALE AS SHOWN		
RECOMMENDED: <i>[Signature]</i>	REV. NO.		
ENGINEER, ENGINEERING DIVISION	PL. NO.		
	LG-05-46/11		

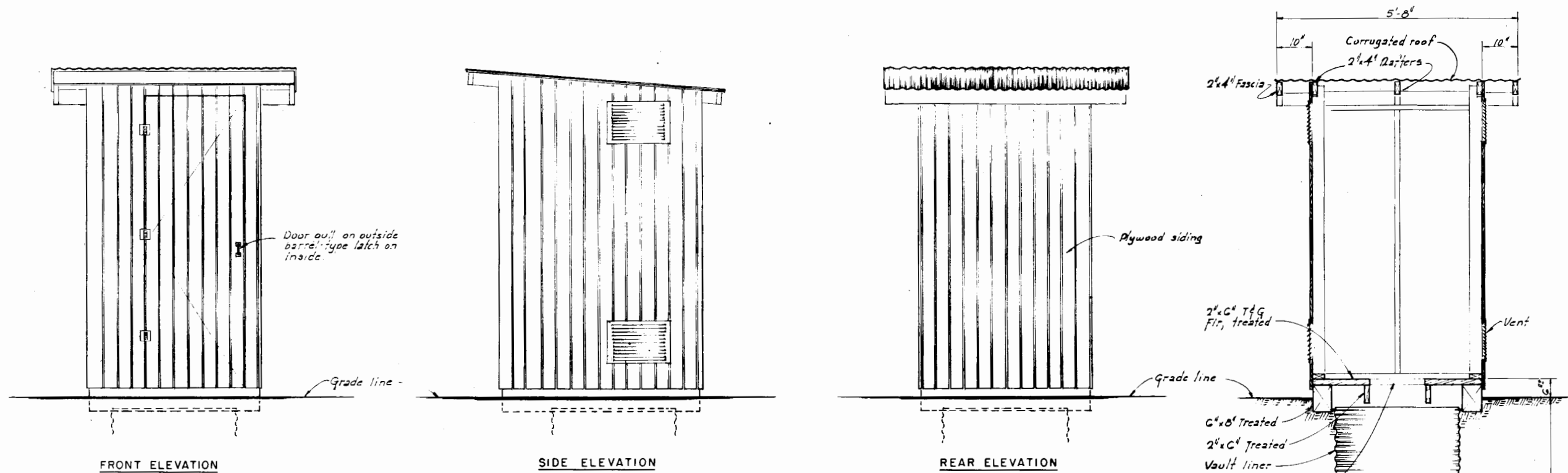


COMFORT STATION FOR CAMPING AREA

COMFORT STATION FOR SWIMMING AREA



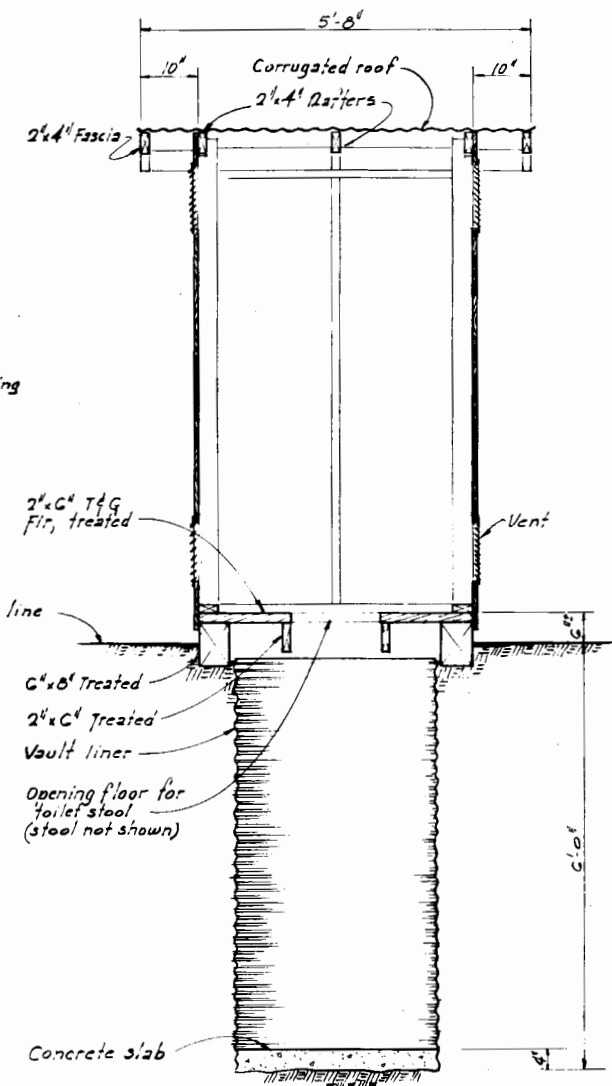
REVISION	DATE	DESCRIPTION	BY
U.S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON			
LITTLE GOOSE LOCK AND DAM SNAKE RIVER, OREGON, WASHINGTON & IDAHO			
RECREATION FACILITIES AND PUBLIC USE AREAS COMFORT STATIONS - BOYER			
DESIGNED: <i>W. J. Boyer</i> DRAWN: <i>W. J. Boyer</i> CHECKED: <i>W. J. Boyer</i> SUBMITTED: <i>W. J. Boyer</i>	APPROVED: <i>W. J. Boyer</i> COLONEL, U.S. DISTRICT ENGINEER	DATE: 6 May 27	FILE NO. LG-05-46/12
RECOMMENDED: <i>W. J. Boyer</i> CHIEF, ENGINEERING SECTION	SCALE AS SHOWN	INV. NO.	SHEET



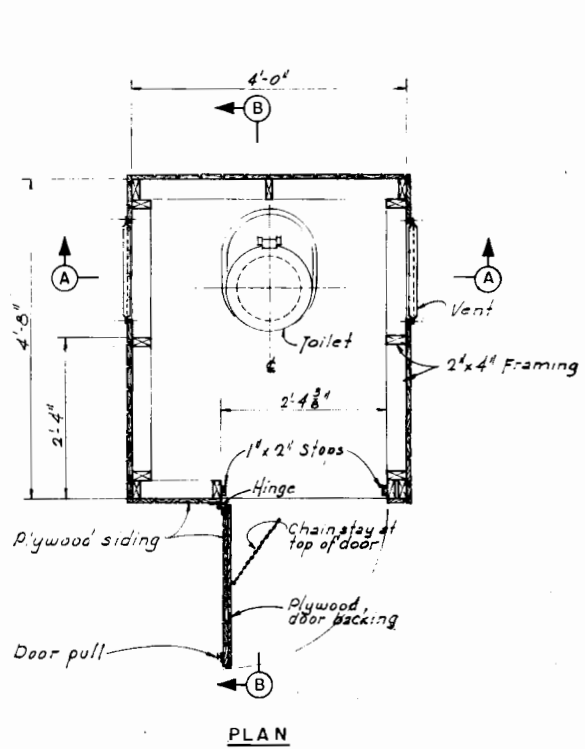
FRONT ELEVATION

SIDE ELEVATION

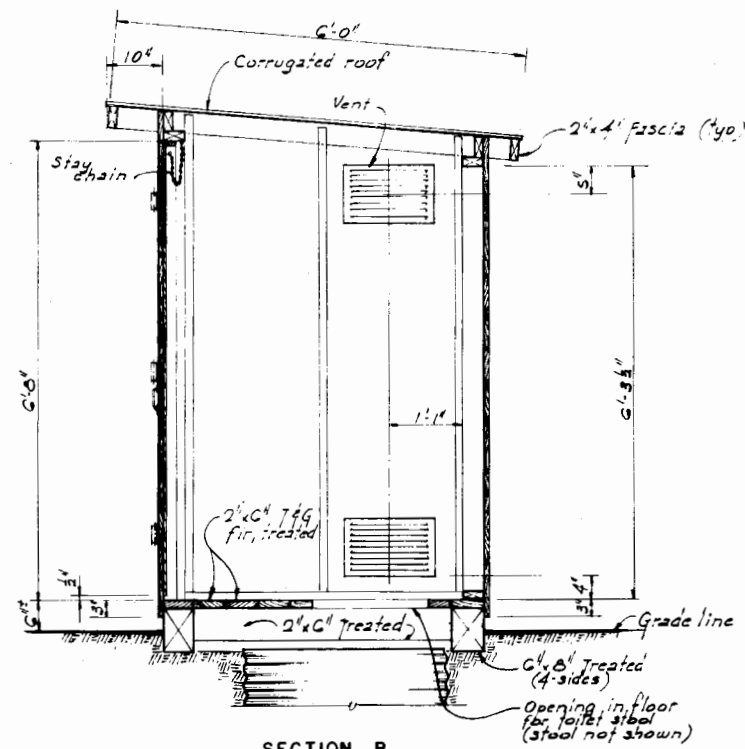
REAR ELEVATION



SECTION A



PLAN



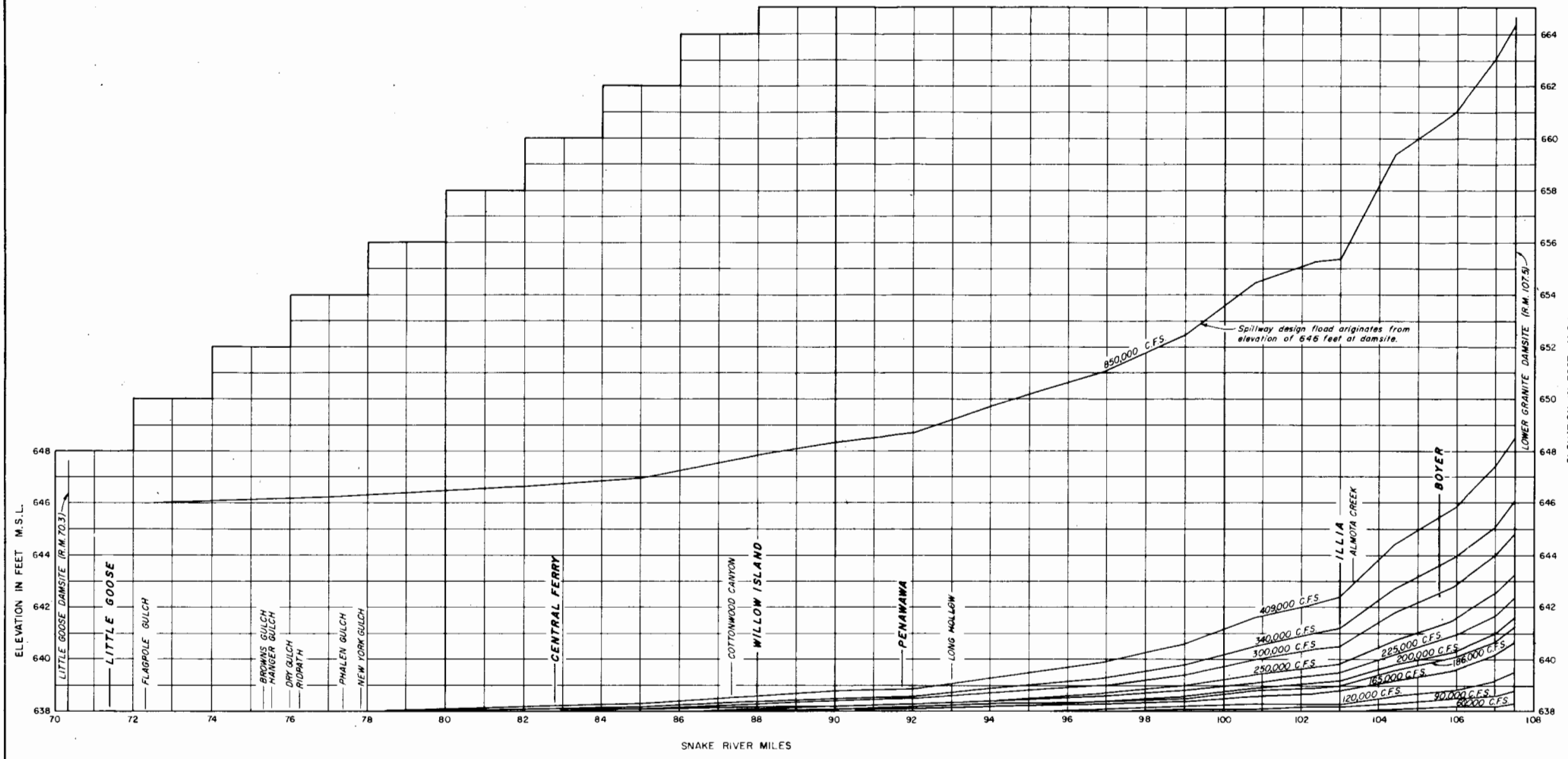
SECTION B

SCALE IN FEET
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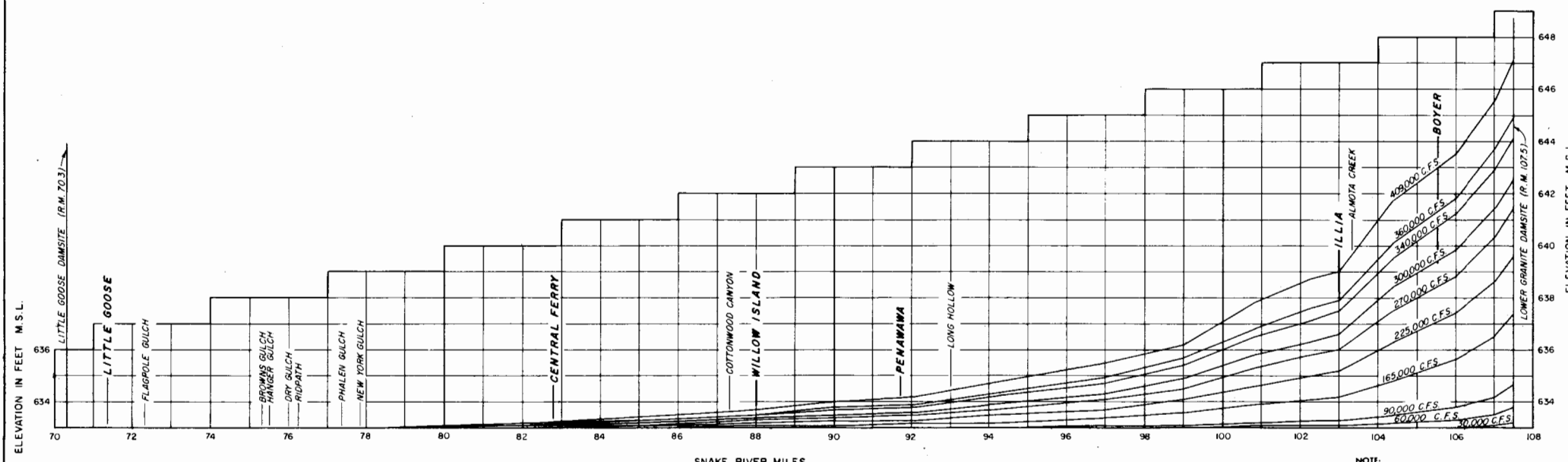
NOTES:

1. CORRUGATED ROOF SHALL BE TRANSLUCENT FIBERGLASS WITH CORRUGATIONS 2-1/2" WIDE AND 9/16" DEEP, SAND COLOR.
2. SIDING SHALL BE TEXTURE 1-11, EXTERIOR, DFFA, 5/8" THICK, WITH UNSANDED FACE AND GROOVES AT 4" O.C.
3. PLYWOOD DOOR BACKING SHALL BE A-C, EXTERIOR, DFFA, 1/2" THICK.
4. FRAMING SHALL BE S4S, F1R, #2 COMMON OR BETTER.
5. WOOD ITEMS TO BE TREATED SHALL BE TREATED WITH "WOODLIFE" OR EQUAL, AS PER MANUFACTURER'S DIRECTIONS.
6. CARPENTRY AND NAILING SHALL CONFORM TO STANDARD PRACTICE. USE GALVANIZED NAILS; CLINCH NEARLY ANY EXPOSED NAIL POINTS.
7. PAINT EXTERIOR AND INTERIOR (EXCEPT FLOOR) WITH TWO COATS EXTERIOR ACRYLIC LATEX PAINT, LIGHT BROWN IN COLOR, OVER COMPATIBLE PRIMER.
8. HINGES SHALL BE 3" x 3" FULL SURFACE, SPRING-LOADED, 3 REQUIRED; SCREW TO FRAME, BOLT TO DOOR.
9. LATCH SHALL BE BARREL-TYPE WITH 4" BOLT.
10. VENTS SHALL BE GRILLE-TYPE, SIGHT-PROOF, ALUMINUM LOUVERS WITH INSECT SCREEN, APPROXIMATELY 12" x 18" IN SIZE.
11. INSTALL A SURFACE-MOUNTED, TOILET TISSUE DISPENSER. DISPENSER SHALL HOLD TWO STANDARD ROLLS OF TISSUE, SECOND ROLL AUTOMATICALLY PLACED INTO USE AFTER FIRST ROLL IS EXHAUSTED, BOWBACK TYPE B-289, OR EQUAL.
12. INSTALL STAINLESS STEEL TOILET STOOL, MONOGRAM INDUSTRIES, INC., OR EQUAL.
13. VAULT LINER SHALL BE CORRUGATED METAL CULVERT SECTIONS, BIFUNCTIONAL COATED, 14 GAGE, 30 INCH DIAMETER, OR SHALL BE FIBERGLASS VAULTS AS MANUFACTURED BY SIBAS FIBERGLASS CO., JEFFERSON, OREGON, OR APPROVED EQUAL.
14. "MEN" AND "WOMEN" SIGNS SHALL BE INSTALLED ON DOOR AND REAR OF BUILDING. SIGNS SHALL HAVE LETTERING 1-1/4" MINIMUM IN HEIGHT.

REVISION	DATE	DESCRIPTION
U. S. ARMY ENGINEER DISTRICT WALLA WALLA, WASHINGTON		
LITTLE GOOSE LOCK AND DAM SNAKE RIVER, OREGON, WASHINGTON & IDAHO		
RECREATION FACILITIES AND PUBLIC USE AREAS		
VAULT TOILET		
DESIGNED: Roanfeldt	APPROVED: <i>Robert J. Anderson</i>	DATE: 69 May 27
DRAWN:	COLONEL, C. E. DISTRICT ENGINEER	
CHECKED: Roanfeldt	SCALE AS SHOWN	INV. NO. ENG.
PREPARED: <i>R. S. Tucker</i>	FILE NO.	
CHIEF, STUDY DESK		LG-05-46/13
RECOMMENDED: <i>R. S. Tucker</i>	SHEET	
CHIEF ENGINEERING DIVISION		

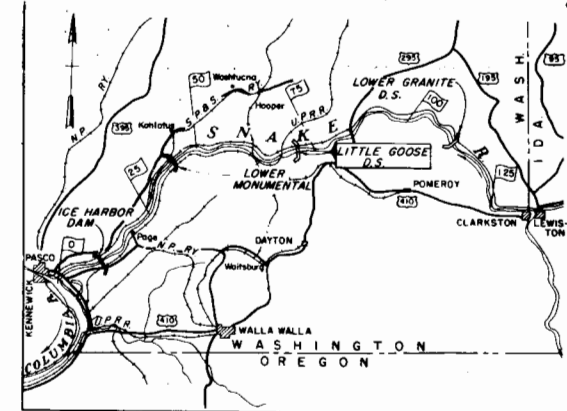


PROFILES FOR POOL ELEVATION 638 FEET M.S.L.



PROFILES FOR POOL ELEVATION 633 FEET M.S.L.

NOTE:
THESE CURVES DO NOT REFLECT THE LOCAL EFFECTS OF LOWER GRANITE DAM AT RIVER MILE 107.5.



MEAN SECTIONAL VELOCITIES AT SELECTED LOCATIONS IN LITTLE GOOSE RESERVOIR - 638 FOOT POOL ELEVATION AT LITTLE GOOSE DAM

RIVER MILE	DISCHARGE - 1000 C.F.S.													
	10	30	60	90	120	165	186	200	225	250	300	340	409	850
70.3	.1	.1	.2	.3	.5	.6	.7	.8	.9	1.0	1.1	1.3	1.6	3.0
72.9	.1	.1	.2	.4	.5	.7	.8	.8	.9	1.0	1.3	1.4	1.7	3.2
77.0	.1	.1	.3	.4	.5	.7	.8	.9	1.0	1.1	1.3	1.5	1.8	3.4
82.0	.1	.2	.4	.6	.7	1.0	1.1	1.2	1.4	1.5	1.8	2.1	2.5	4.4
85.0	.1	.3	.5	.8	1.1	1.4	1.6	1.8	2.0	2.2	2.6	3.0	3.6	6.5
88.0	.1	.3	.5	.8	1.0	1.4	1.6	1.7	2.0	2.2	2.6	2.9	3.5	6.3
90.0	.1	.2	.5	.7	1.0	1.3	1.5	1.6	1.8	2.0	2.4	2.7	3.3	5.7
92.1	.1	.3	.7	1.0	1.3	1.8	2.0	2.2	2.5	2.7	3.3	3.7	4.4	7.8
94.0	.1	.3	.7	1.0	1.4	1.9	2.1	2.3	2.5	2.8	3.4	3.8	4.5	7.5
96.9	.1	.4	.8	1.2	1.6	2.2	2.5	2.7	3.0	3.3	3.9	4.4	5.2	8.6
99.0	.2	.5	1.0	1.5	2.0	2.7	3.0	3.2	3.6	4.0	4.8	5.3	6.3	9.9
100.8	.2	.5	.9	1.4	1.8	2.4	2.7	2.9	3.3	3.6	4.3	4.8	5.5	8.3
102.3	.2	.6	1.2	1.9	2.5	3.3	3.7	4.0	4.5	4.9	5.8	6.4	7.5	11.1
103.0	.3	.8	1.6	2.4	3.2	4.3	4.8	5.1	5.7	6.3	7.4	8.3	9.6	14.7
104.4	.2	.7	1.4	2.0	2.7	3.6	4.0	4.3	4.8	5.2	6.1	6.7	7.6	11.0
106.0	.3	.9	1.8	2.7	3.6	4.8	5.3	5.6	6.2	6.8	7.8	8.5	9.6	13.5
107.0	.4	1.1	2.1	3.1	4.0	5.3	5.8	6.2	6.8	7.3	8.3	9.0	10.0	13.4

MEAN SECTIONAL VELOCITIES AT SELECTED LOCATIONS IN LITTLE GOOSE RESERVOIR - 633 FOOT POOL ELEVATION AT LITTLE GOOSE DAM

RIVER MILE	DISCHARGE - 1000 C.F.S.										
	10	30	60	90	165	225	270	300	340	409	
70.3	.1	.1	.2	.4	.7	.9	1.1	1.2	1.4	1.4	1.6
72.9	.1	.1	.3	.4	.7	1.0	1.2	1.3	1.5	1.6	1.8
77.0	.1	.1	.3	.4	.8	1.1	1.3	1.4	1.6	1.7	1.9
82.0	.1	.2	.4	.6	1.1	1.5	1.8	2.0	2.3	2.4	2.8
85.0	.1	.3	.6	.9	1.6	2.1	2.6	2.8	3.2	3.4	3.9
88.0	.1	.3	.6	.9	1.6	2.1	2.6	2.8	3.2	3.4	3.8
90.0	.1	.3	.5	.8	1.5	2.0	2.4	2.7	3.0	3.2	3.6
92.1	.1	.4	.7	1.1	2.0	2.7	3.2	3.6	4.1	4.3	4.8
94.0	.1	.4	.8	1.1	2.1	2.8	3.4	3.7	4.2	4.5	5.0
96.9	.2	.5	.9	1.4	2.5	3.3	4.0	4.4	4.9	5.2	5.8
99.0	.2	.6	1.1	1.7	3.1	4.2	4.9	5.4	6.0	6.3	7.1
100.8	.2	.5	1.1	1.6	2.9	3.8	4.5	4.9	5.4	5.7	6.2
102.3	.2	.7	1.5	2.2	3.9	5.1	6.0	6.6	7.2	7.5	8.3
103.0	.3	.9	1.8	2.8	4.9	6.5	7.6	8.3	9.2	9.6	10.6
104.4	.3	.8	1.7	2.5	4.3	5.5	6.3	6.8	7.4	7.7	8.3
106.0	.4	1.1	2.2	3.3	5.6	7.1	8.1	8.6	9.3	9.7	10.4
107.0	.5	1.4	2.7	3.9	6.3	7.7	8.6	9.1	9.8	10.0	10.7

U. S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON

LITTLE GOOSE LOCK AND DAM
SNAKE RIVER, OREGON, WASHINGTON & IDAHO

RESERVOIR BACKWATER PROFILES
638 AND 633 FOOT POOL
ELEVATIONS AT DAM

DESIGNED: J.D.A.
T. Richardson
DRAWN:
CHECKED: J.A.A.
SUPERVISED: [Signature]
SUBMITTED: [Signature]

APPROVED: [Signature] DATE 69 May 27
COLONEL, U.S. ARMY
SCALE AS SHOWN INV. NO. ENG.
RECOMMENDED: [Signature]
CHIEF, ENGINEERING DIVISION

FILE NO. LG-05-46/14
SHEET