DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
PANAMA CITY REGULATORY OFFICE
1002 WEST 23rd STREET, SUITE 350
PANAMA CITY. FLORIDA 32405-3648

REPLY TO
ATTENTION OF

September 27, 2005

Regulatory Division
North Permits Branch
SAJ-2002-679(GP-DEB)

St. Joe Company
c/o William Britton Greene
1701 East County Road 30-A, Suite 201
Santa Rosa Beach, FL 32459

Dear Mr. Greene:

We have completed the review of permit application number SAJ-2002-679(GP-DEB). The proposed project includes the placement of fill in approximately 57.09 acres of low quality and 3.55 acres of high quality freshwater wetlands on a 1453.6-acre site in order to construct a residential and commercial development with golf amenities and waterfront access referred to as WaterSound North. The project site is bordered to the east by the Bay/Walton County line, to the south by the north shoreline of Lake Powell, and to the west by U.S. Highway 98, in Sections 13, 14, 25, 22, 23, 24, 25 and 26, Township 2 south, and Range 18 west, Walton County, Florida.

Your project, as depicted on the enclosed drawings, is authorized by Regional General Permit (RGP) SAJ-86. This authorization is valid until the expiration date noted for RGP SAJ-86 listed in the table at our website. Please access the U.S. Army Corps of Engineers' Regulatory web address at *http://www.saj.usace.army.mil/permit/permitting/general_permits.htm* to view the special and general conditions for SAJ-86, which apply specifically to this authorization. To view the referenced conditions click on the permit number and the general condition column in the row corresponding to the SAJ number noted above. You must comply with all of the special and general conditions and any project specific condition of this authorization or you may be subject to enforcement action. The following special conditions are included with this authorization:

1. Prior to commencement of authorized construction, the permittee agrees to meet the following mitigation requirements as compensation for impacts to **57.09** acres (20.01 acres in Phillips Inlet Basin and 37.08 in Direct Runoff to Bay) of low quality and **3.55** acres (1.18 acres in Phillips Inlet Basin and 2.37 acres in Direct Runoff to Bay) of high quality wetlands, as shown in the following tables:

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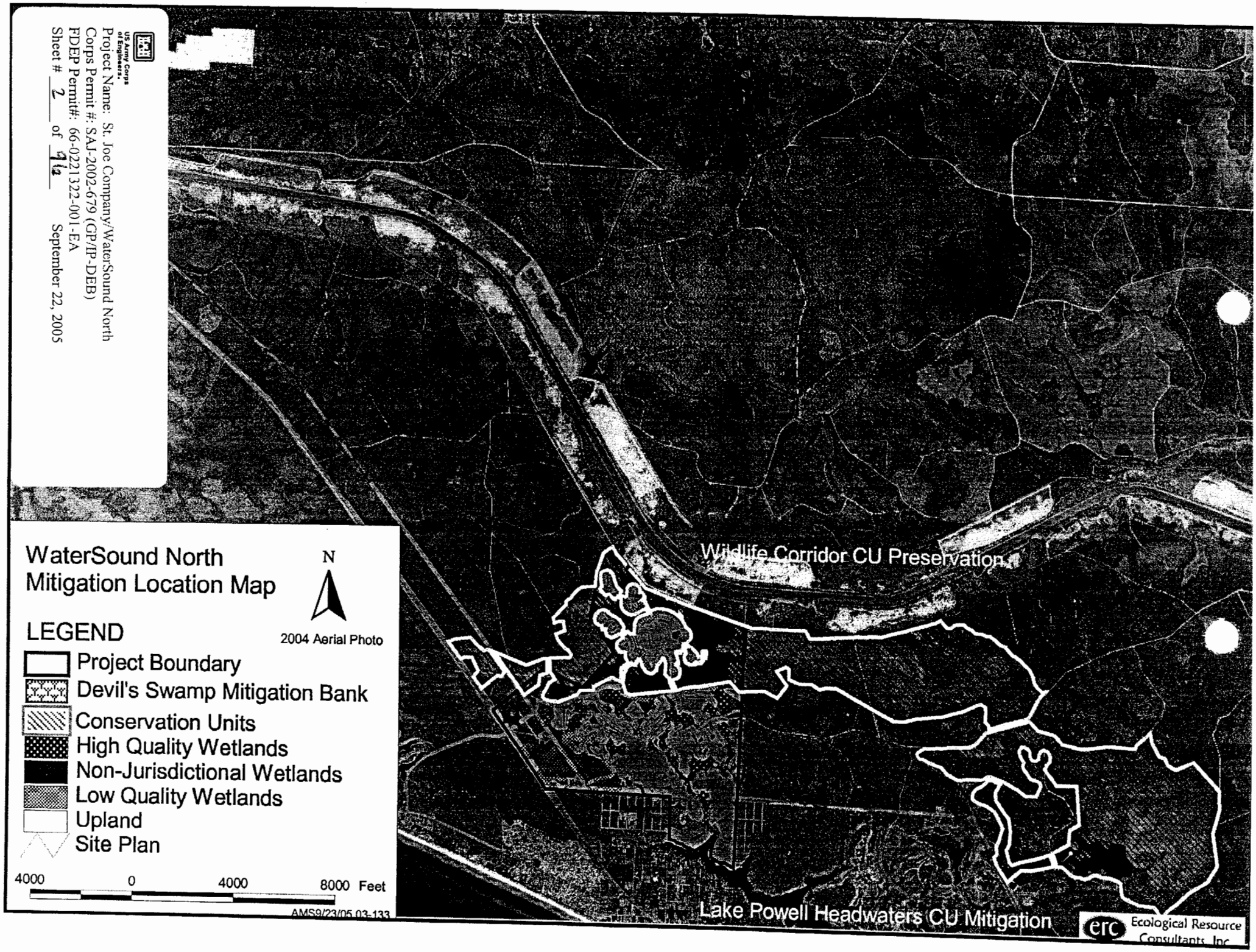

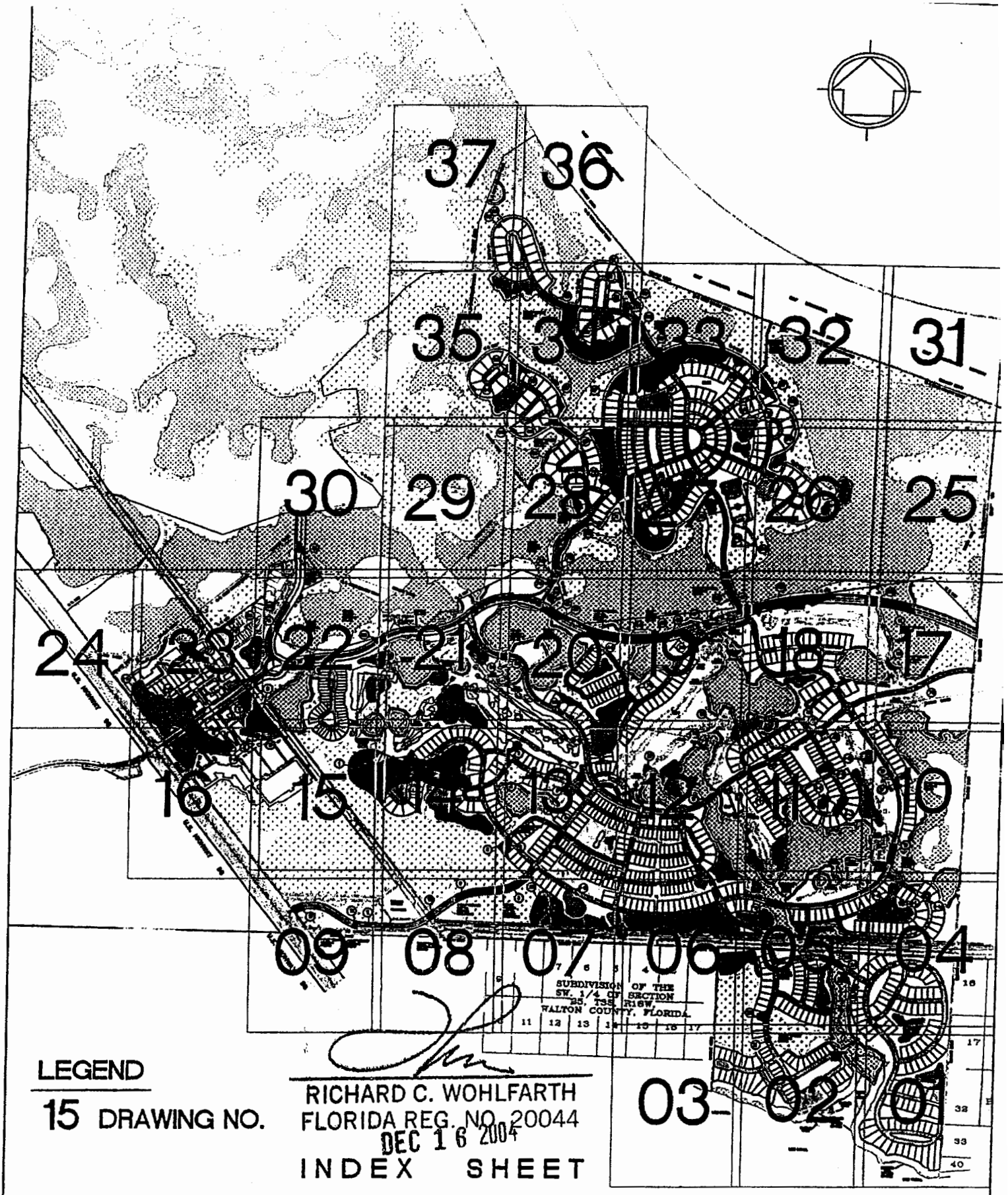

LEGEND

15 DRAWING NO.

RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
DEC 16 2004

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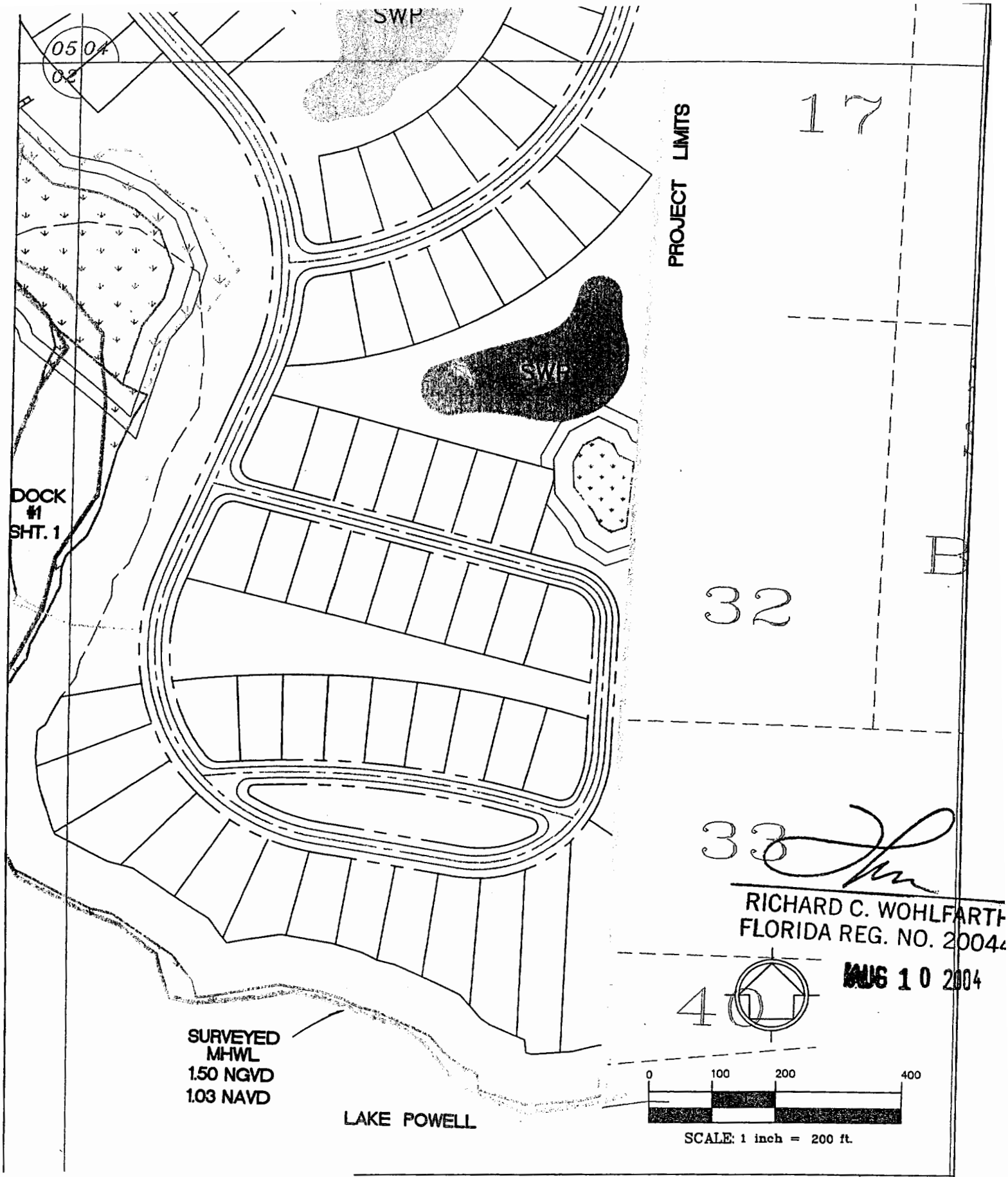
DREDGE AND FILL APPLICATION
PROPOSED DEVELOPMENT PLAN

DWG. NO.
00



RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044

AUG 10 2004

US Army Corps of Engineers

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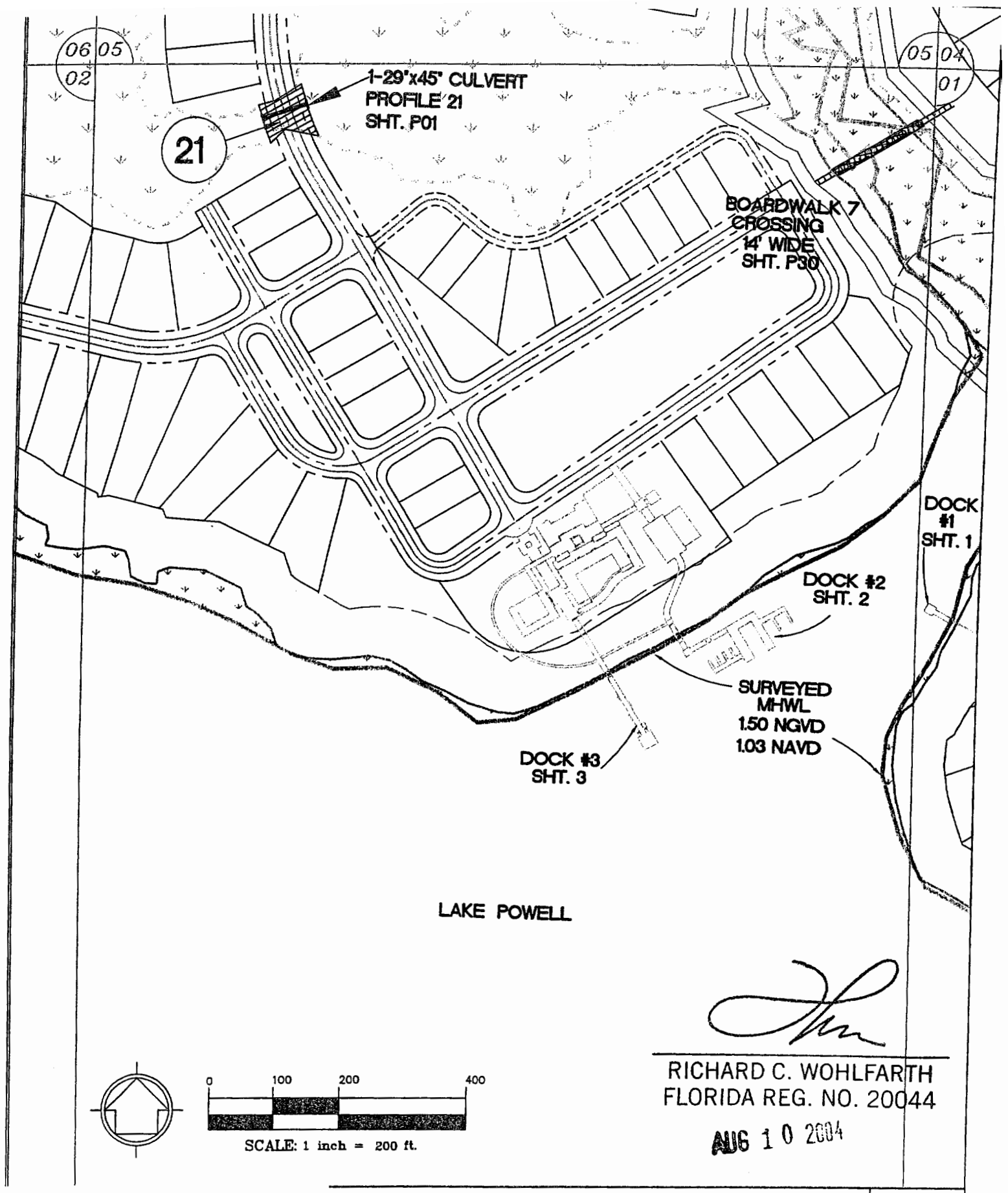
DWG. NO.
01



RICHARD C. WOHLFARTH
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AUG 10 2004

US Army Corps of Engineers.

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DWG. NO.
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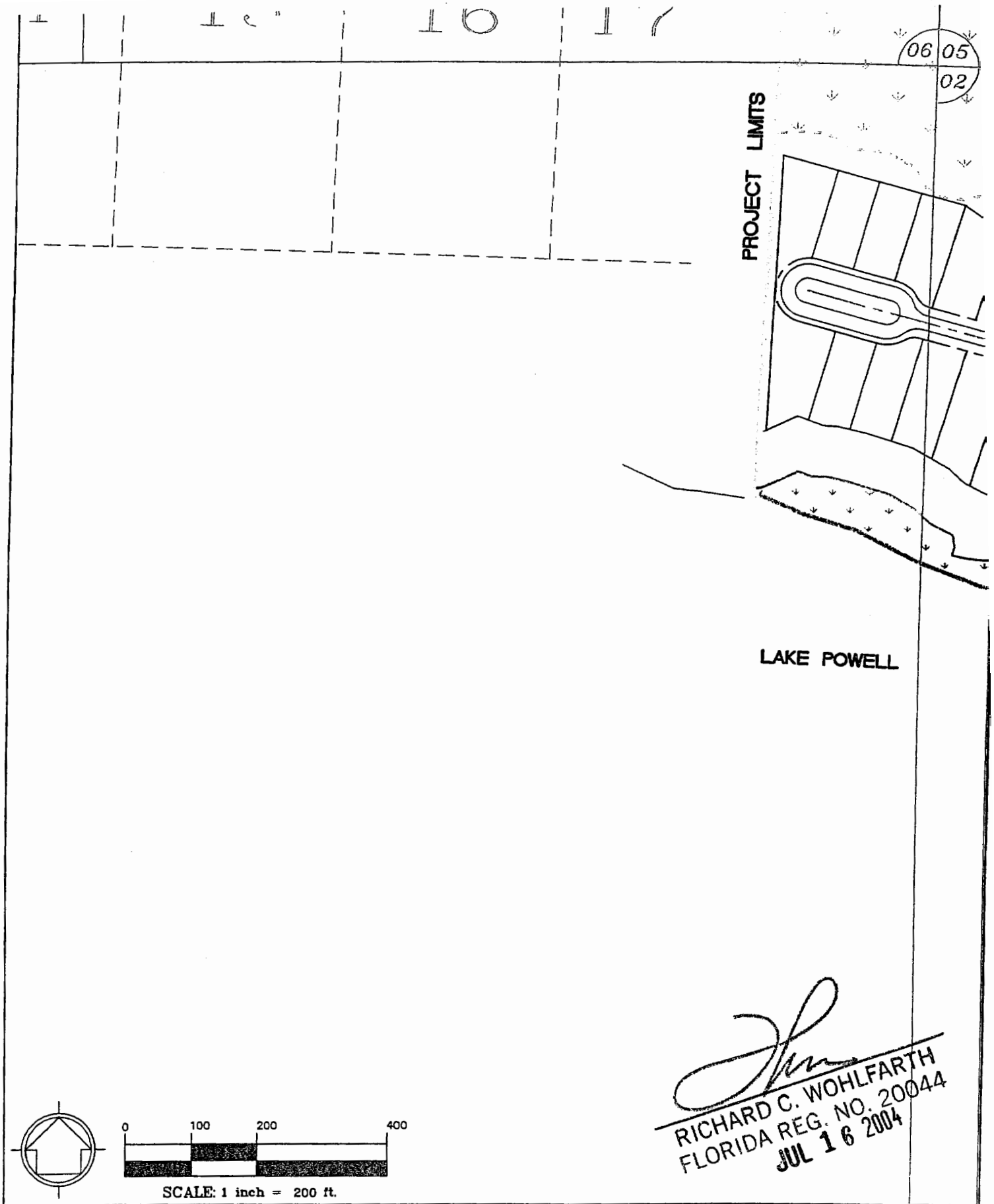

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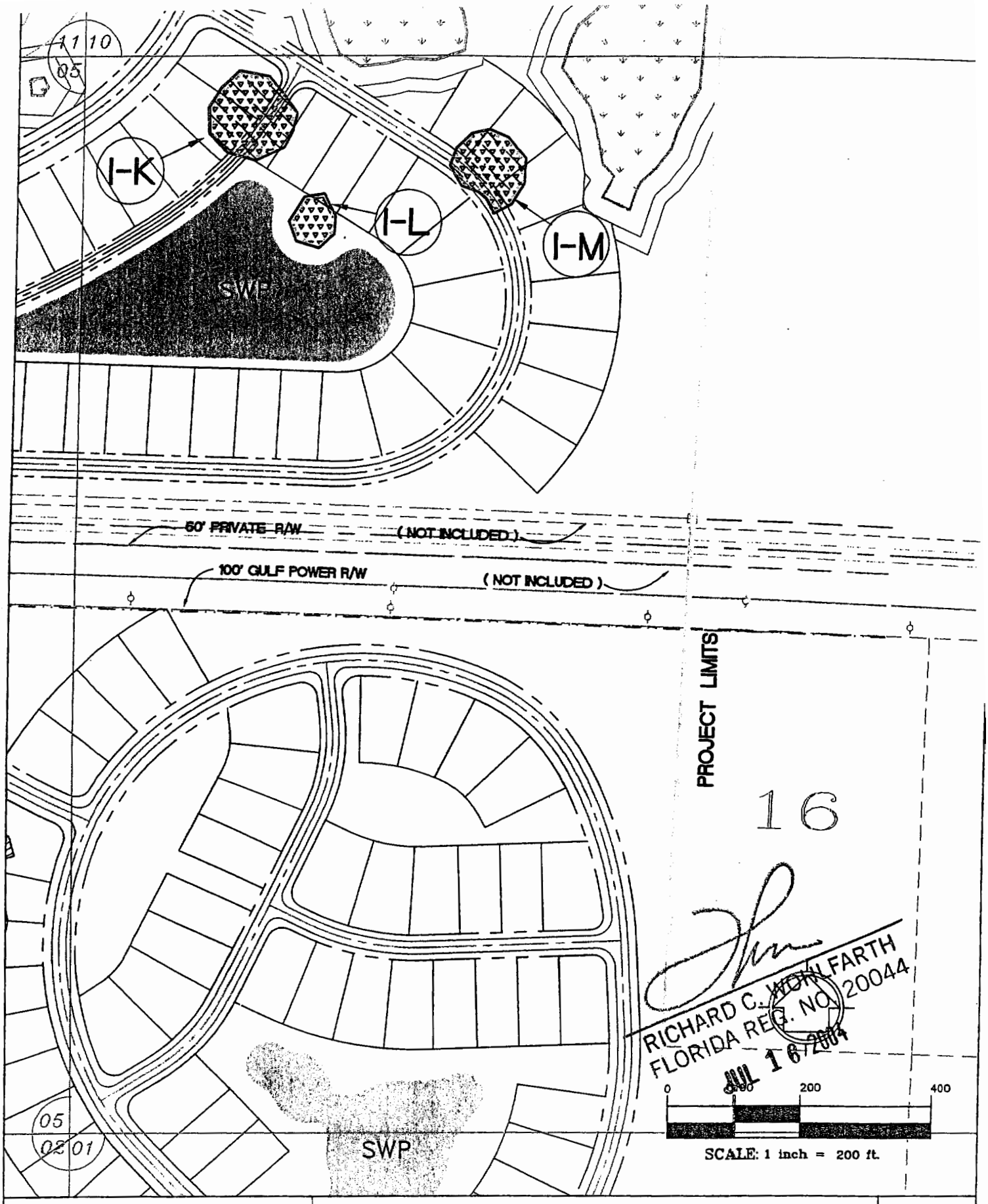
DWG. NO.
03



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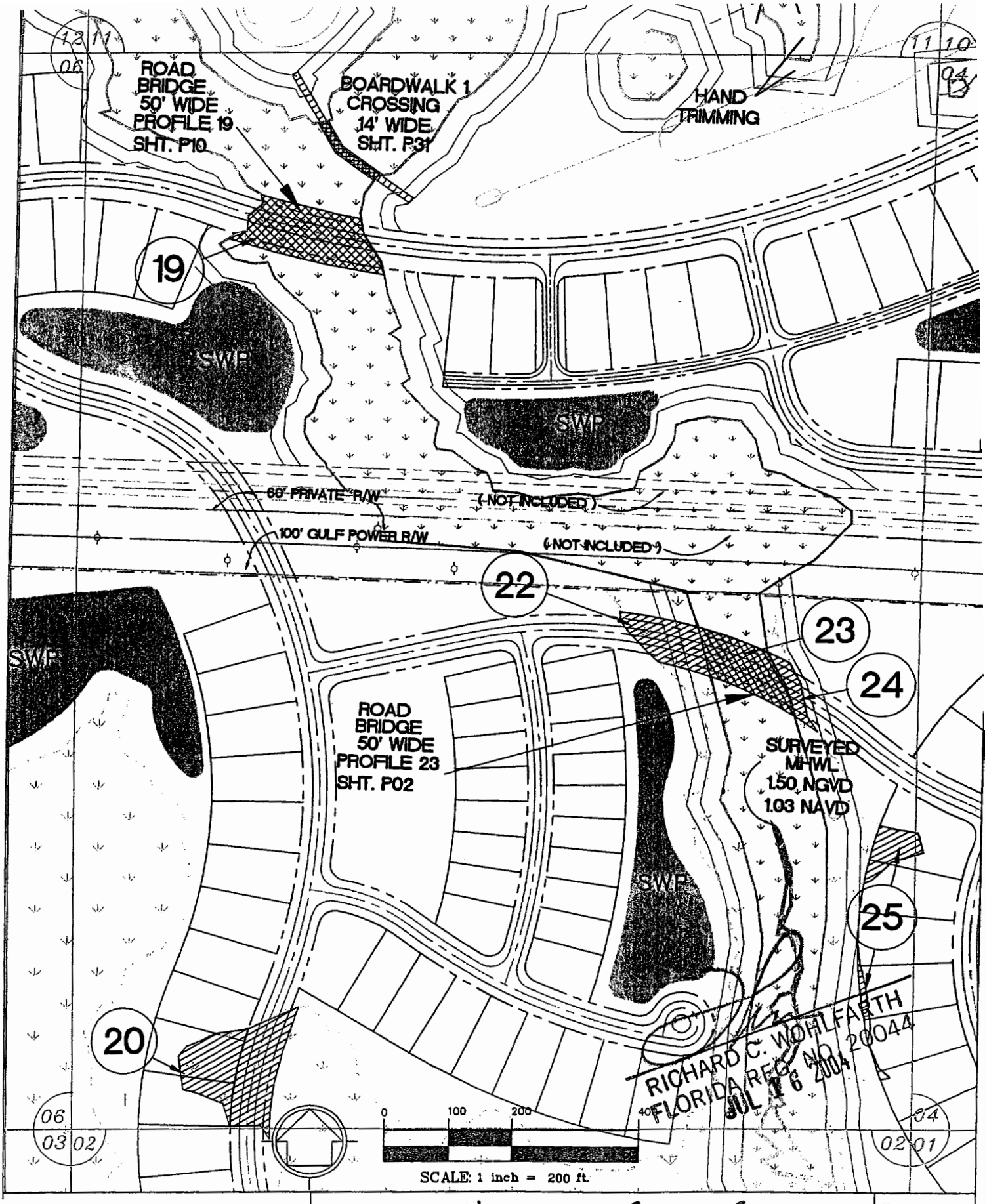

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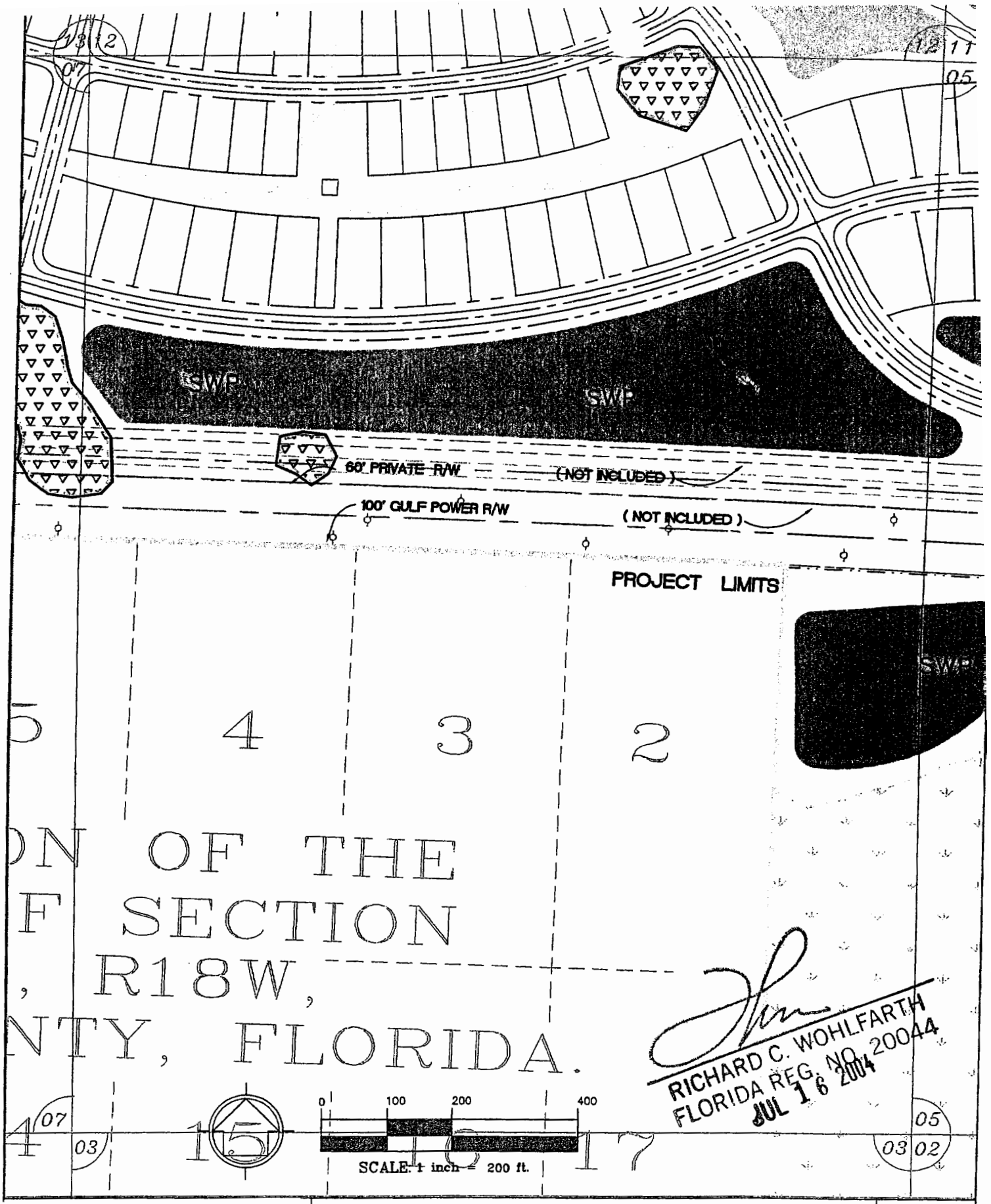

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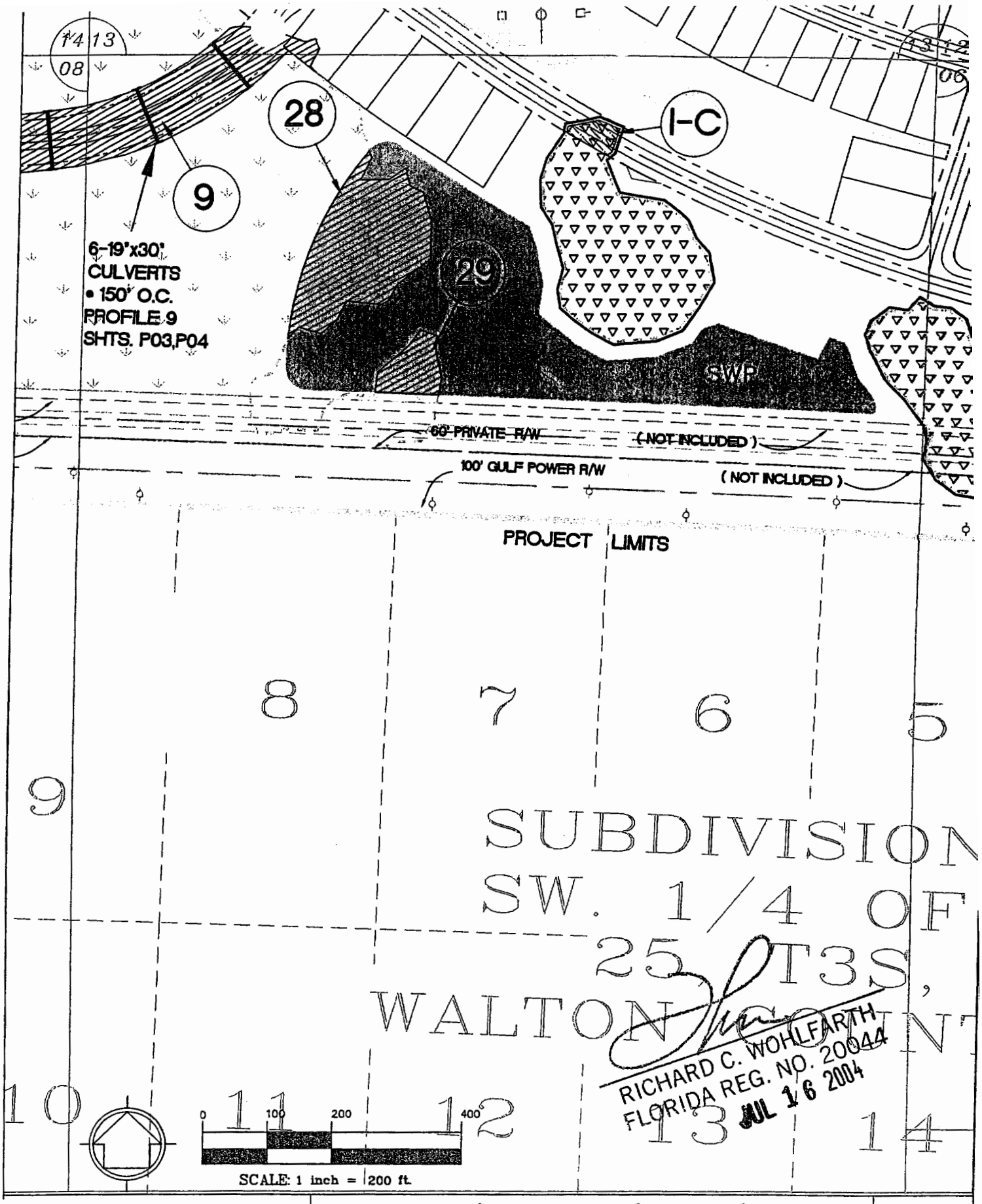

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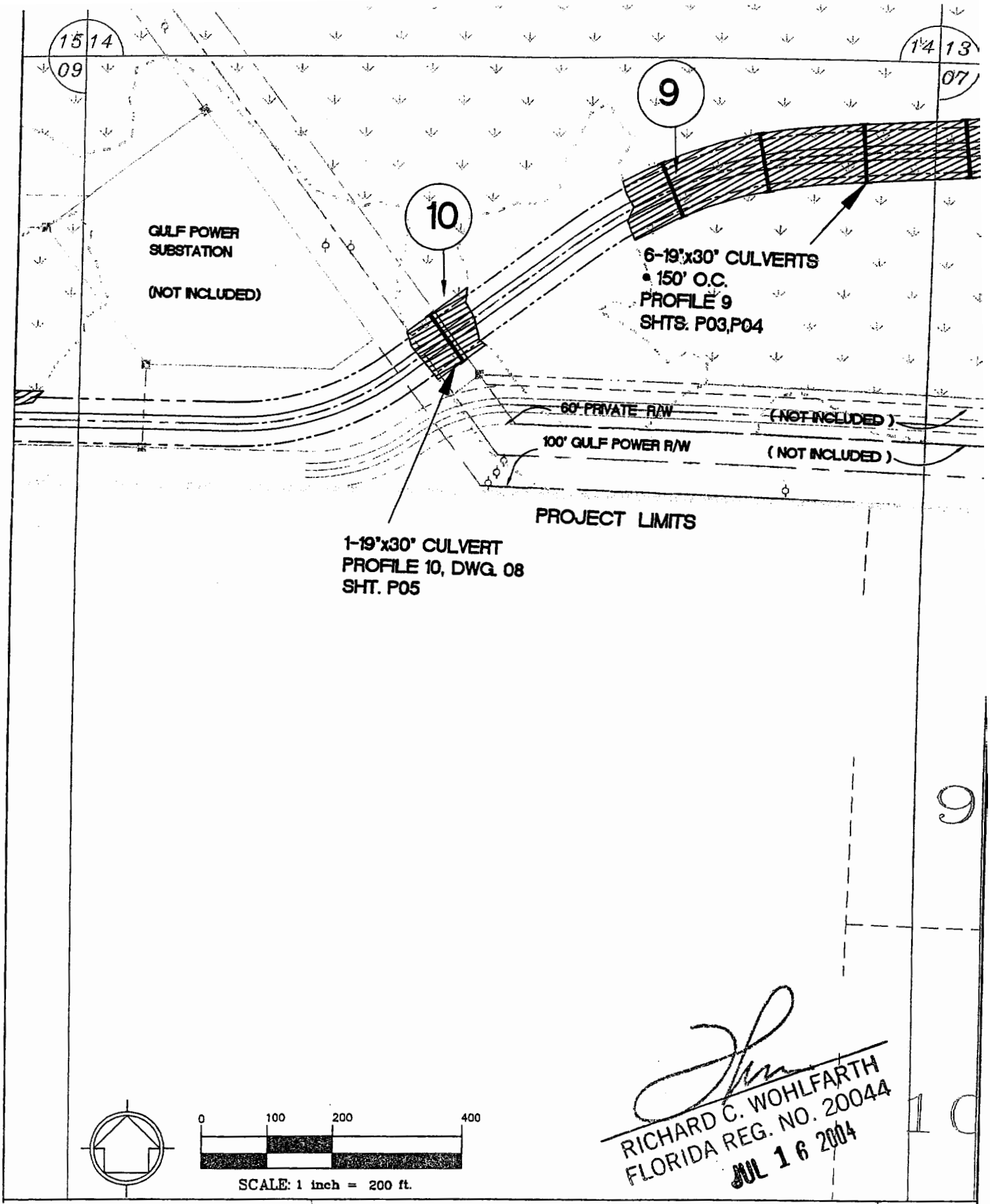

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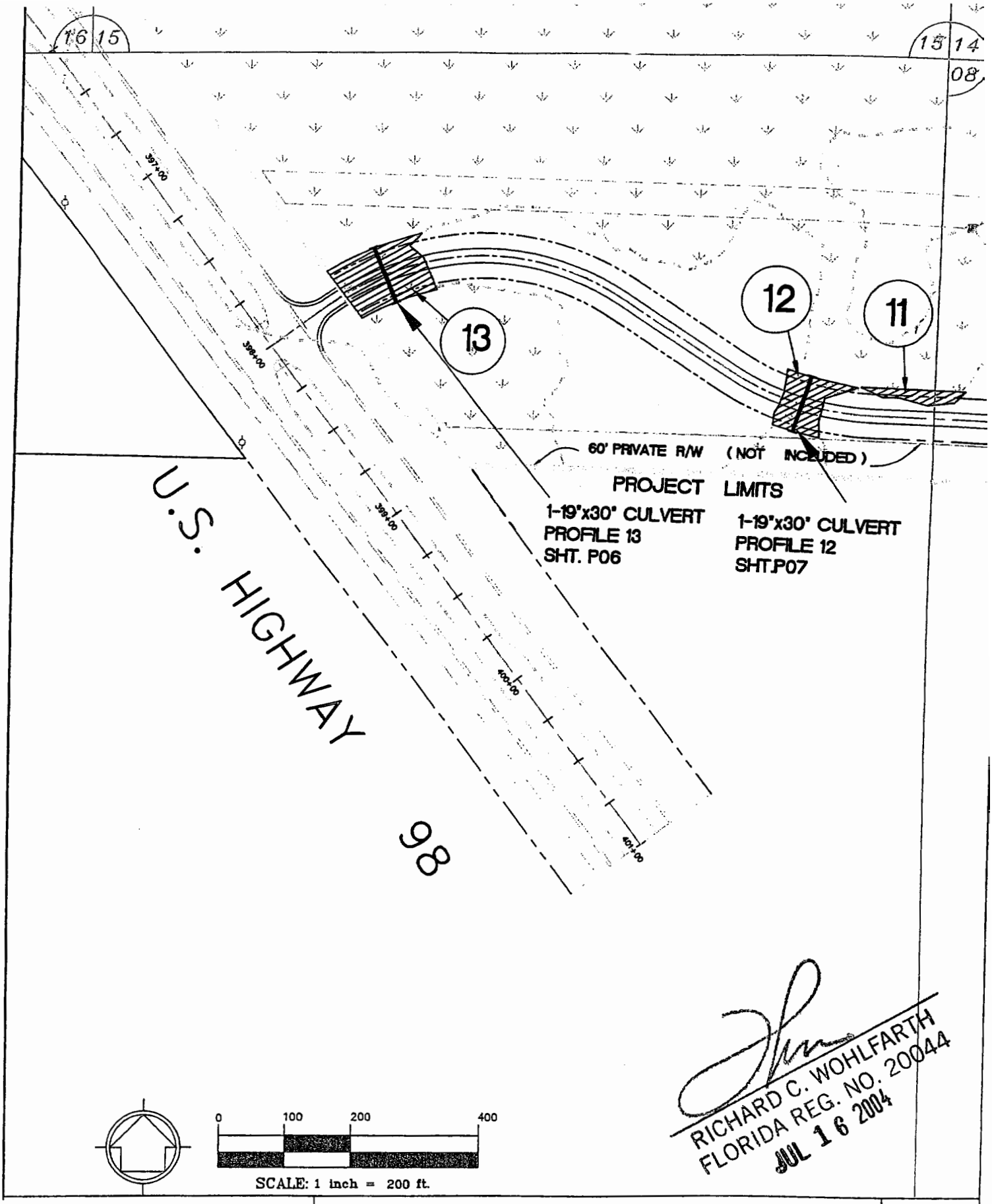

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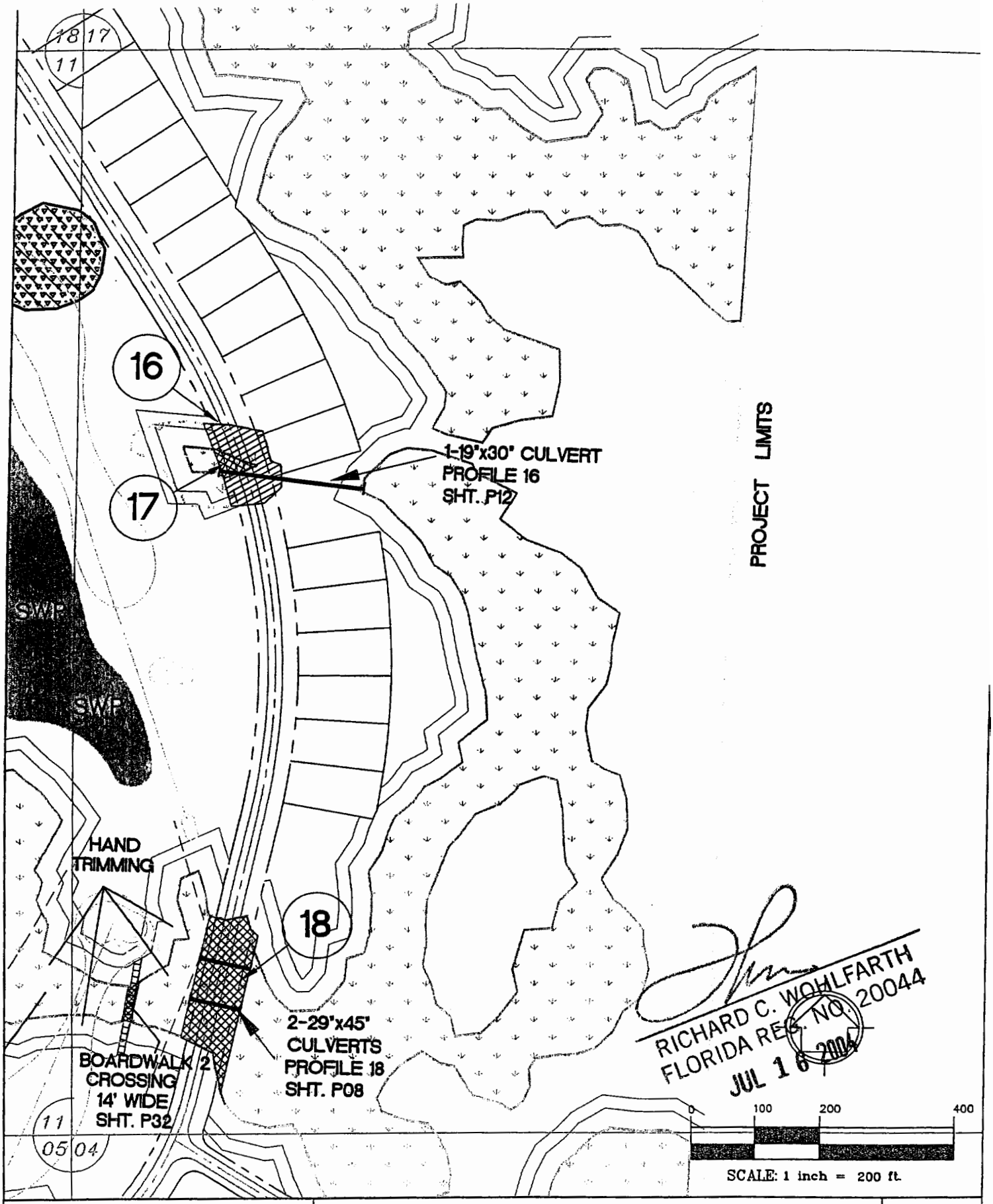

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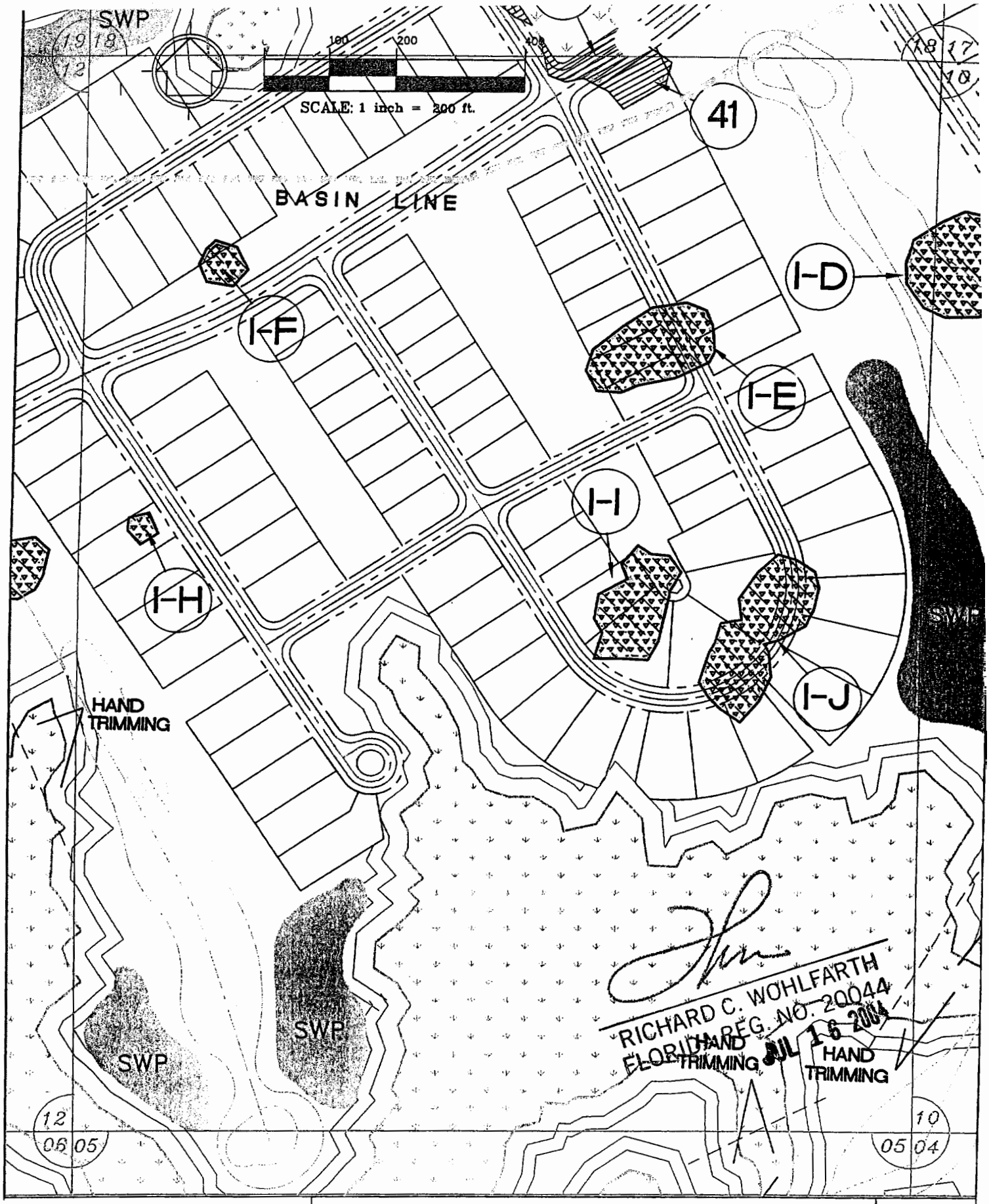

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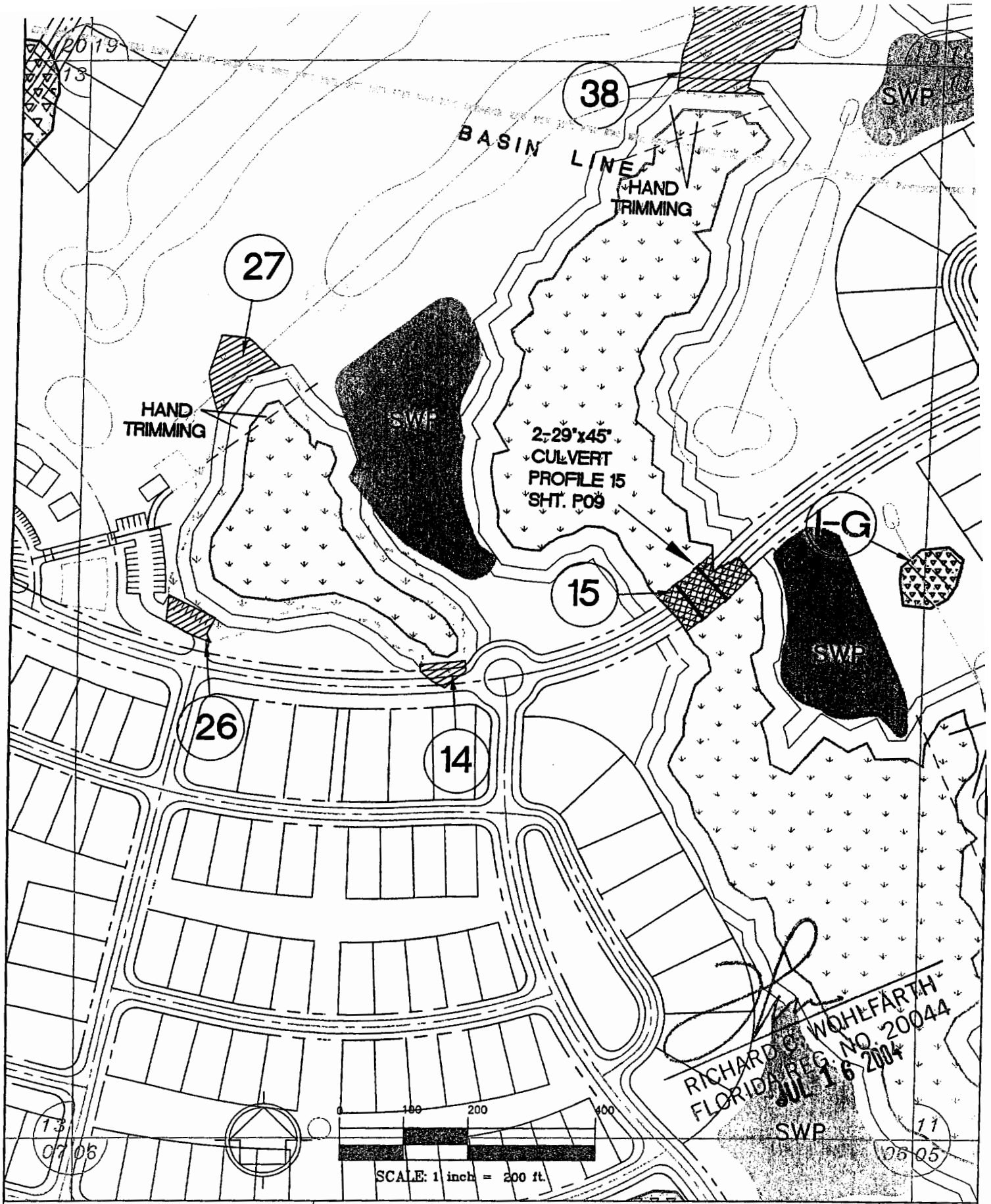

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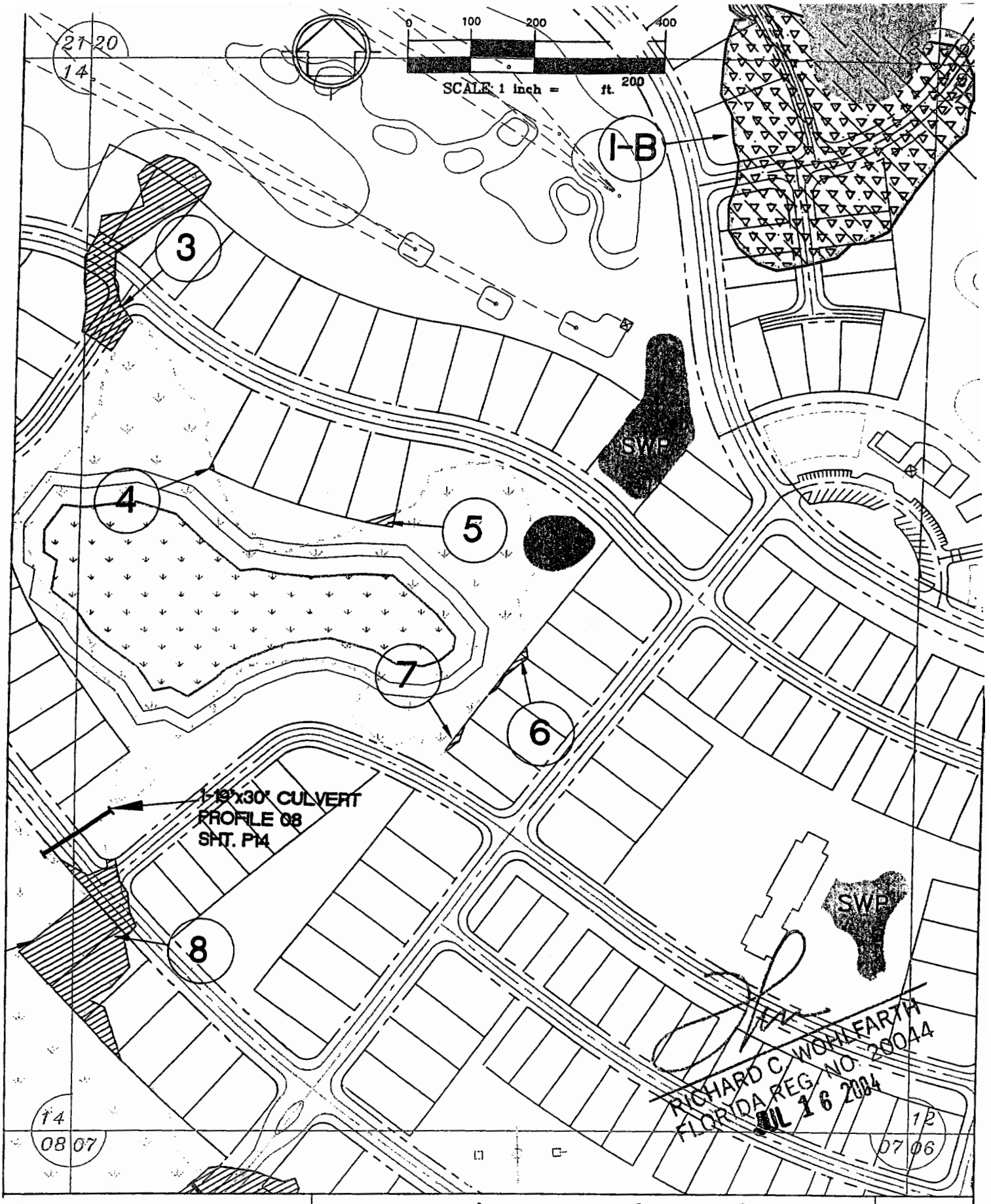

US Army Corps of Engineers

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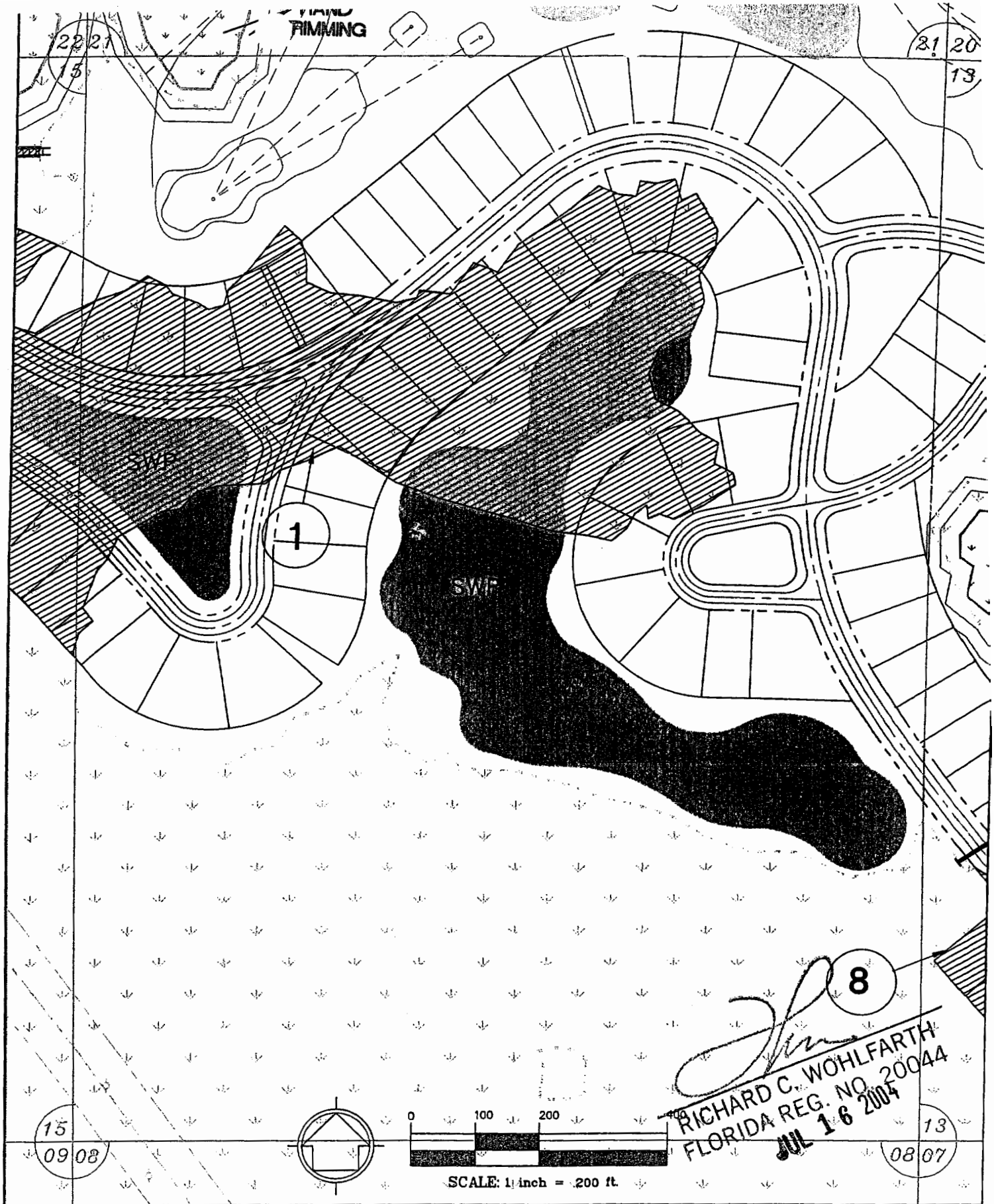

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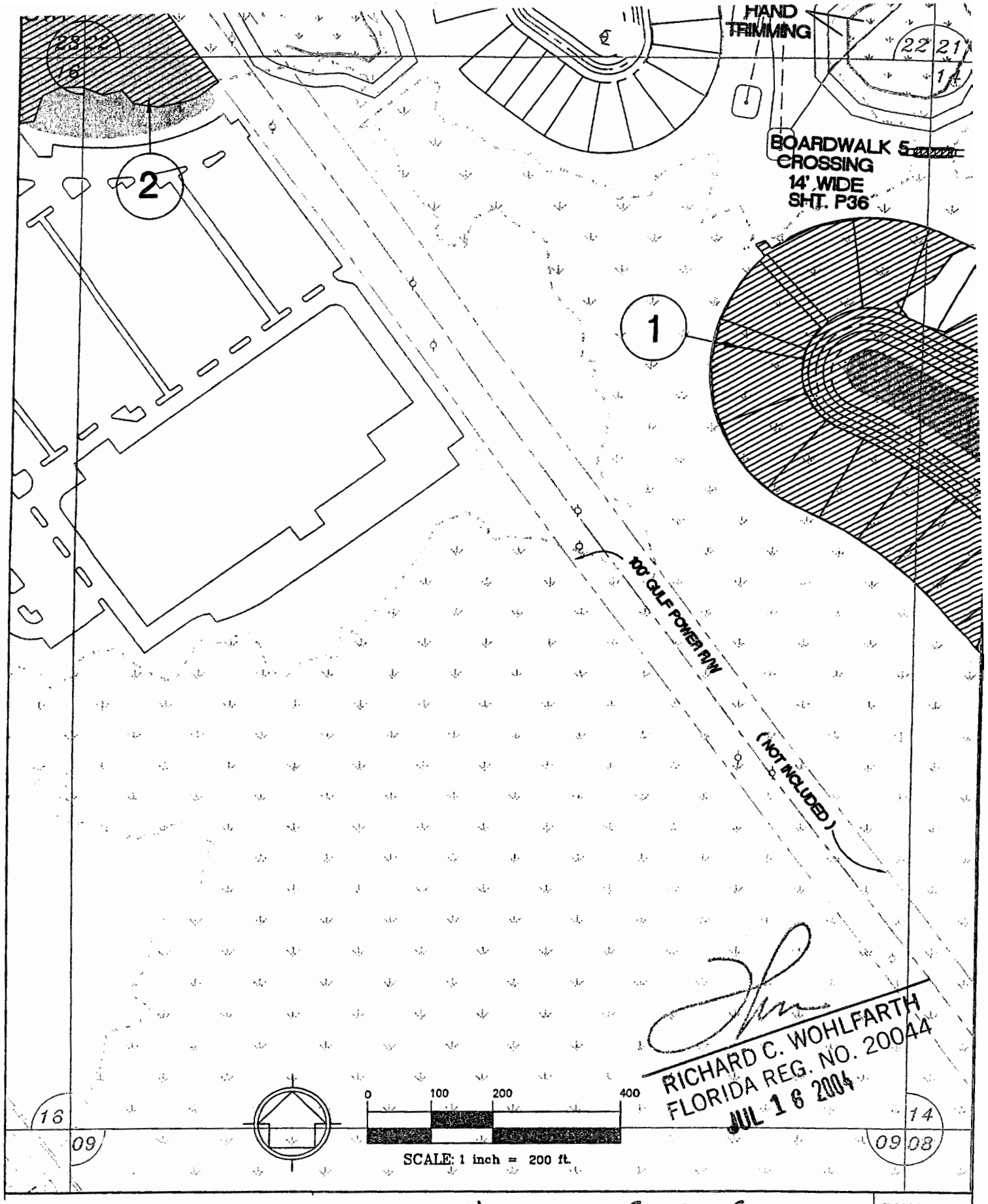

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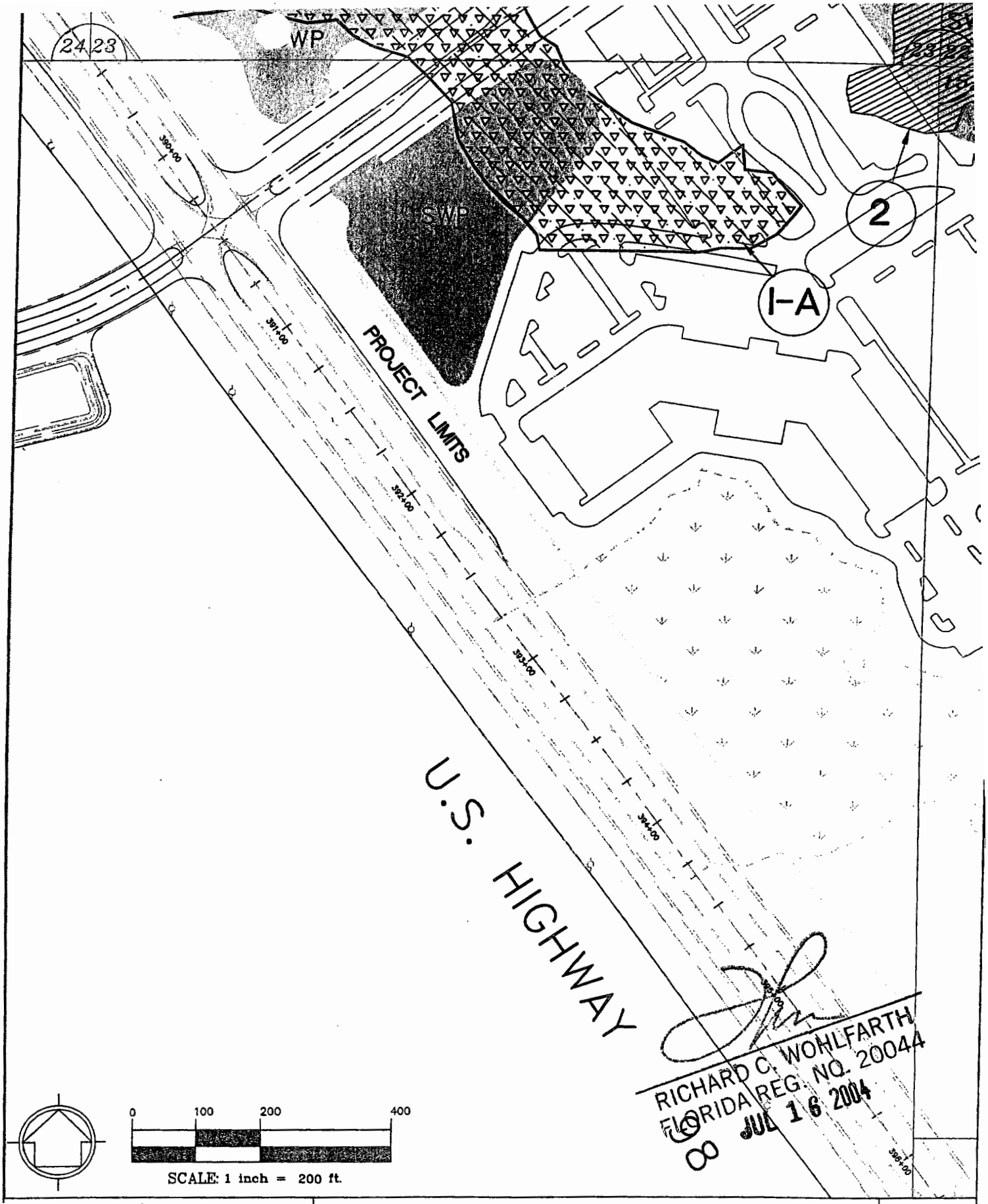

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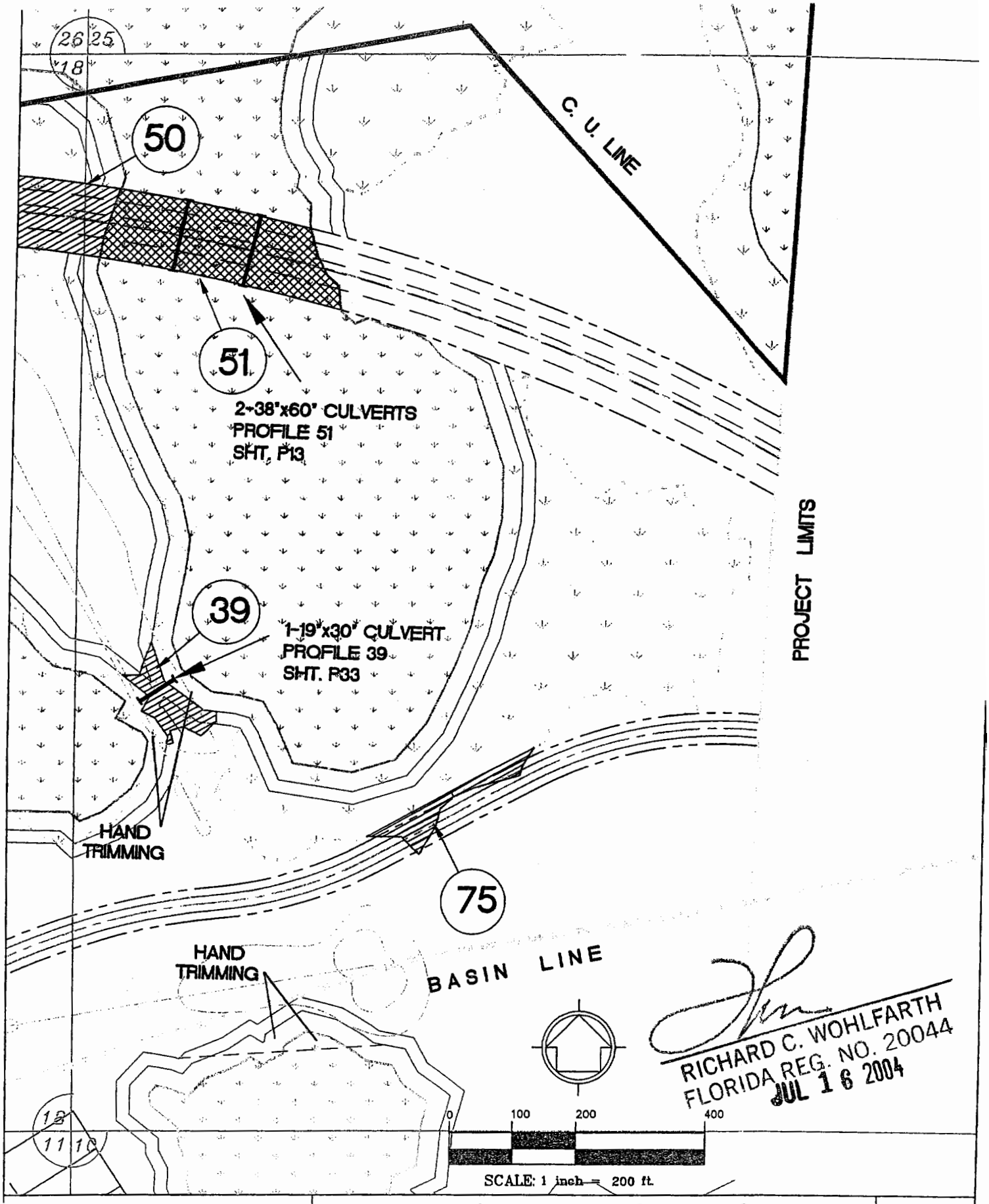

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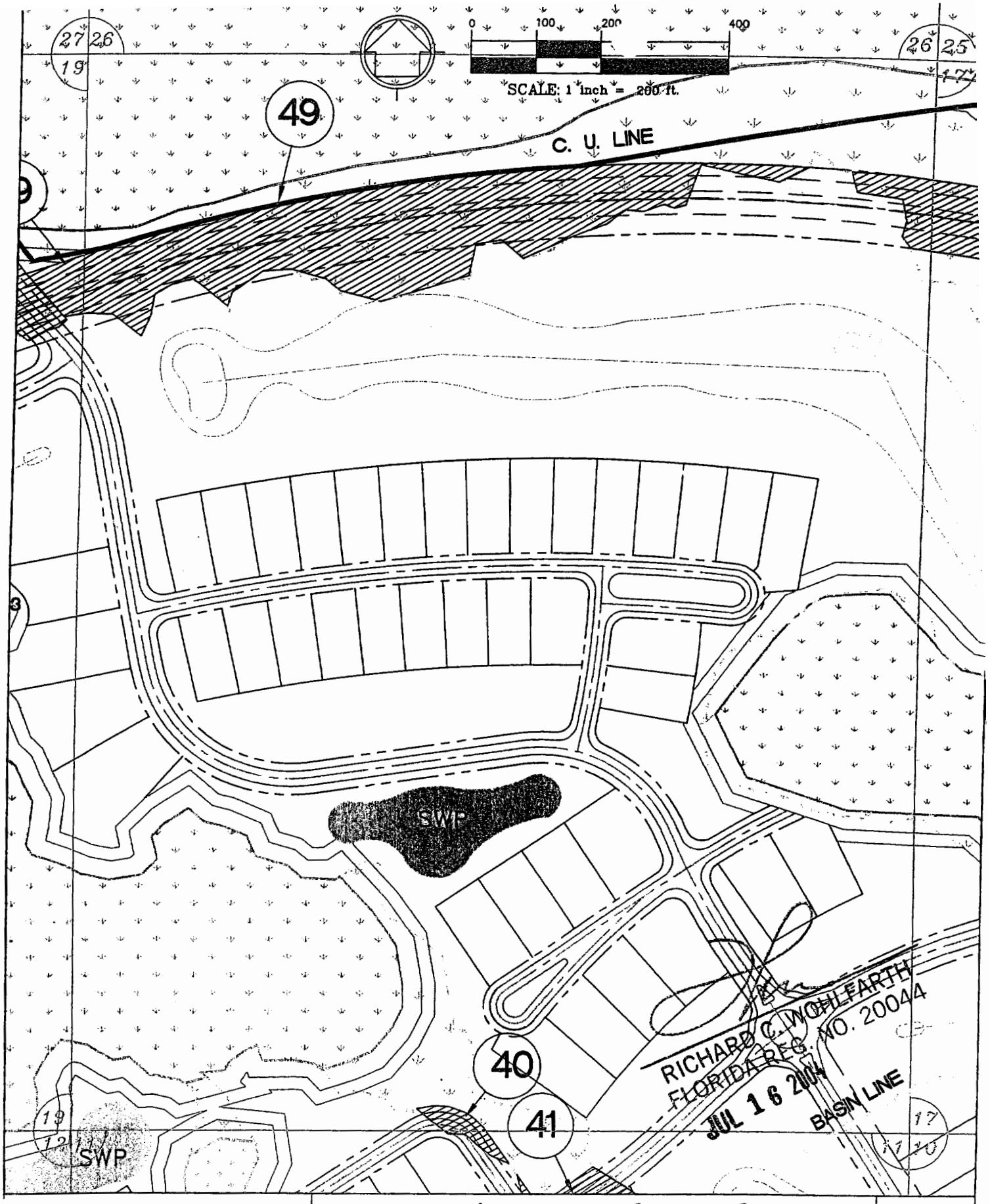

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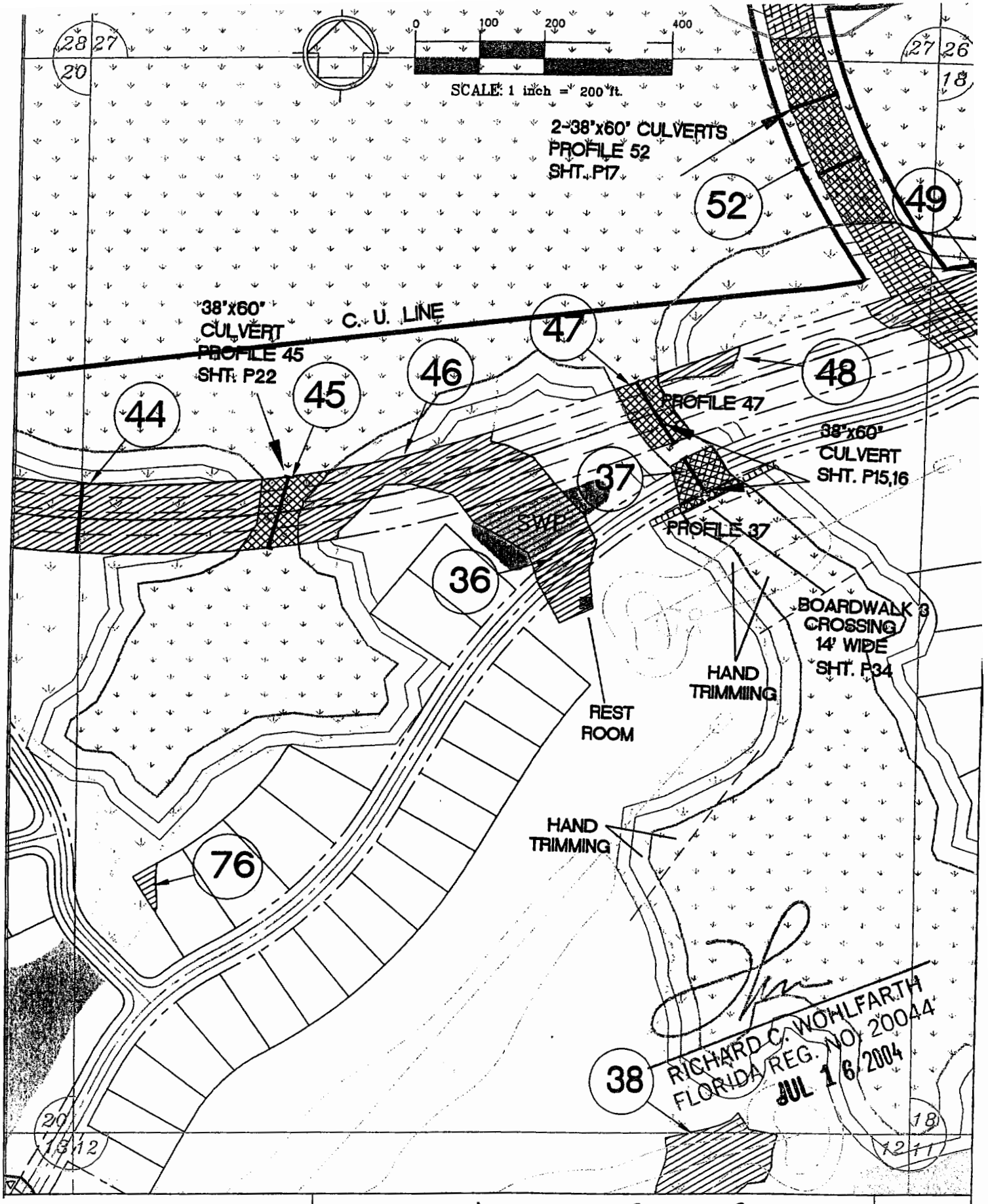

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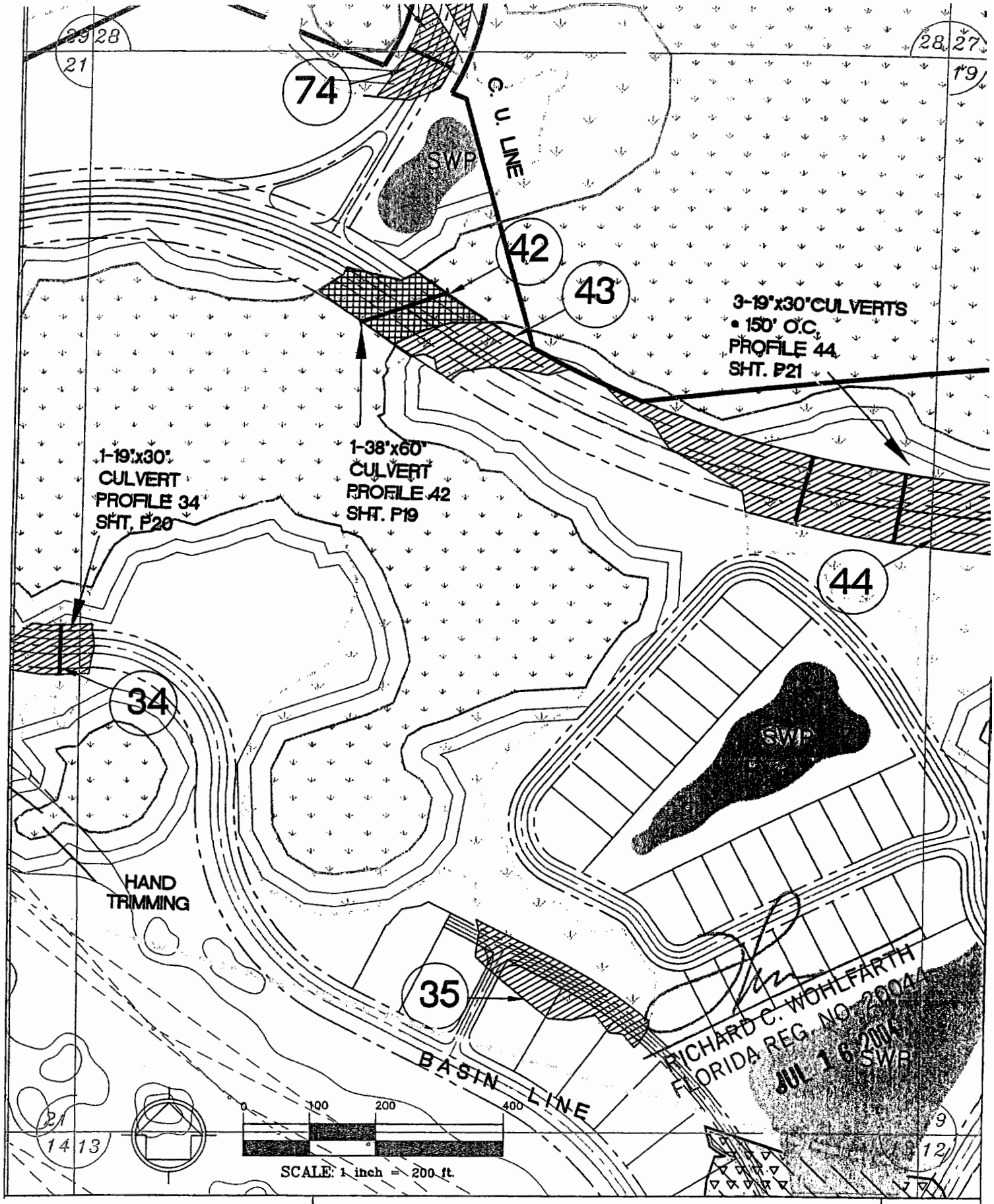

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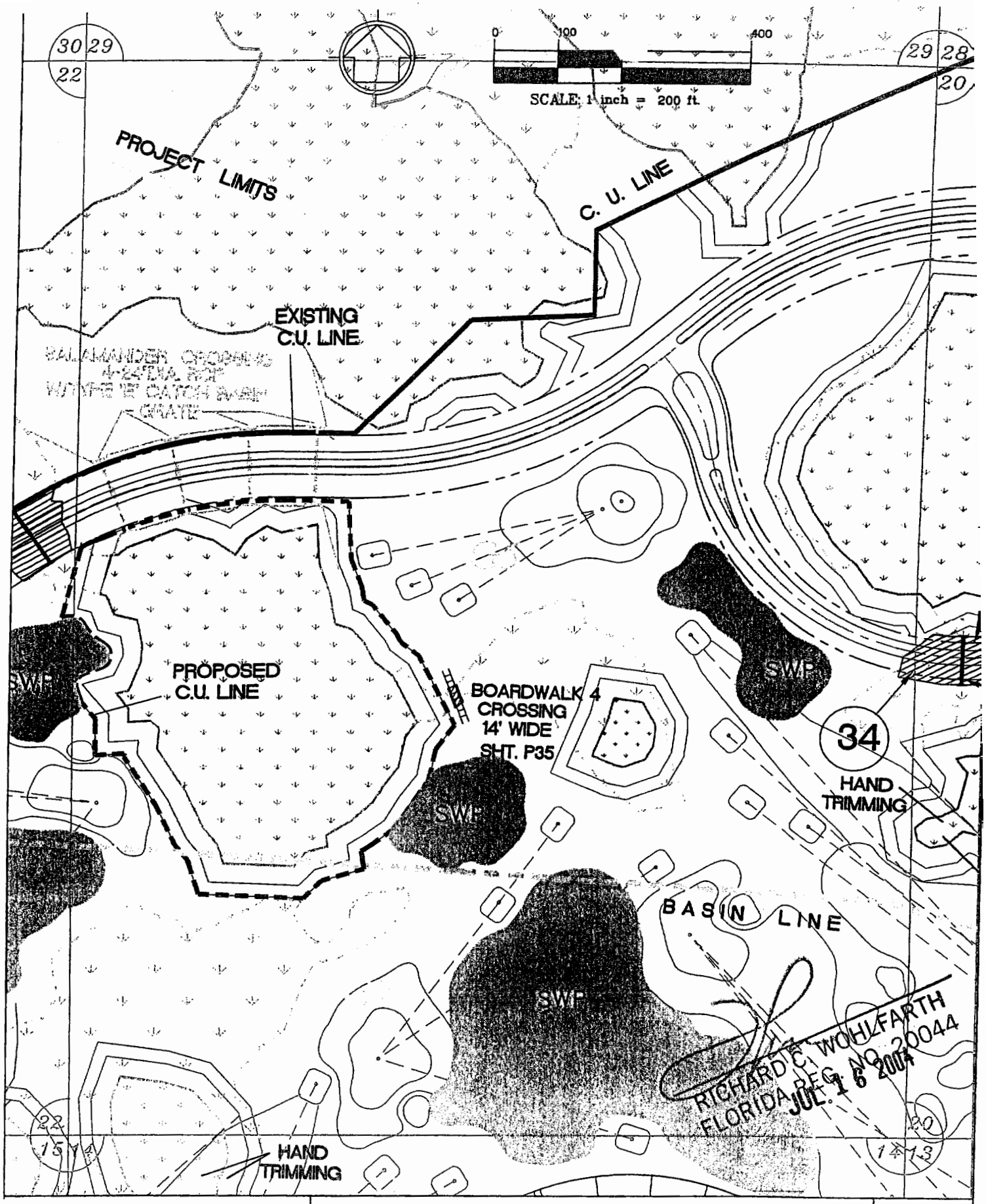

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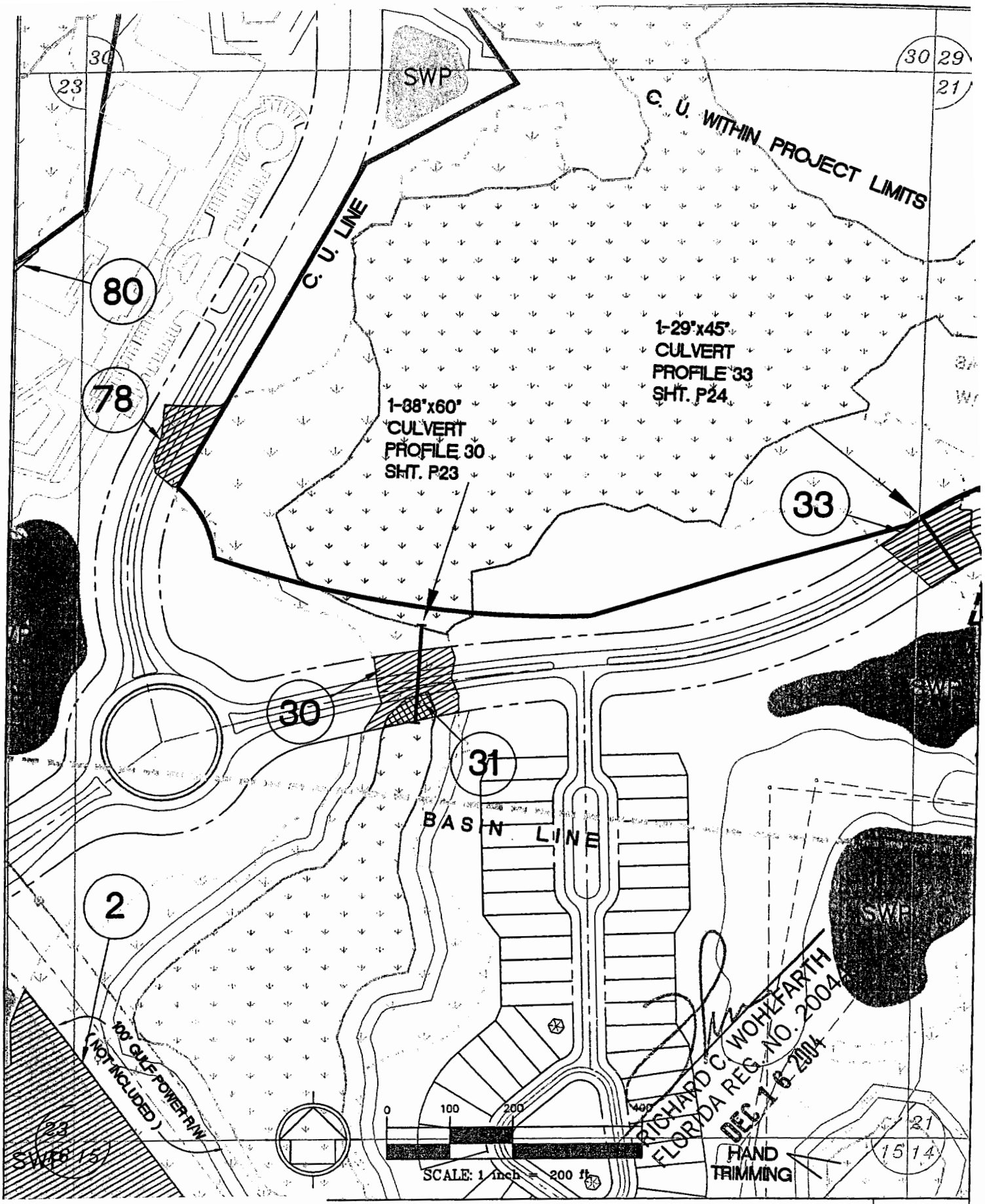

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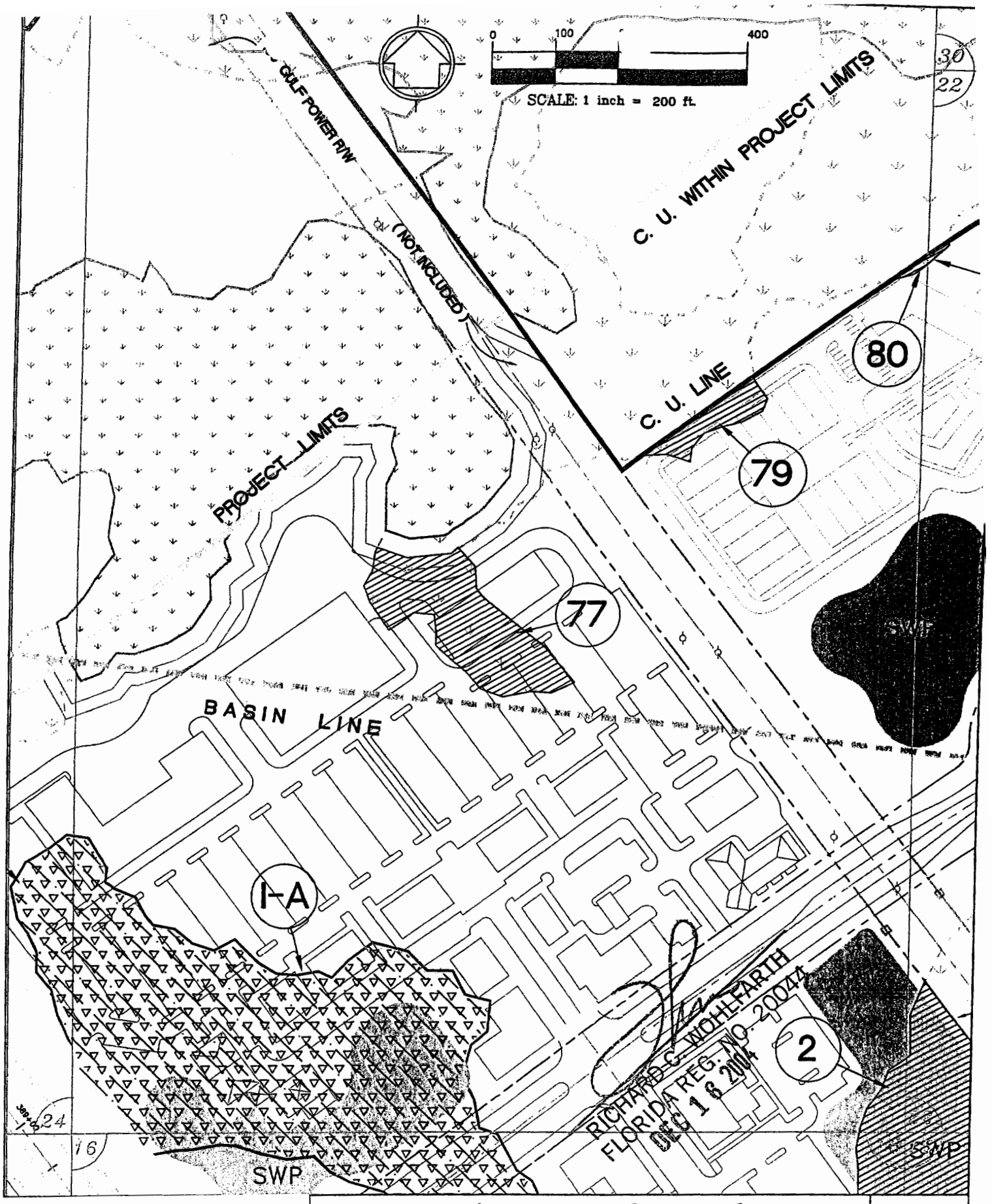

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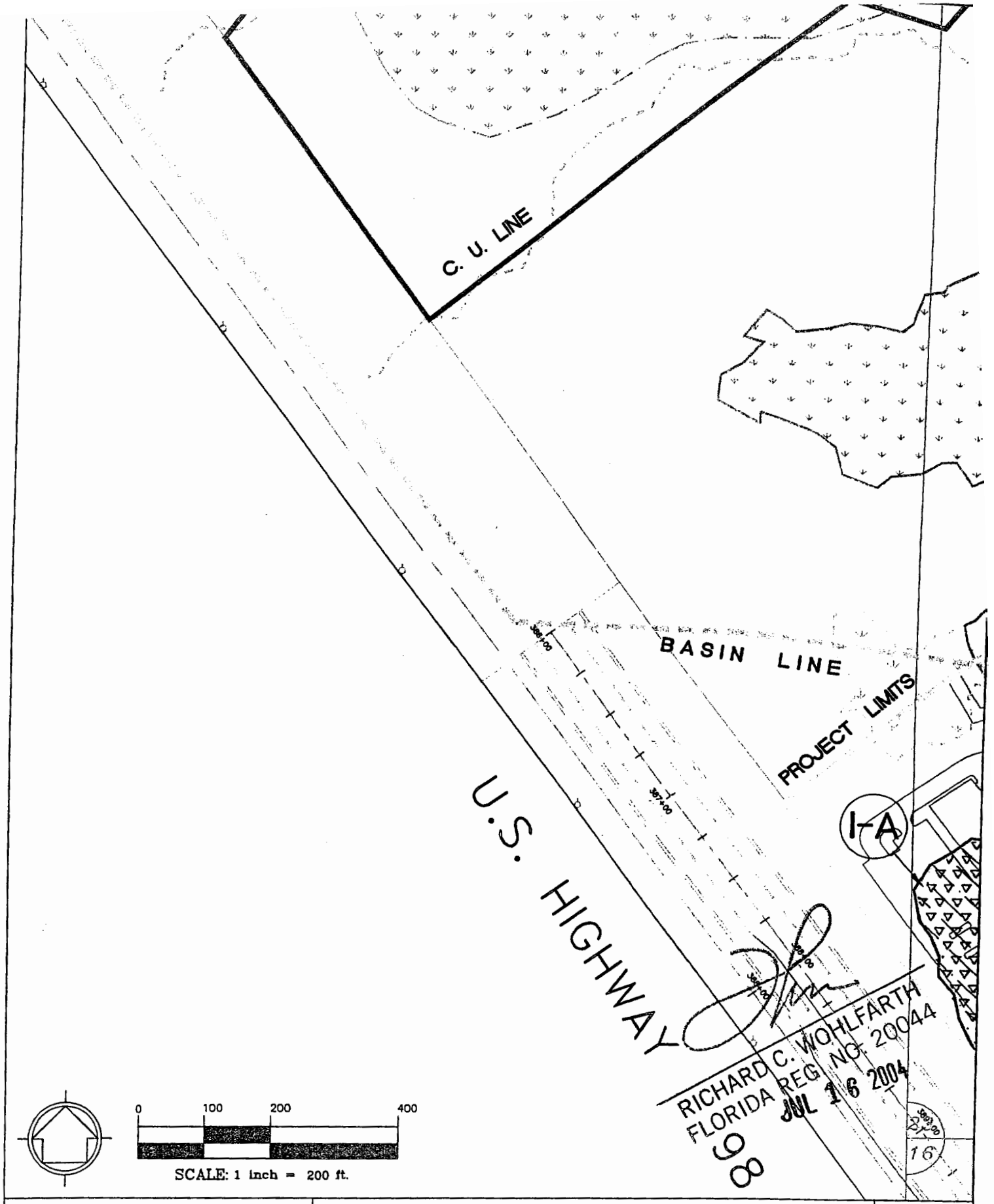

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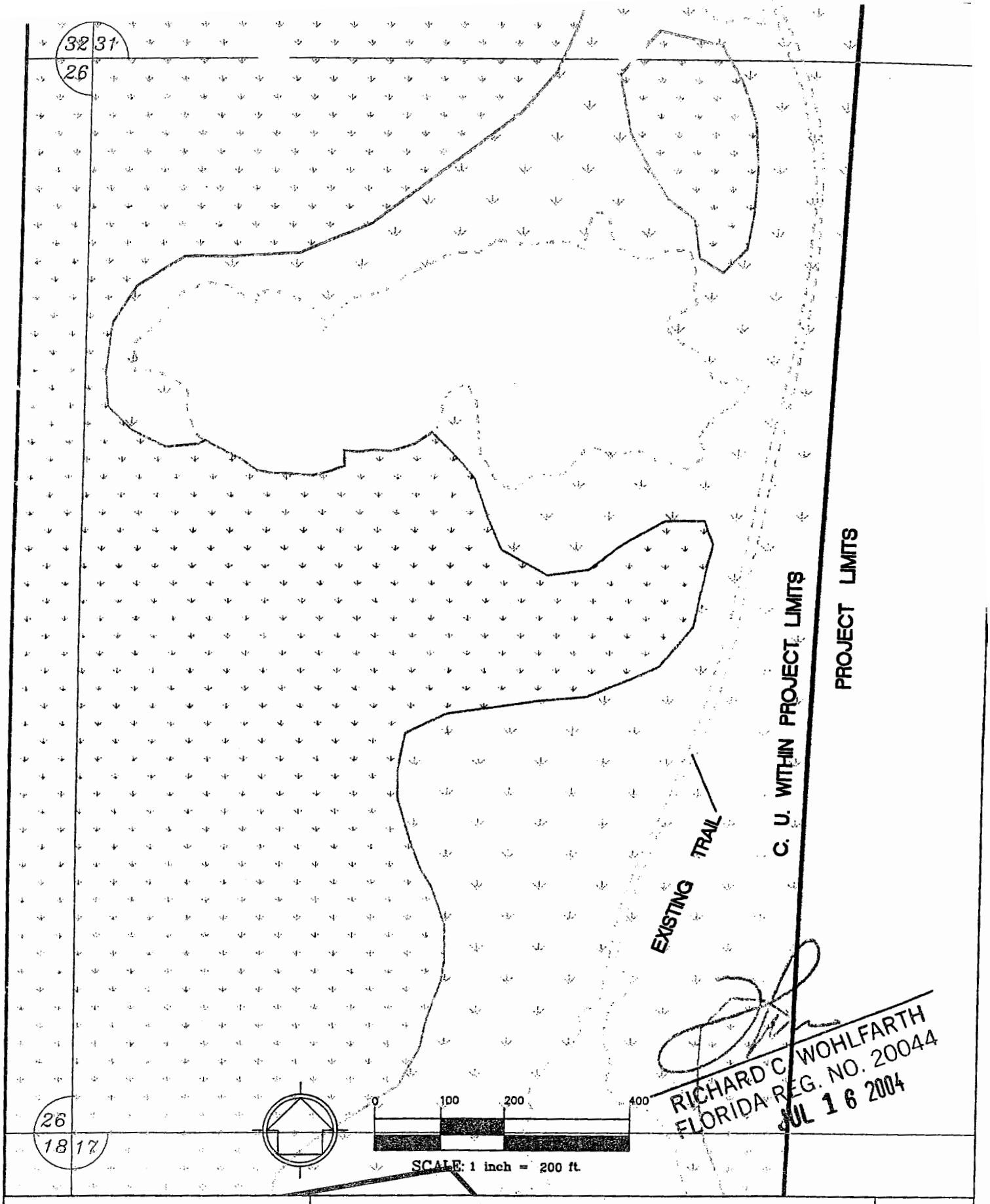

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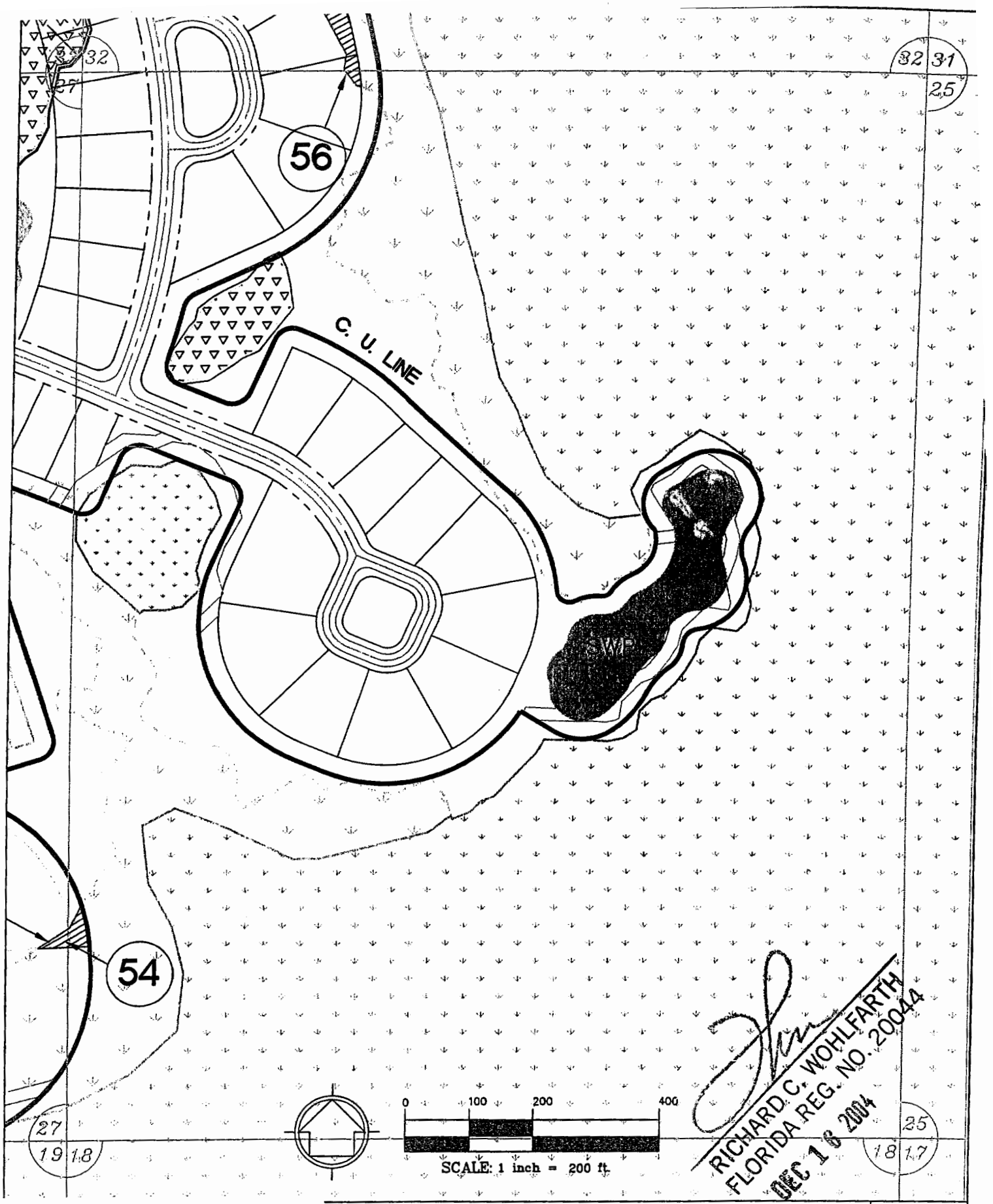

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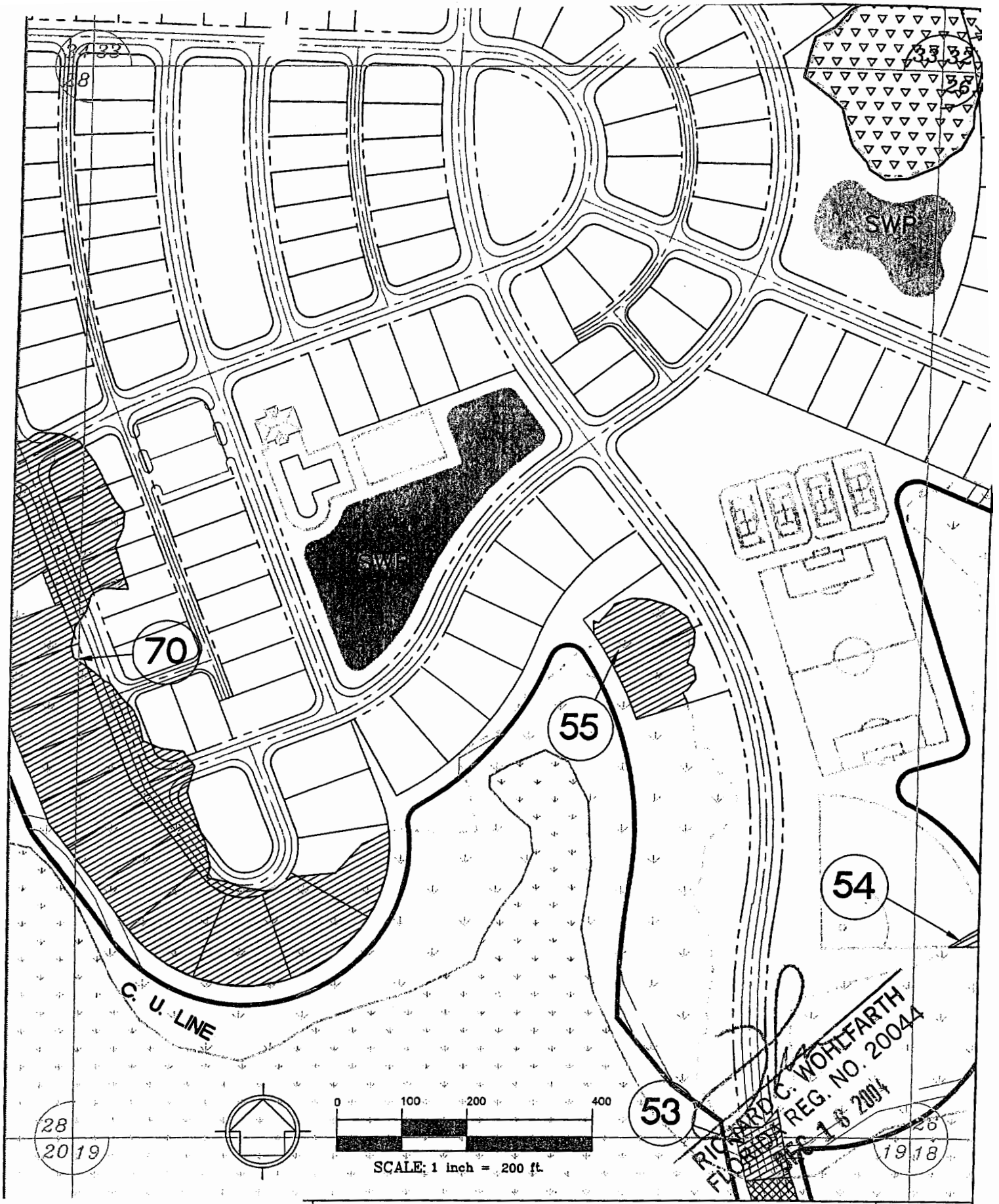

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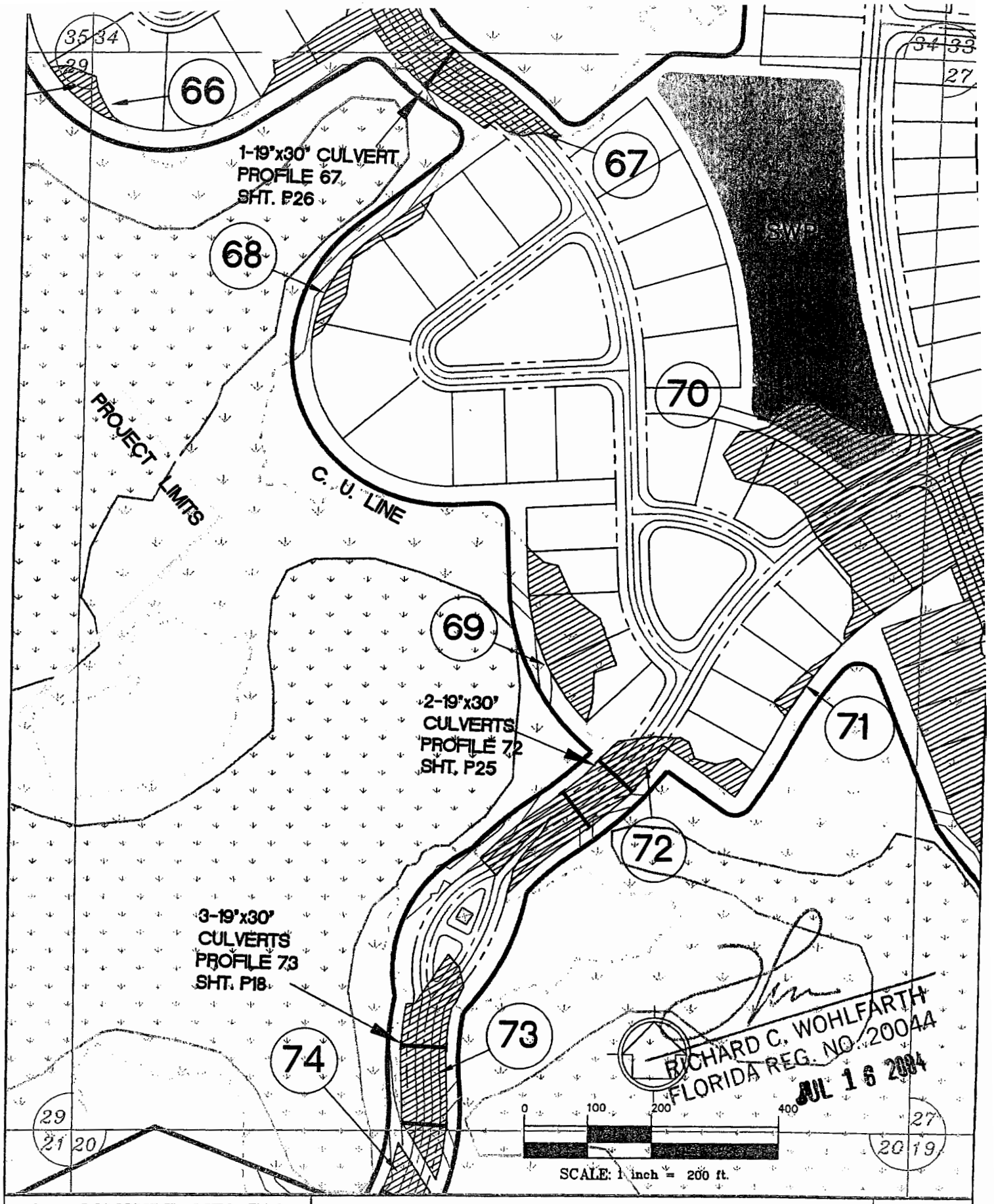

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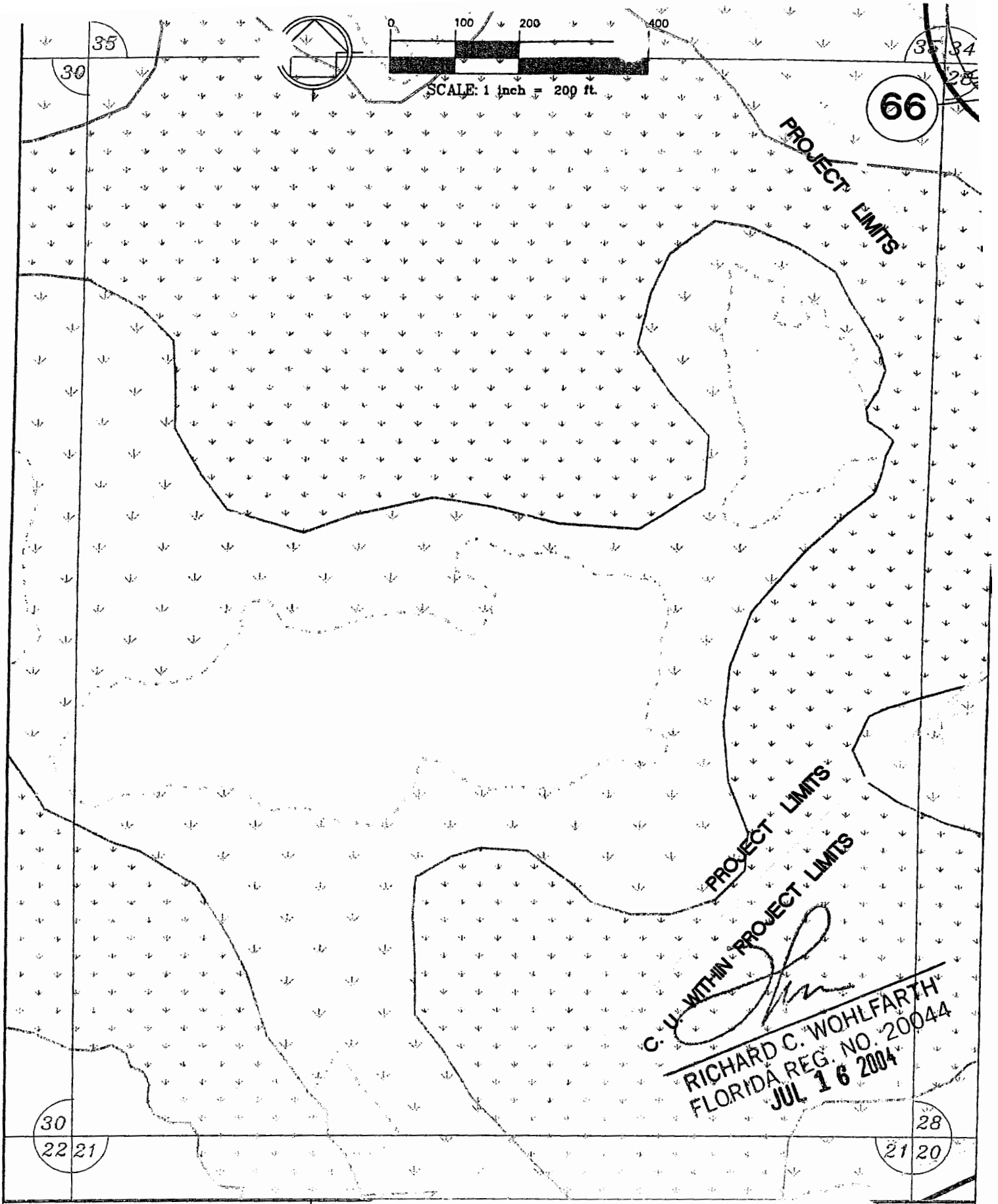

CCL CONSULTANTS, INC.

Engineers Planners
Surveyors & Mappers
GIS Consultants
Landscape Architects
Environmental Consultants

US Army Corps of Engineers.

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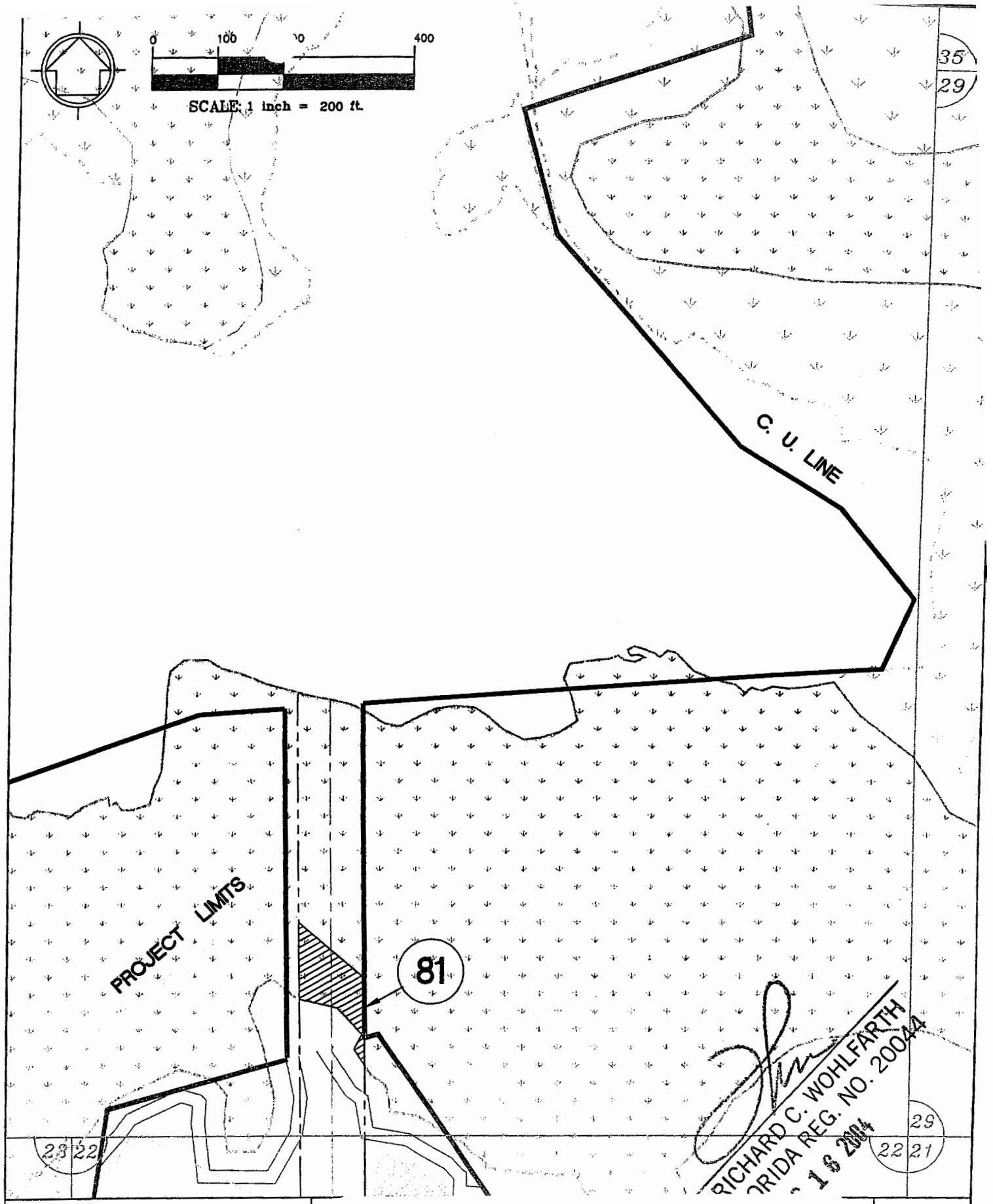

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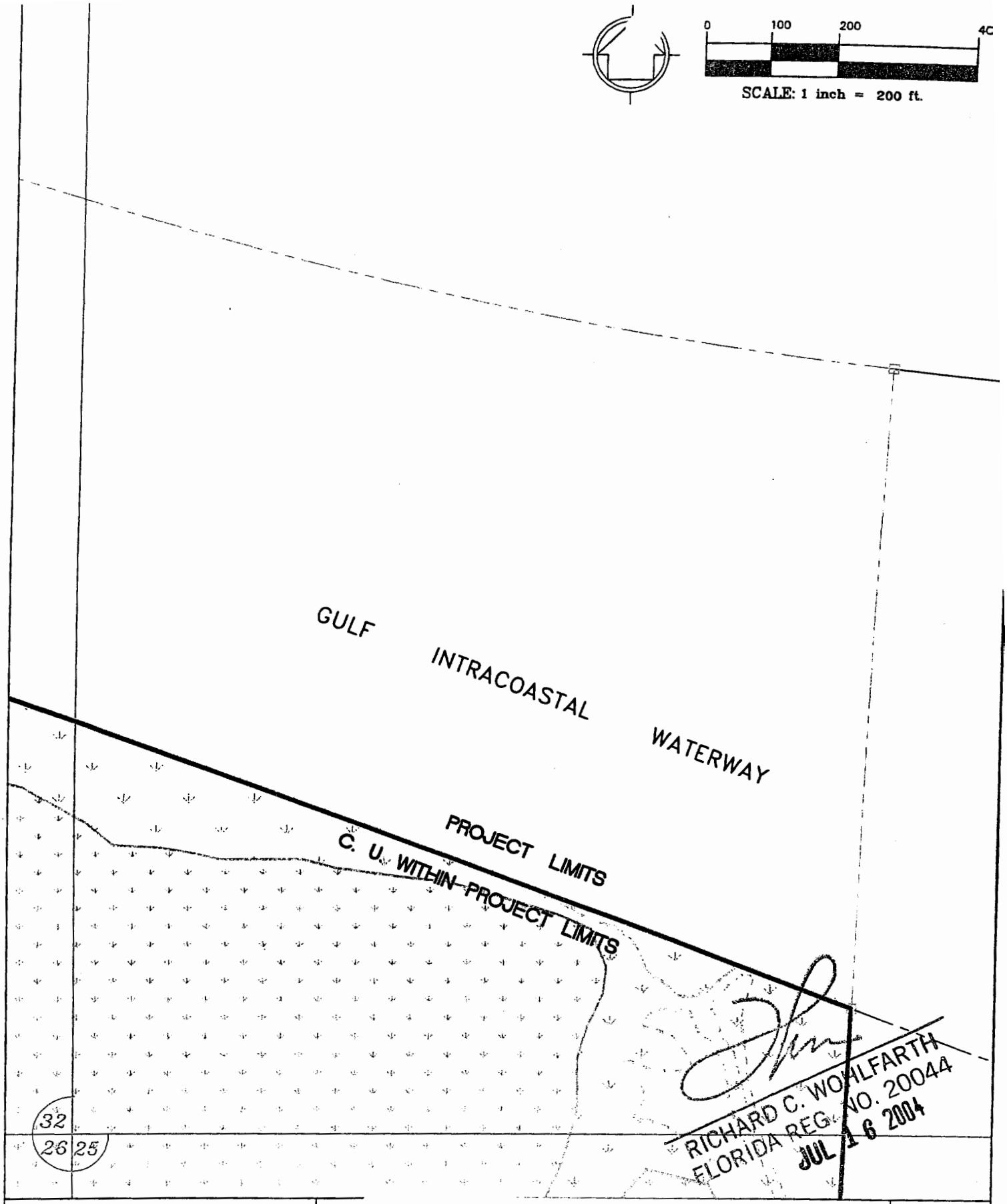
DWG. NO.
30



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Landscape Architects
Environmental Consultants

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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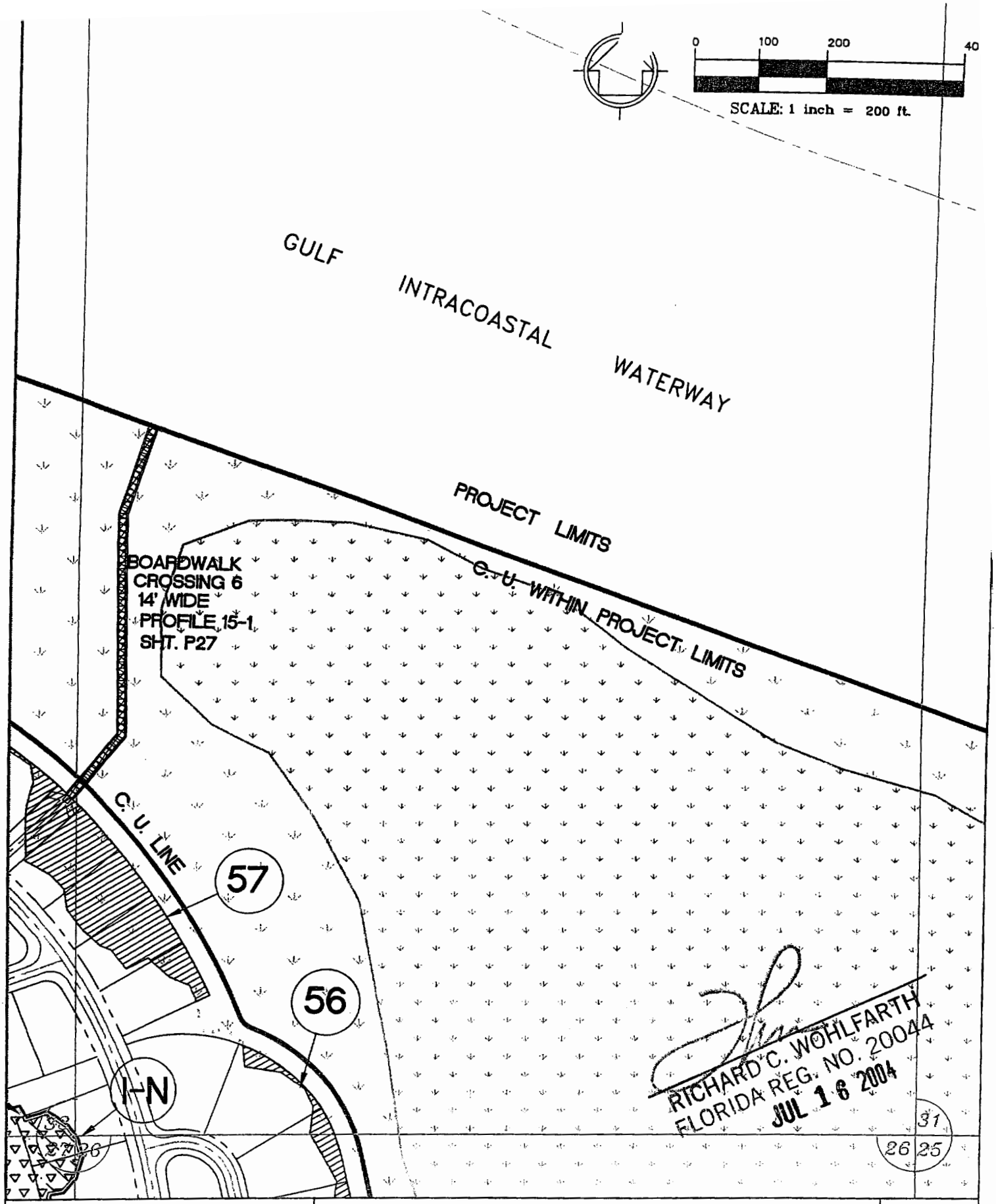
DWG. NO.
31



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GIS Consultants
Landscape Architects
Environmental Consultants

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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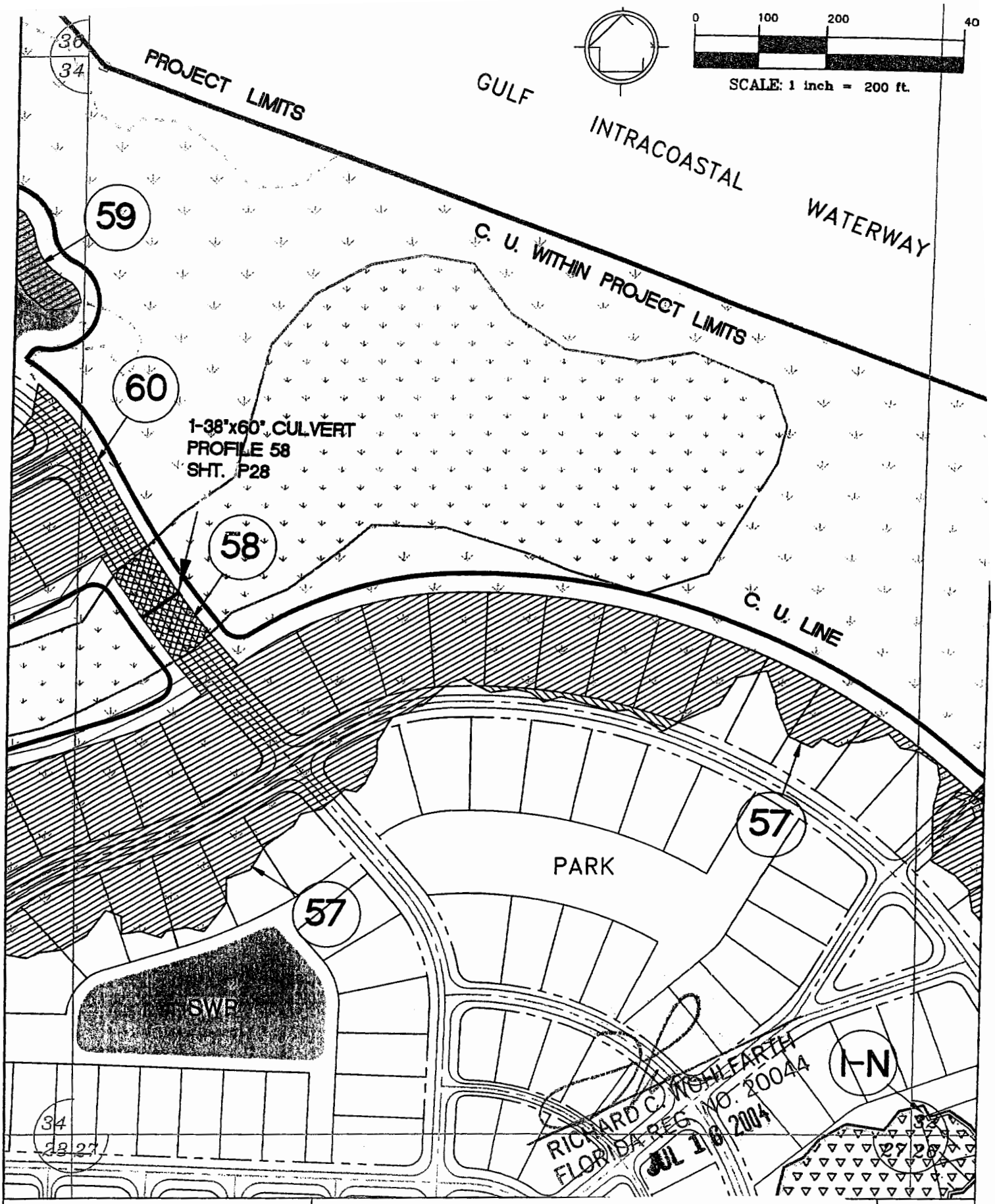
DWG. NO.
32



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Environmental Consultants

US Army Corps of Engineers

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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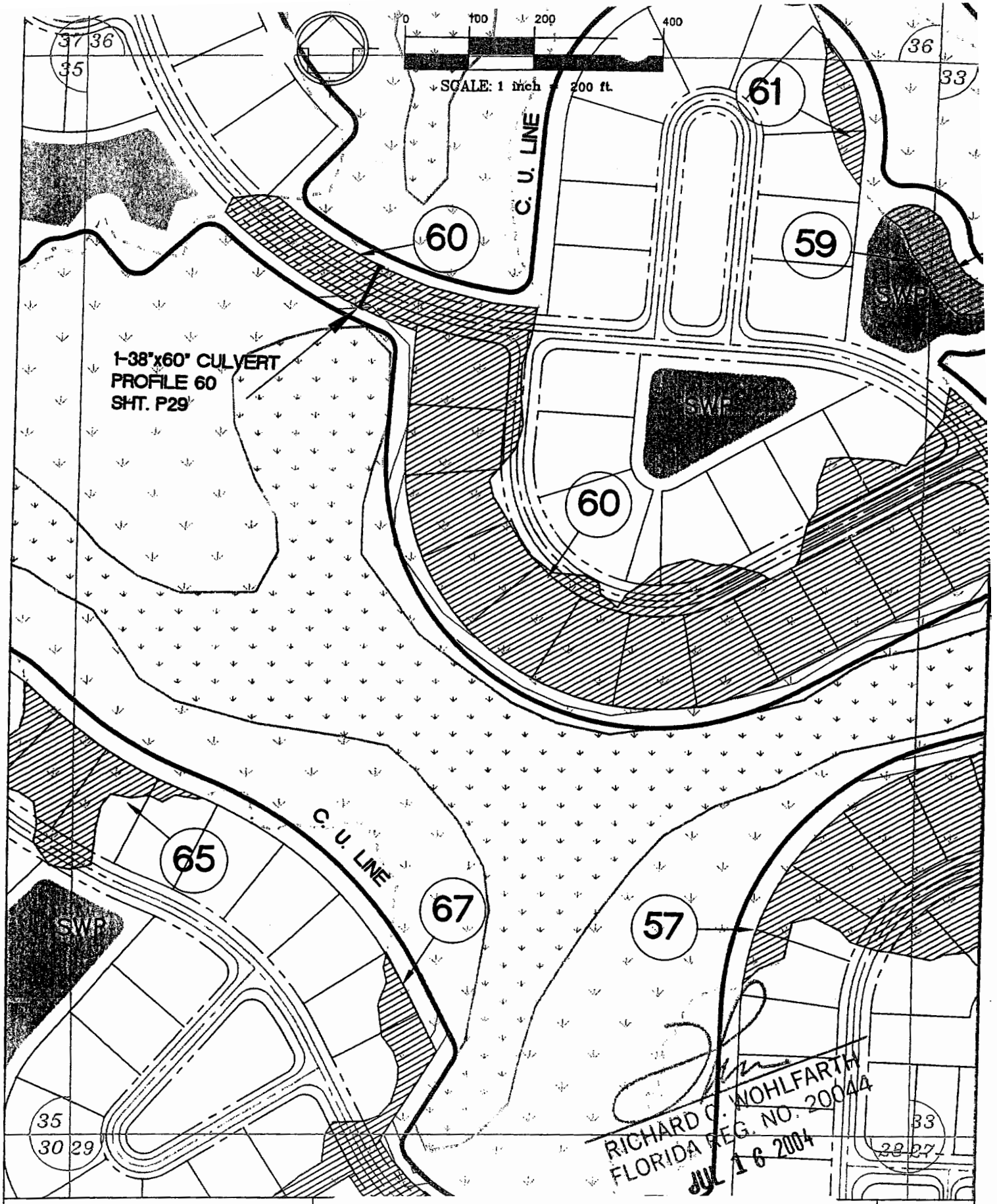
DWG. NO.
33



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GIS Consultants
Landscape Architects
Environmental Consultants

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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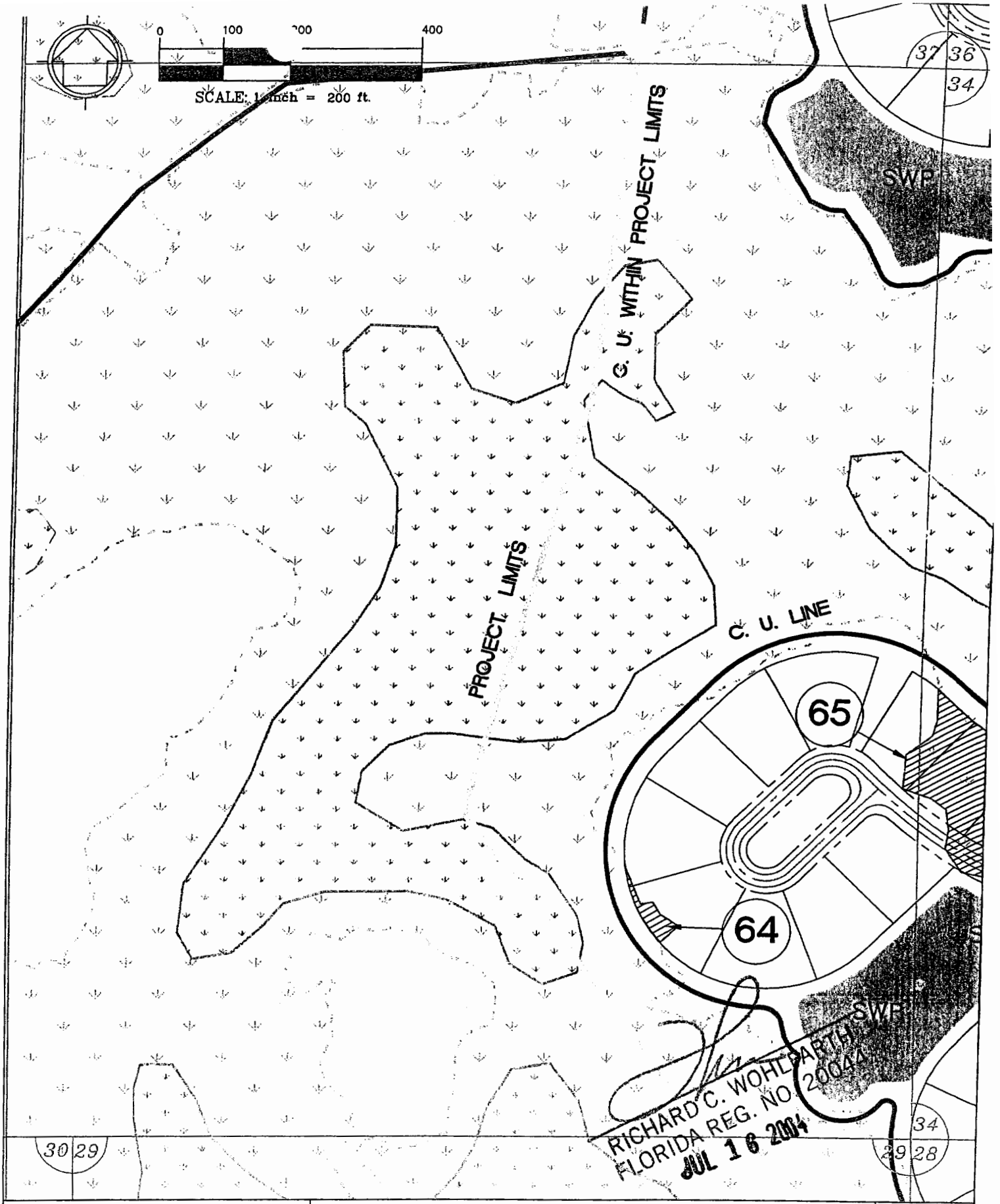
DWG. NO.
34



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GIS Consultants
Landscape Architects
Environmental Consultants

US Army Corps of Engineers

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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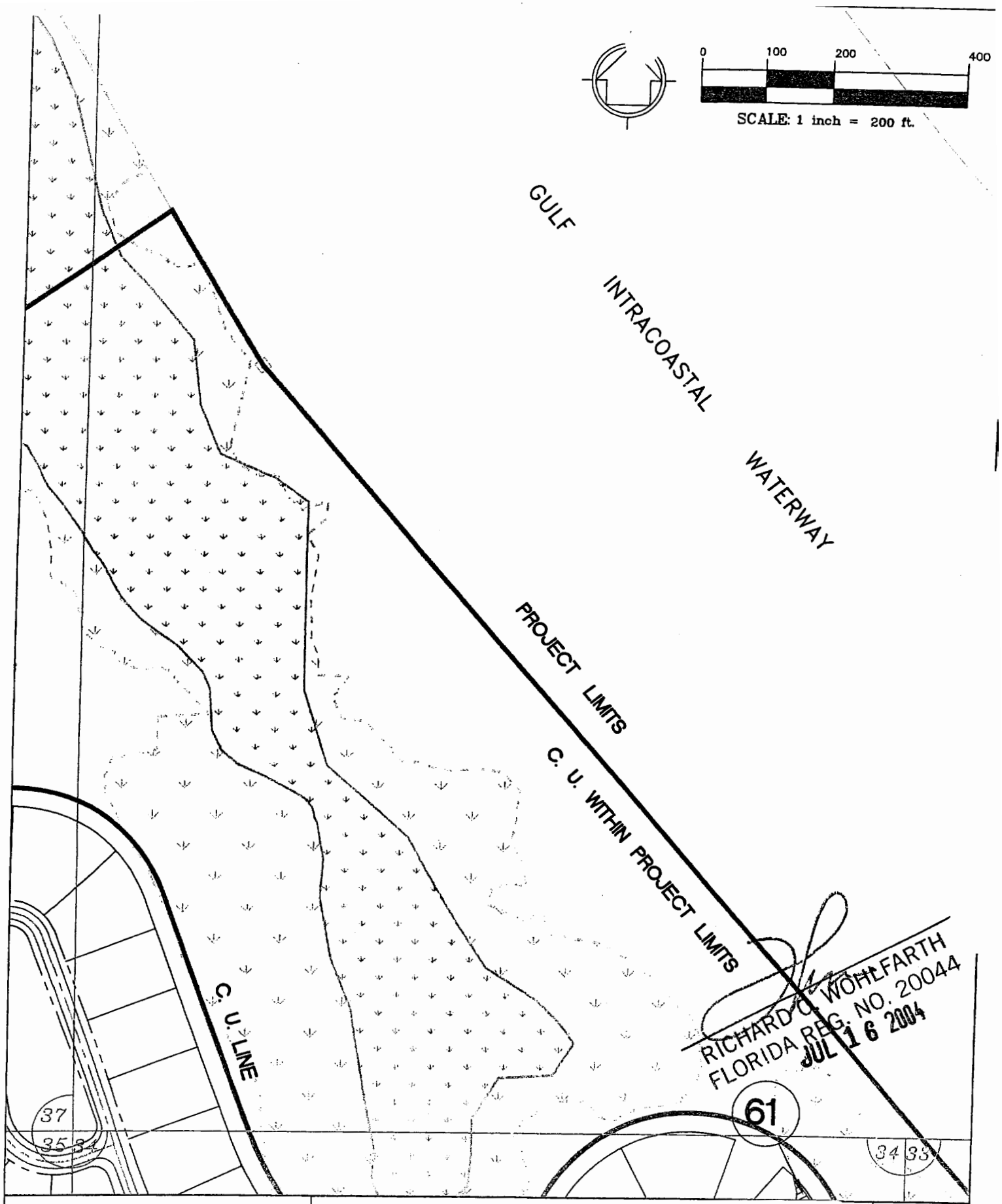
DWG. NO.
35



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GIS Consultants
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Environmental Consultants

2200 PARK CENTRAL BLVD. N. SUITE 100 POMPANO BEACH, FL 33064 (954) 974-2253

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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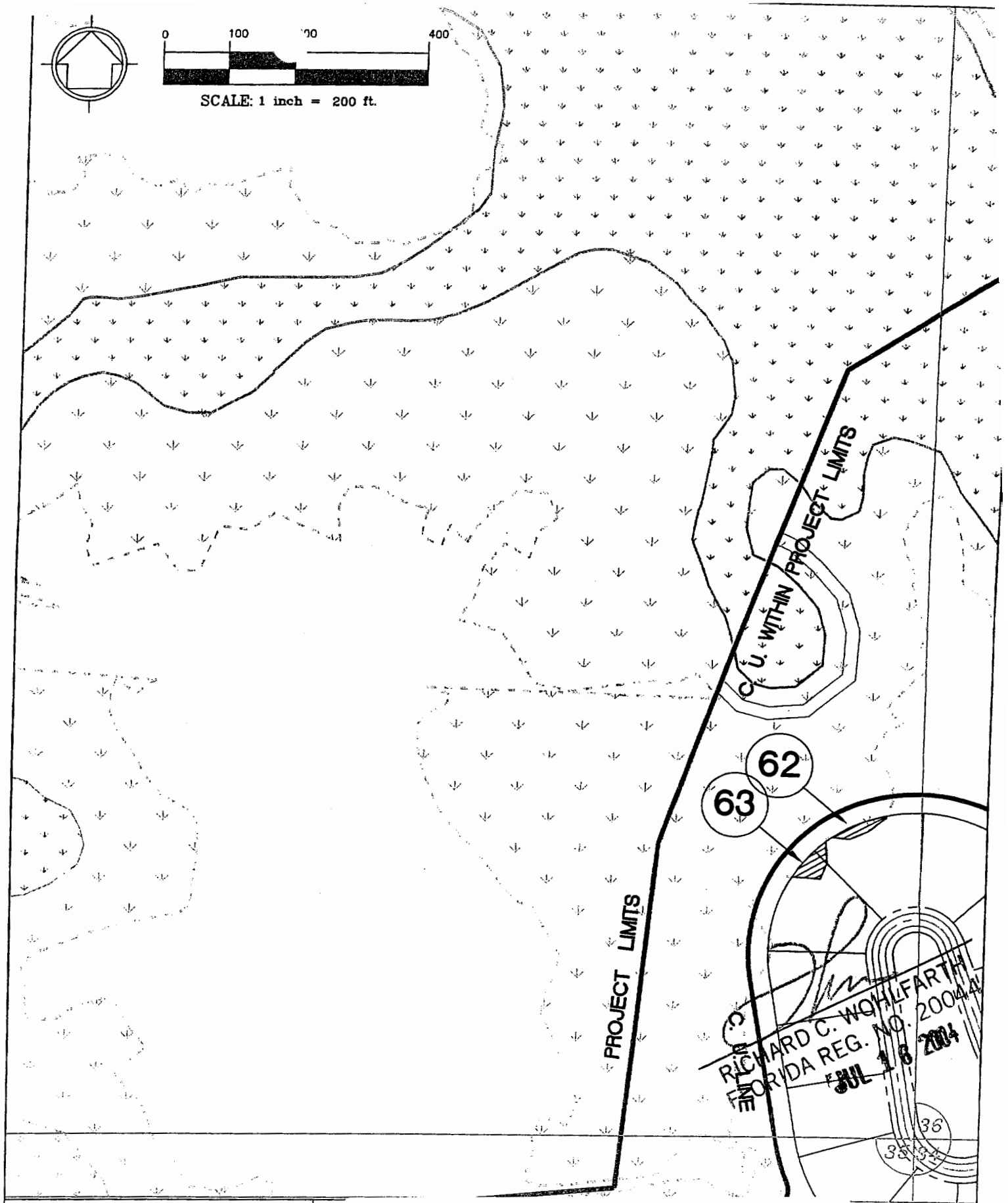
DWG. NO.
36



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Engineers Planners
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GIS Consultants
Landscape Architects
Environmental Consultants

2200 PARK CENTRAL BLVD. N. SUITE 100 POMPANO BEACH, FL 33064 (954) 974-2200

US Army Corps of Engineers

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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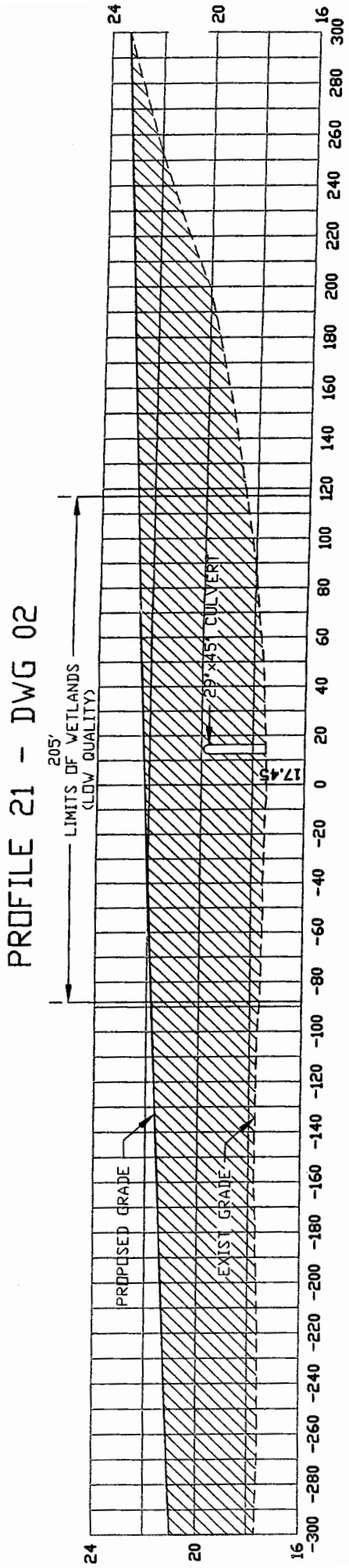
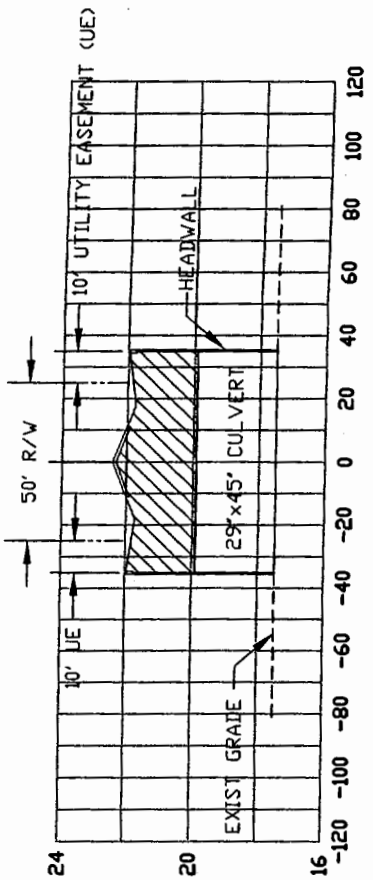
DWG. NO.
37





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2005

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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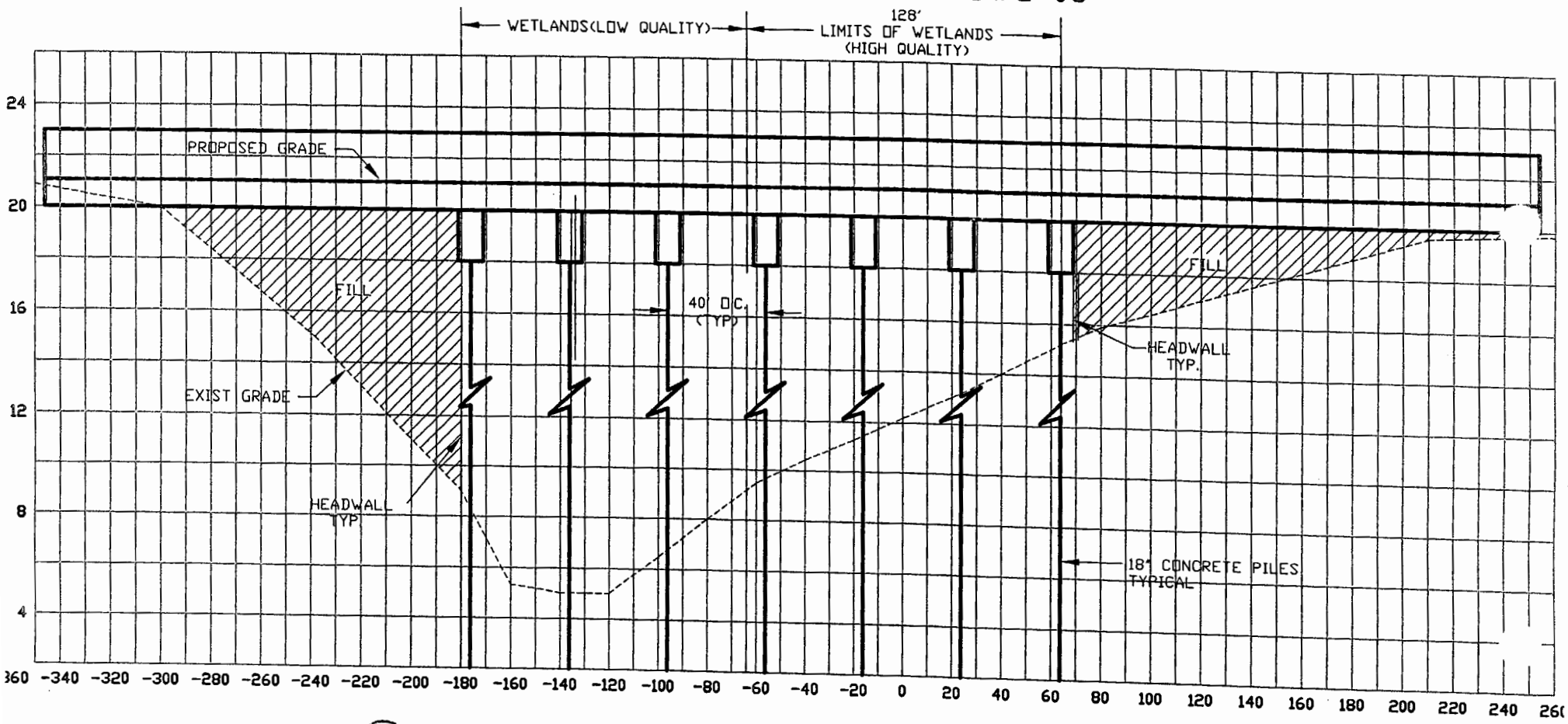
SHEET 101

PROFILE 23 - DWG 05



SCALE: VERT. 1"=6'
HORZ. 1"=60'

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Engineers Planners
Surveyors & Mappers
GIS Consultants
Landscape Architects
Environmental Consultants

SHEET P02

US Army Corps of Engineers

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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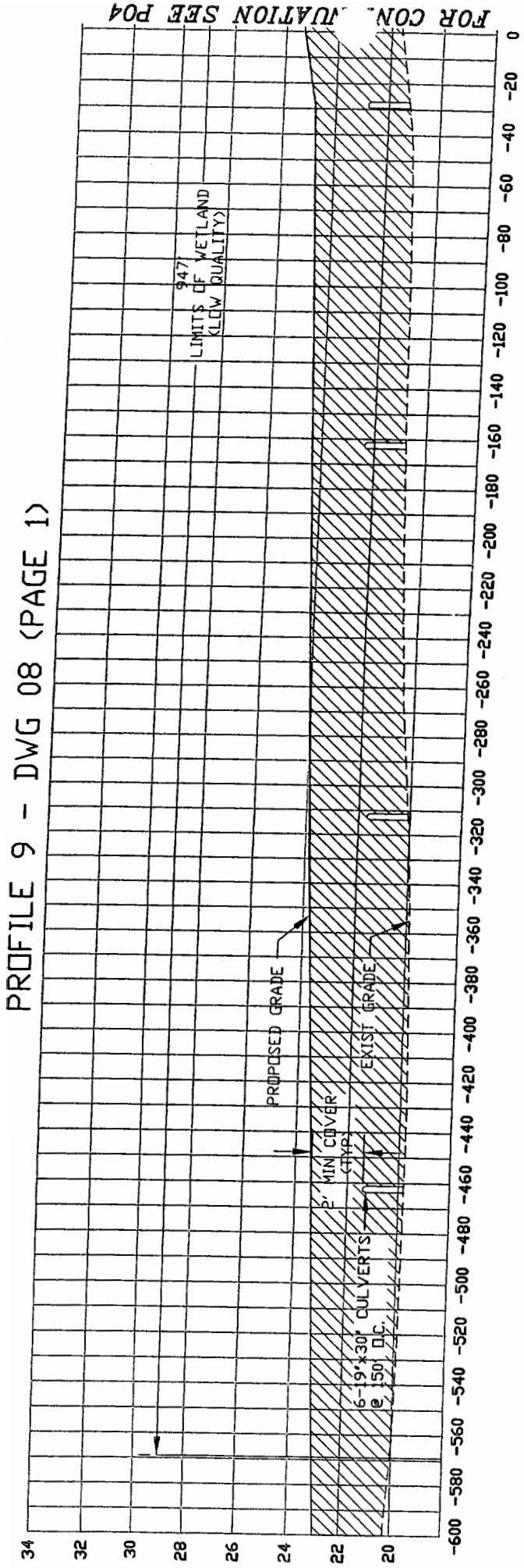

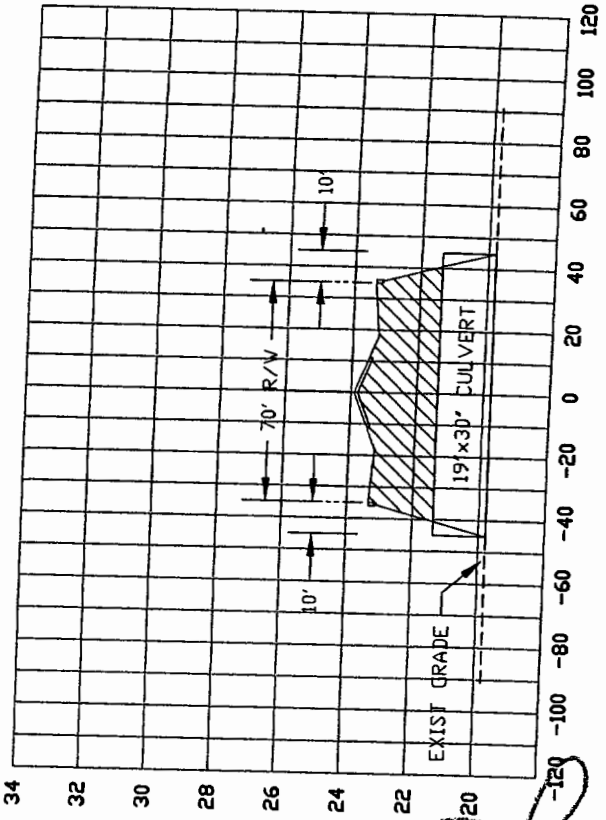

SCALE: VERT. 1"=4'
HORZ. 1"=60'

RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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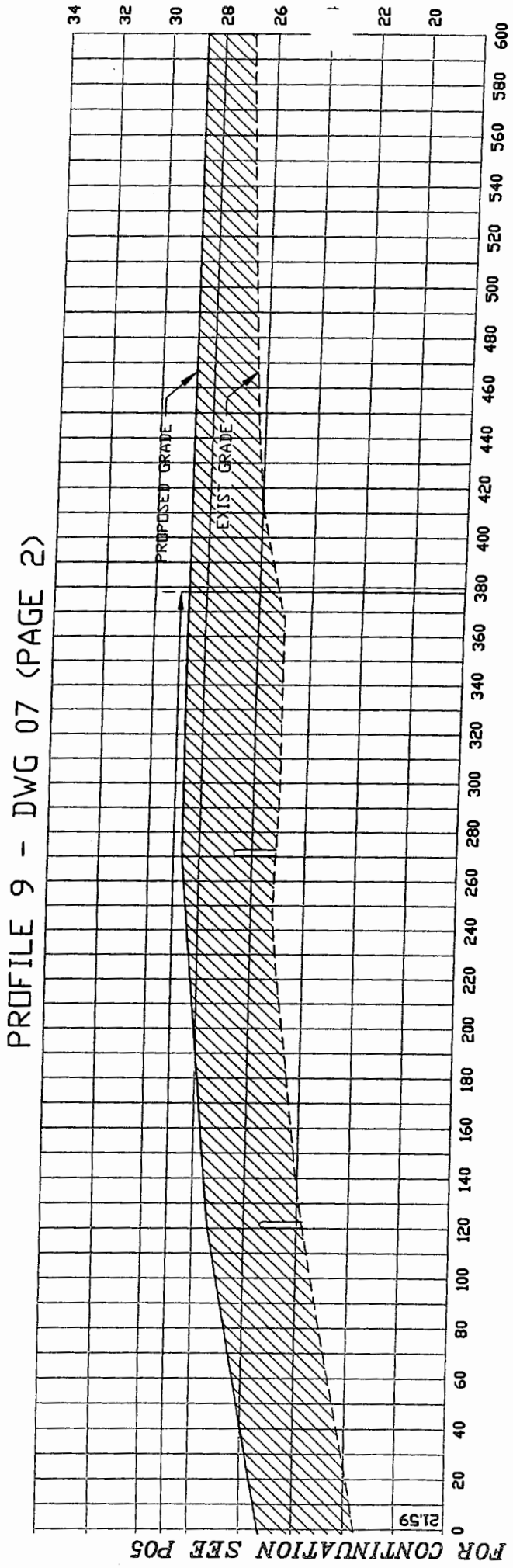
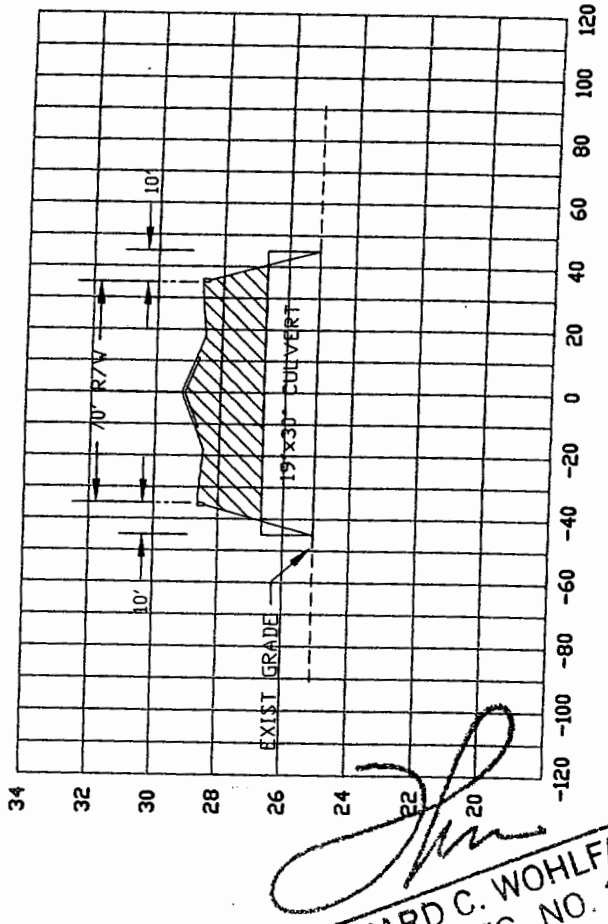
SHEET P03





SCALE: VERT. 1"=6'
HORZ. 1"=60'

RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

US Army Corps of Engineers

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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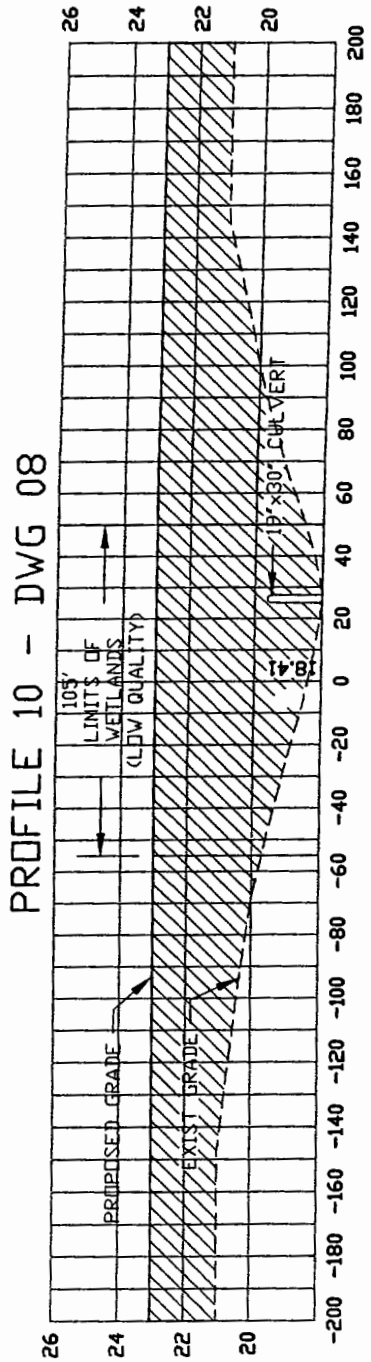
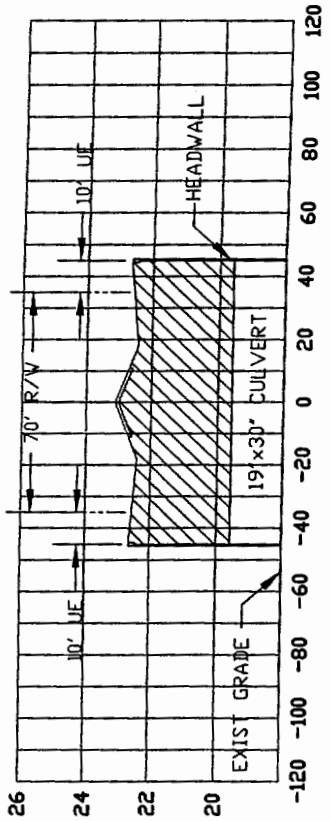
SHEET 104





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1'=6'
HORZ. 1'=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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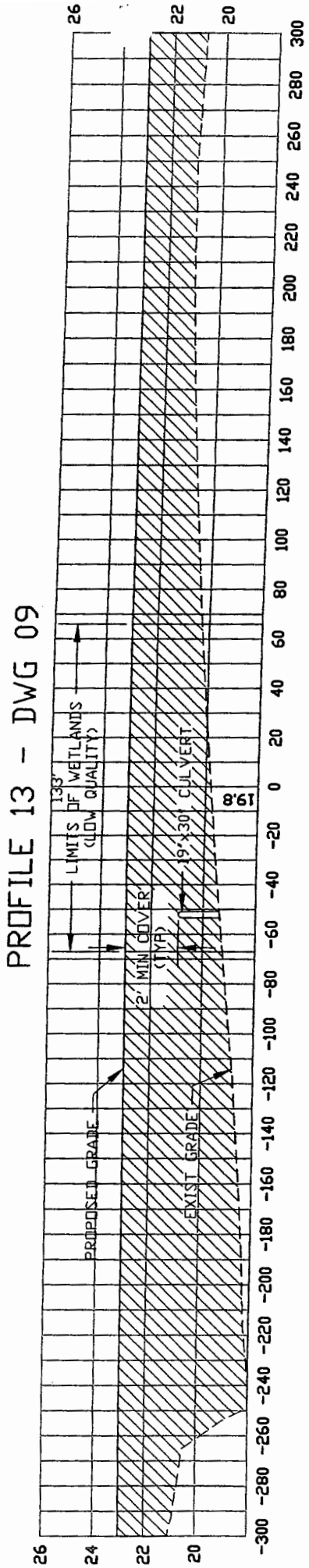
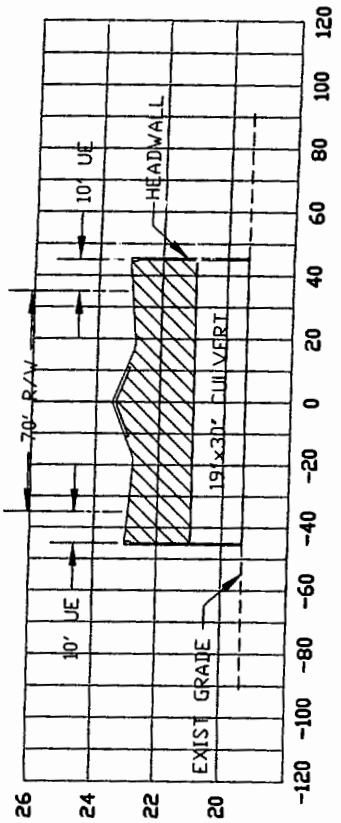
SHEET P05





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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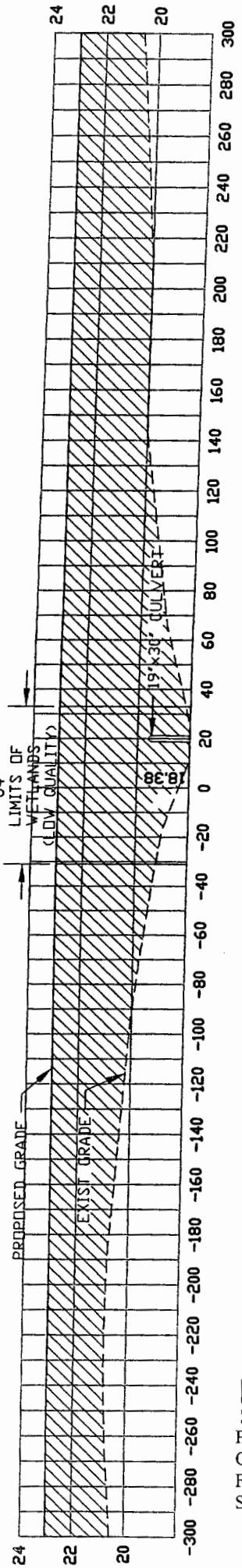
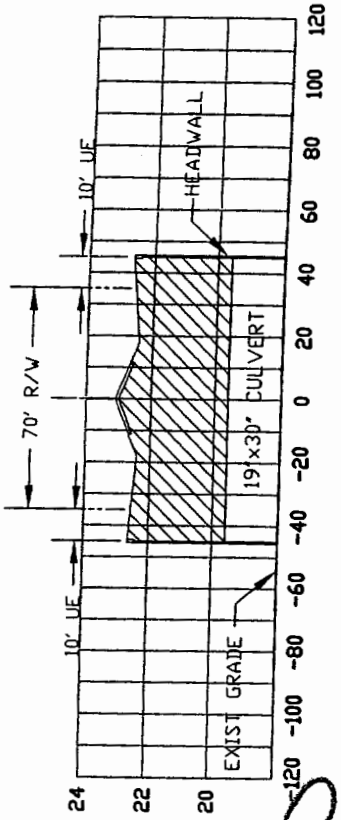
SHEET P06

PROFILE 12 - DWG 09





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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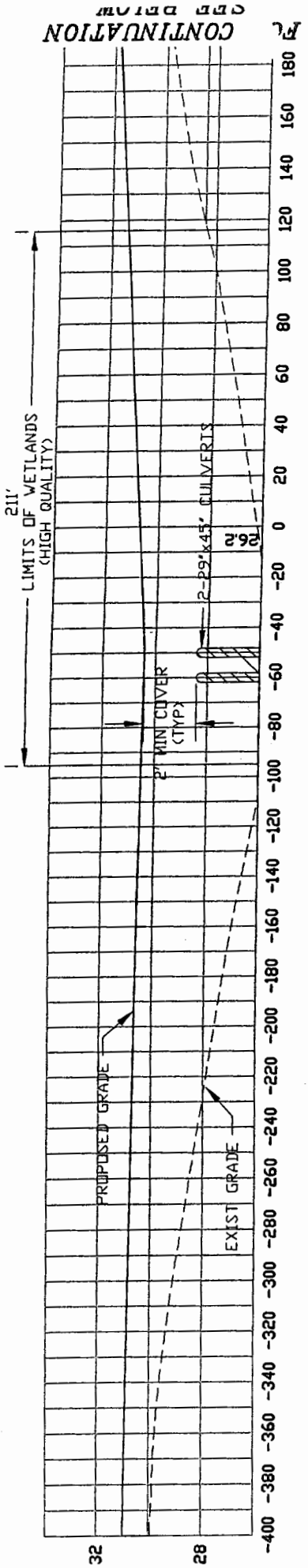
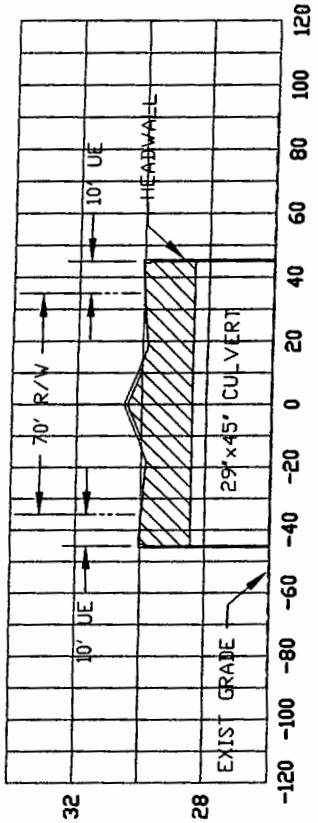
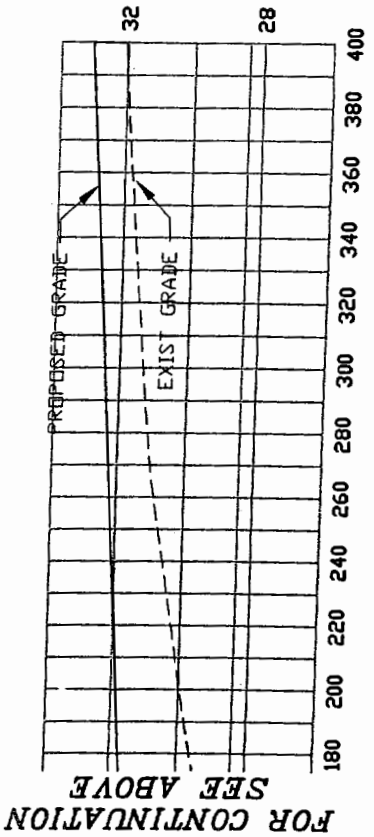
PROFILE 18 - DWG 10







RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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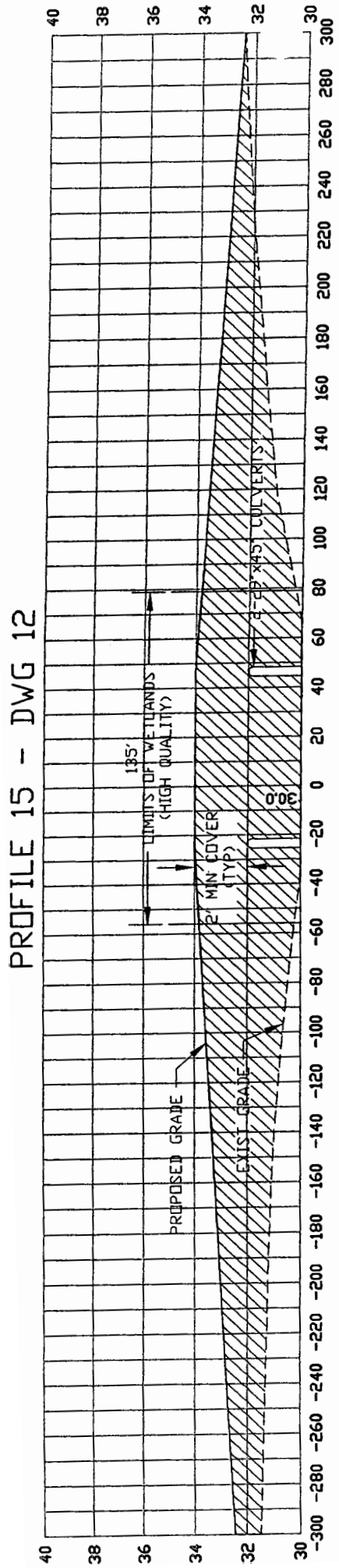
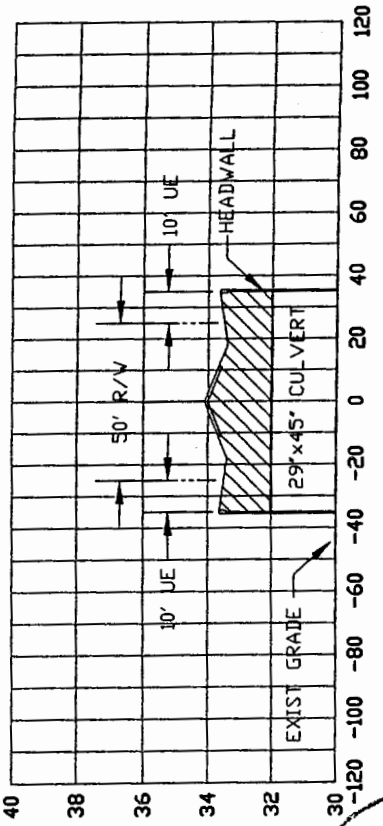
SHEET PUB





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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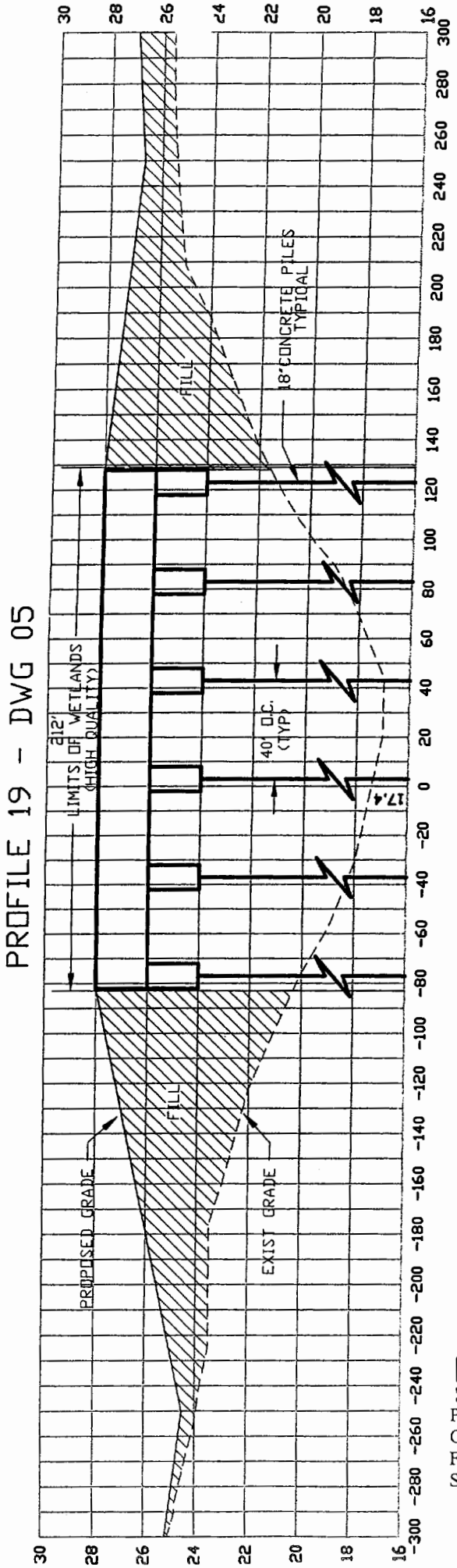
SHEET P09



RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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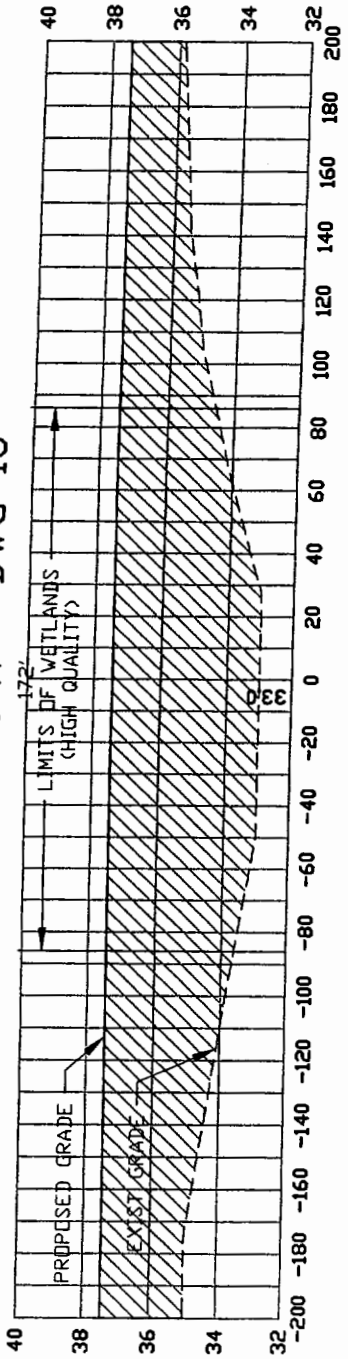
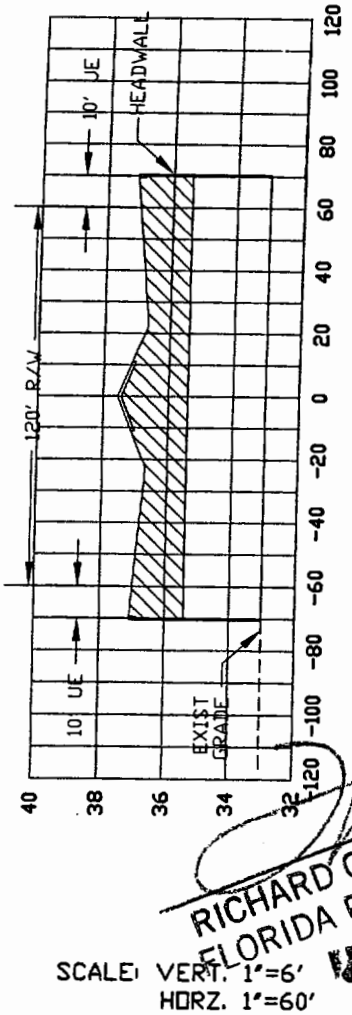
SHEET 19

PROFILE 1-A - DWG 16





SCALE: VERT. 1"=6'
HORZ. 1"=60'

RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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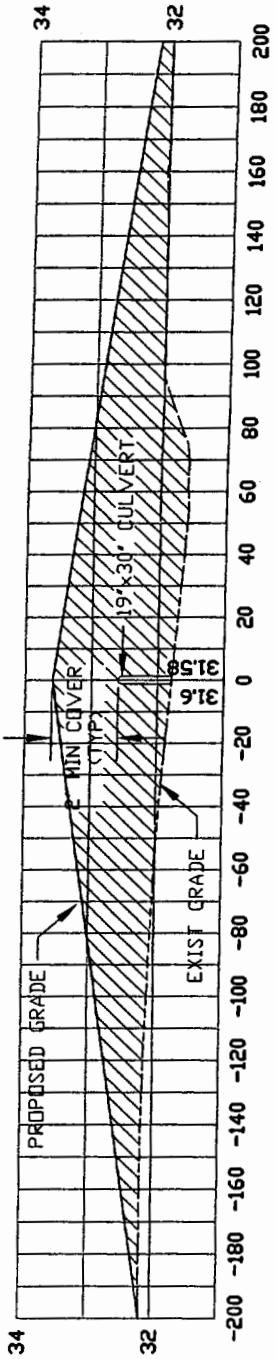
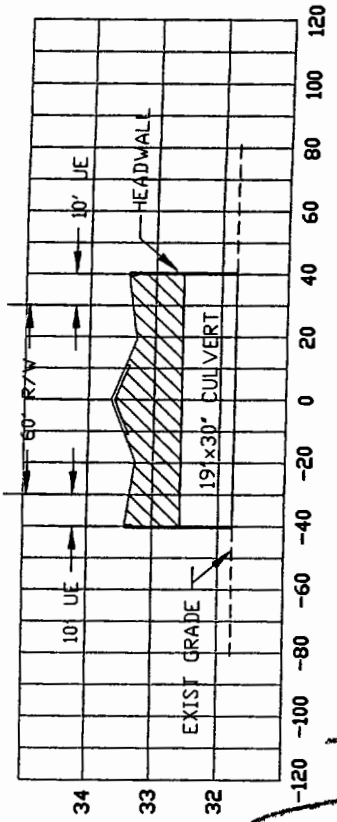
SHEET P11

PROFILE 16 - DWG 10





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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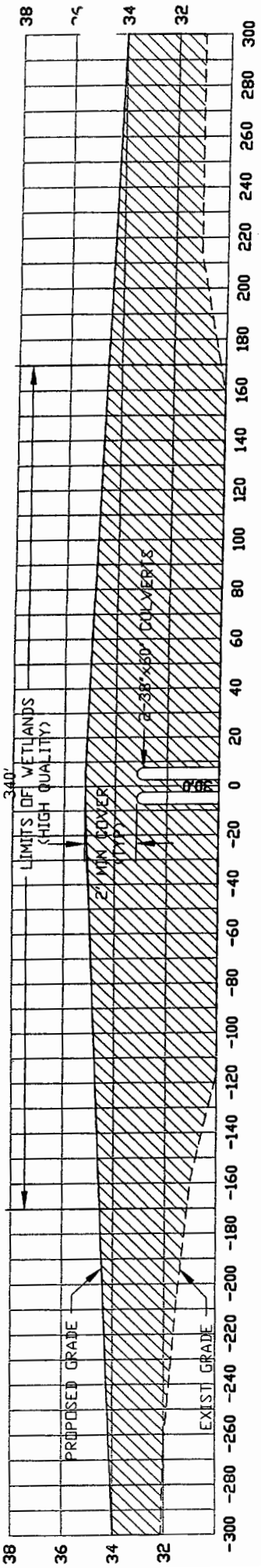
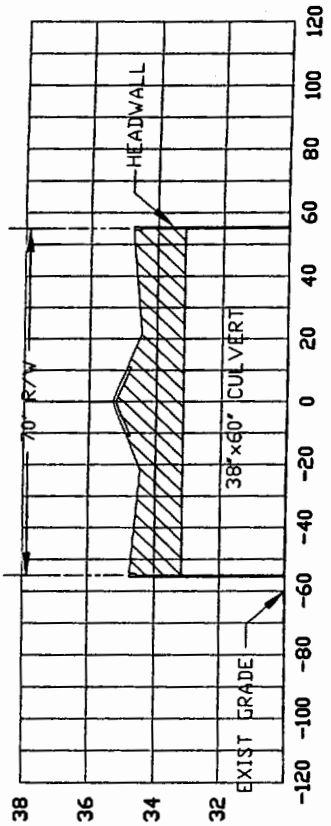
SHEET P12

PROFILE 51 - DWG 17





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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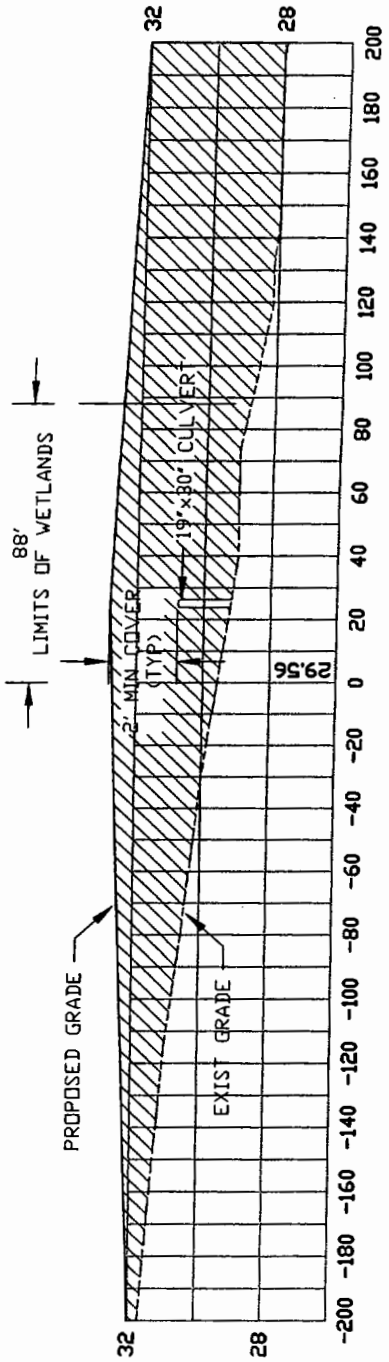
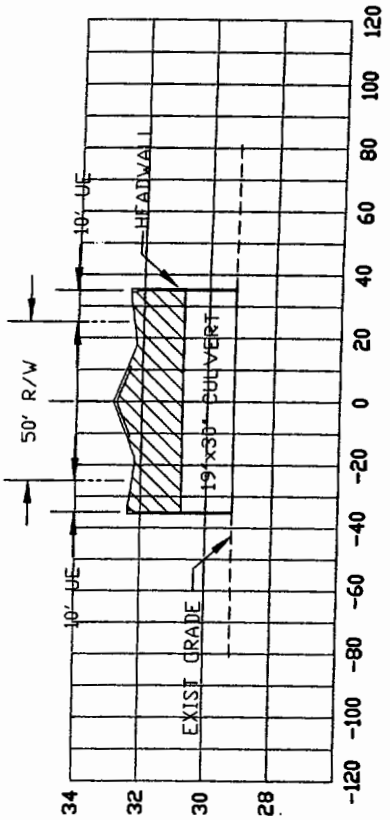
SHEET P13

PROFILE 08 - DWG 13





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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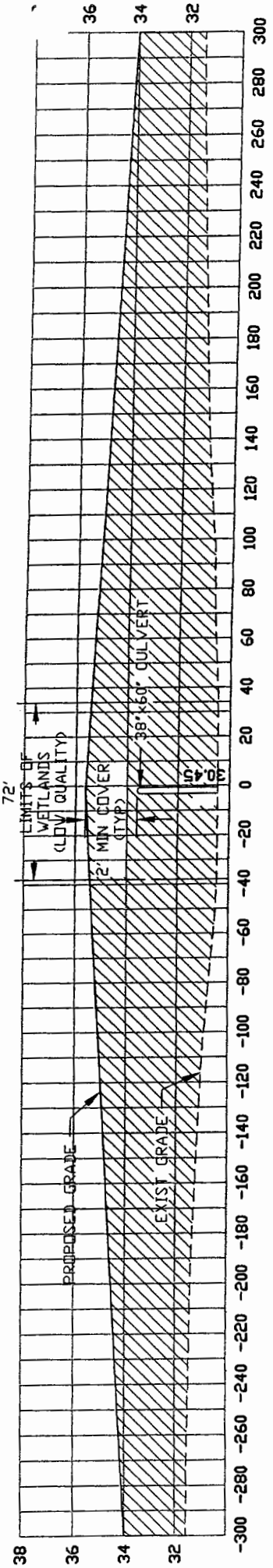
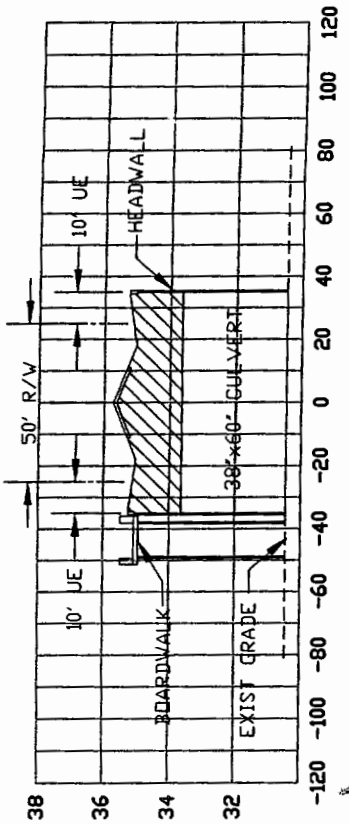
SHEET P14

PROFILE 37 - DWG 19





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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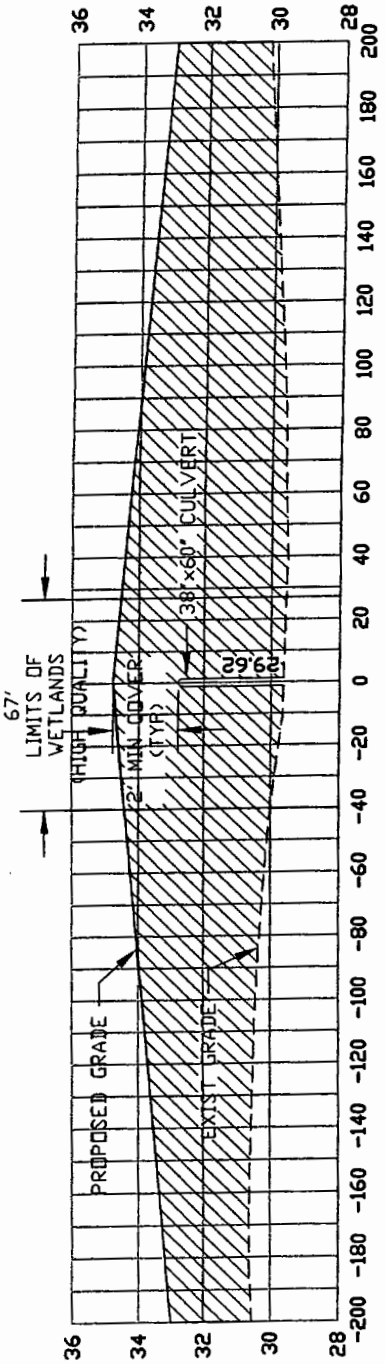
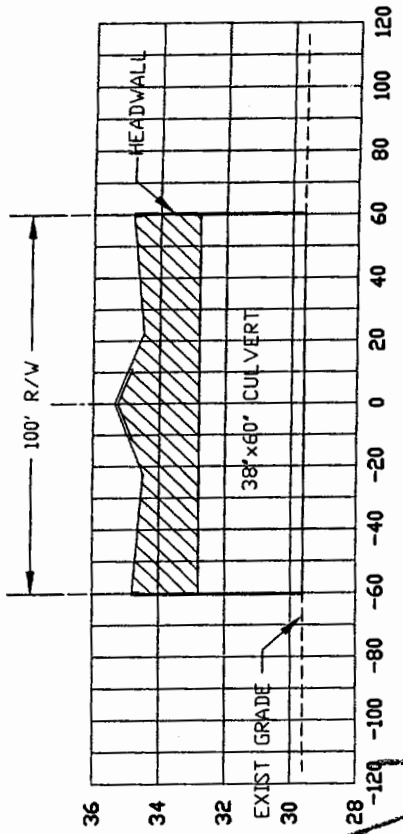
SHEET P15

PROFILE 47 - DWG 19





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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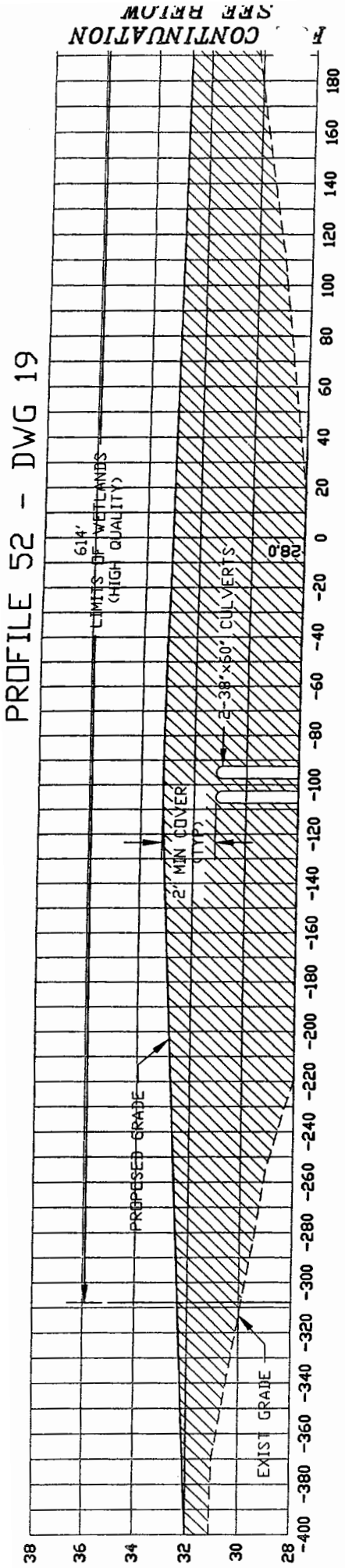
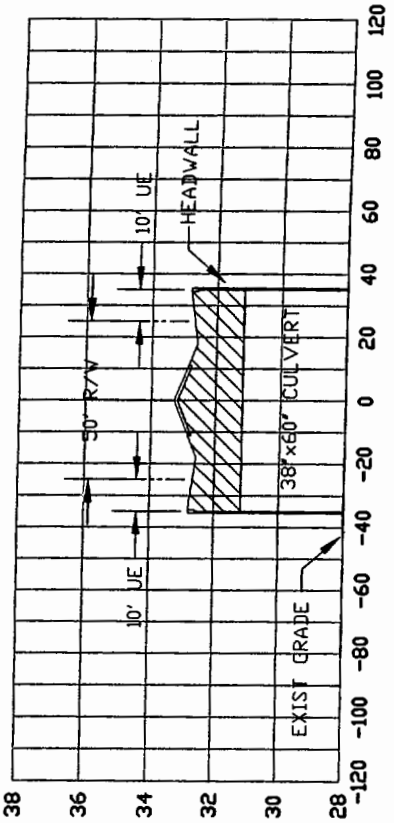
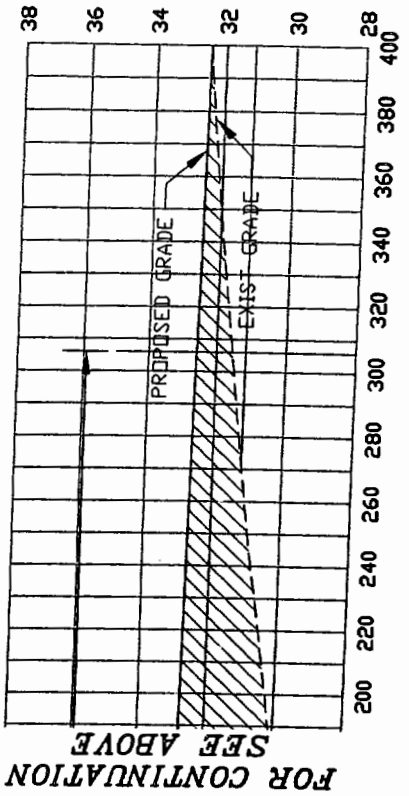
SHEET P16







RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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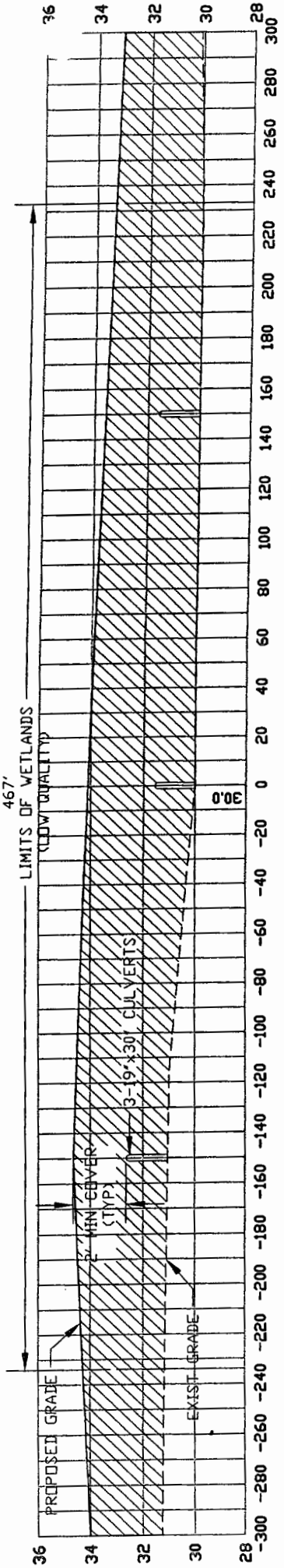
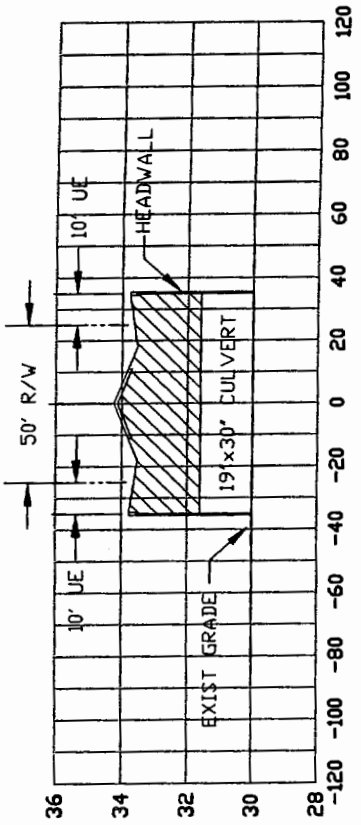
SHEET P17

PROFILE 73 - DWG 28





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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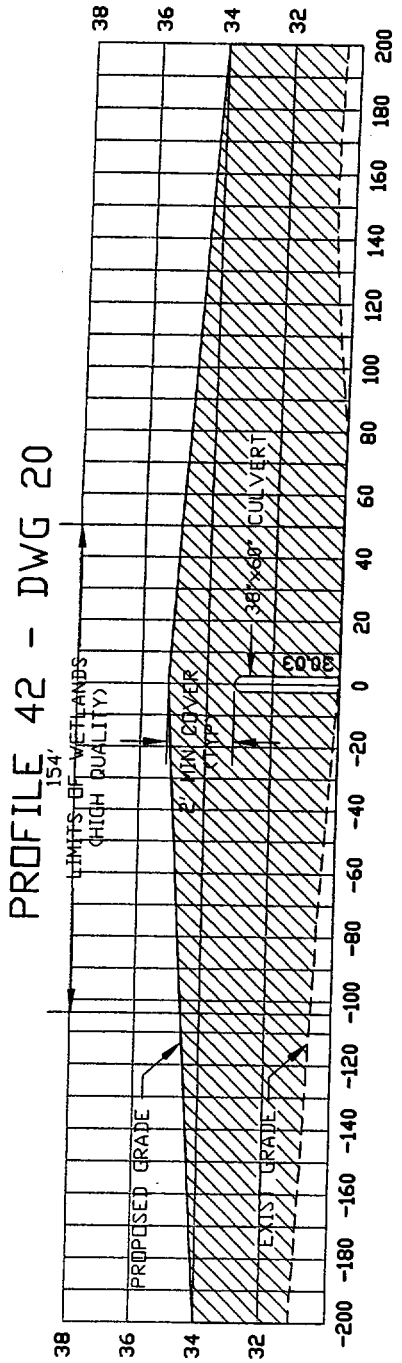
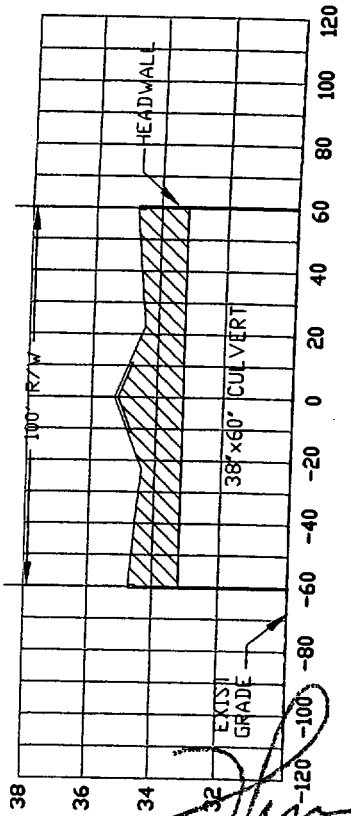
SHEET P18





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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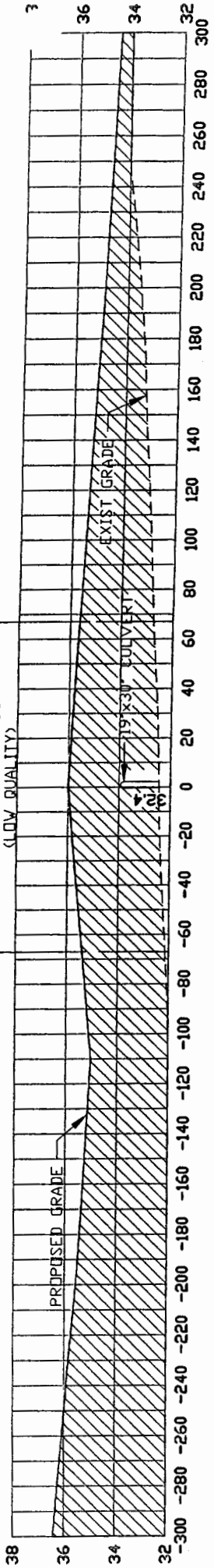
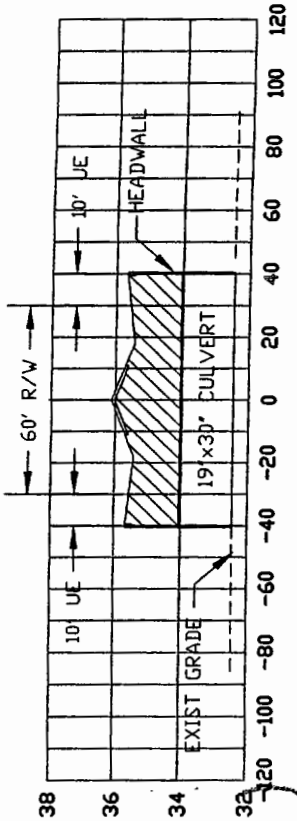
SHEET P19

PROFILE 34 - DWG 20





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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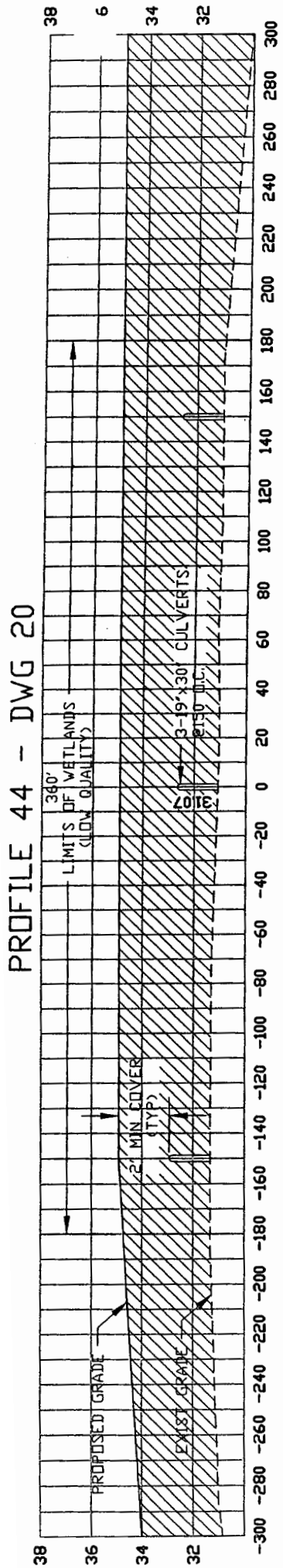
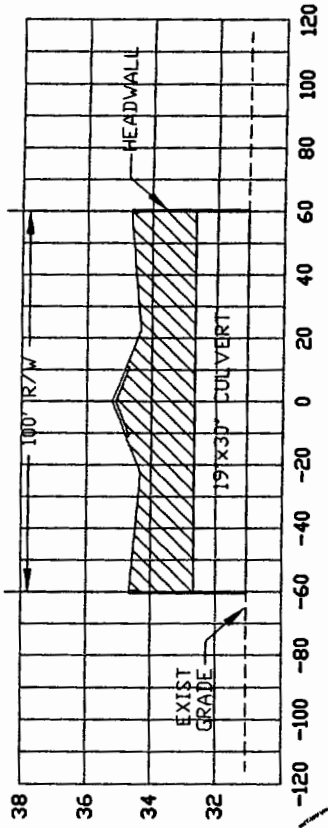
SHEET P20





RICHARD C. WOHLFARTH
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HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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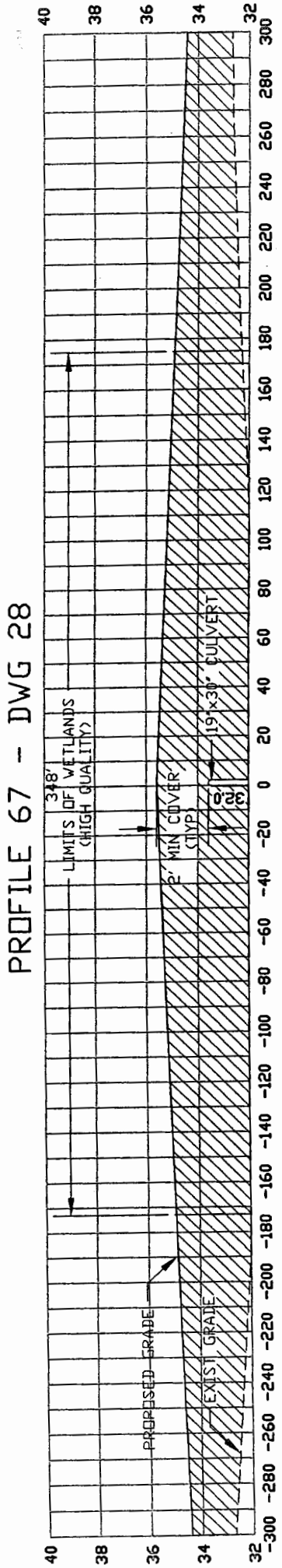
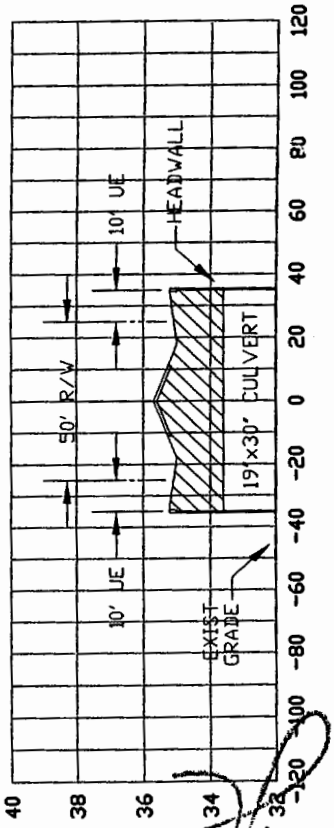
SHEET P21





RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1'=6'
HORZ. 1'=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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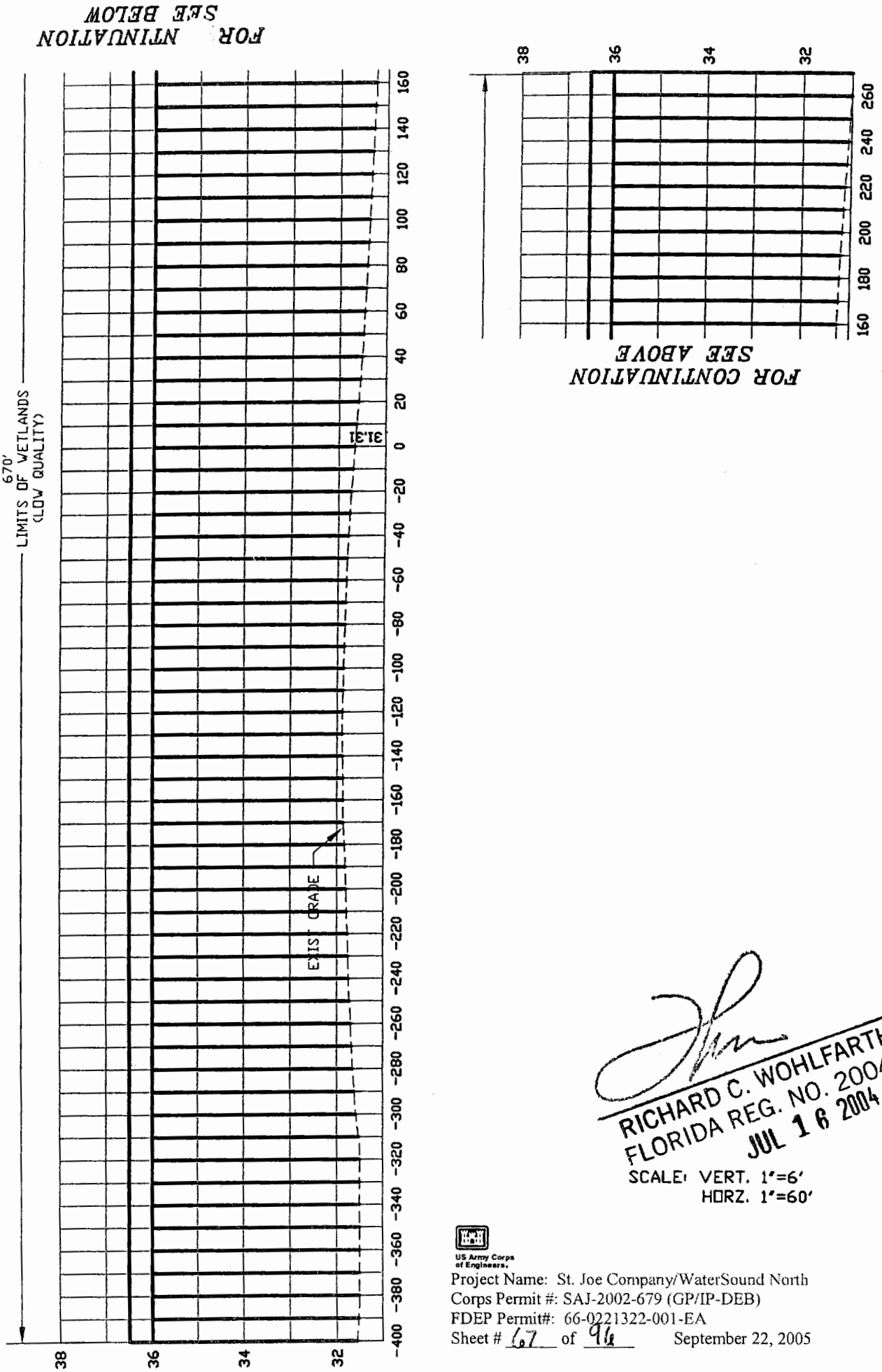
BOARDWALK 6

PROFILE 15-1 - DWG 32



RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

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HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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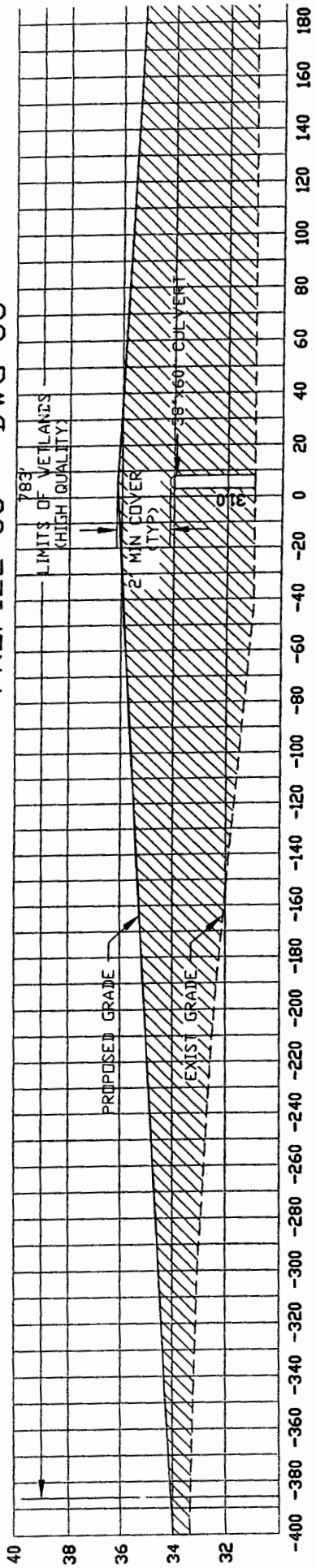
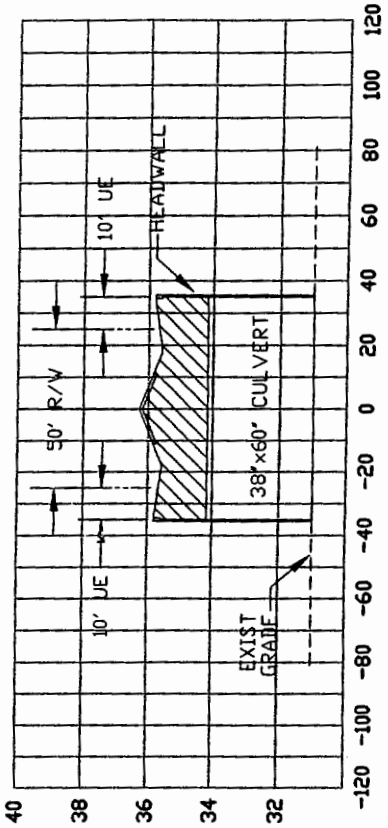
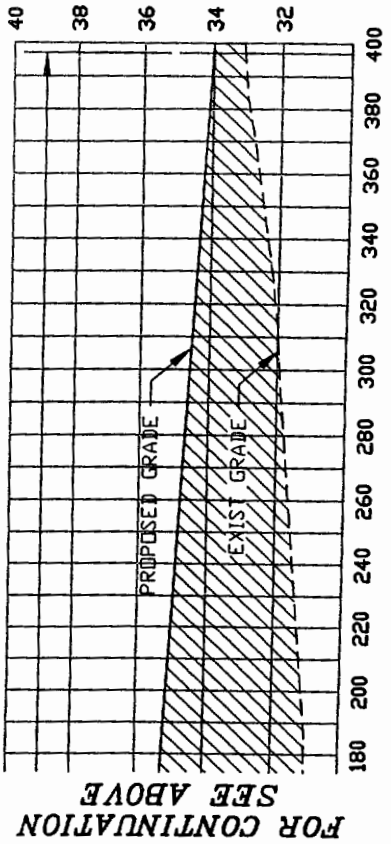
PROFILE 58 - DWG 33







RICHARD C. WOHLFARTH
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JUL 16 2004

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HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
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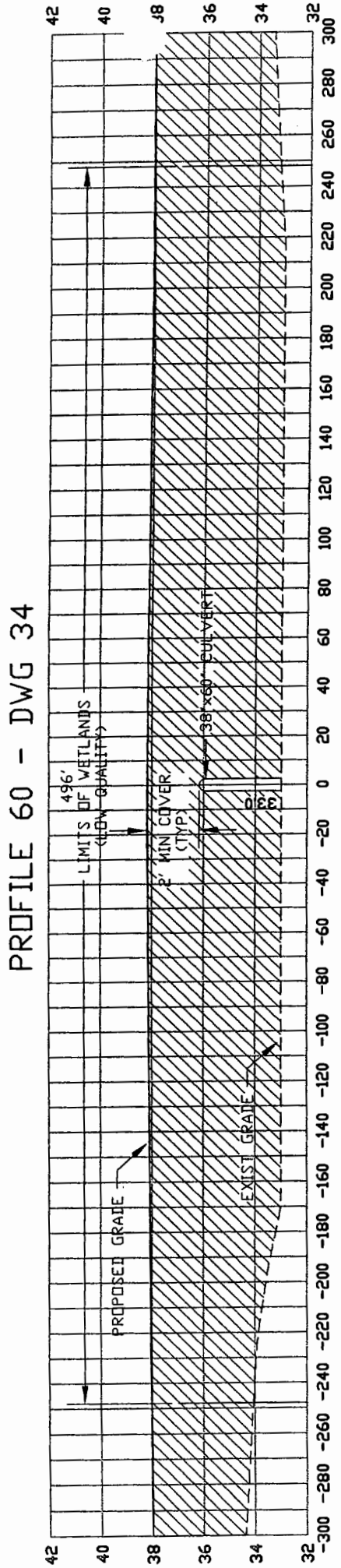

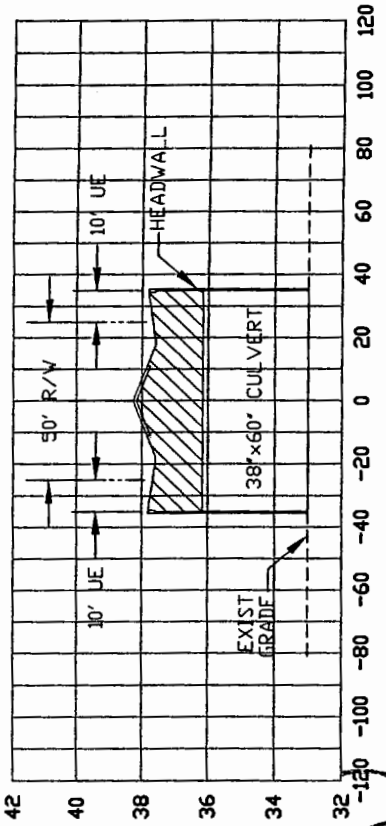

RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1"=6'
HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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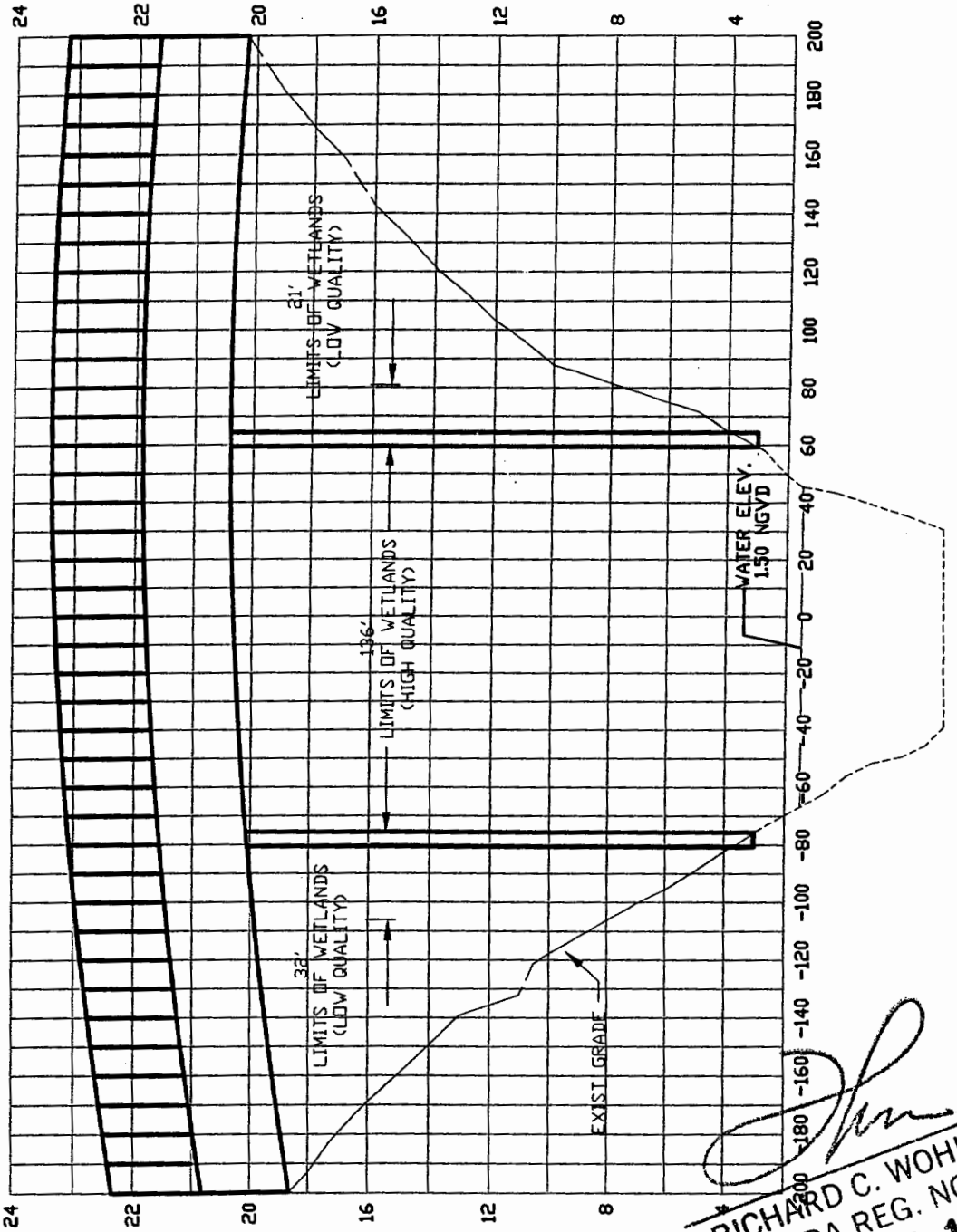
SHEET P29

BOARDWALK 7
DWG. 02



RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

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HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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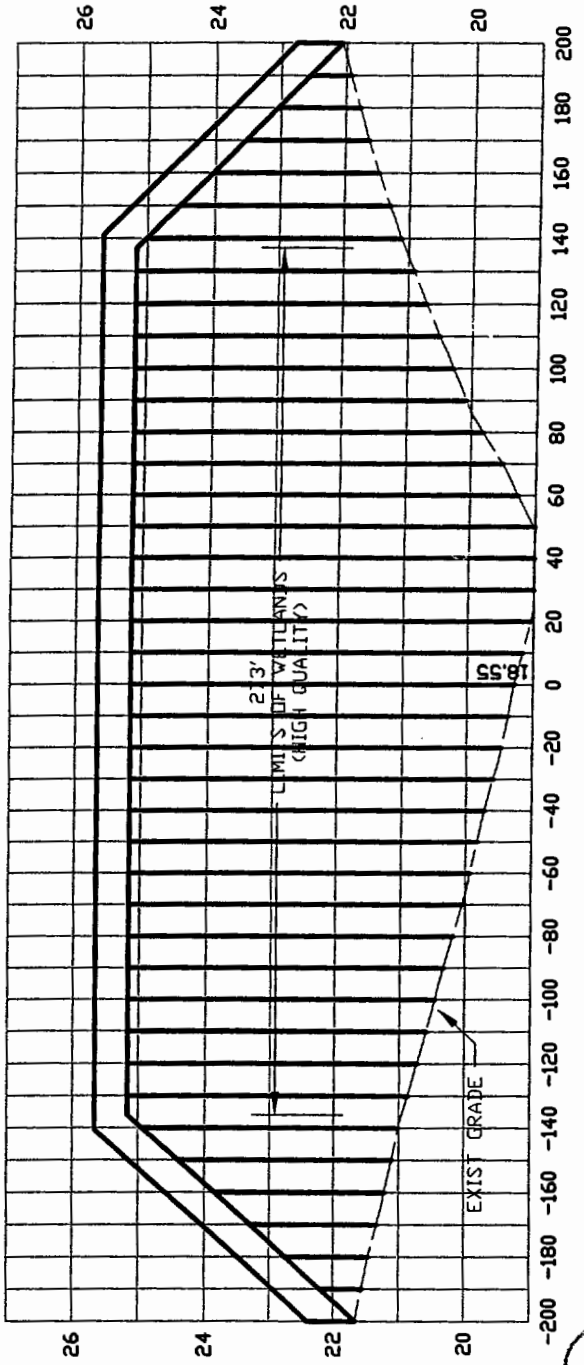
CCL CONSULTANTS, INC.
Engineers Planners
Surveyors & Mappers
GIS Consultants
Landscape Architects
Environmental Consultants

SHEET P30

BOARDWALK 1
DWG. 05



RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

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HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
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Engineers Planners
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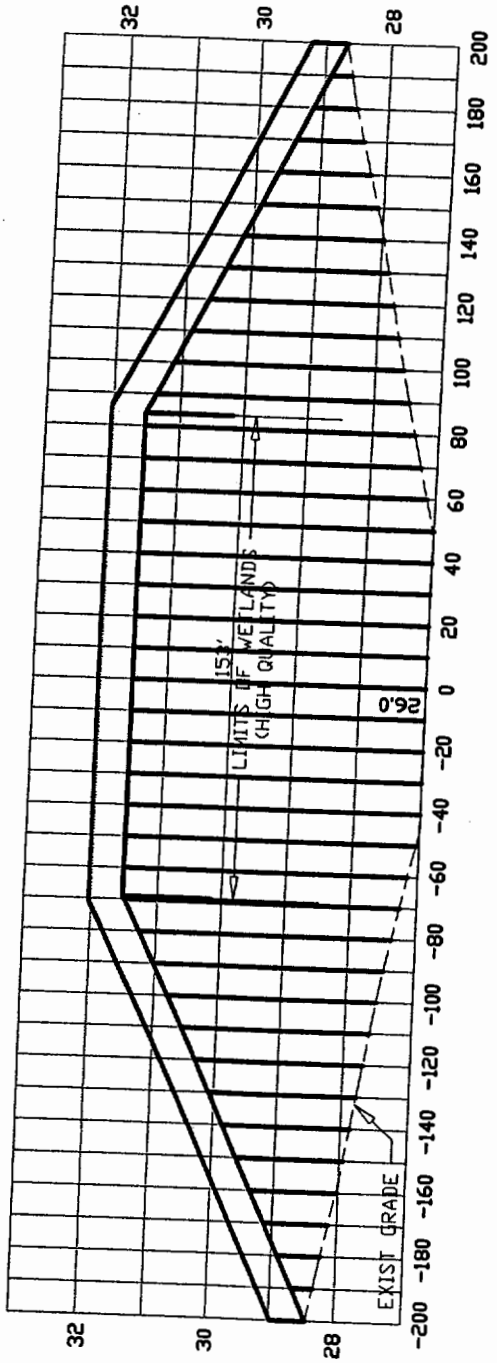
GIS Consultants
Landscape Architects
Environmental Consultants

SHEET P31

BOARDWALK 2
DWG. 10



RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

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HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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CCL CONSULTANTS, INC.
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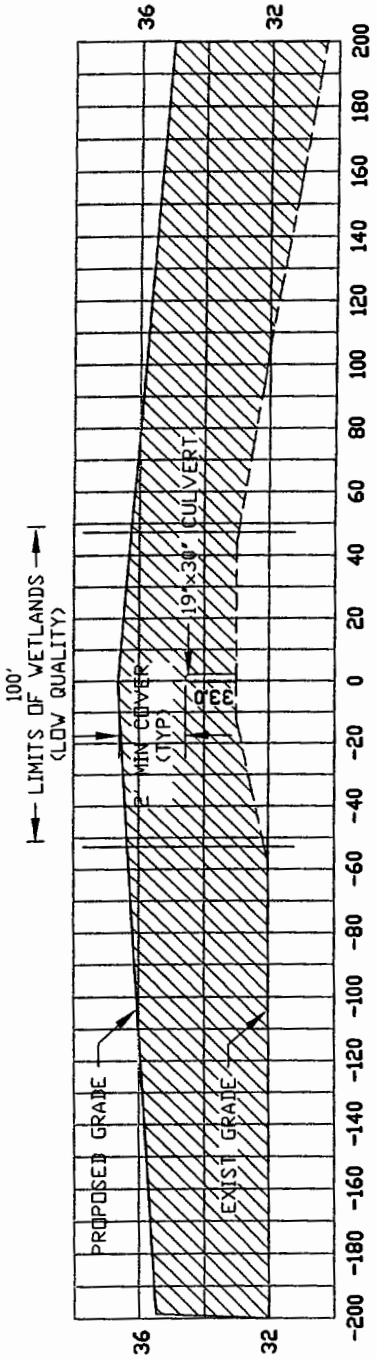
GIS Consultants
Landscape Architects
Environmental Consultants

SHEET P32

PROFILE 39 - DWG 17



RICHARD C. WOHLFARTH
FLORIDA REG. NO. 20044
JUL 16 2004

SCALE: VERT. 1'=6'
HORZ. 1'=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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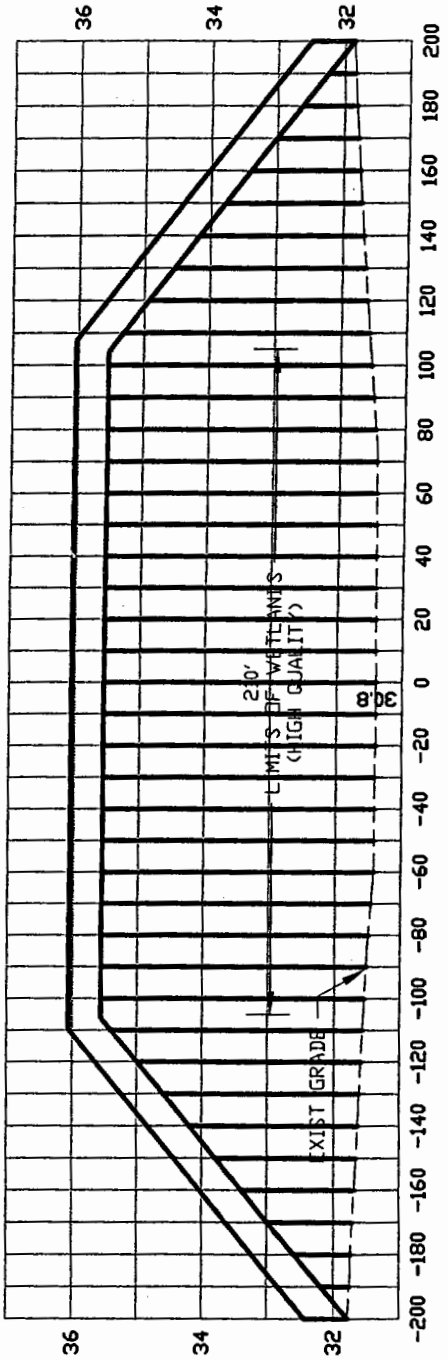
Engineers Planners
Surveyors & Mappers
GIS Consultants
Landscape Architects
Environmental Consultants

SHEET P33

BOARDWALK 3
DWG. 19



RICHARD C. WOHLFARTH
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JUL 16 2004

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HORZ. 1"=60'

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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Engineers Planners
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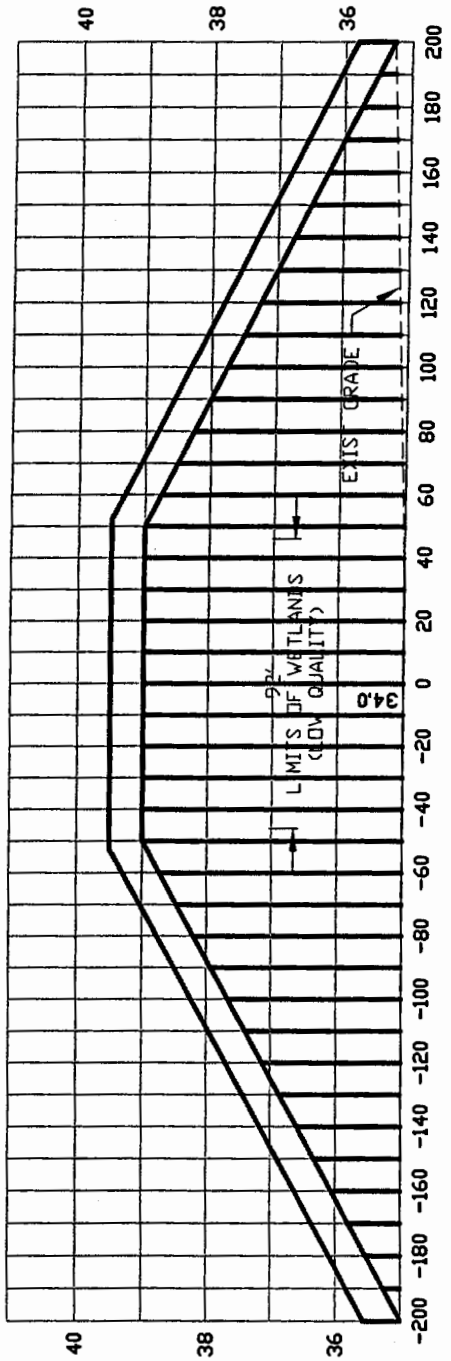
Landscape Architects
Environmental Consultants

SHEET P34

BOARDWALK 4
DWG. 21



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GIS Consultants
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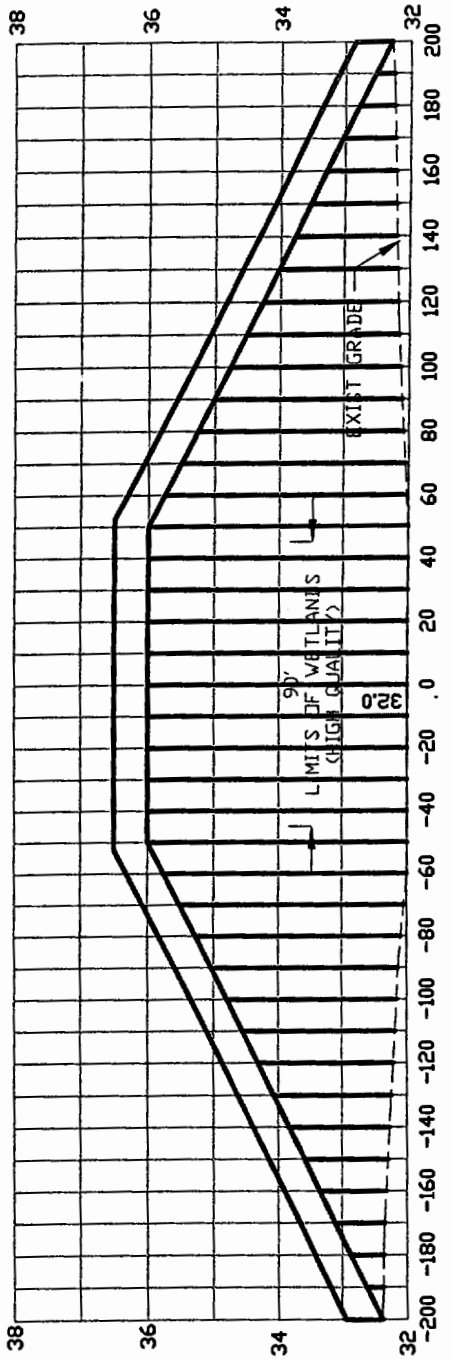
Environmental Consultants

SHEET P35

BOARDWALK 5
DWG. 15



RICHARD C. WOHLFARTH
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JUL 16 2004

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US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
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GIS Consultants
Landscape Architects
Environmental Consultants

SHEET P36

LEGEND

BASIN LINE

SWP STORM WATER POND

GOLF COURSE GREEN NUMBER

ADJACENT DWG. NO.

16 15
04

MATCH LINES

WETLAND - LOW QUALITY

WETLAND - HIGH QUALITY

10 WETLAND IMPACT NUMBER

WETLAND IMPACT - LOW QUALITY

WETLAND IMPACT - HIGH QUALITY

NON-REGULATED WETLAND IMPACT

ISOLATED WETLAND

ISOLATED WETLAND IMPACT NUMBER I-A

30 FOOT WETLAND BUFFER (HIGH QUALITY)

50 FOOT WETLAND BUFFER (HIGH QUALITY)

PROPERTY LINE(P.L.) DESIGNATES OWNERSHIP

C. U. WITHIN PROJECT LIMITS

CONSERVATION UNIT LINE

PROJECT LIMITS

US Army Corps of Engineers

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FARTH 20044 14

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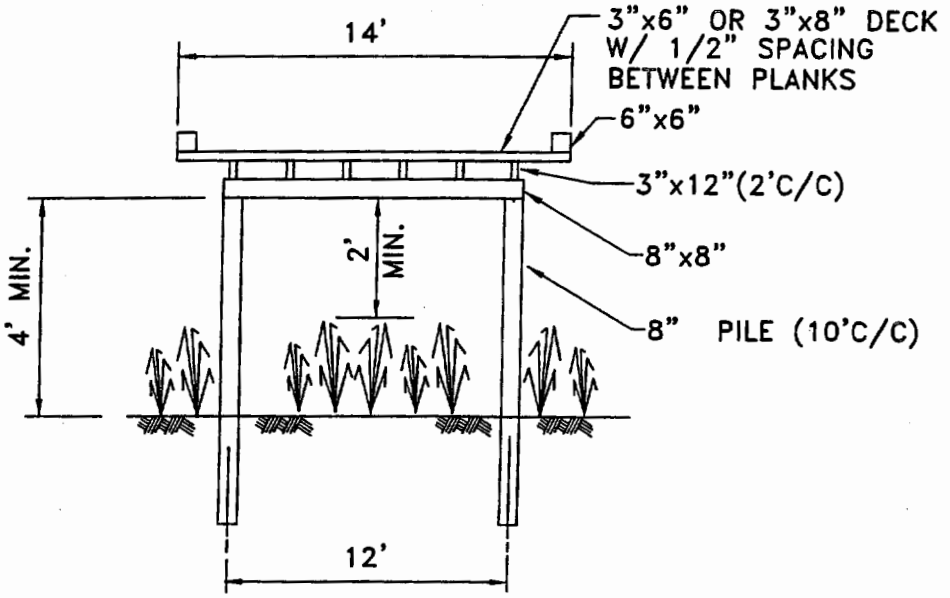
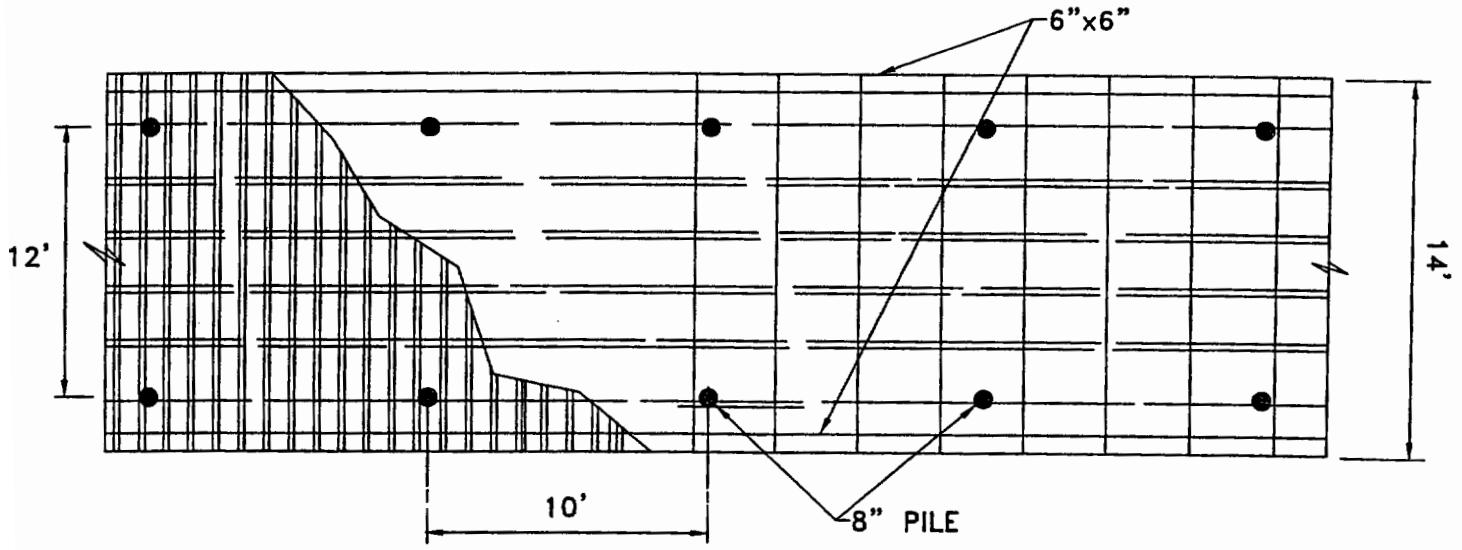
Surveyors & Mappers
GIS Consultants
Landscape Architects
Environmental Consultants

NOTE:

TYPE OF CONSTRUCTION

1. TOP DOWN





BOARDWALK CROSSING

TYPICAL SECTION

N.T.S.

RICHARD C. WOI
FLORIDA REG. N(

JUL 16 2004

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
Corps Permit #: SAJ-2002-679 (GP/IP-DEB)
FDEP Permit#: 66-0221322-001-EA
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ST JOE

October 23, 2003

Mr. Don Hambrick
U.S. Army Corps of Engineers
Panama City Regulatory Field Office
475 Harrison Avenue, Suite 202
Panama City, FL 32401

RECEIVED
OCT 27 2003
JACKSON... DISTRICT
USACE

Mr. Larry O'Donnell
Department of Environmental Protection
160 Government Center
Pensacola, FL 32501-5794

Mr. Hildreth Cooper
U.S. Fish & Wildlife Service
1601 Balboa Ave.
Panama City, FL 32405

Subject: **Modification to the Joint Application for Watersound North, a St. Joe Arvida project located in Sections 13, 14, 15, 22, 23, 24, 25 & 26, Township 2 South, Range 18 West, Walton County, FL.**

Gentlemen,

The effort to provide data and documentation for the Biological Assessment portion of the RGP SAJ-86 / St. Joe EMA for Bay and Walton Counties, involved a detailed survey of potential Flatwoods Salamander (FWS) habitat (*Ambystoma cingulatum*) throughout the RGP area. A total of 85 potential flatwoods salamander habitat locations were identified from aerial photography and soils maps. Onsite investigations were conducted for all 85 areas, by a consultant team led by John Palis. The onsite habitat evaluations revealed that 9 of the 85 sites do contain suitable habitat (see Exhibit 1 – Potential FWS Ponds). Seven of the nine are located within RMAs or CUs. Two of the nine are located within the "developable" area of the RGP/EMA. One of these, #64, falls within the boundaries of the Watersound North project, specifically within an area planned for the main spine road (see Exhibit 2 – Current DWG 02).

As a result of this discovery we have modified the plan to minimize impacts to the habitat while retaining project integrity. The proposed modifications include the following (see Exhibit 3 – Proposed DWG 02, Detail):

1. Removal of the golf cart crossing from the area.
2. Shifting of the road to the North to avoid impacting the savanna and minimize encroachment into the upland buffer along the savanna.

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5. Conservation Easements will be placed on both the adjacent wetland and remaining adjacent upland area, tying the site into the existing Wildlife Corridor Conservation Unit.
6. Active habitat management to maintain the ambient onsite conditions. The "site" includes approximately 2.64 acres of uplands, 1.63 acres of relatively intact savanna-like pond edge and 2.31 acres of cypress pond. The management goal will be focused on maintaining/ enhancing the ground cover and keeping woody midstory vegetation from encroaching (see Appendix B).

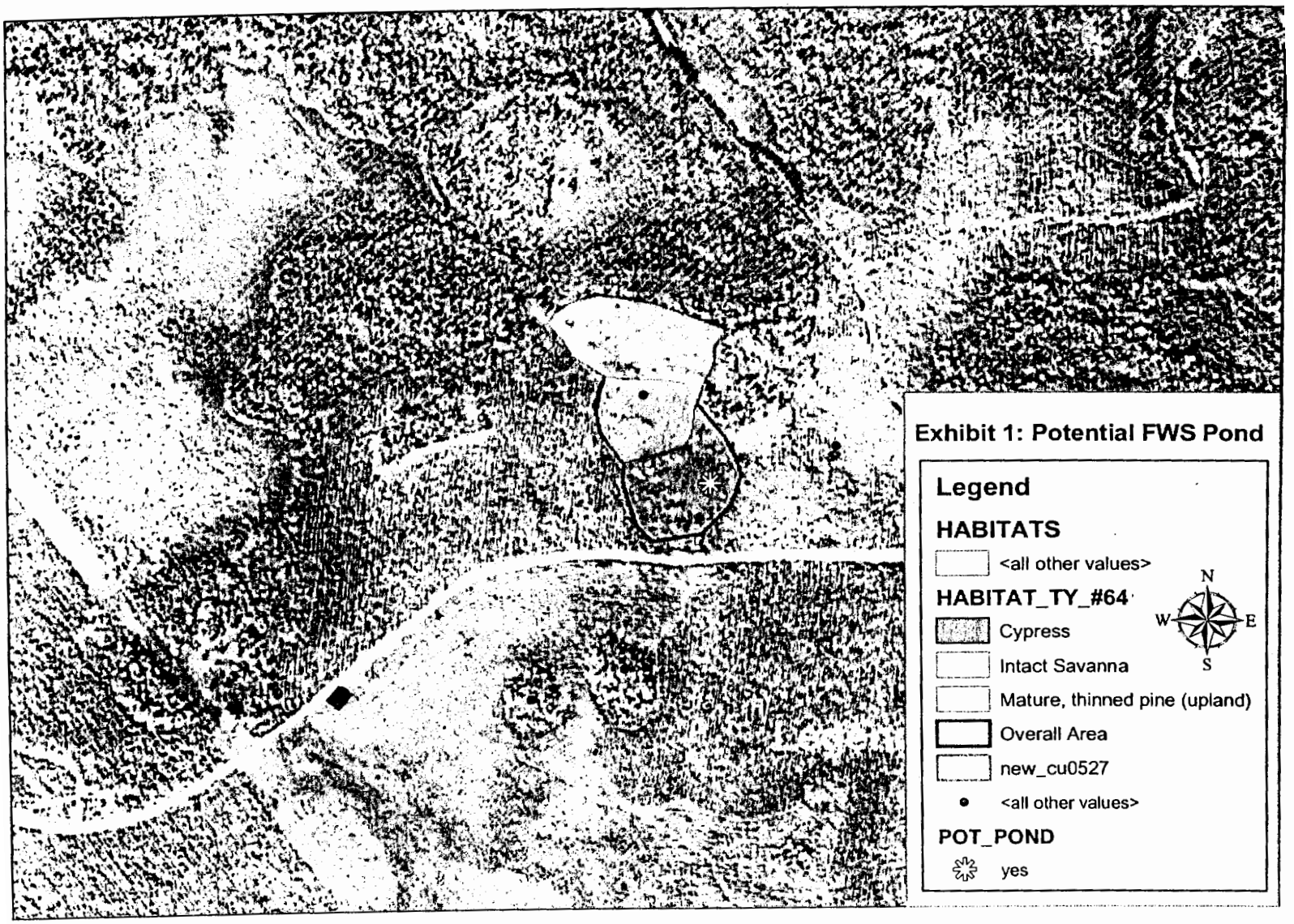
It should be stressed that this site as well as the other 8 located within the RGP were determined to be simply *potential habitat* for flatwoods salamanders, but that no individuals were observed or captured at any of these *potential habitat* sites. The Watersound North project team has acted in a very proactive manner to design around this area, yielding modifications which should satisfy management and resource concerns. The installation of culverts under the road directly links this area into the Wildlife Corridor Conservation Unit, via a conservation easement. The modifications were undertaken based on the recommendation from John Palis (the Flatwoods Salamander Scientist engaged by Willson-Miller to satisfy the Flatwoods Salamander portion of the Biological Assessment) that Pond #64 is in fact a moderate potential pond. The extent of good potential habitat (uplands & wetlands) as identified in the field has been the focus of our collective efforts to re-orient the project around the site. The guidelines developed by Dr. Scott D. Jackson, Department of Natural Resources Conservation, University of Massachusetts, will be followed for constructing underpass systems for amphibians (see Appendix C).

Please review this modification package and contact me with your thoughts, comments and requests for additional information. The project team will be available at your earliest convenience for any onsite field review you may wish to perform.

Kind regards,

Thomas O'Neil Estes
Manager, Regulatory Affairs

cc: Mr. Dave Tillis, The St. Joe Company
Mr. Britt Greene, St. Joe Arvida
Mrs. Mary Rosenheim, St Joe Arvida
Mr. George Jones, St Joe Arvida
Ms. Ashley Griffin, ERC, Inc.
Mr. Nick Cassala, St. Joe Arvida
Mr. Tony Jackson, St. Joe Arvida



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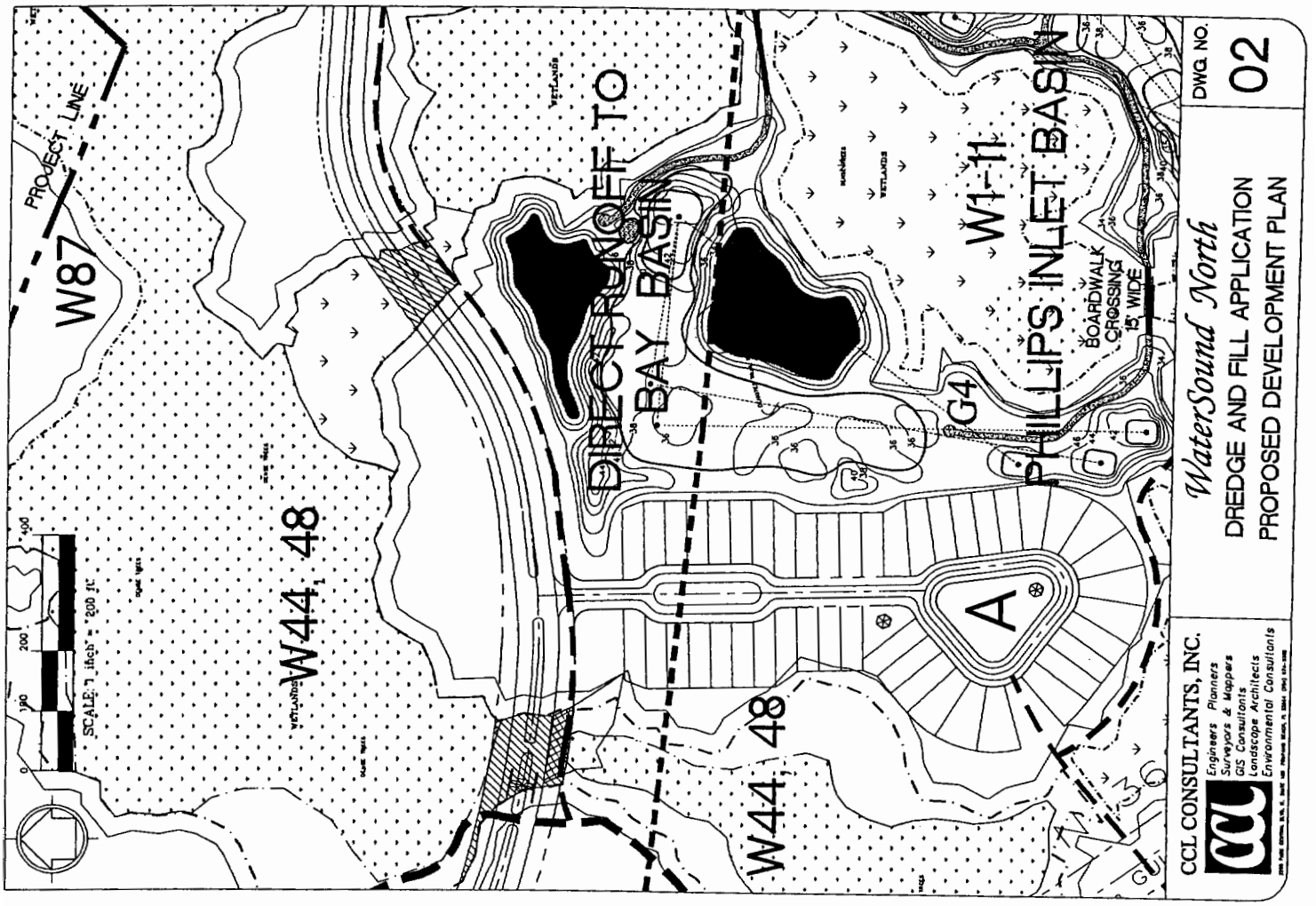

US Army Corps of Engineers.

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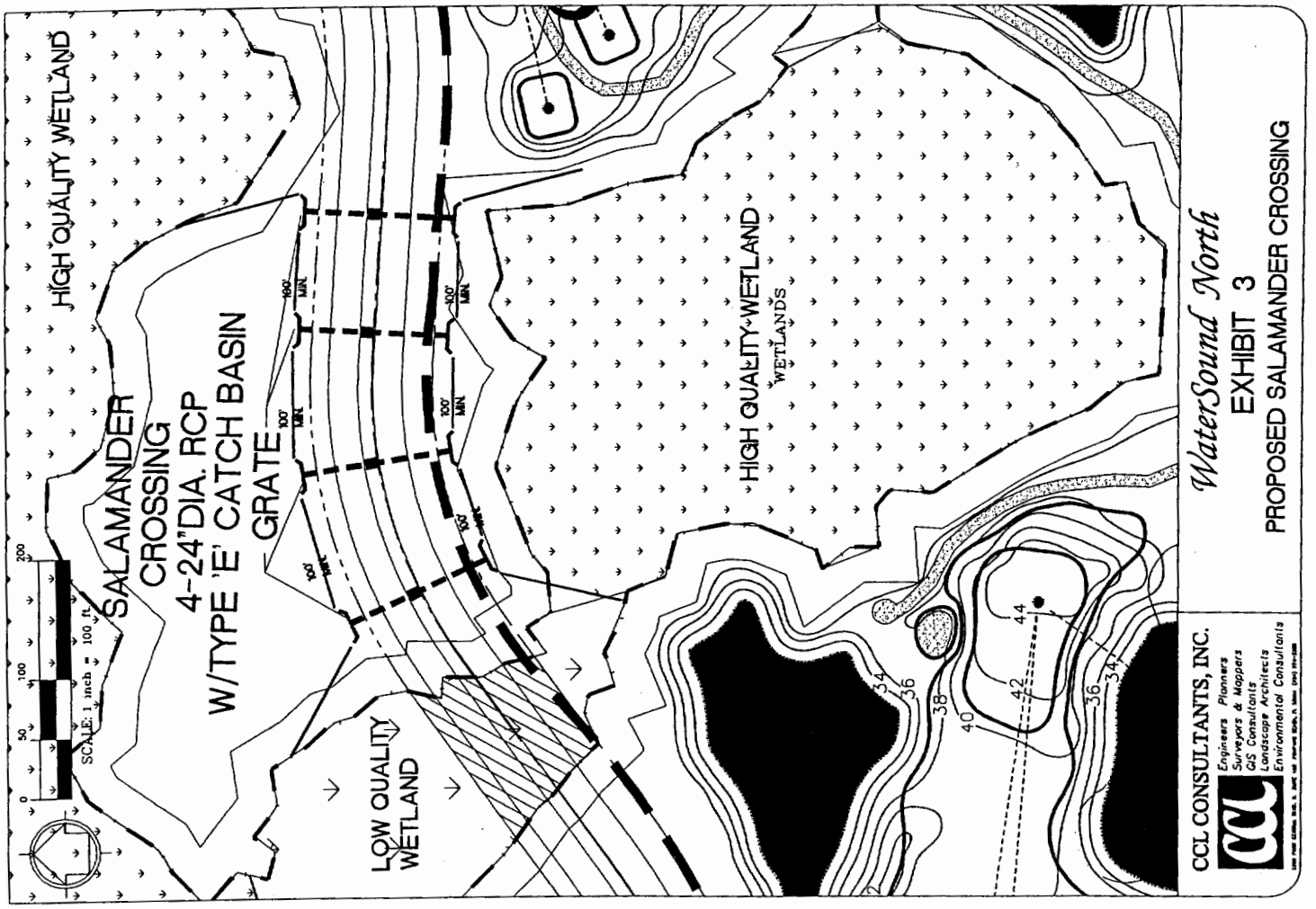

US Army Corps of Engineers

Project Name: St. Joe Company/WaterSound North
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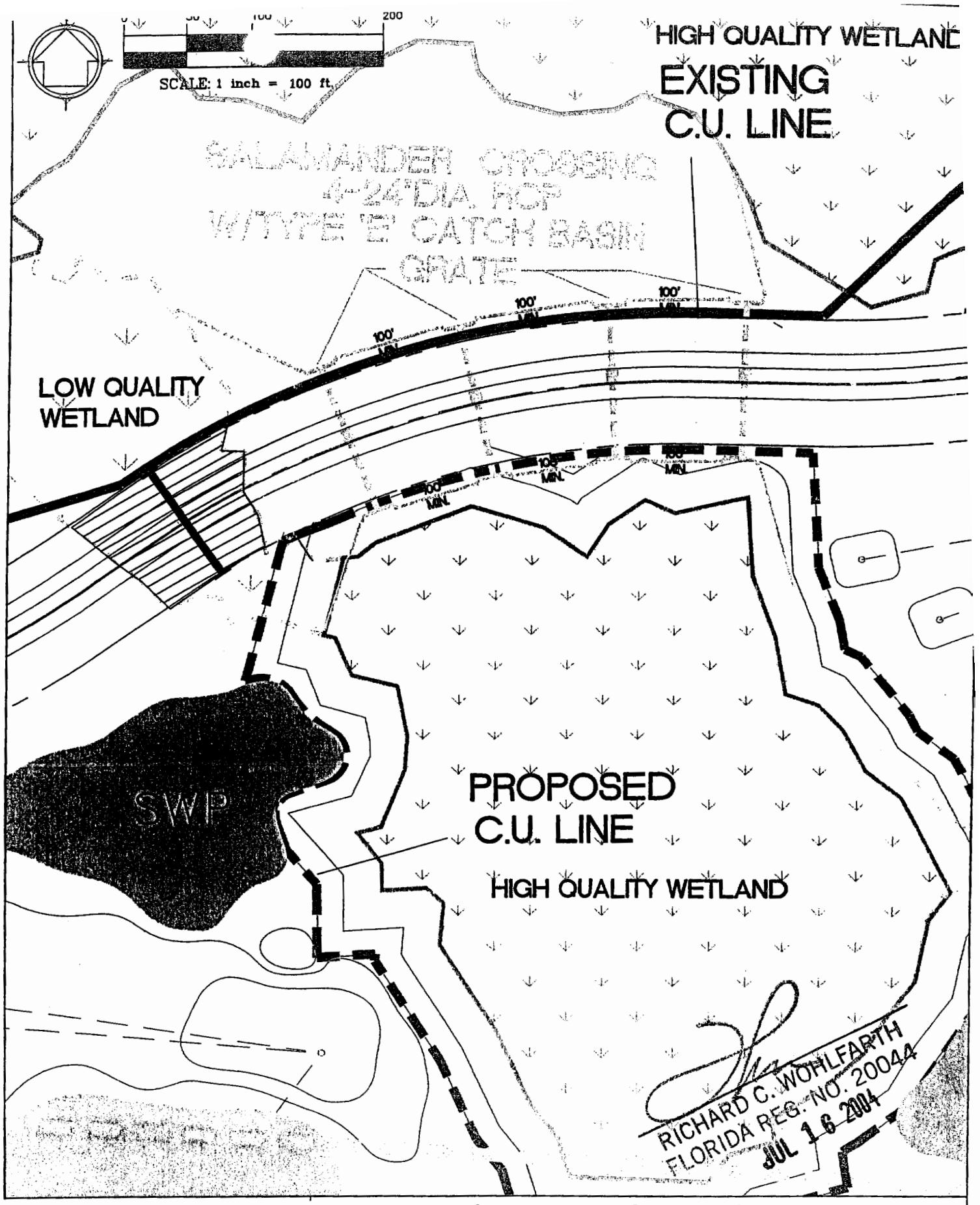

US Army Corps of Engineers.

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WaterSound North

EXHIBIT 3

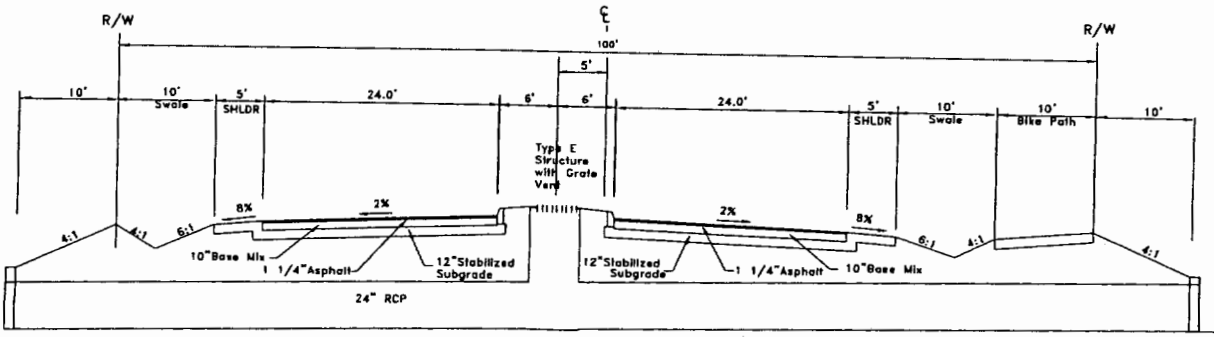
PROPOSED SALAMANDER CROSSING

CCL CONSULTANTS, INC.

Engineers Planners
Surveyors & Mappers
GIS Consultants
Landscape Architects
Environmental Consultants

WaterSound North

EXHIBIT 4



TYPICAL SECTION
ENTRANCE ROAD 'B'
100' R/W - DIVIDED, 24' PAVEMENT & SWALES
Salamander Crossing

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
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APPENDIX A

In addition to utilizing the criteria set forth in the "Best Management Practices for Florida Golf Courses, 2nd Edition," we propose to grade the back slopes of the green at # 4 and tee at #5 into a swale and/ or cart path to be conveyed to the nearest stormwater pond for treatment. We will also adhere to the following guidelines listed below:

- A buffer planting will be established between the golf course turf and the protected area of the wetland utilizing native materials.
- Pesticides will not be applied at #4 green or #5 tee complexes when the wind is blowing towards the protected area.
- To limit herbicide application in this area, manual weed control methods will be used whenever possible.
- When a pest control application is necessary, we will evaluate whether spot treatment or blanket treatment provides the least environmental impact as well as providing the necessary pest control for that individual application.

Appendix B
Management Plan for Pond #64

I. Maintenance / Enhancement of Existing Habitats

The roughly 6.6 acres of concern (cypress pond + savanna + uplands) will be managed via prescribed burning, on a 3-5 year fire regime. Burns will be conducted May through September, outside the window of above ground salamander activity. The first burn will be initiated in May of 2004, weather permitting. Some form of limiting stressors on woody vegetation has maintained a diverse graminaceous cover in both the savanna, and adjacent open canopy upland pocket. Given this current habitat structure it is not expected that management will have to be particularly intense. Burns will be allowed to penetrate, if possible, the cypress pond area to reduce shrub competition and seed source.

II. Conservation Easement

The 6.6 acres referenced above shall be placed into a conservation easement with FDEP as grantee and will be recorded in the official public records of Walton County. This will connect pond #64 and its adjacent North upland to the Wildlife Corridor Conservation Unit, effectively extending the conservation area.

Appendix C
Monitoring & BMPs for Pond #64

I. Vegetative Monitoring

To gauge the success of management efforts, six permanent monitoring plots will be established, two in the upland area, two in the savanna and two in the cypress pond. Plots in the upland and savanna will be established to capture: species composition, species diversity, shrub vegetation, herbaceous vegetation, tree DBH and canopy cover (upland only). Plots in the cypress pond will be used to collect data on changes to canopy and shrub structure, but will not include a herbaceous component.

All plot boundaries will be surveyed with a GPS and permanently labeled in the field. Permanent photo-point locations will also be established.

Sampling will take place annually, in the fall. A summary of findings will be submitted to the agencies within two months of each monitoring session.

II. Best Management Practices (BMPs)

1. Buffers will be maintained in a natural condition in perpetuity as described in the mitigation plan.

2. Construction personnel shall receive information regarding identification of flatwoods salamanders, and instructions for reporting sightings.

3. If a flatwoods salamander is observed in or near the construction area, all work will cease until the animal moves out of danger. Observations will be reported to the USFWS Panama City Field Office immediately.

Proposed Design and Considerations for Use of Amphibian and Reptile Tunnels in New England

Scott Jackson
Department of Natural Resources Conservation
University of Massachusetts Amherst
2003

Based on my experience with salamander tunnels used in Amherst, MA, and knowledge of other amphibian tunnels in Europe and elsewhere I propose the following underpass design for facilitating overland passage of amphibians and reptiles (See figures 1, 2 and 3). It is important to note that this design has not been extensively tested and that future work may indicate the need to significantly change this design.

1. The tunnel should be in the form of a box culvert at least 2'x 2' square and should be the minimum length necessary to accommodate safety issues and achieve other design features. I imagine that the culvert would be made of concrete, although other material would probably be acceptable. A proper base must be used to prevent disruption of the road surface due to frost heaves.
2. The tunnel should be open at the top and fitted with an iron grate that would sit flush with the road surface. The iron grate must allow ample rain, light and air circulation into the culvert.
3. Sandy soil (sandy loam) should be used to cover the bottom of the tunnel to provide a more natural substrate for travel.
4. Wing walls should angle out from each end of the tunnel at approximately 45 degrees.
5. Vertical retaining walls at least 18" high should angle out away from the wing walls at a broad angle for a length of 100-200 feet. The tops of these retaining walls should be flush with the ground surface on the side closest to the road, and present a vertical surface at least 18" high.
6. Ideally, crossing structures should be placed no more than 100 feet apart, although for many species a 200-foot distance between structures may be acceptable.

It is important to note that amphibian and reptile tunnels are experimental techniques for conservation. In New England we know that they work for spotted salamanders. We suspect that they will work equally well for other mole salamanders if they are well designed. A recent study in California of mole salamander use of tunnels indicated that the tunnels were ineffective, probably because the fence system was parallel to the road and failed to adequate funnel the salamanders to the passage structures.

A 2'x 2' tunnel is actually quite small with a very small openness ratio (cross-sectional area divided by length). It is hoped that the inclusion of an open top (essential for meeting the moisture requirements of many amphibians) will help compensate for the confining nature of these passages. The challenge of highway mitigation is always a matter of getting the most out of limited mitigation dollars. If they prove effective, small low-cost reptile and amphibian structures would make it more

practical to create multiple structures, perforating sections of roadway rather than relying on single passages. Because many amphibians and reptiles have limited mobility, there are considerable drawbacks to concentrating mitigation efforts at a single location.

We have done some preliminary tests that indicate that tunnels may work for painted turtles, but that fence designs for turtles must be carefully considered. A very large tunnel is reported to be used by spotted turtles in Eastern MA. There are early indications that a tunnel and wall system in eastern MA does not work for Blanding's turtles, even though the tunnel is quite large. In Europe, toads and newts will use tunnels. So it might be expected that tunnels will work for New England species of toads and newts. However, these structures have not been adequately tested for other species such as small mammals (shrews, moles, voles, etc), snakes, box turtles or several other species of turtles (wood, spotted, snapping etc.).

We do know that particular design features may be necessary to facilitate tunnel use by certain species. Size, placement, moisture, hydrology, temperature, and noise have all been demonstrated to affect wildlife use of underpasses. Until a tunnel design is tested for a wide variety of species, I would not recommend it for wide application. If the tunnel design does not meet the needs of a wide variety of species, fences that are necessary to channel some wildlife to the tunnels may act as barriers to movement for other species.

Therefore, I only recommend the use of tunnels when:

1. There is a documented need
    - Is there a known population at risk?
    - Is there a known crossing point?
    - Are rare species involved?
    - Will traffic volumes be high enough to represent a serious threat?
    - Are we dealing with a species that is vulnerable to additive mortality from roads (e.g. species characterized by low reproductive potential and high adult survival rates like turtles and mole salamanders)?
2. The benefits for a particular species outweigh the risks to other species that may have their movements blocked if the tunnels don't function as intended.
3. The tunnel systems are carefully designed, located and constructed.
4. An adequate maintenance plan is in place.

I do not recommend the routine use of tunnels for sub-division roads or light volume access roads.

For smaller roads and driveways, the most important design feature to consider is curbing. Granite curbs and some traditional curbing can act as a barrier to amphibian movements. I know of situations in MA and Canada where large numbers of salamanders have been intercepted in their migrations by curbs and catch basins. Use of Cape Cod berms rather than traditional curbing may be one solution. Alternative, where storm water management systems require more traditional curbing, it may be possible to design in escape ramps on either side of each catch basin.

Use of large embedded culverts or open bottom structures (arches or bridges) at stream crossings may also help facilitate wildlife movement for species that naturally follow streams (without requiring fences). The goal is to use structures that preserve the natural stream bottom. Preserving the natural stream bottom will likely facilitate movement of salamanders, fish, turtles and stream invertebrates through the culvert. Culverts wide enough to allow for some dry ground on one or both sides of the stream will be even more effective for facilitating wildlife passage in general.

There is a need for much more research before we can put forward a design for reptile and amphibian passage that can be used with high confidence. In the meantime, where roads and highways threaten amphibian or reptile populations, we must experiment with designs based on our best guesses. Whenever passage structures are used it is very important that they are monitored to determine their effectiveness. For the time being, trial and error is the chief source of information we have for designing passage structures. If you have information about amphibian and reptile use of crossing structures that you are willing to share, please contact me at:

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University of Massachusetts
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(413) 545-4358 (fax)
sjackson@umext.umass.edu

Figure 1.

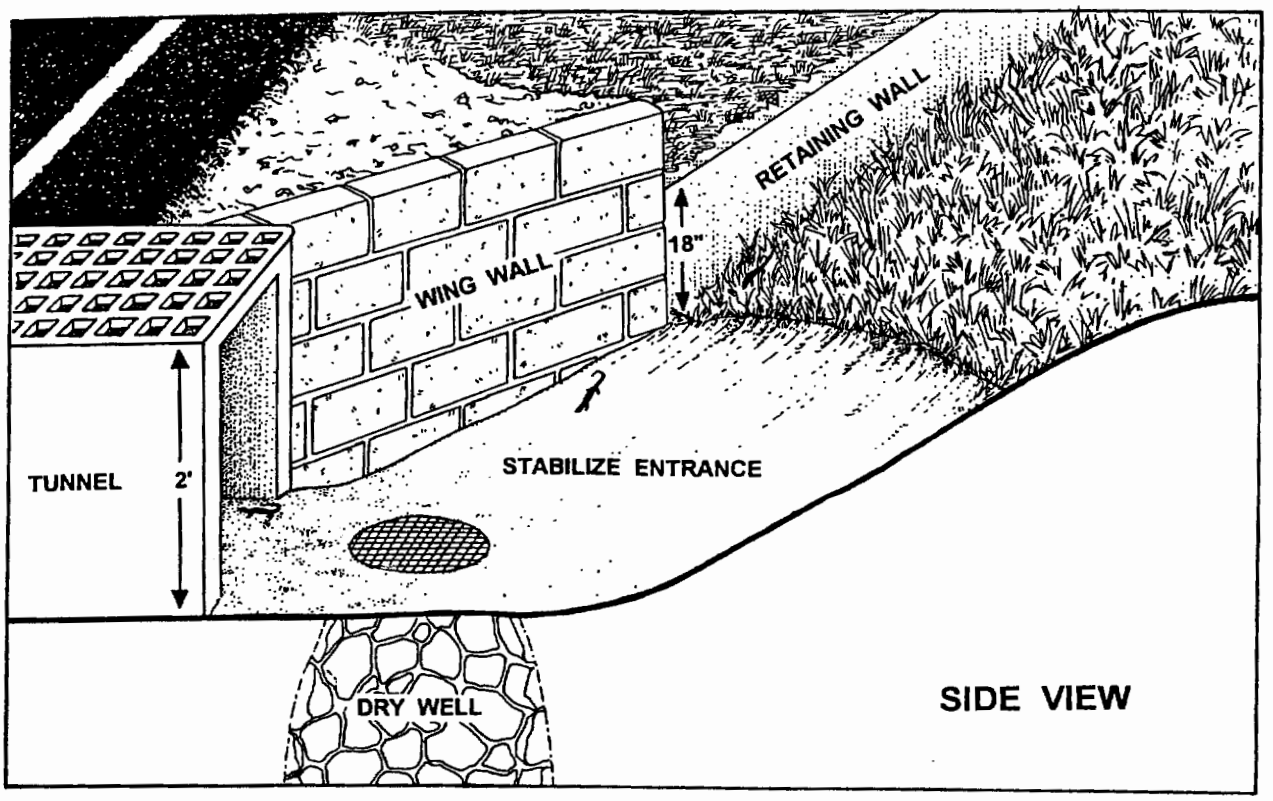

RETAINING WALL
18"
WING WALL
TUNNEL
2'
STABILIZE ENTRANCE
DRY WELL
SIDE VIEW

Figure 2.

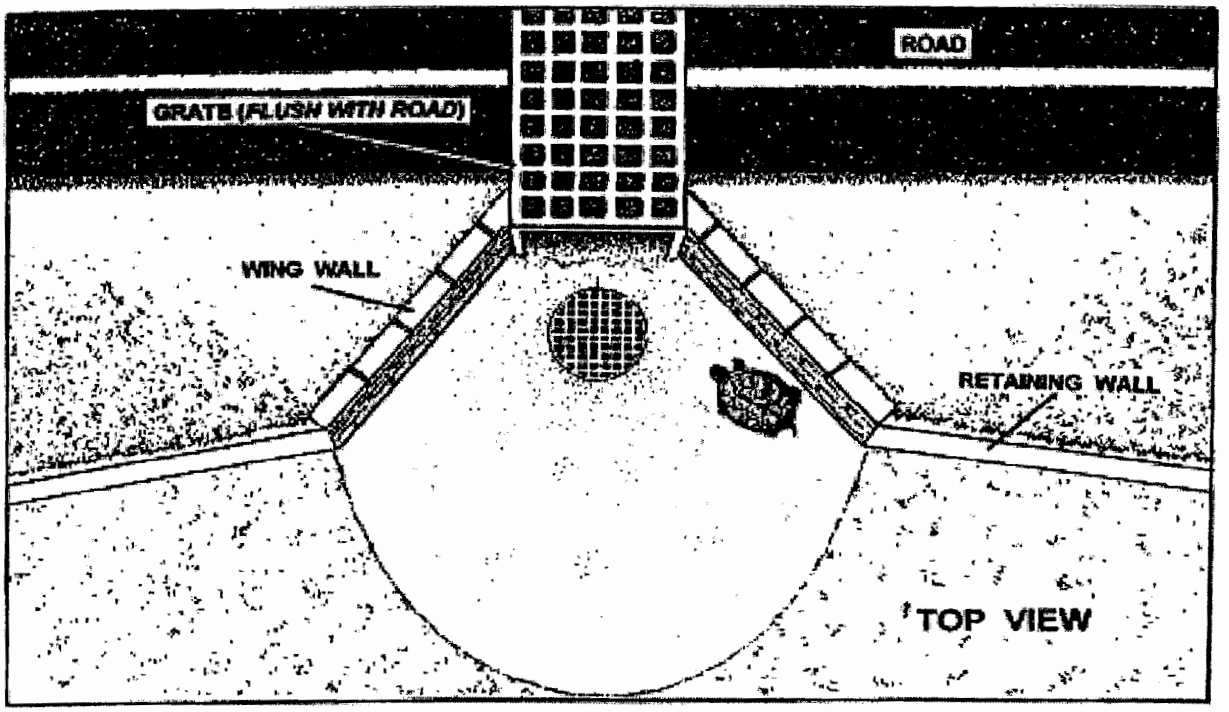
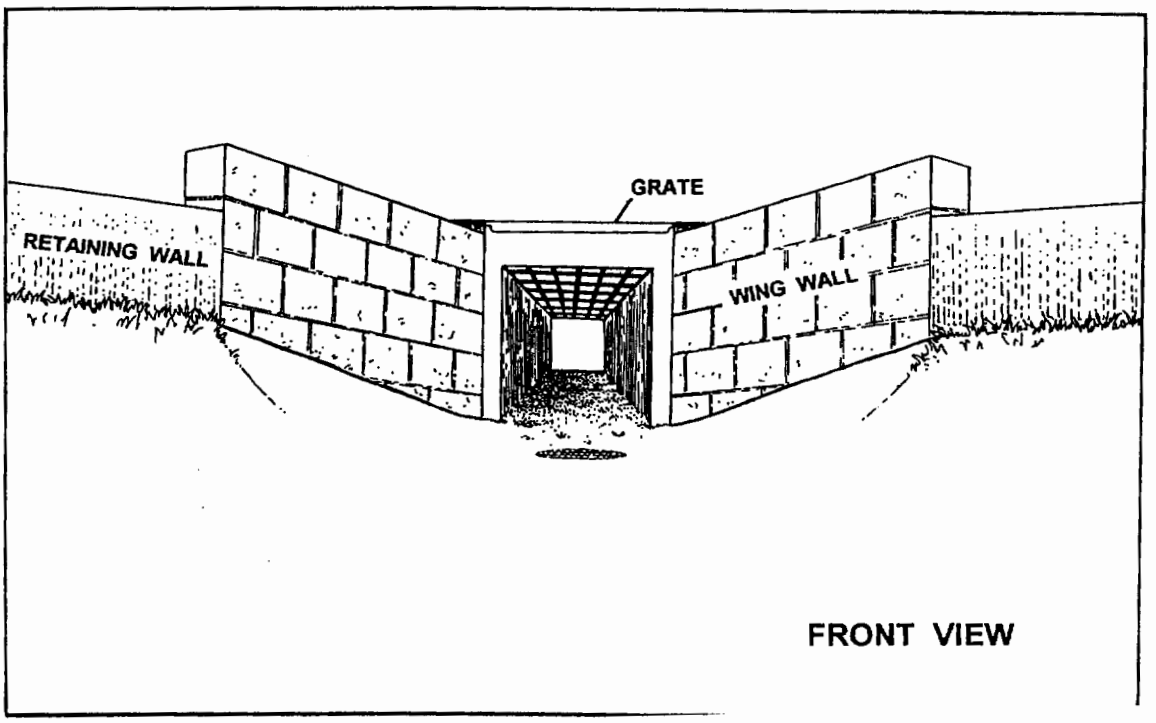


Figure 3.



WETLAND IMPACTS

PHILLIPS INLET BASIN

WETLAND IMPACT NO.	(ISOLATED) NON-REG. NO.	WETLAND IMPACT Low Quality AC	WETLAND IMPACT High Quality AC	NON-REGULATED Low Quality AC	NON-REGULATED High Quality AC	DWG. NO.
	I-A	–	–	6.28	1.28	16, 23
	I-B	–	–	1.59	0.89	13
	I-C	–	–	–	0.06	07
	I-D	–	–	0.24	0.22	11
	I-E	–	–	0.31	0.06	11
	I-F	–	–	–	0.06	11
	I-G	–	–	–	0.13	12
	I-H	–	–	–	0.02	11
	I-I	–	–	0.24	0.06	11
	I-J	–	–	0.42	0.06	11
	I-K	–	–	–	0.15	04
	I-L	–	–	110 S.F.	–	04
	I-M	–	–	–	0.20	04
	I-N	–	–	–	0.18	32, 33
1		12.53	–			14, 15
2		2.17	–			15,16,22,23
3		0.41	–			13
4		57 S.F.	–			13
5		0.01	–			13
6		0.01	–			13
7		0.01	–			13
8		0.57	–			13, 14
9		1.89	–			07, 08
10		0.21	–			08
11		0.06	–			09
12		0.15	–			09
13		0.27	–			09
14		0.05	–			12
15		–	0.19			12
16		0.20	–			10
17		–	0.03			10
18		–	0.39			10
19		–	0.36			05
20		0.44	–			05
21		0.10	–			21
22		0.18	–			05
23		–	0.21			05
24		0.05	–			05
25		0.09	–			05
26		0.07	–			12
27		0.15	–			12
28		0.78	–			07
29		0.16	–			07
Total		20.01 AC.	1.18 AC.	9.08 AC.	3.37 AC.	
% OF IMPACT		15.43%	2.29%			

CCL CONSULTANTS, INC.

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US Army Corps of Engineers.

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WETLAND IMPACTS

DIRECT RUNOFF TO BAY BASIN

WETLAND IMPACT NO.	(ISOLATED) NON-REG. NO.	WETLAND IMPACT Low Quality AC	WETLAND IMPACT High Quality AC	NON-REGULATED Low Quality AC	NON-REGULATED High Quality AC	DWG. NO.
30		0.27	–			22
31		–	0.06			22
32		–	–			22
33		0.27	–			22
34		0.23	–			20, 21
35		0.43	–			20
36		0.48	–			19
37		–	0.16			19
38		0.51	–			12
39		0.18	–			17
40		0.09	–			18
41		0.29	–			11, 18
42		–	0.14			20
43		0.30	–			20
44		1.91	–			19, 20
45		–	0.19			19
46		0.67	–			19
47		–	0.17			19
48		0.07	–			19
49		3.13	–			18, 19
50		0.52	–			17, 18
51		–	0.86			17
52		–	0.50			19
53		0.14	–			27
54		0.06	–			26, 27
55		0.45	–			27
56		0.13	–			26, 32
57		8.46	–			32, 33, 34
58		–	0.28			33
59		0.25				34
60		6.53	–			33, 34
61		0.18	–			34
62		0.02	–			37
63		0.04	–			37
64		0.05	–			35
65		0.72	–			34, 35
66		0.07	–			28
67		0.97	–			24, 28
68		0.11	–			28
69		0.43	–			28
70		5.80	–			27, 28
71		0.04	–			28
72		0.58	–			28
73		0.45	–			28
74		0.20	–			20,28
75		0.16	–			17
76		0.03	–			19
77		0.83	–			23
78		0.19	–			22
79		0.17	–			23
80		0.02	–			22,23
81		–	0.23			30
Total		36.43 AC.	2.59 AC.			
% OF IMPACT		19.59%	1.[illegible]			

CCL CONSULTANTS, INC.

RICHARD C. W[illegible]
FLORIDA REG. [illegible]
DEC 1 6 2[illegible]

US Army Corps of Engineers.

Project Name: St. Joe Company/WaterSound North
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WETLAND AREAS

DIRECT RUNOFF TO BAY BASIN

WETLAND AREA SUMMARY (WITHIN DRI BOUNDARY)

WETLAND AREA	Low Quality	High Quality	TOTALS
	AC	AC	AC
PHASE 1 & 2	42.65	78.77	121.42
PHASE 3	143.33	160.84	304.17
Total	185.98	239.61	425.59

PHILLIPS INLET BASIN

WETLAND AREA SUMMARY (WITHIN DRI BOUNDARY)

WETLAND AREA	Low Quality	High Quality	TOTALS
	AC	AC	AC
PHASE 1 & 2	129.62	51.63	181.25
PHASE 3	0	0	0
Total	129.62	51.63	181.25

BASIN TOTALS (NOT INCLUDING NON-REGULATED WETLANDS)

WETLAND AREA SUMMARY (WITHIN DRI BOUNDARY)

WETLAND AREA	Low Quality	High Quality	TOTALS
	AC	AC	AC
DIRECT RUNOFF	185.98	239.61	425.59
PHILLIPS INLET	129.62	51.63	181.25
Total	315.60	291.24	606.84

BASIN IMPACTS	57.09	3.55	60.62
Total (NET)	258.53	287.69	546.22

57.09 AC.	3.55 AC.	60.64 AC.
18.09%	1.22%	9.99%

RICHARD C. V
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