# CASTLE HILLS ACCESS ROAD
# DRAINAGE IMPROVEMENTS
# Project No. HWY-O-04-98

## Application for:

## Stream Channel Alteration Permit

**State of Hawaii**
**Department of Transportation**
**Highways Division**
869 Punchbowl Street
Honolulu, Hawaii 96813

April 2009

**State of Hawaii**
**COMMISSION ON WATER RESOURCE MANAGEMENT**
**Department of Land and Natural Resources**

# APPLICATION FOR PERMIT

☒ **Stream Channel Alteration** ☐ **Stream Diversion Works Abandonment**
☐ **Stream Diversion Works Construction** ☐ **Stream Diversion Works Alteration**

**Instructions: Please print in ink or type and send completed application with attachments to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. Application must be accompanied by a non-refundable filing fee of $25.00 payable to the Dept. of Land and Natural Resources. The Commission may not accept incomplete applications. For assistance, call the Regulation Branch at 587-0225.**

1. APPLICANT: (may be a, b, or c, but all must be filled in)

(a) DIVERSION WORK OWNER
Firm/Name Department of Transportation
Contact Person Brennon Morioka, Dir Ph: 587-2150
Address 869 Punchbowl St., Honolulu, HI 96813

(b) LANDOWNER
Firm/Name State of Hawaii
Contact Person Ph: -
Address

(c) CONTRACTOR
Firm/Name Not determined at this time Ph: - Contractor's License No.
Address

2. STREAM LOCATION: Island Oahu Tax Map Key (1)4-5-024:2-5,4-5,-108:68-74
(Attach a USGS map, scale 1" = 2000', and a property tax map showing diversion location referenced to established property boundaries.)

3. STREAM DATA: Stream Name Kapunahala Stream
Streamflow: ☒ Perennial ☐ Intermittent Ave Annual Flow 1.94 cfs
Instream Flow Std: ☐ Interim ☐ Permanent Ave Annual Flow cfs
(Applicant must submit petition to amend interim instream flow standard should there be diverted water)
* per USGS records at Station 16273950 from 1988 to 1998

4. MAINTENANCE/DIVERSION WORK DATA:
Is maintenance/diversion work a part of a battery of diversions? ☐ Yes ☒ No
If yes, briefly describe diversion system
(Attach a sketch or continue under description under remarks, explanations if more space is needed)

Diversion Structure: ☐ Concrete ☐ Wood ☐ Pipe ☐ Other (explain)
Proposed Structure Elevation (msl) ft.
Designer Firm/Name Park Engineering Ph: 808 - 596-0384
Address 711 Kapiolani Blvd. Suite 1500 Honolulu, Hawaii 96813
(Attach an engineering drawing & detailed specifications of proposed maintenance/diversion work)

5. PROPOSED USE:
☐ Municipal (including hotels, stores, etc.) ☐ Military
☒ Domestic (individual, noncommercial water sys.) ☐ Industrial
☐ Irrigation (crop) ☐ Other (explain)
State Land Use District: ☒ Urban ☐ Agriculture ☐ Rural ☐ Conservation
County Zoning (describe) Public

6. (a) PROPOSED DIVERTED AMOUNT: 1.94 ☐ mgd ☐ gpm ☒ cfs
(b) METHOD OF FLOW MEASUREMENT: ☐ Flow-meter ☐ Open-pipe ☐ Orifice Plate ☐ Weir
(c) AMOUNT TO BE RETURNED TO STREAM: 1.94 ☐ mgd ☐ gpm ☒ cfs
(d) METHOD OF FLOW MEASUREMENT: ☐ Flow-meter ☐ Open-pipe ☐ Orifice Plate ☐ Weir

7. PENDING ACTIONS: ☐ CDUA ☐ SMA ☐ EIS ☐ EA ☐ NONE ☒ Other (explain)

8. REMARKS, EXPLANATIONS: Dept. of Army 404, Dept. of Health 401, and Office of Planning CZM pending

NOTE: Signing below indicates that the applicant understands that, if the permit requested is granted by the Commission on Water Resource Management, the proposed work is to be completed within two (2) years of the approval date. In addition, the contractor shall submit to the Commission a diversion work completion report within 30 days of the completion date of the permit work. The applicant also understands that monthly water use data shall be submitted to the Commission. The applicant also understands that approval of the proposed permit shall not constitute a determination of riparian water rights and shall not guarantee the maximum capacity or future use up to the permitted diversion work capacity.

| Diversion Work Owner | Landowner | Contractor |
|---|---|---|
| Signature | Signature | Signature |
| Date | Date 4-28-09 | Date |

For Official Use Only:
Date Received
Date Accepted
Field Checked By
Date
Longitude
Latitude
Aquifer System name
State Diversion Work No.

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | HWY-0-04-98 | 2009 | 1 | 33 |

## INDEX TO DRAWINGS

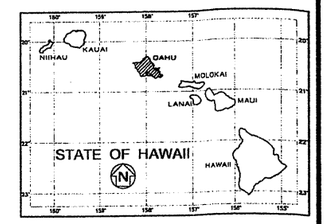


STATE OF HAWAII

# DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

HONOLULU, HAWAII




PLANS FOR

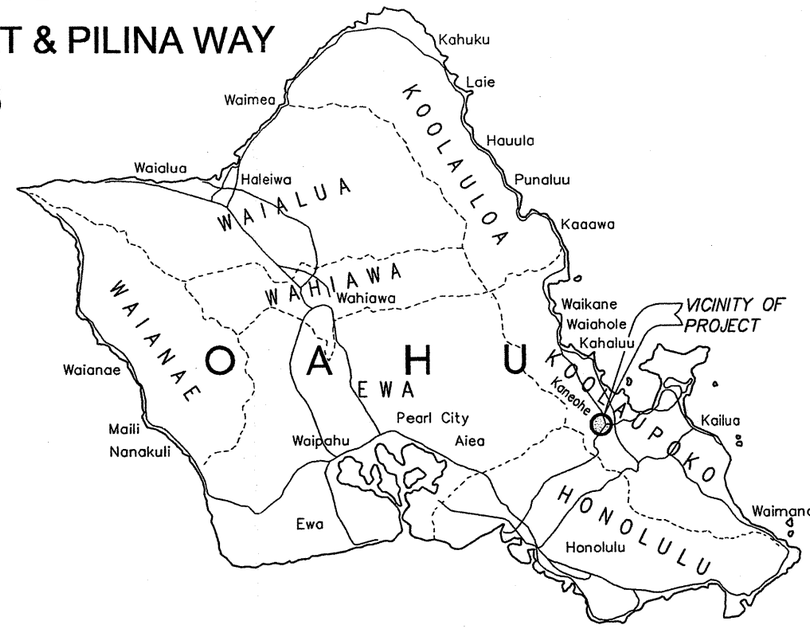
# CASTLE HILLS ACCESS ROAD DRAINAGE IMPROVEMENTS

VICINITY OF POOKELA STREET, KUPOHU STREET & PILINA WAY

PROJECT NO. HWY-O-04-98

DISTRICT OF KOOLAUPOKO

ISLAND OF OAHU

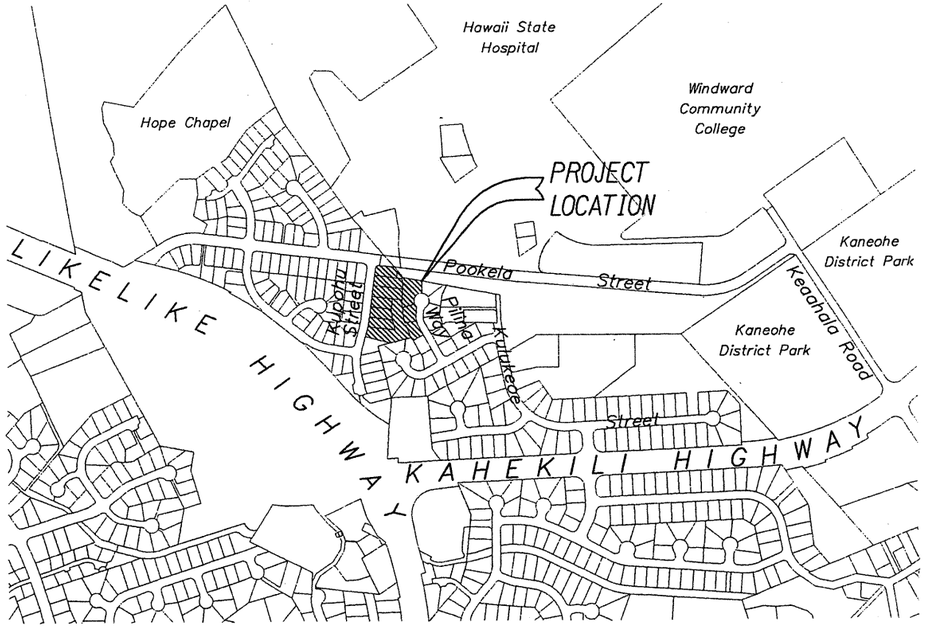



VICINITY MAP

NOT TO SCALE

4 0 4 8

SCALE IN MILES




400 0 200 400

SCALE IN FEET

## LAYOUT PLAN

REDUCED PLAN
(HALF SIZE)

0 1 2 3

3 INCHES OF ORIGINAL PLAN

DEPARTMENT OF TRANSPORTATION
STATE OF HAWAII

APPROVED:

DIR. OF TRANSPORTATION DATE

PAREN, INC. — DESIGNED BY

HWY-DS — MANAGED BY

692-7552 — PHONE

MARCH 2009 — DATE

ORIGINAL PLAN — DRAWN BY — TRACED BY — DESIGNED BY — QUANTITIES BY — CHECKED BY — DATE

NOTE BOOK — No.

DRWG PLOTTED BY

Wed, 18 Mar 2009 - 9:59am
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| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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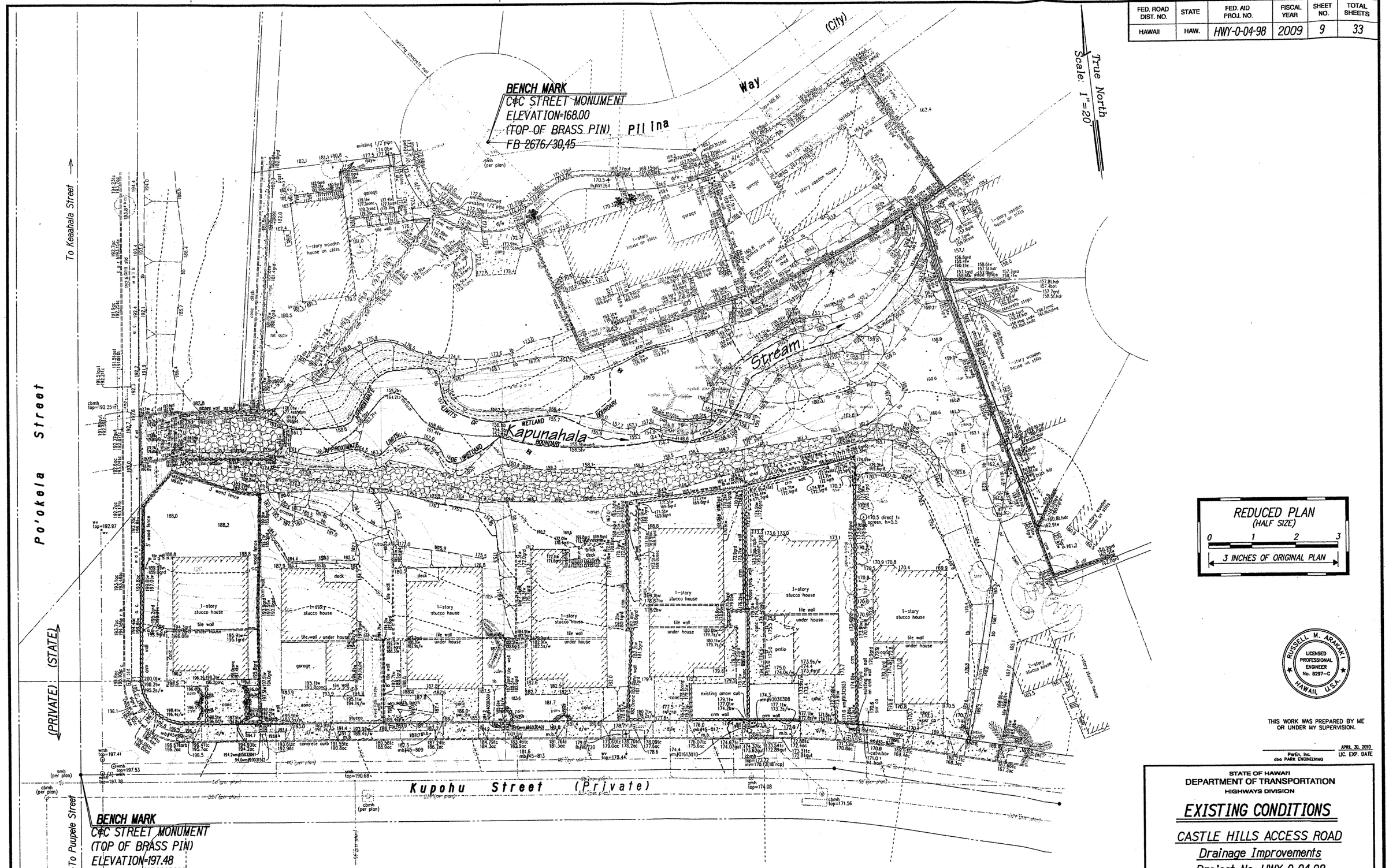


## EXISTING CONDITIONS

SCALE: 1"=20'

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

RUSSELL M. ARAKAKI
LICENSED PROFESSIONAL ENGINEER
No. 8297-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

PARSON, INC.
dba PARK ENGINEERING

APRIL 30, 2010
LIC. EXP. DATE

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

# EXISTING CONDITIONS

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. 1 OF 1 SHEETS

| DATE | REVISION |
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| ORIGINAL PLAN | JERRY PLOTTED BY | DATE |
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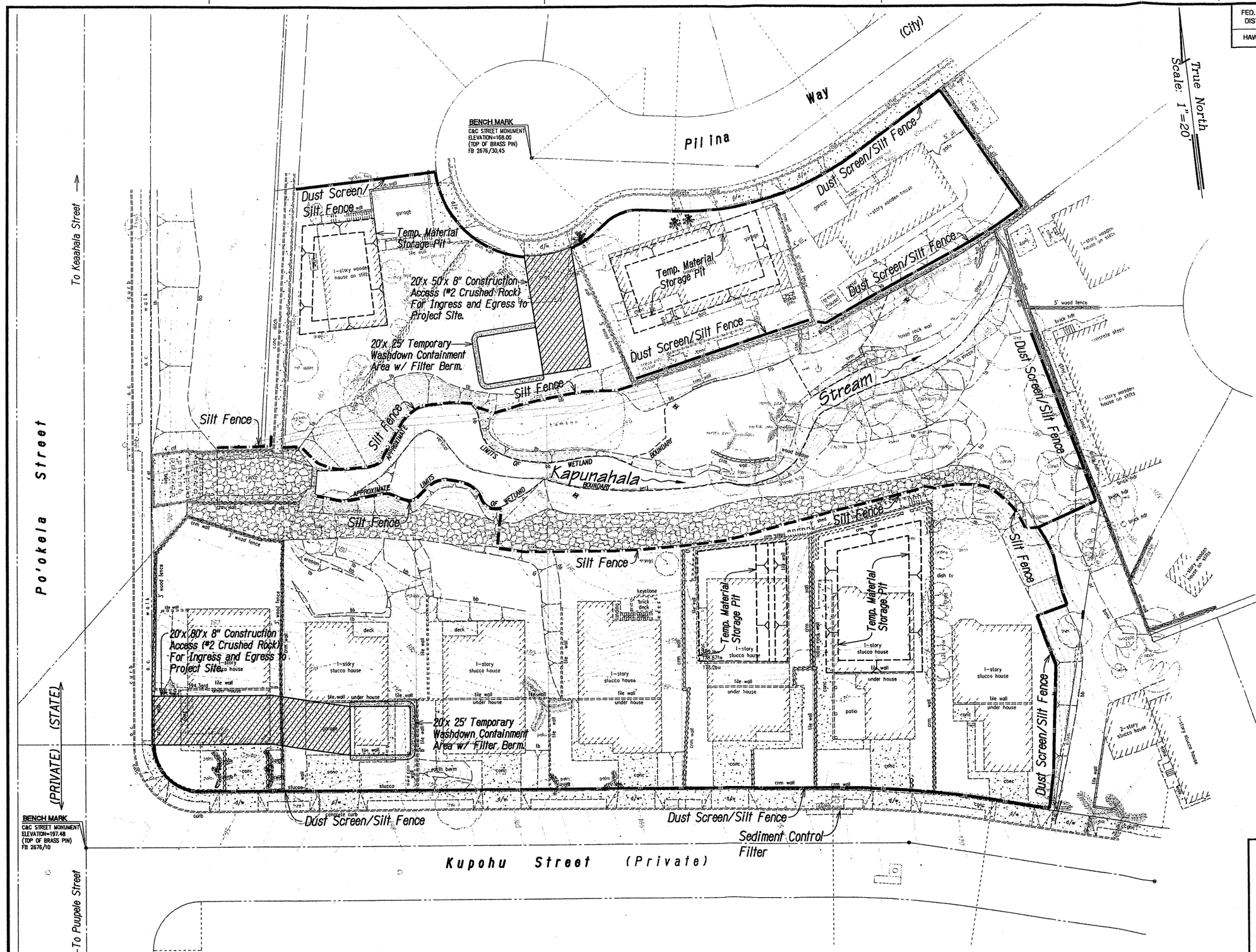


**Legend:**

- Silt Fence
- Dust Screen/Silt Fence

## EROSION CONTROL PLAN

SCALE: 1"=20'

| DATE | REVISION |
|---|---|

RUSSELL M. ARAKAKI
LICENSED PROFESSIONAL ENGINEER
No. 8297-C
HAWAII, U.S.A.

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ParEn, Inc.
dba PARK ENGINEERING

APRIL 30, 2010
LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

# EROSION CONTROL PLAN

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. EC1 OF EC1 SHEETS

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08-Ccshills-GeneralLayout 12/11/08

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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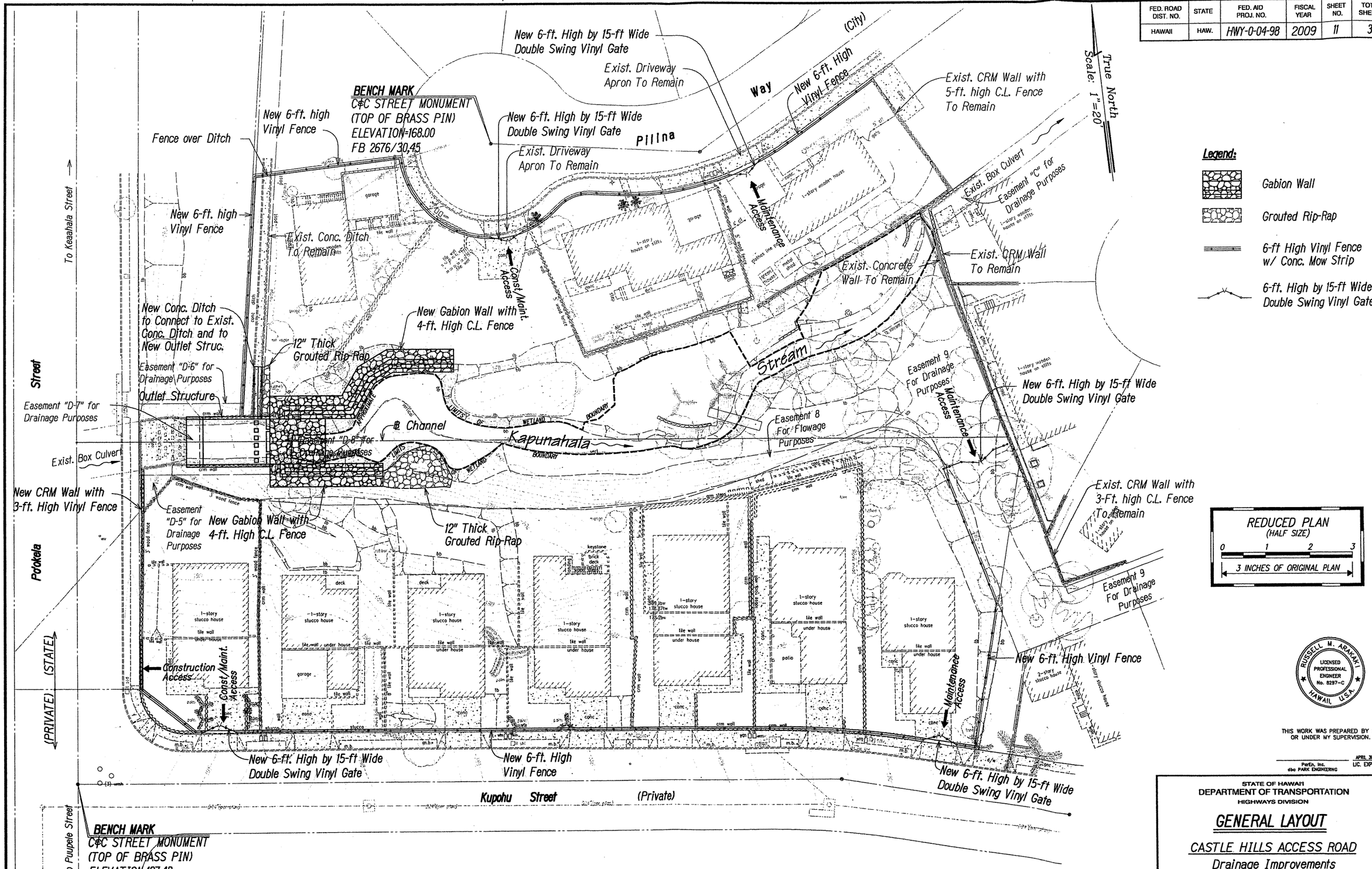


**Legend:**

- Gabion Wall
- Grouted Rip-Rap
- 6-ft High Vinyl Fence w/ Conc. Mow Strip
- 6-ft. High by 15-ft Wide Double Swing Vinyl Gate

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

RUSSELL M. ARAKAKI
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APRIL 30, 2010
LIC. EXP. DATE

PerEn, Inc.
dba PARK ENGINEERING

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

## GENERAL LAYOUT

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. C1 OF C1 SHEETS

## GENERAL LAYOUT

SCALE: 1"=20'

| DATE | REVISION |
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ORIGIN PLAN | NOTE BOOK | No. | DRWG PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE

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09-Cashills-DemoPlan.dwg 12/03/08

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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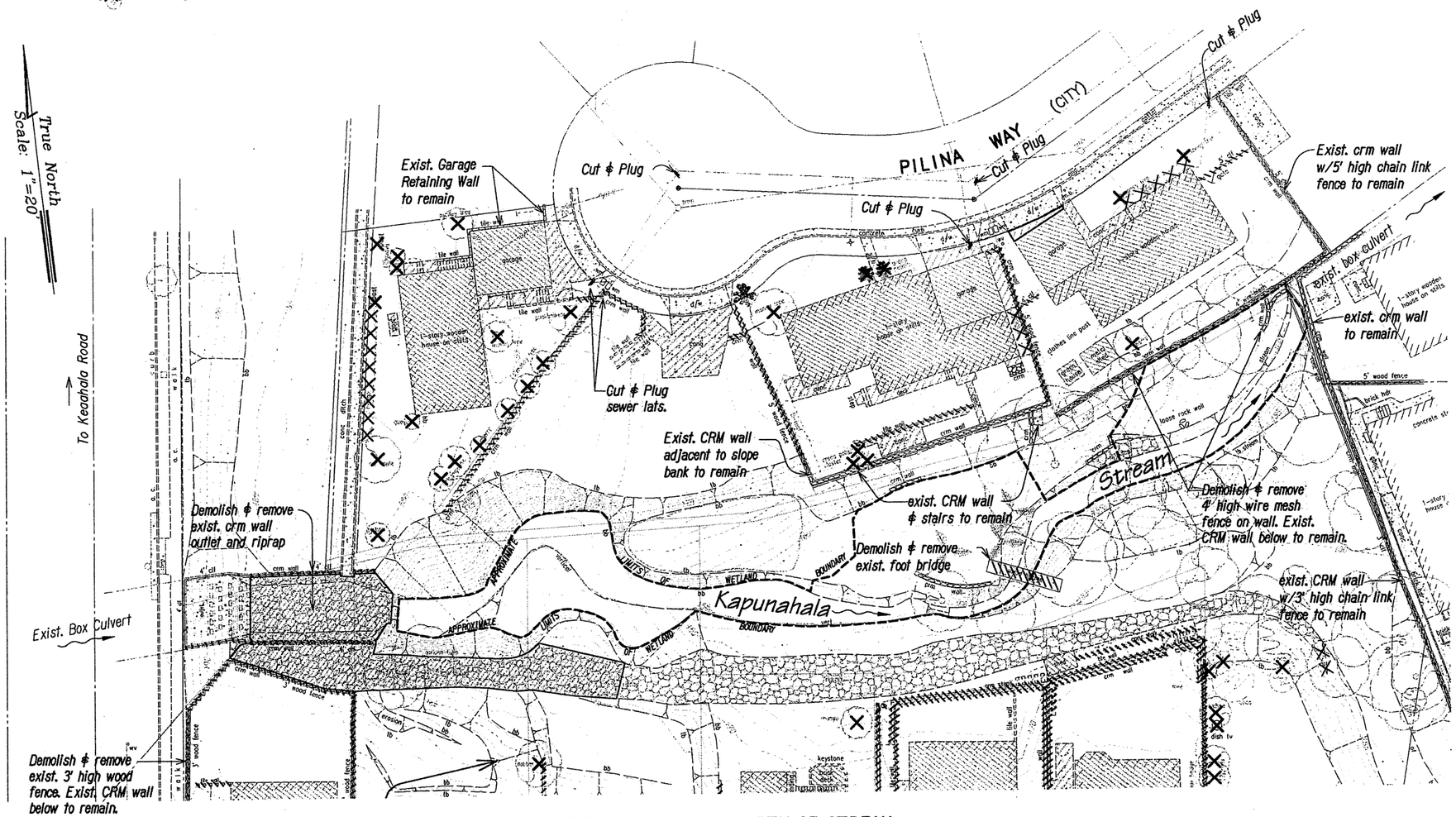
## Legend:

- Existing structure to be demolished and removed.
- Existing pavement to be demolished and removed.
- Existing crm wall to be demolished and removed, including fencing where applicable.
- Existing cmu wall to be demolished and removed, including fencing where applicable.
- Existing foot bridge to be demolished and removed
- Existing hedge to be demolished and removed.
- Existing tree to be demolished and removed.
- Existing tree to be demolished and removed.
- Existing tree to be demolished and removed.

## General Demolition Notes:

1. The Contractor shall verify existing conditions prior to bidding. Any discrepancies shall be brought to the attention of Engineer for clarification.
2. The Contractor shall bring any conflicts and/or and questions to the atttention of the Engineer prior to the start of demolition. Any remedial work resulting from the Contractor's failure to do so shall be paid by the Contractor at no cost to the State. All restoration work shall be paid for by the Contractor.
3. All existing improvements and utilities that are to remain within the demolition and construction areas shall be protected and maintained by the Contractor during his operations, unless otherwise noted. Any remedial work resulting from the Contractor's failure to do so shall be paid for by the Contractor at no cost to the State.
4. Backfill and compact all voids and depressions caused by demolition operations.
5. The Contractor shall properly remove and dispose offsite of all demolition materials at no additional cost to the State.
6. After completion of the demolition work, the Contractor shall clean the project limits of all demolished materials, rubbish and all other debris which shall then be transported to a legal offsite disposal site.
7. All temporary erosion control measures shall be installed prior to demolition work as shown on the erosion control plan, dwg.
8. Existing utility lines shown are based on best available as-built drawings on file with the City and County of Honolulu.
9. Prior to excavation near or around the existing utilities, the Contractor shall restrain all existing pipes, water valves, concrete block, concrete jackets, etc., as required to ensure the existing utilities are not disturbed.




## DEMOLITION PLAN - NORTH OF STREAM

SCALE: 1"=20'

## Notes:

1. Contractor to cut and plug existing unused water laterals at the main. Meter and valve boxes shall be demolished and removed. The damaged areas shall be repaired to an equal or better condition than the surrounding area.
2. Contractor to cut and plug existing unused sewer laterals at the property line. Existing sewer cleanouts, whether or not shown on the plans shall be demolished and removed. The existing holes shall be backfilled and compacted with aggregate based course.
3. Contractor to locate, cap, cut and plug, and abandon all existing unused electric telephone and cable conduits at the property line after removal of conductors.
4. Salvage clean and reuse rock for the new CRM Walls and grouted riprap paving (grp) slope protection.

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

RUSSELL M. ARAKAKI
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THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

APRIL 30, 2010
Parsn, Inc. dba PARK ENGINEERING — LIC. EXP. DATE

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**DEMOLITION PLAN**
**NORTH OF STREAM**
CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. DP1 OF DP2 SHEETS

| DATE | REVISION |
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ORIGINAL PLAN
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
NOTE BOOK
No.
DATE

Wed, 18 Mar 2009 - 10:27am
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10-Cashills-DemoPlan.dwg 12/03/08

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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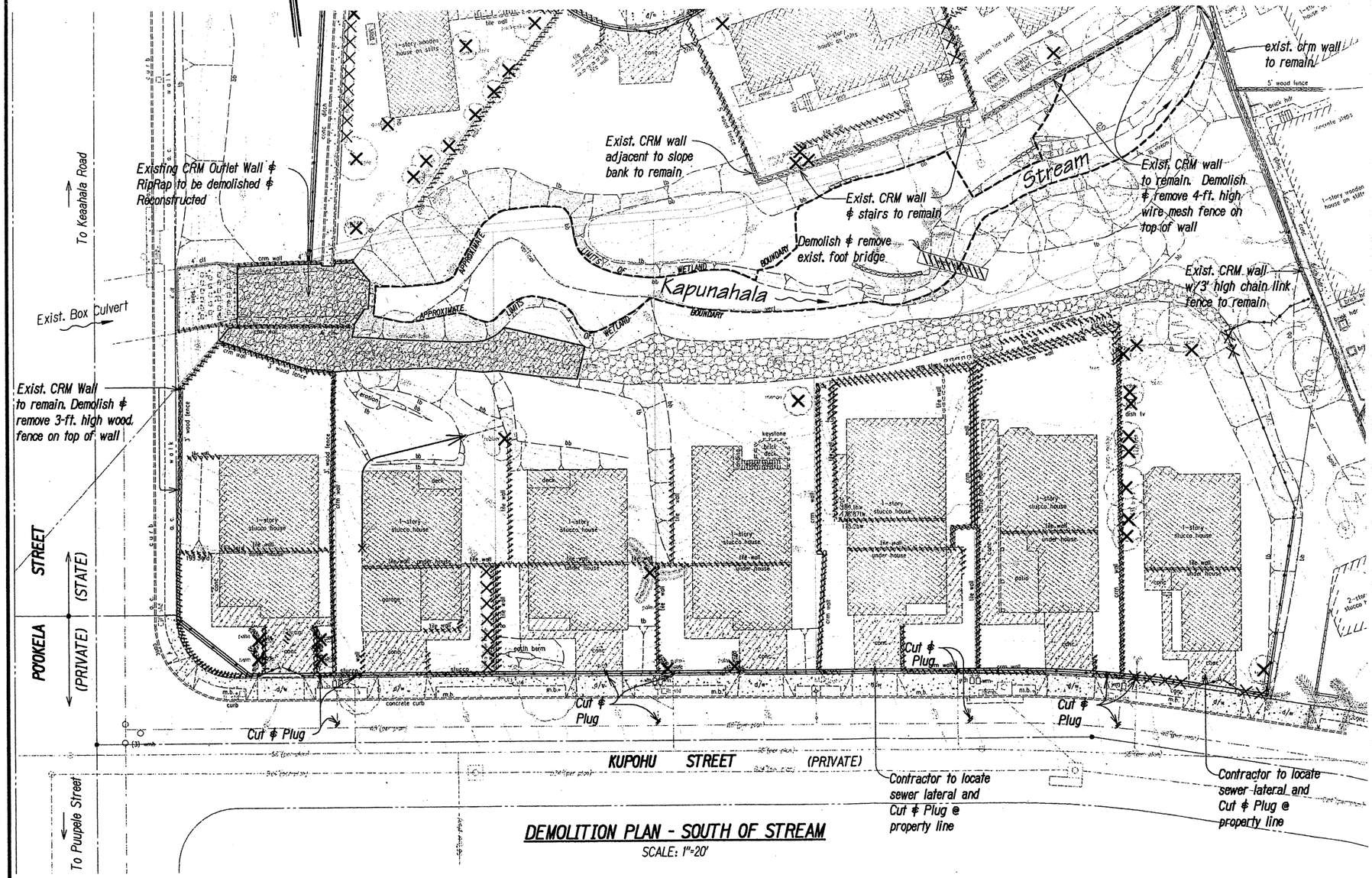
True North
Scale: 1"=20'




DEMOLITION PLAN - SOUTH OF STREAM
SCALE: 1"=20'

Legend:

- Existing structure to be demolished and removed.
- Existing pavement to be demolished and removed.
- Existing crm wall to be demolished and removed, including fencing where applicable.
- Existing cmu wall to be demolished and removed, including fencing where applicable.
- Existing foot bridge to be demolished and removed
- Existing hedge to be demolished and removed.
- Existing tree to be demolished and removed.
- Existing tree to be demolished and removed.
- Existing tree to be demolished and removed.

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

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APRIL 30, 2010
PerEn, Inc. dba PARK ENGINEERING
LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

# DEMOLITION PLAN
# SOUTH OF STREAM

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. DP2 OF DP2 SHEETS

| DATE | REVISION |
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ORIGINAL PLAN
NOTE BOOK No.
SURVEY PLOTTED BY DATE
DRAWN BY
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DESIGNED BY
QUANTITIES BY
CHECKED BY

Wed, 18 Mar 2009 - 10:28am
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09-Cashills-DemoPlan.dwg 12/03/08

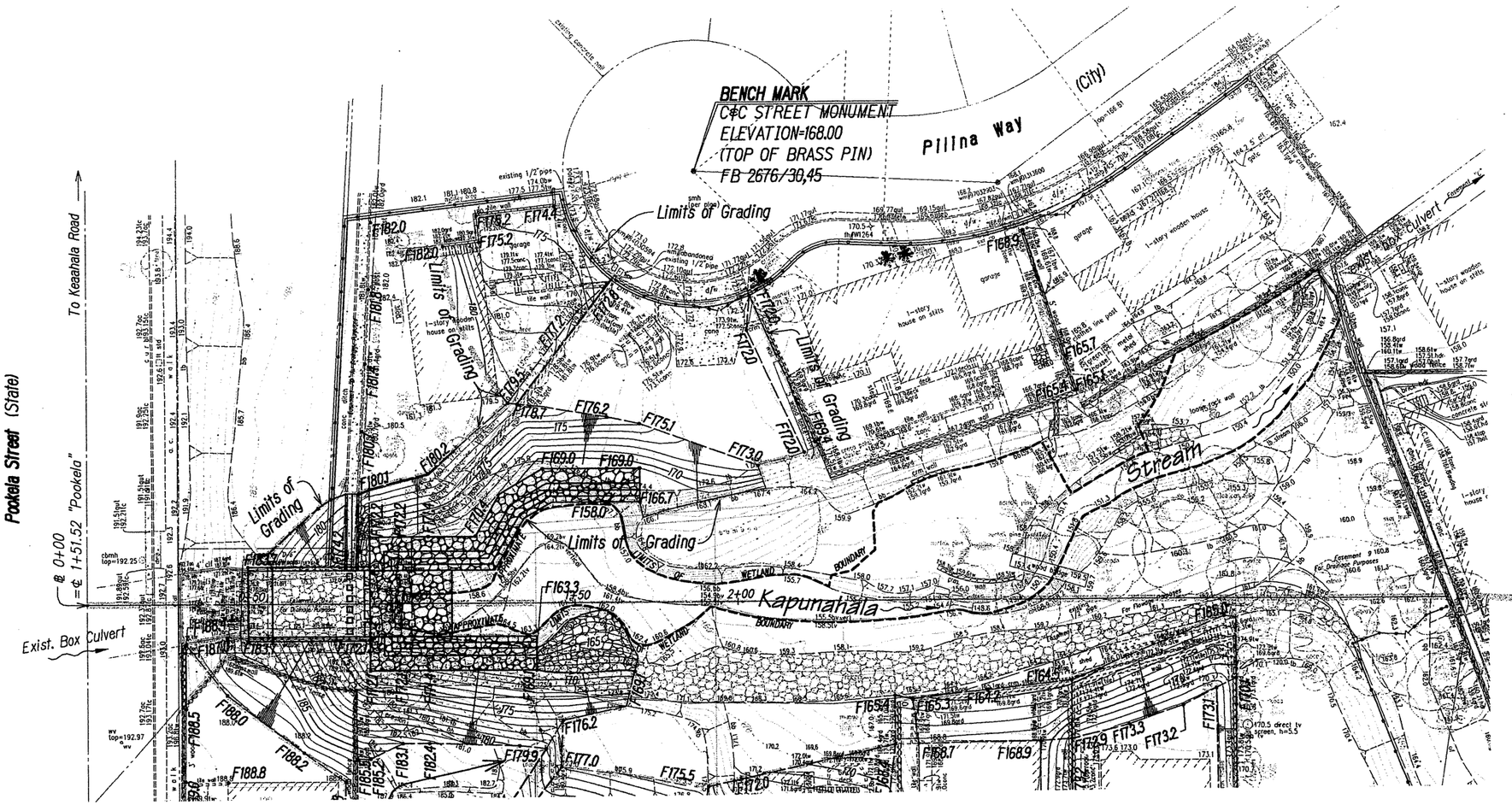
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | HWY-0-04-98 | 2009 | 14 | 33 |

**Legend:**

- 180 — Finish 5-ft Contour
- Finish 1-ft Contour
- Existing 5-ft Contour
- Existing 1-ft Contour
- Limits of Grading
- F179.9 — Finish Grade Elevation
- 182.0 — Existing Ground Elevation
- Grade Bank

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

True North
Scale: 1"=20'




GRADING PLAN - NORTH OF STREAM
SCALE: 1"=20'

| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
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Parth, Inc. dba PARK ENGINEERING — APRIL 30, 2010 LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**GRADING PLAN**
**NORTH OF STREAM**
CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

| DATE | REVISION |
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SHEET No. GP1 OF GP2 SHEETS

10-Cashills-DemoPlan.dwg 12/03/08

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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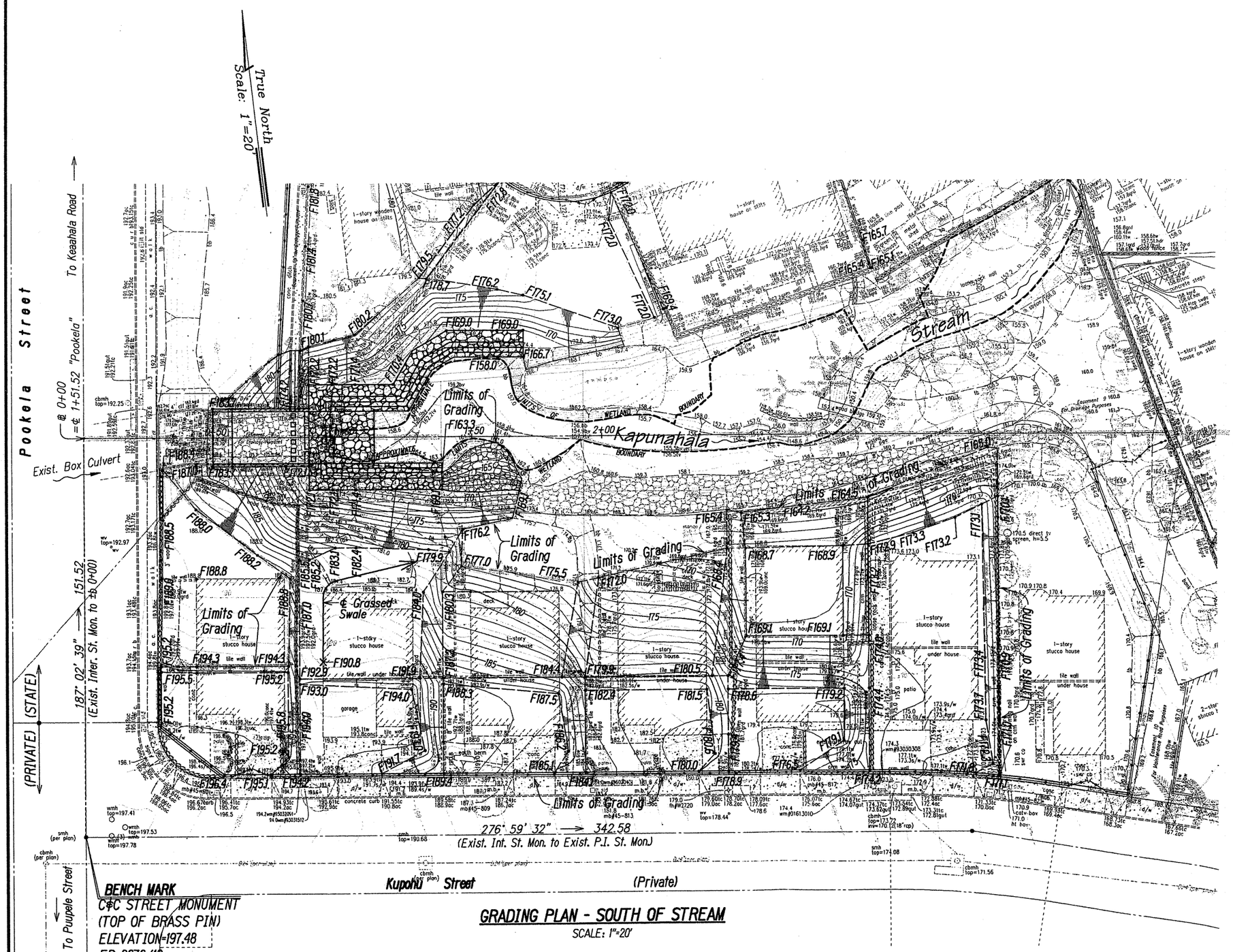


**BENCH MARK**
C&C STREET MONUMENT
(TOP OF BRASS PIN)
ELEVATION=197.48
FB 2676/10

## GRADING PLAN - SOUTH OF STREAM

SCALE: 1"=20'

**Legend:**

- 180 — Finish 5-ft Contour
- Finish 1-ft Contour
- Existing 5-ft Contour
- Existing 1-ft Contour
- Limits of Grading
- F179.9 — Finish Grade Elevation
- 182.0 — Existing Ground Elevation
- Grade Bank

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

RUSSELL M. ARAKAKI
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No. 8287-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

PanEn, Inc. dba PARK ENGINEERING — APRIL 30, 2010 LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**GRADING PLAN**
**SOUTH OF STREAM**
CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. GP2 OF GP2 SHEETS

15

| DATE | REVISION |
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| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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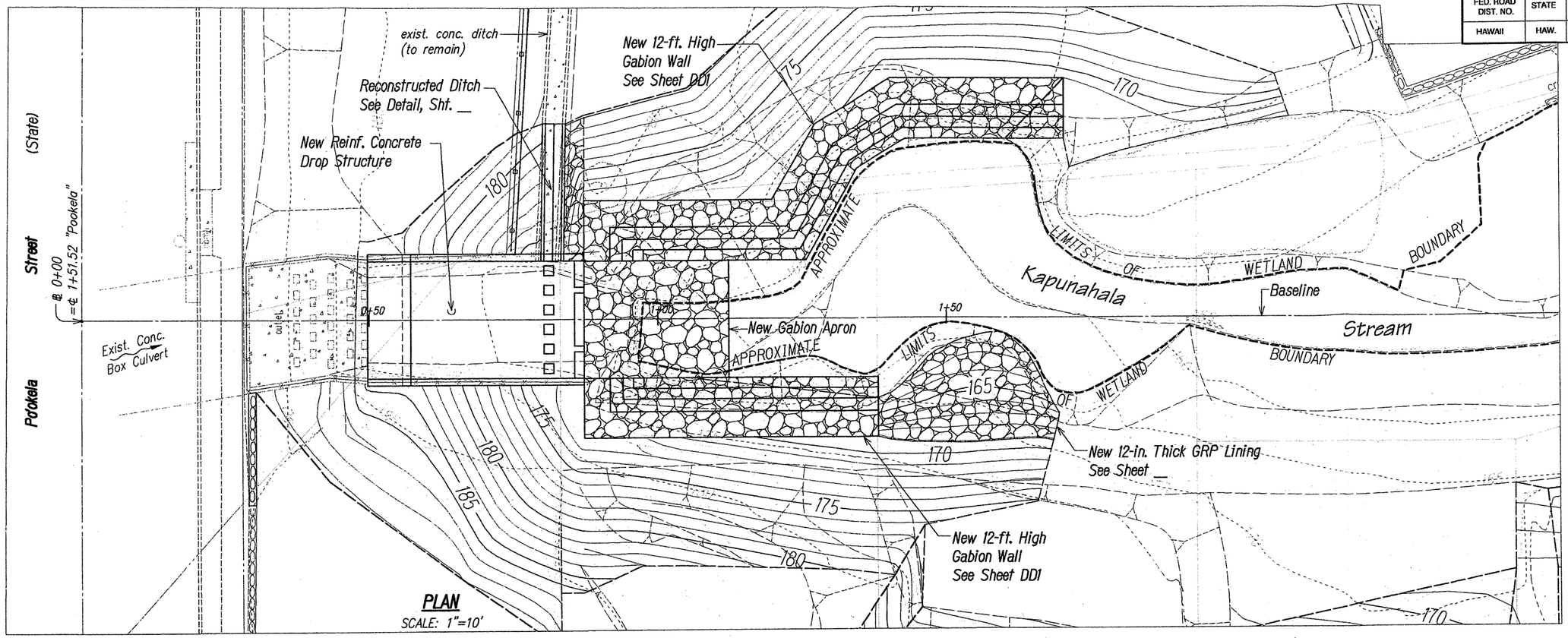
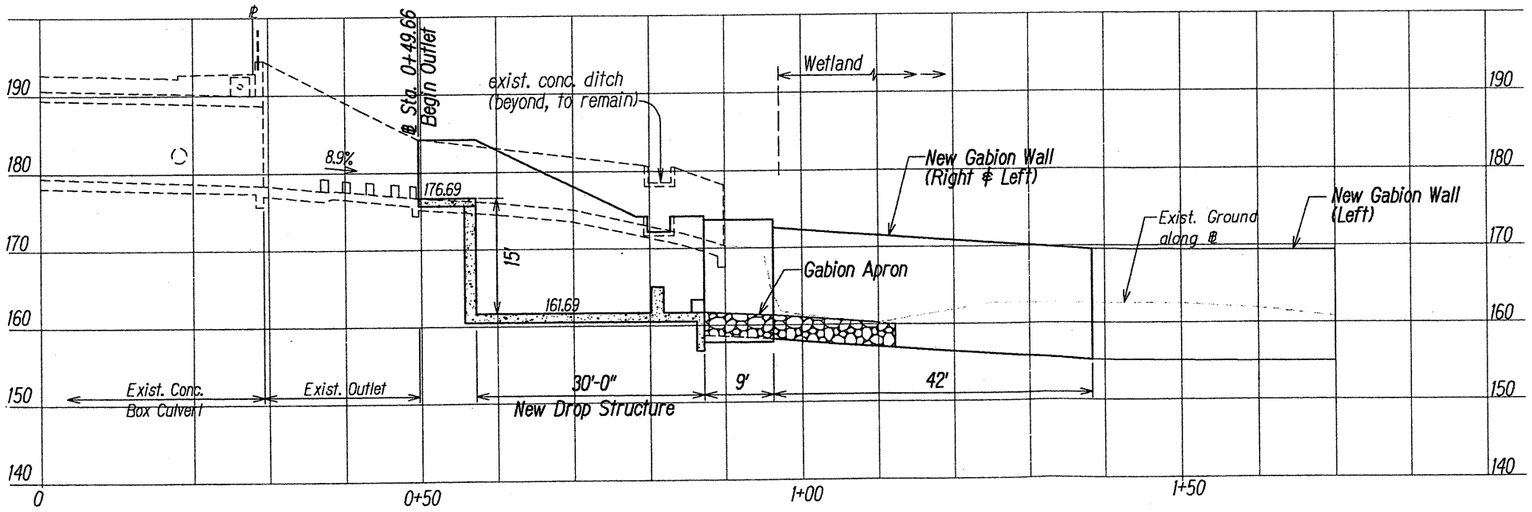



**PLAN**
SCALE: 1"=10'




**PROFILE**
Scale: 1"=10' (Bothways)

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

RUSSELL M. ARAKAKI
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No. 8297-C
HAWAII, U.S.A.

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PanEn, Inc.
dba PARK ENGINEERING

APRIL 30, 2010
LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

# PLAN AND PROFILE
# NEW DRAINAGE OUTLET
## CASTLE HILLS ACCESS ROAD
## Drainage Improvements
## Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. D1 OF D2 SHEETS

| DATE | REVISION |
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ORIGINAL PLAN | SHEET PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE
NOTE BOOK | No.

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| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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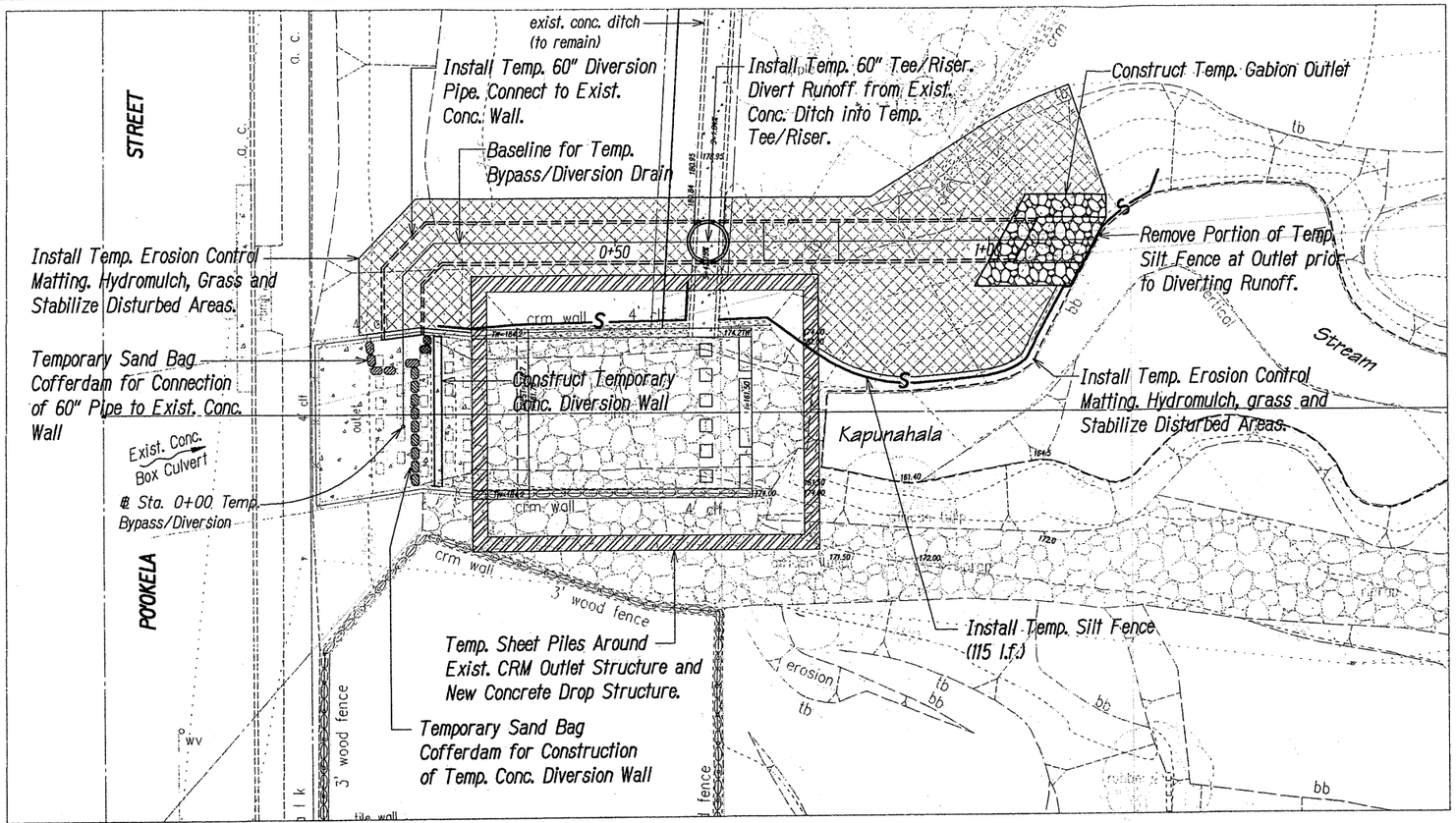
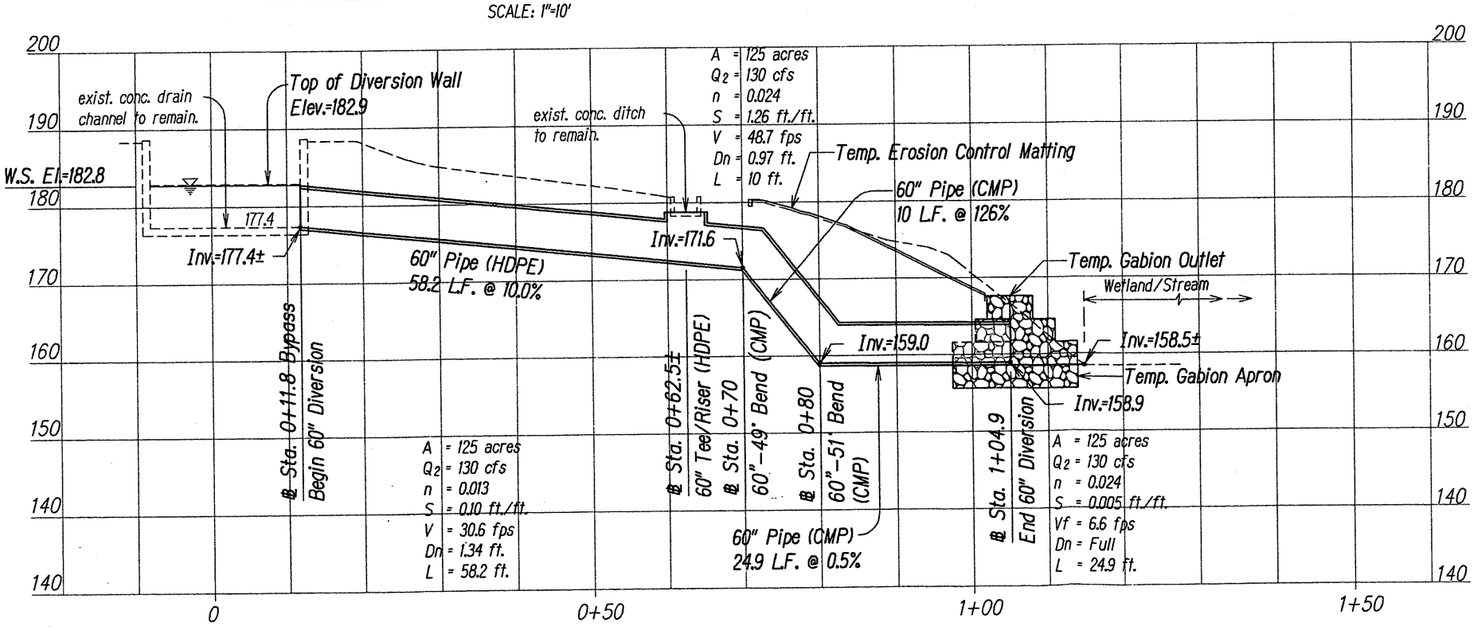



## PLAN - TEMPORARY BYPASS/DIVERSION DRAIN

SCALE: 1"=10'




## PROFILE - TEMPORARY BYPASS/DIVERSION DRAIN

Scale: 1"=10' (Bothways)

## CONSTRUCTION SEQUENCE FOR TEMP. BYPASS/DIVERSION DRAIN

1. Install temporary silt fence at gabion outlet, along stream, stream bank, exist. crm and concrete walls, and concrete ditch.
2. Construct temporary gabion outlet.
3. Install 60" bypass/diversion drain from temporary gabion outlet to exist. concrete wall.
4. Remove temporary silt fence at gabion outlet and divert runoff from concrete lined ditch into the 60" bypass/diversion pipe.
5. Install sand bag cofferdam at existing concrete wall for connection of the 60" bypass/diversion pipe.
6. Demolish exist. concrete headwall as required for connection of the 60" bypass/diversion pipe.
7. Connect the 60" bypass/diversion pipe to exist. concrete headwall.
8. Remove temporary sand bag cofferdam at exist. conc. headwall.
9. Install temporary sand bag cofferdam for construction of the temporary concrete diversion wall and divert stream to 60" pipe.
10. Construct temporary concrete diversion wall.
11. Remove sand bag cofferdam at temporary concrete diversion wall and divert the flow into the 60" bypass/diversion pipe.
12. Install temporary erosion control matting over trench backfill and other disturbed areas, then hydromulch, grass and stabilize disturbed areas.

RUSSELL M. ARAKAKI LICENSED PROFESSIONAL ENGINEER No. 8297-C HAWAII, U.S.A.

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# TEMPORARY STREAM DIVERSION PLAN

## CASTLE HILLS ACCESS ROAD

## Drainage Improvements

## Project No. HWY-0-04-98

Scale: As Shown — Date: March 2009

SHEET No. D2 OF D2 SHEETS

| DATE | REVISION |
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| ORIGINAL PLAN | AWY PLOTTED BY | DATE |
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| | DRAWN BY | |
| NOTE BOOK | TRACED BY | |
| | DESIGNED BY | |
| | QUANTITIES BY | |
| No. | CHECKED BY | |

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15--Ceshills-XSect-01 12/22/08

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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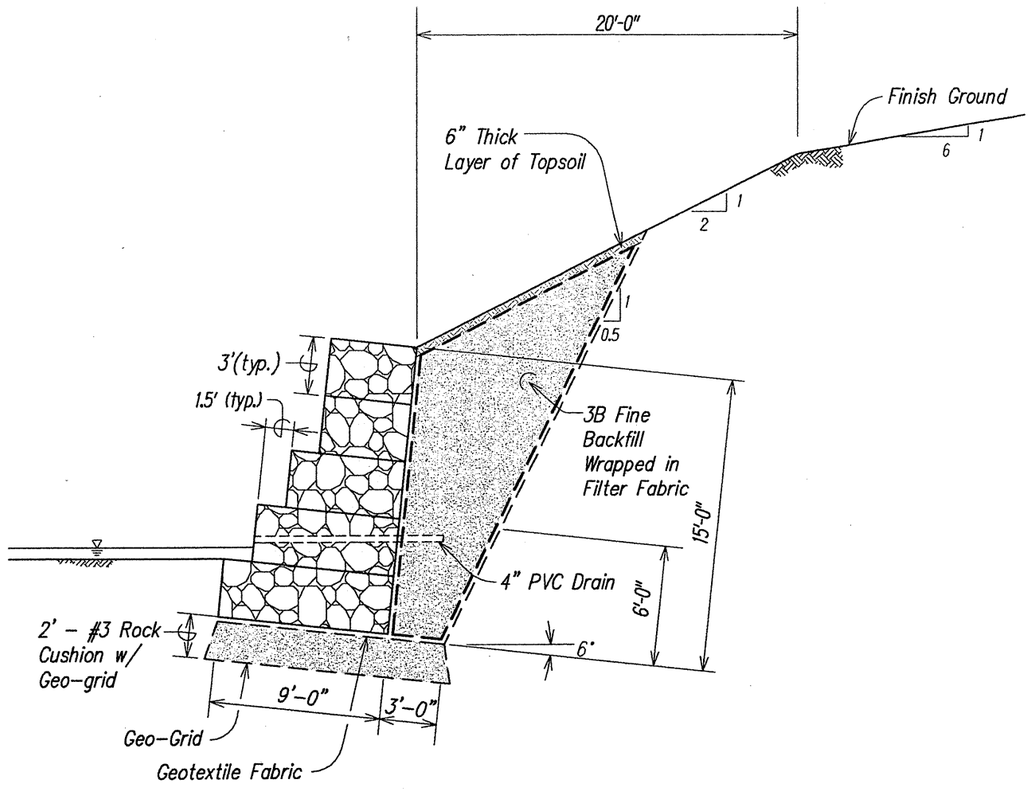
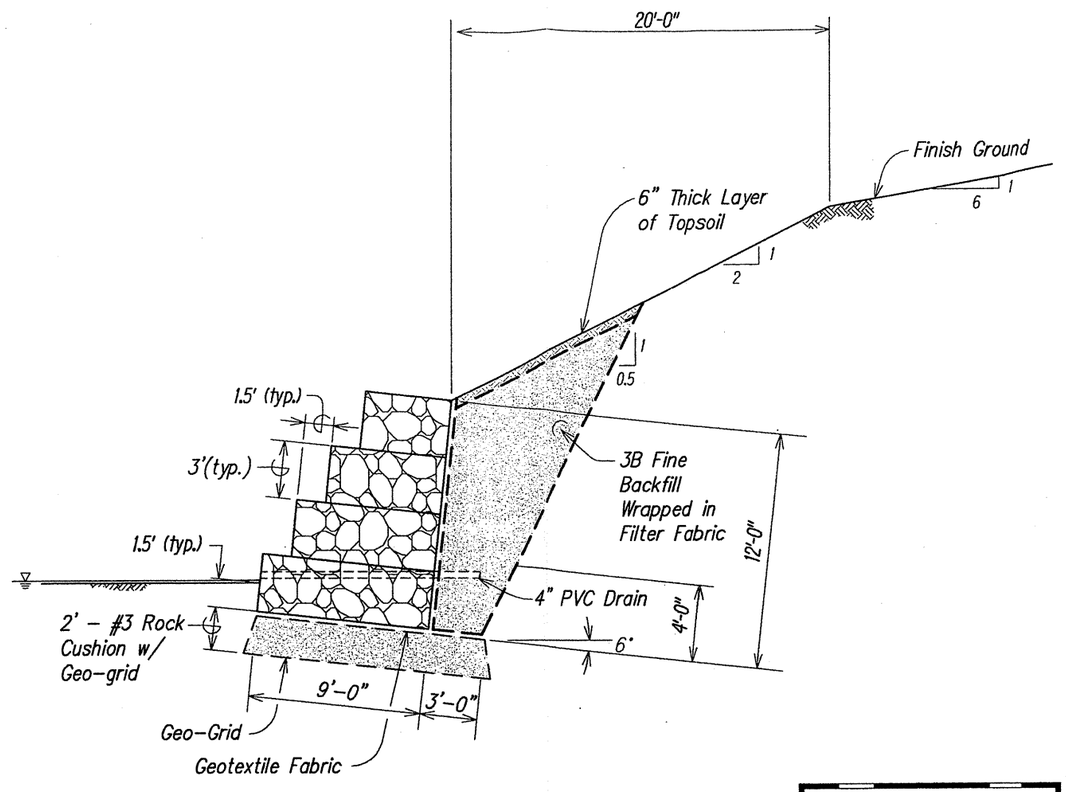
| HAWAII | HAW. | HWY-0-04-98 | 2009 | 18 | 33 |




## 15-FT HIGH GABION WALL SECTION (TYPICAL)

SCALE: 1/4" = 1'-0"




## 12-FT HIGH GABION WALL SECTION (TYPICAL)

SCALE: 1/4" = 1'-0"

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

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LICENSED PROFESSIONAL ENGINEER
No. 8297-C
HAWAII, U.S.A.

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HIGHWAYS DIVISION

# DETAILS

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. DD1 OF DD2 SHEETS

| DATE | REVISION |
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ORIGINAL PLAN
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TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE
NOTE BOOK
No.

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| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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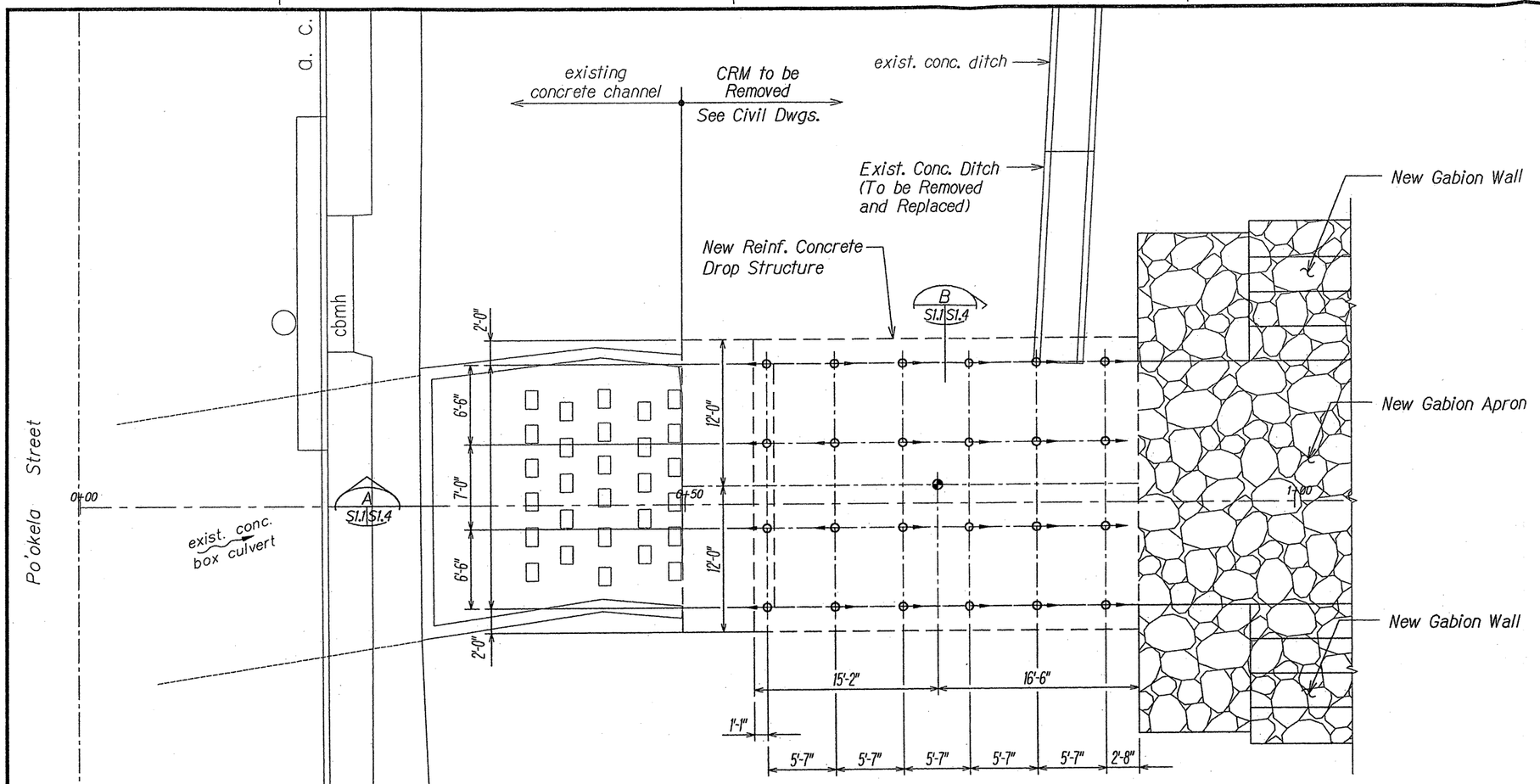


LEGEND:

- Direction of Battered Micropile (1H:8V)
- Preproduction Micropile

## MICROPILE LAYOUT PLAN

Scale: 3/16" = 1'-0"

ORIGINAL PLAN
NOTE BOOK No.
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# MICROPILE LAYOUT PLAN

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. S1.1 OF 11 SHEETS

| DATE | REVISION |
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| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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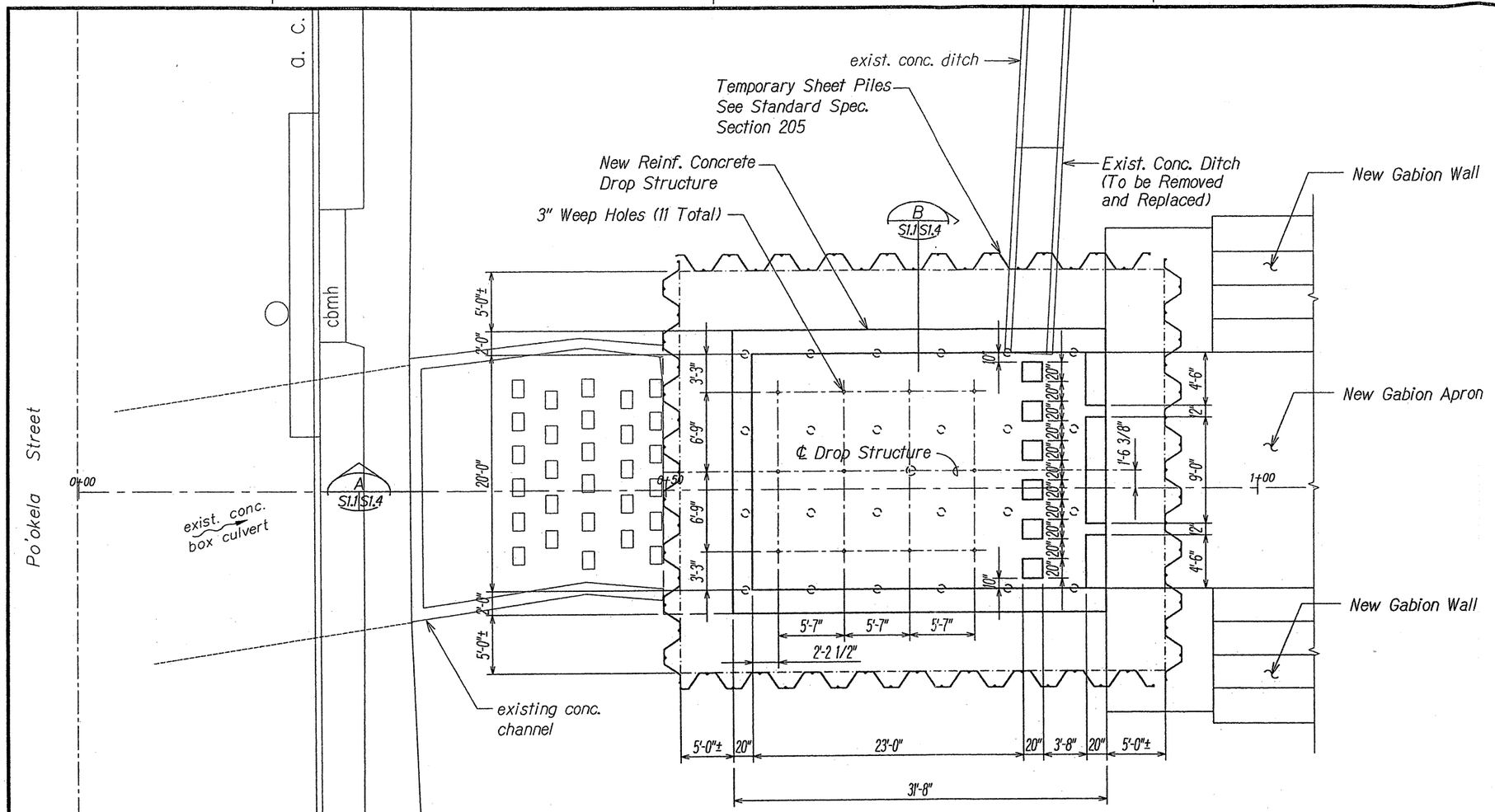


## DROP STRUCTURE PLAN

Scale: 3/16" = 1'-0"

| ORIGINAL PLAN | DAYS |
|---|---|
| NOTE BOOK | PLOTTED BY |
| No. | DRAWN BY |
| | TRACED BY |
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| | QUANTITIES BY |
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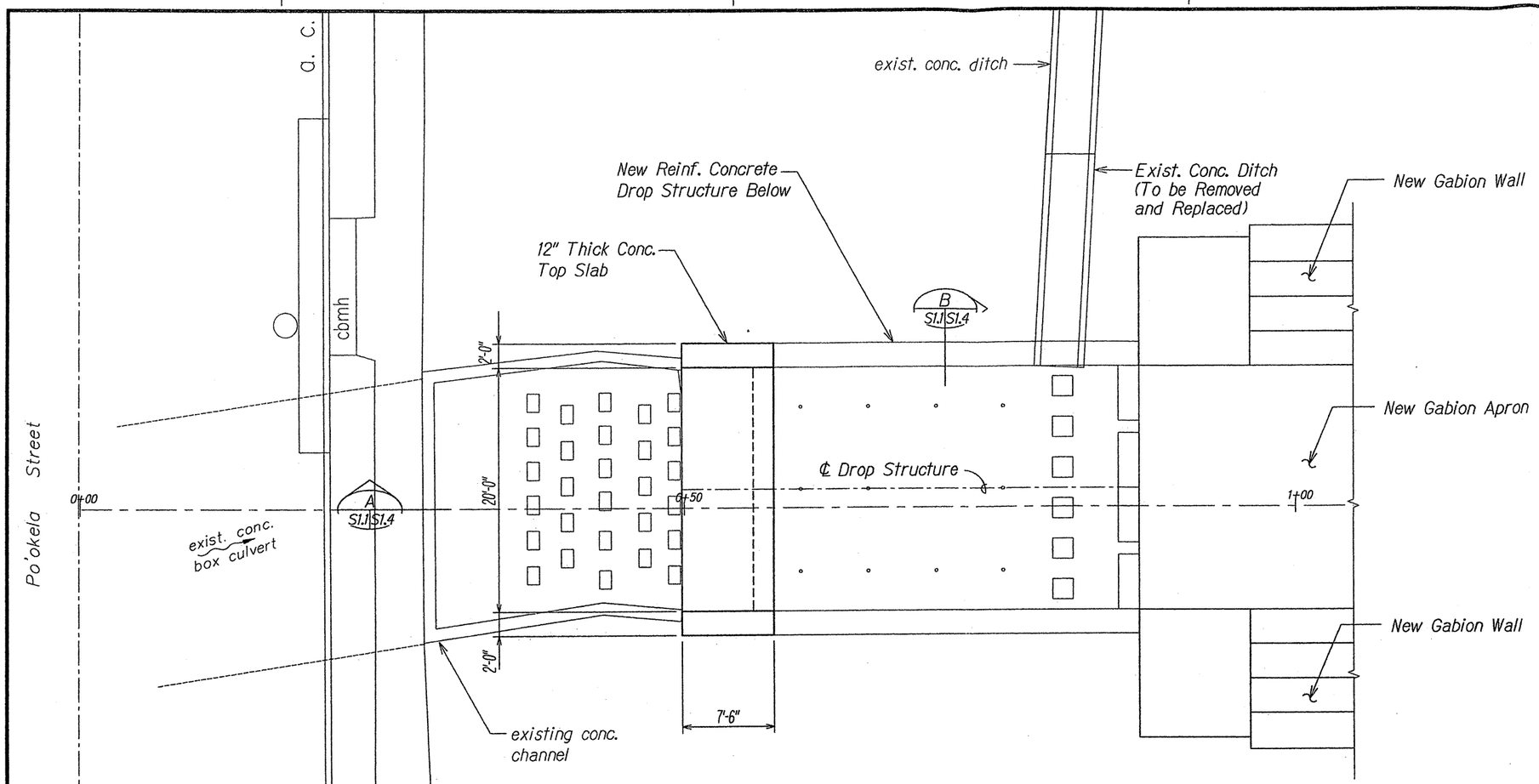
DROP STRUCTURE PLAN

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. S1.2 OF 11 SHEETS

| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | HWY-0-04-98 | 2009 | 00 | X |




## DROP STRUCTURE TOP SLAB PLAN

Scale: 3/16" = 1'-0"

ORIGINAL PLAN | NOTE BOOK | No. | DATE PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY

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# DROP STRUCTURE TOP SLAB PLAN

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

| DATE | REVISION |
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SHEET No. S1.3 OF 11 SHEETS

| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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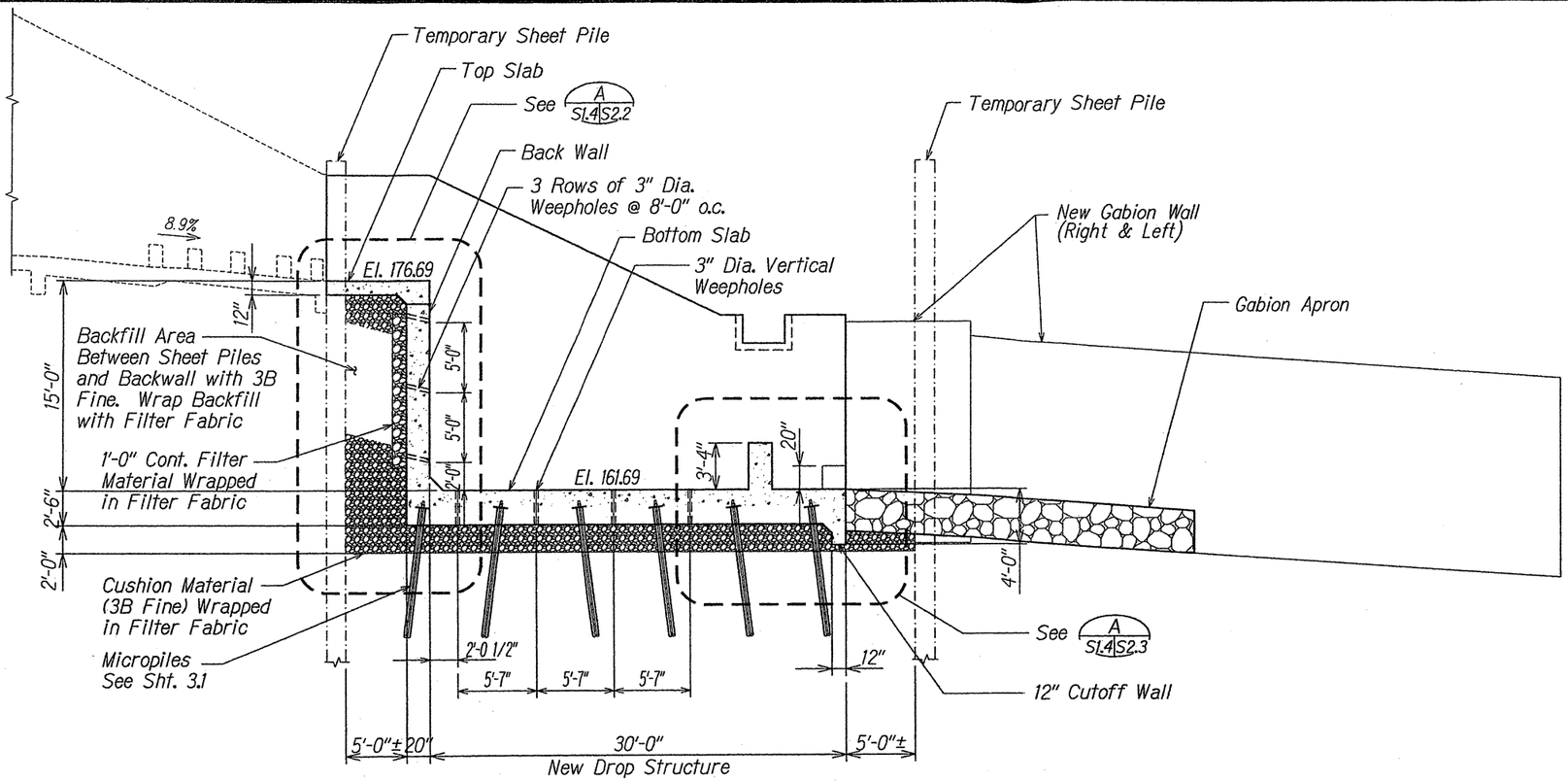
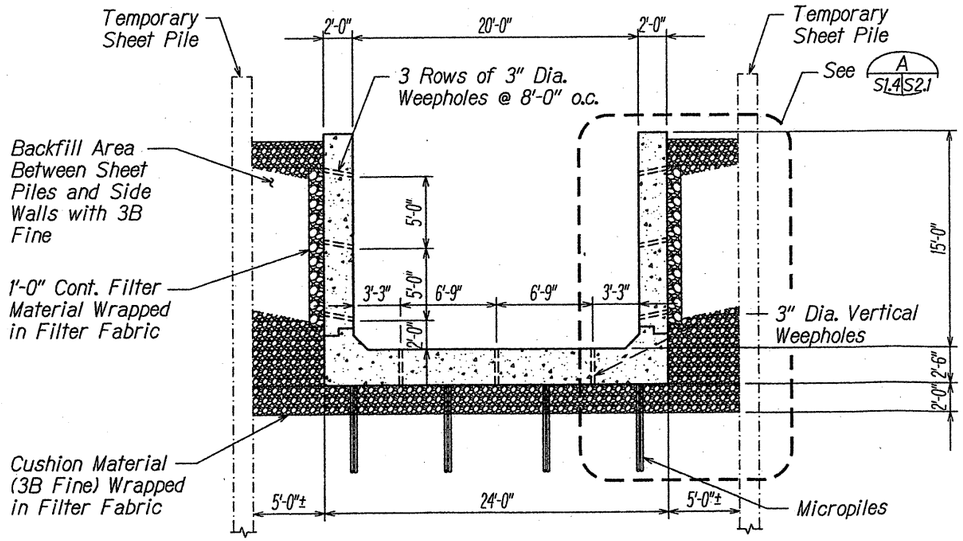



## LONGITUDINAL SECTION A S1.1 S1.4

Scale: 3/16" = 1'-0"




## TRANSVERSE SECTION B S1.1 S1.4

Scale: 3/16" = 1'-0"

ORIGINAL PLAN | KEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

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# DROP STRUCTURE SECTIONS

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

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| DATE | REVISION |
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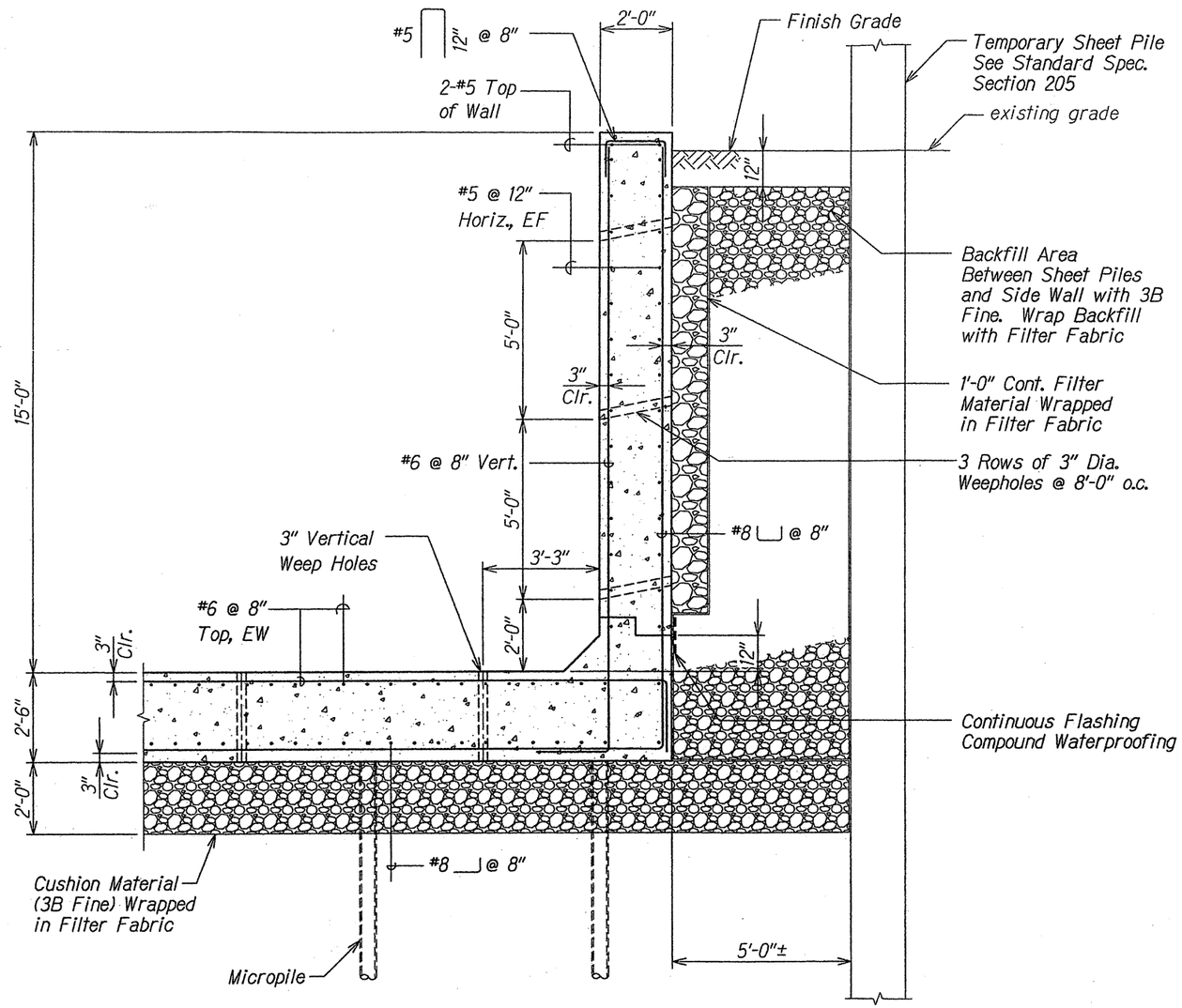


## DROP STRUCTURE SECTION

A
S1.4 | S2.1

Scale: 1/2" = 1'-0"

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# HEAD WALL SECTION

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. S2.1 OF 11 SHEETS

| DATE | REVISION |
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| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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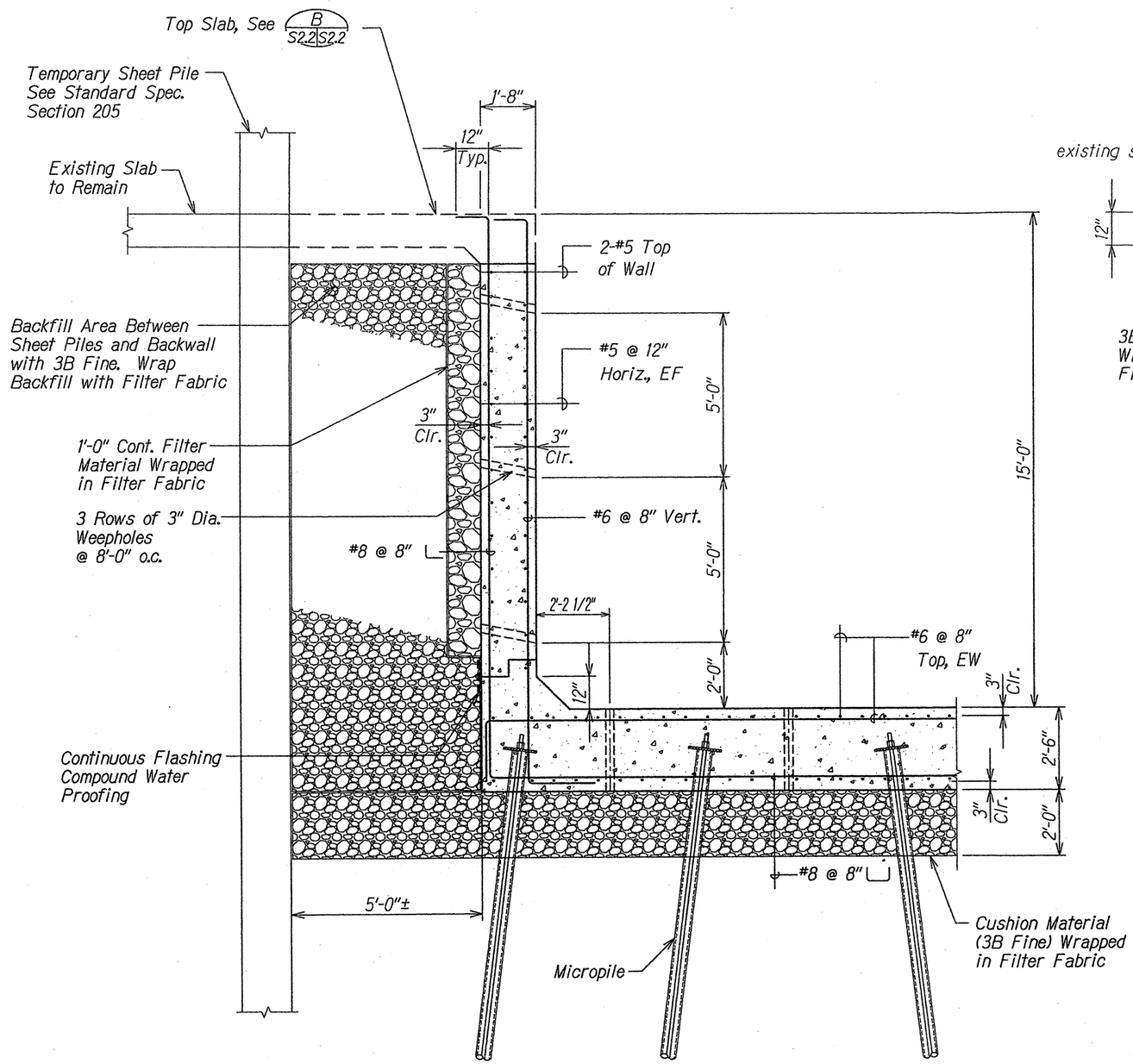
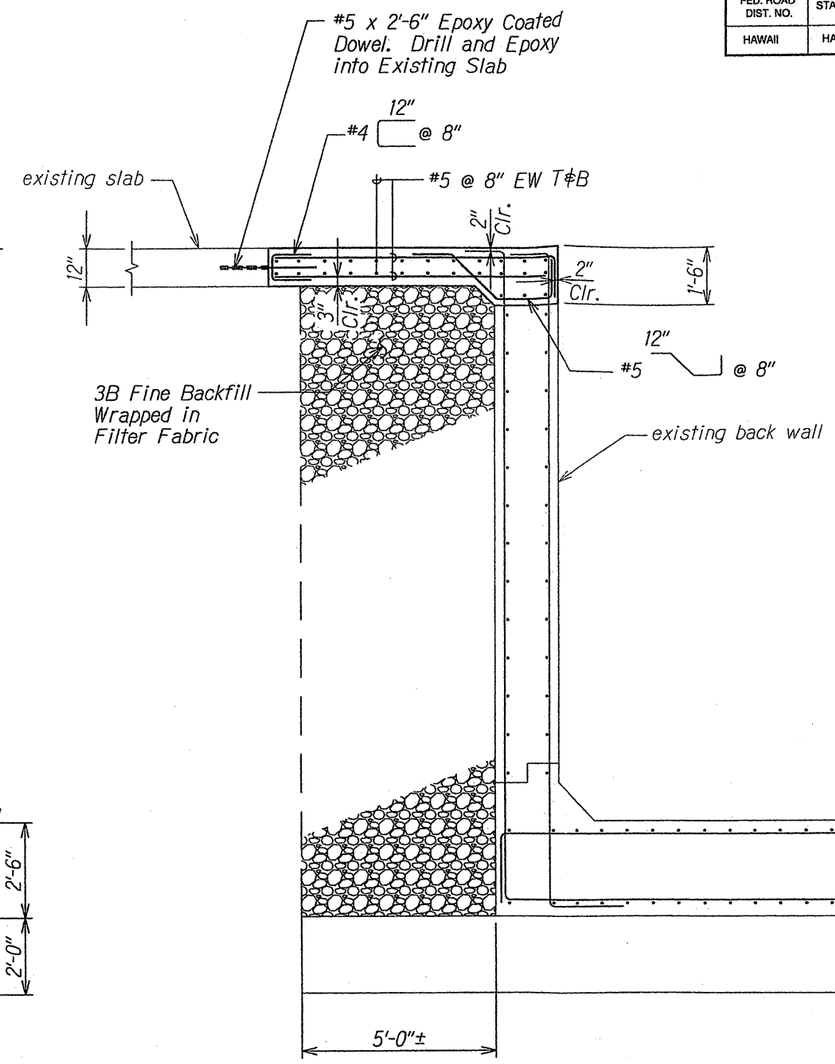



## DROP STRUCTURE BACK WALL SECTION

A S1.4 S2.2

Scale: 1/2" = 1'-0"




## DROP STRUCTURE TOP SLAB SECTION

B S2.2 S2.2

Scale: 1/2" = 1'-0"

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## DROP STRUCTURE SECTIONS

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown — Date: March 2009

SHEET No. S2.2 OF 11 SHEETS

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ORIGINAL PLAN
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| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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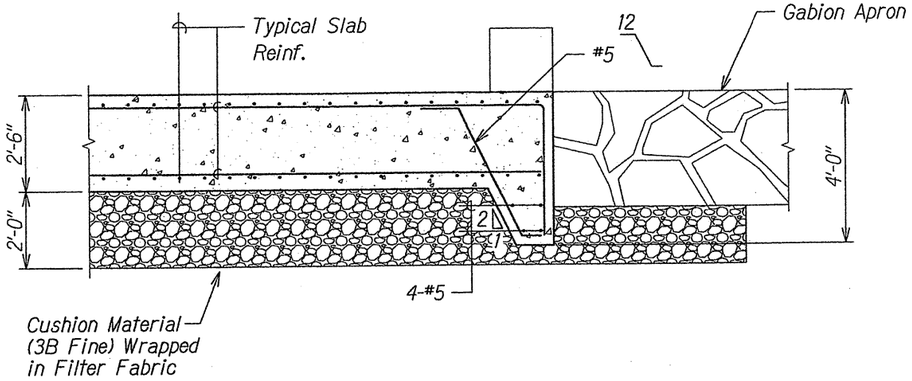


## DROP STRUCTURE CUTOFF WALL SECTION

A
S1.4 | S2.3

Scale: 1/2" = 1'-0"

ORIGINAL PLAN
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# DROP STRUCTURE SECTION

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. S2.3 OF 11 SHEETS

| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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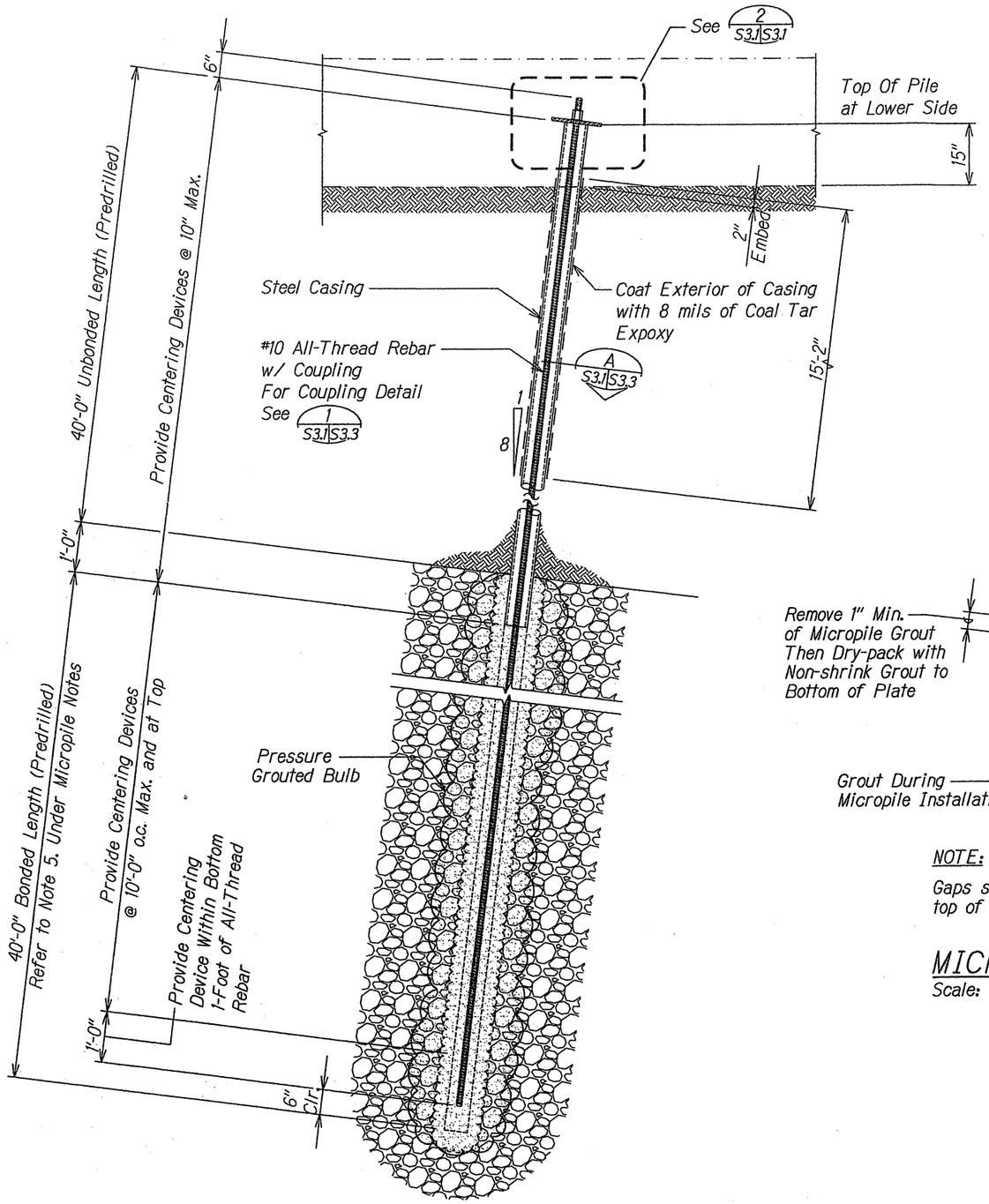
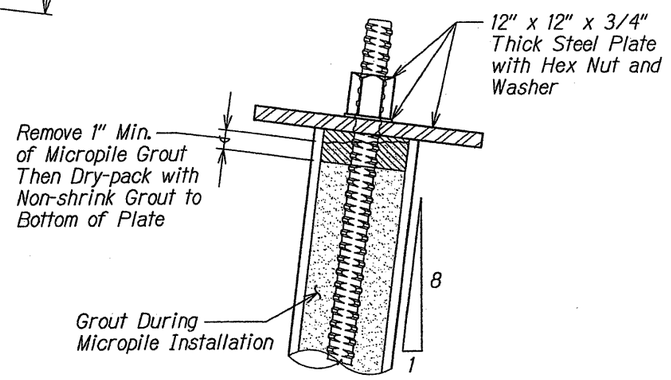



## TYPICAL MICROPILE DETAIL 1 S3.1 S3.1

Scale: 3/4" = 1'-0"




NOTE:

Gaps shall not exist between plate and top of steel casing and non-shrink grout.

## MICROPILE DETAIL 2 S3.1 S3.1

Scale: 3" = 1'-0"

MICROPILE NOTES:

1. All nuts and bar couplings shall develop 100% of the bar's ultimate tensile strength.
2. Splices within steel casing shall develop 100% of the steel casing's ultimate tensile strength.
3. All accessories such as nuts, couplings, washers, and steel plates shall be hot-dip galvanized according to ASTM A-153.
4. Material Properties of Accessories:
   (a) Steel Plates - ASTM A36
   (b) Hex Nuts - ASTM A108
   (c) Couplings - ASTM A108
   (d) Washers - ASTM F436
5. The bonded length is estimated. The actual bonded length will be determined by the Engineer after the preproduction micropile load test.
6.

| Micropile Load Combination (Demand) | | |
|---|---|---|
| | Axial Load (kips) | Moment (k-ft) |
| Strength Limit State | 80 Compression | 50 |
| Strength Limit State | 50 Tension | 50 |

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# MICROPILE DETAIL AND SECTION

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. S3.1 OF 11 SHEETS

| DATE | REVISION |
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ORIGINAL PLAN
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| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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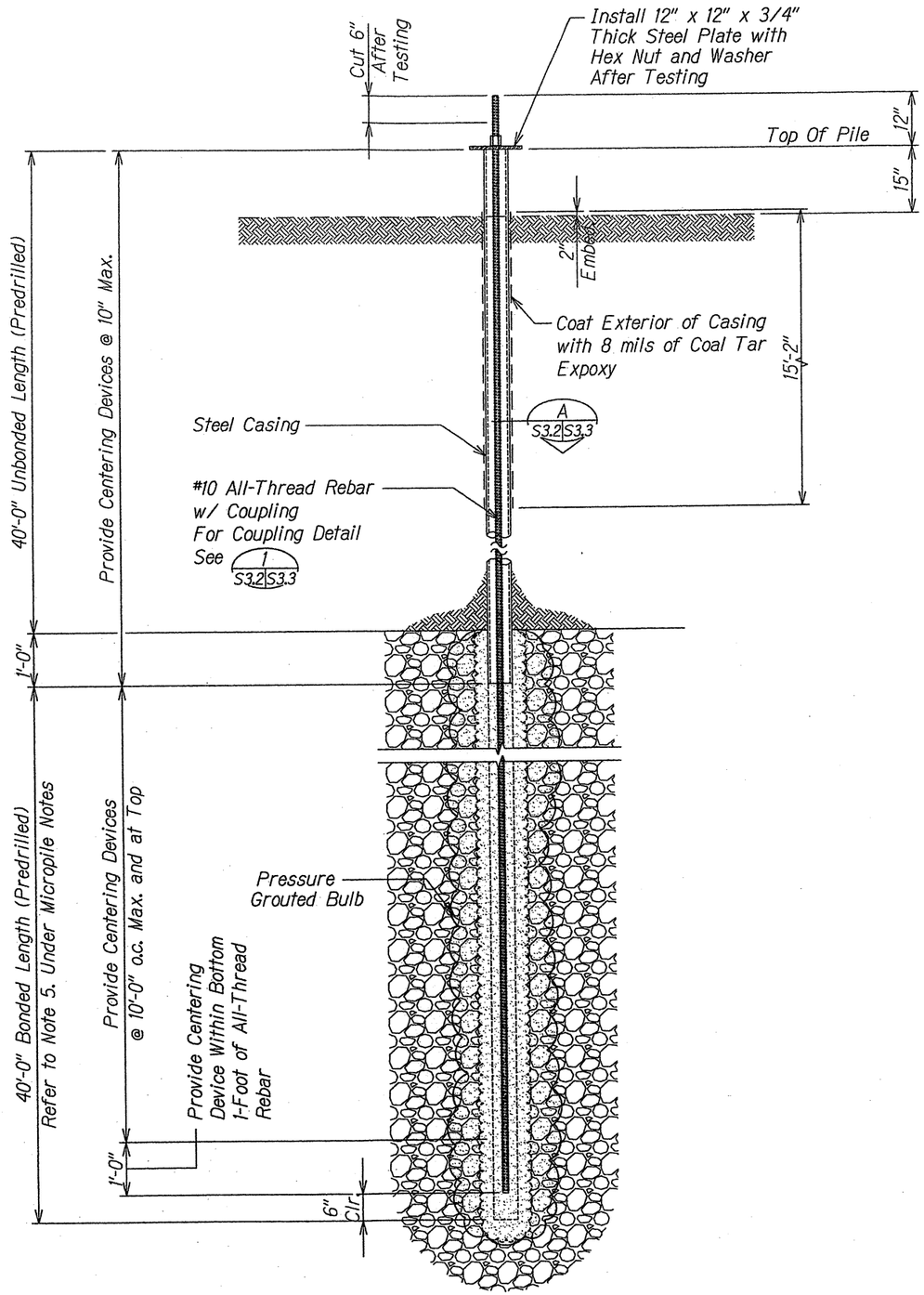


## TYPICAL PREPRODUCTION MICROPILE DETAIL

1
S3.2 S3.2

Scale: 3/4" = 1'-0"

| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
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PREPRODUCTION MICROPILE DETAIL

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. S3.2 OF 11 SHEETS

| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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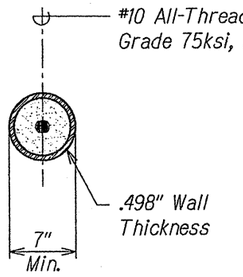


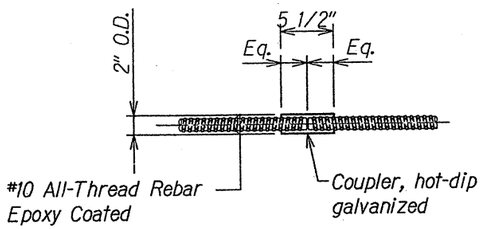

NOTES:

1. Centering devices (centralizers) shall be fabricated from plastic or material non-detrimental to the reinforcing steel.
2. The centralizer shall support the reinforcing such that a minimum of 2" of grout cover is provided and shall permit grout to flow freely up the drill hole.

## TYPICAL MICROPILE SECTION

A
S3.1 | S3.3

Scale: 1 1/2" = 1'-0"




NOTE:

Coupler to develop full ultimate tensile strength of Al-Thread Rebar.

## COUPLER DETAIL OF ALL-THREAD REBAR

1
S3.1 | S3.3

Scale: 1 1/2" = 1'-0"

COUPLER INSTALLATION PROCEDURE

1. Apply corrosion inhibiting grease to the bare ends of the bars and the inside of the coupler.
2. Connect the two bar ends with the coupler. Each end shall be screwed into the coupler half the length of the coupler.
3. Add another coat of grease to bare bar and coupler and wrap with two layers of denso tape.

PREPARATION FOR FIELD CUT BARS

1. Cut corrosion protection and all-thread rebar with an abrasive saw (DO NOT USE A TORCH).

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NOTE BOOK
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MICROPILE DETAIL AND SECTION

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. S3.3 OF 11 SHEETS

| DATE | REVISION |
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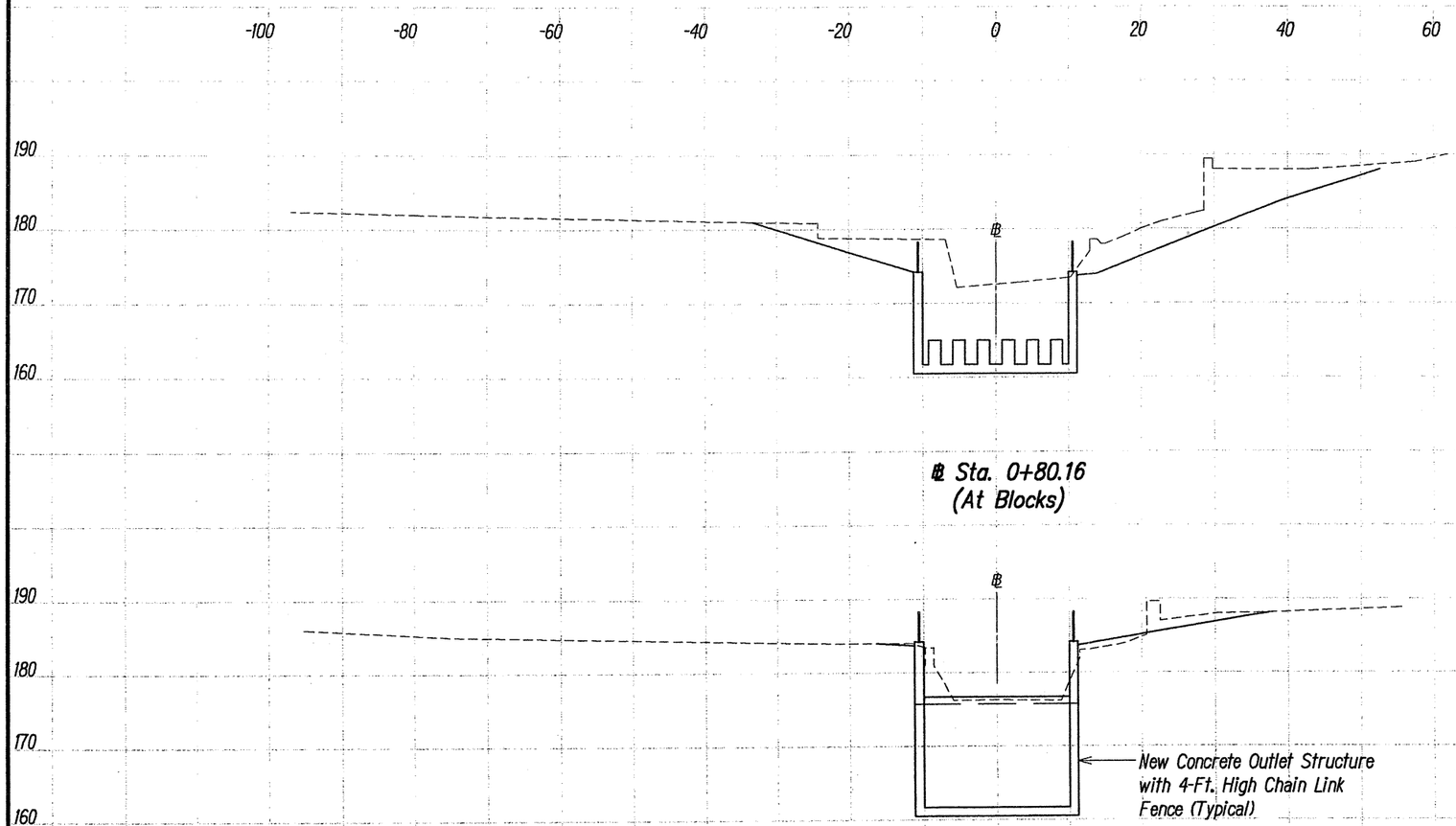
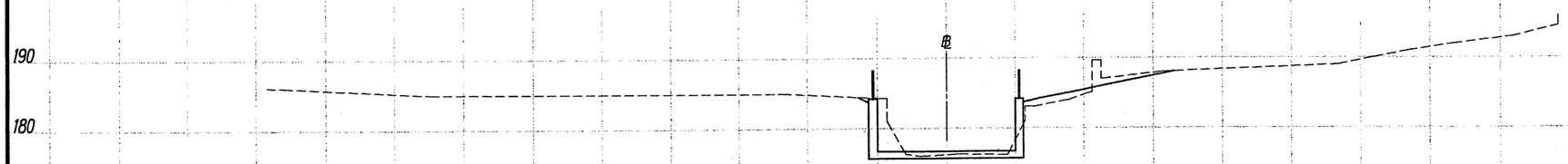
| HAWAII | HAW. | HWY-0-04-98 | 2009 | 31 | 33 |




℄ Sta. 0+80.16
(At Blocks)



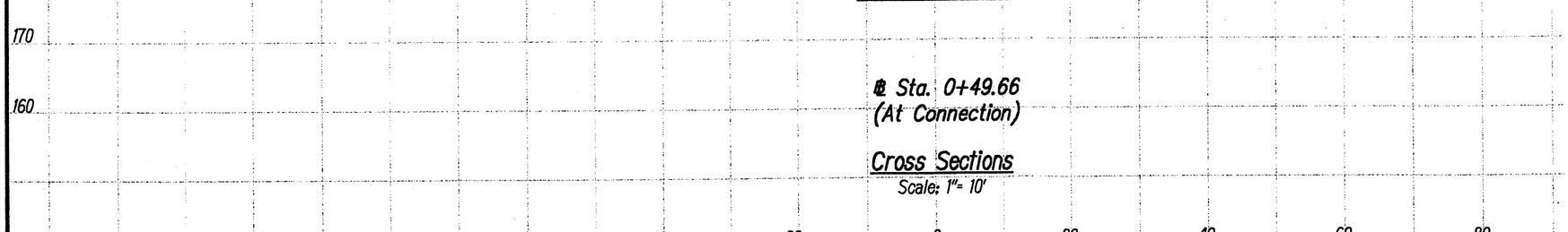

℄ Sta. 0+57.16
(At Drop)




℄ Sta. 0+49.66
(At Connection)

## Cross Sections

Scale: 1"= 10'




REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

RUSSELL M. ARAKAKI
LICENSED PROFESSIONAL ENGINEER
No. 8297-C
HAWAII, U.S.A.

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# CROSS SECTIONS

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. XS1 OF XS3 SHEETS

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TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
NOTE BOOK
No.

Wed, 18 Mar 2009 - 11:05am
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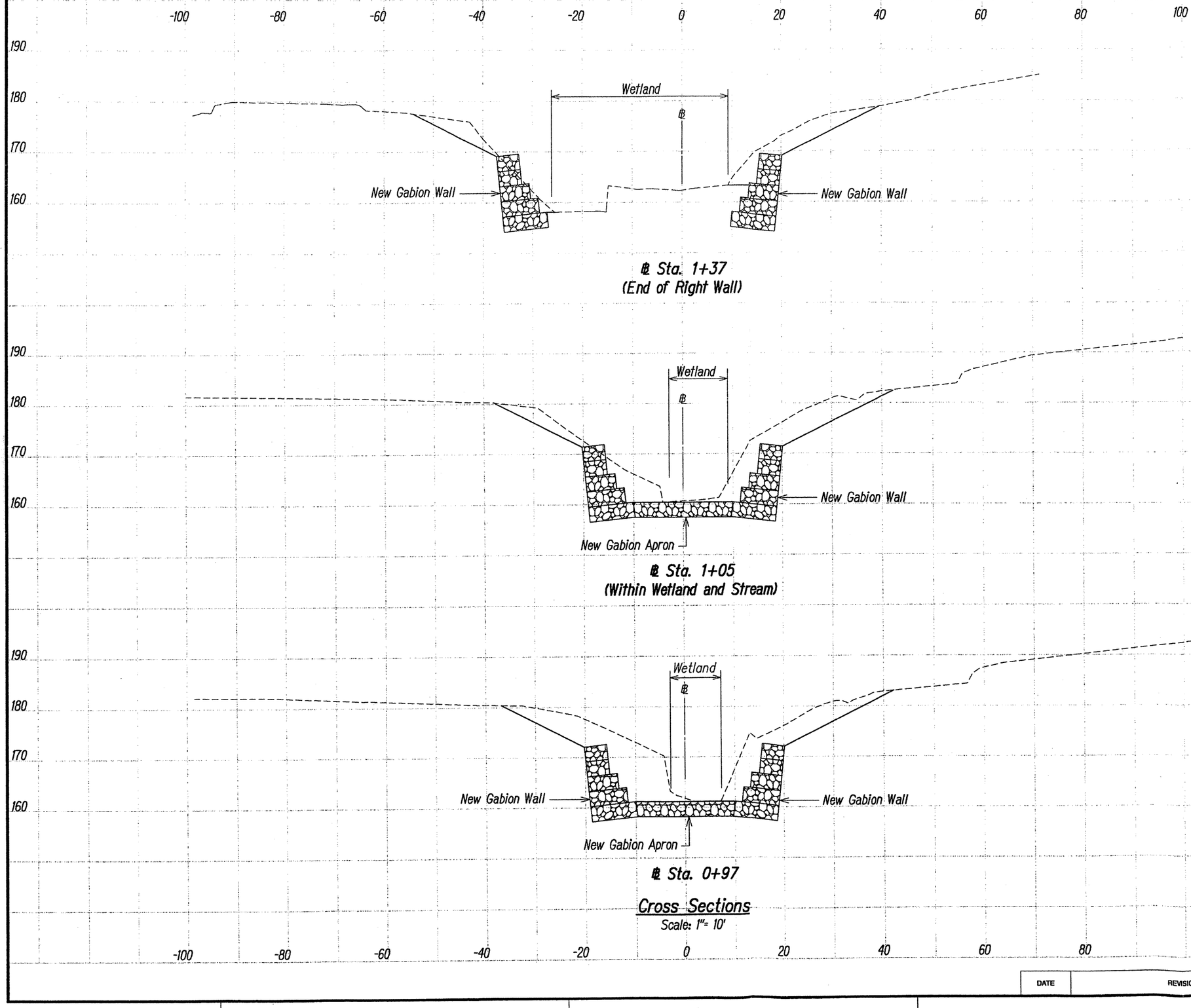
15-Cashills-XSect-01 12/22/08

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | HWY-0-04-98 | 2009 | 32 | 33 |




## Cross Sections

Scale: 1"= 10'

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

RUSSELL M. ARAKAKI
LICENSED PROFESSIONAL ENGINEER
No. 8297-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ParEn, Inc. dba PARK ENGINEERING — APRIL 30, 2010 LIC. EXP. DATE

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

# CROSS SECTIONS

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. XS2 OF XS3 SHEETS

| DATE | REVISION |
|---|---|

ORIGIN PLAN
NOTE BOOK
No.
SURVEY PLOTTED BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE

Wed, 18 Mar 2009 - 10:42am
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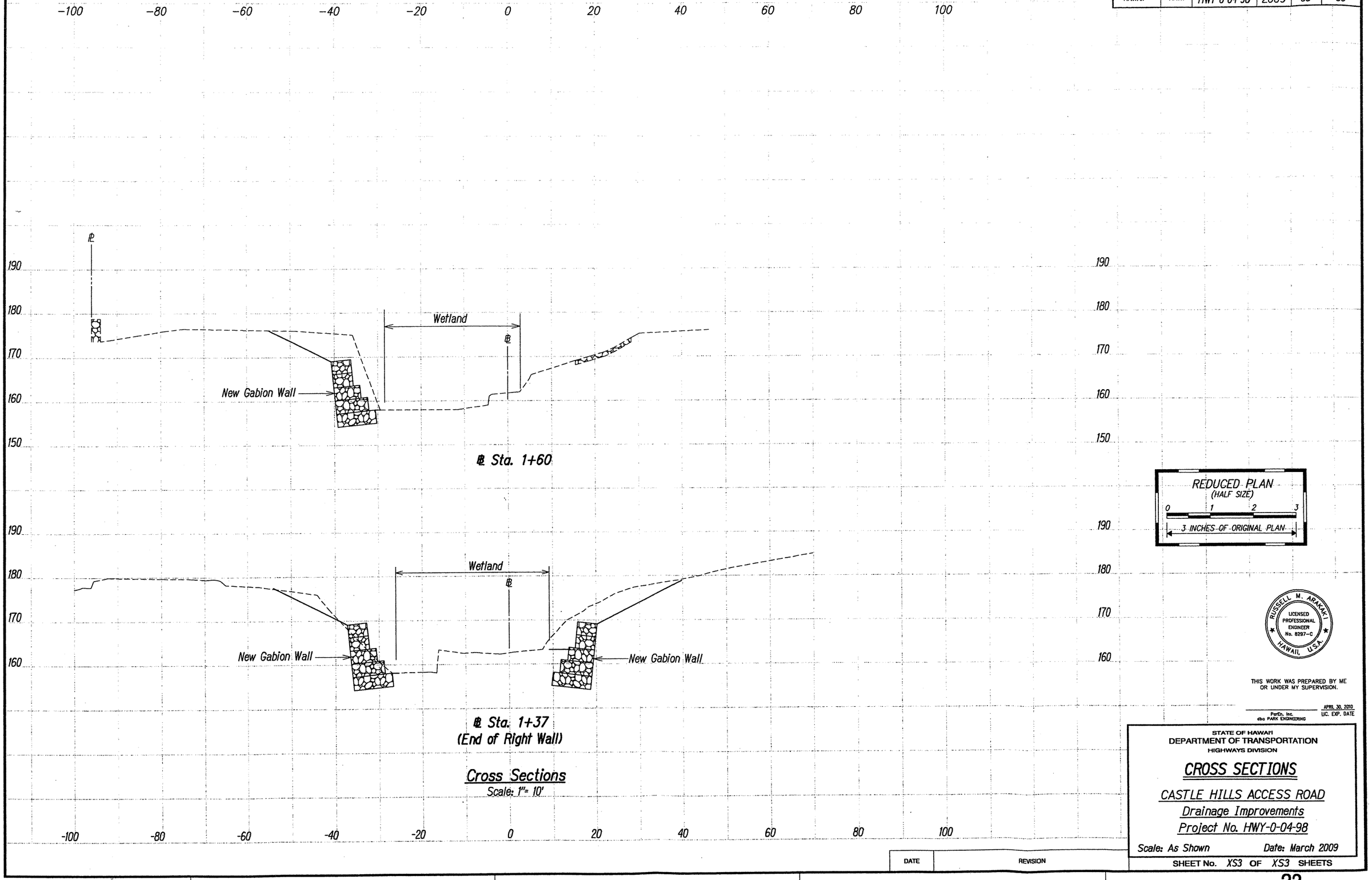
15-Cashills-XSect-01 12/22/08

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | HWY-0-04-98 | 2009 | 33 | 33 |




## Cross Sections

Scale: 1"= 10'

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

RUSSELL M. ARAKAKI
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ParEn, Inc. dba PARK ENGINEERING — APRIL 30, 2010 LIC. EXP. DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

# CROSS SECTIONS

CASTLE HILLS ACCESS ROAD
Drainage Improvements
Project No. HWY-0-04-98

Scale: As Shown Date: March 2009

SHEET No. XS3 OF XS3 SHEETS

| DATE | REVISION |
|---|---|

ORIGINAL PLAN
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
NOTE BOOK
No.
DATE

Wed, 18 Mar 2009 - 10:43am
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# *Appendix* A

## Construction Sequence and Method

Construction Sequence and Method

**Temporary Water Pollution, Dust and Erosion Control Measures/BMP's:**

1. Install, maintain, monitor, repair and replace temporary BMP's including:
   a. Curb inlet protection,
   b. Sediment control filters,
   c. Gravel construction access roads for ingress/egress,
   d. Temporary washdown containment areas,
   e. Concrete waste disposal facilities,
   f. Filter berms,
   g. Dust screen,
   h. Silt fence,
   i. Hose connection to fire hydrant for dust control,
   j. Other water pollution, dust and erosion control measures.

2. Establish air and water quality monitoring station(s), rain gage station and other measurement devices as required by the contract documents. Obtain air quality, water quality and rainfall readings. Record, maintain and submit measurements to the state Engineer and as required by the contract documents.

**Demolition:**

3. Provide mitigation measures for lead-based paint and asbestos-containing building materials as required by the contract documents.

4. Demolish, remove, haul and dispose ten (10) residential structures, including concrete driveways, concrete walkways and slabs, CRM and CMU walls, fence, wooden foot-bridge, trees, vegetation and other items identified on the demolition plans.

5. Remove invasive plants within the stream corridor and project site. The invasive plants within the stream corridor will be removed using small, portable hand-held equipment and tools, such as a chain saw, then hauled by hand to the upland areas (back and/or front yard of properties) of the project site for disposal.

6. Stabilize the disturbed areas with hydromulch, temporary grassing, erosion control matting and other temporary erosion control measures.

Construction Sequence and Method

**Installation of Temporary Stream Bypass/Diversion System:**

7. Excavate for and install the temporary stream bypass/diversion system, including the 60-inch pipe culvert and gabion outlet.

8. Backfill the trench excavation and stabilize the disturbed areas with hydromulch, temporary grassing and erosion control matting.

9. Divert the runoff from the concrete-lined ditch into the temporary diversion pipe.

10. Demolish and remove a portion of the concrete-lined ditch between the 60-inch pipe and the existing CRM outlet structure.

11. Install a temporary sand bag cofferdam within the outlet structure at the connection of the 60-inch bypass/diversion pipe to the existing concrete wall. Divert all stream flow around the location of 60-inch pipe and concrete wall connection.

12. Demolish a portion of the concrete wall and connect the 60-inch bypass/diversion pipe to the concrete wall of the outlet structure.

13. Remove the sand bag cofferdam.

14. Install a temporary sand bag cofferdam across the outlet for construction of the temporary concrete diversion wall and divert all stream flow into the 60-inch bypass/diversion pipe.

15. Construct the temporary concrete diversion wall.

16. Remove the sand bag cofferdam at the temporary concrete diversion wall.

17. Stabilize the disturbed areas with hydromulch, temporary grassing, erosion control matting and other temporary erosion control measures.

**Construction of New Concrete Drop Structure Outlet:**

18. Install sheet piles around the existing CRM outlet structure.

19. Demolish and remove the CRM outlet structure.

20. Excavate the soil material within the sheet piles to below the 3B Fine cushion material (basalt aggregate). Haul and dispose of the soil material that is not saturated with water.

Construction Sequence and Method

21. Dewater within the sheet piles as necessary to minimize excavation of saturated soils. The dewatering effluent shall temporarily contained within a disposal/holding area, used for onsite dust control, hauled for offsite disposal, and/or treated prior to discharge into the stream.

22. Construct temporary dewatering basin(s) to dry the saturated soil material.

23. Haul the excavated and saturated soil material to the onsite dewatering basin(s). Haul and dispose of the soil material after it has sufficiently dried.

24. Once the excavation has reached a depth below the 3B fine cushion material, the contractor may install a concrete mudslab to provide a working platform for the construction workers and to minimize groundwater intrusion. The contractor may utilize the 3B fine cushion material as the working platform.

25. Drill for and install the micropile deep foundation.

26. Install filter fabric and 2-feet thick 3B Fine cushion material to below the invert slab of the concrete drop structure.

27. Form and construct the reinforced concrete invert slab including 3-inch diameter weep holes.

28. Form and construct the reinforced concrete drop structure walls including 3-inch diameter weep holes.

29. Install continuous flashing compound waterproofing at all construction joints between the concrete invert slab and concrete walls.

30. Install filter fabric then backfill with aggregate filter material and 3B Fine material between the reinforced concrete walls and the temporary sheet piles.

31. Remove the temporary sheet piles and backfill with additional 3B Fine material as required.

32. Construct the top slab and adjacent concrete walls of the new drop structure and connect to the existing concrete outlet.

33. Stabilize the disturbed areas with hydromulch, temporary grassing, erosion control matting, and other temporary erosion control measures.

Construction Sequence and Method

**Construction of Gabion Walls and Apron for Streambank and Stream Stabilization Measures:**

34. Excavate for the new gabion wall located on the south streambank.

35. Haul and dispose the soil material that is not saturated with water.

36. Haul the excavated and saturated soil material to the onsite dewatering basin(s). Haul and dispose of the soil material after it has sufficiently dried.

37. Install geogrid, geotextile fabric and 2-feet thick of #3 rock cushion to construct the base for the new gabion wall.

38. Construct the gabion wall in 3-feet lifts.

39. Install filter fabric then backfill with 3B Fine material behind the gabion wall.

40. Stabilize the disturbed areas with hydromulch, temporary grassing, erosion control matting and other temporary erosion control measures.

41. Excavate for the new gabion apron located downstream of the new concrete drop structure.

42. Haul and dispose of the soil material that is not saturated with water.

43. Haul the excavated and saturated soil material to the onsite dewatering basin(s). Haul and dispose of the soil material after it has sufficiently dried.

44. Install geogrid, geotextile fabric and 2-feet thick of #3 rock cushion to construct the base for the new gabion apron.

45. Construct the gabion apron.

46. Excavate for approximately 30-feet of new gabion wall located on the north streambank adjacent to the new concrete drop structure.

47. Haul and dispose of the soil material that is not saturated with water.

48. Haul the excavated and saturated soil material to the onsite dewatering basin. Haul and dispose of the material after it has sufficiently dried.

49. Install geogrid, geotextile fabric and 2-feet thick of #3 rock cushion to construct the base for the new gabion wall.

50. Construct the gabion wall in 3-feet lifts.

51. Install filter fabric then backfill with 3B Fine material behind the gabion wall.

52. Install temporary silt fence along the top of the new gabion walls.

53. Stabilize the disturbed area with hydromulch, temporary grassing, erosion control matting and other temporary erosion control measures.

**Installation of Temporary Concrete-Lined Ditch Bypass/Diversion System:**

54. Install a temporary sand bag cofferdam within the concrete lined ditch. Pump and divert the runoff from the ditch into the new concrete drop structure.

**Removal of the Temporary Stream Bypass/Diversion:**

55. Install a temporary sand bag cofferdam on the upstream side of the temporary concrete diversion wall and divert all stream flow into the 60-inch bypass/diversion pipe.

56. Demolish and remove the temporary concrete diversion wall. Repair the concrete outlet structure as required. Remove and clean all demolition debris from the work area within the outlet structure.

57. Relocate the sand bag cofferdam to the inlet of the 60-inch bypass/diversion pipe and direct all stream flow to the new concrete drop structure and gabion apron.

58. Install temporary silt fence along the top of the new gabion wall (constructed in Step 49) and along the bottom/toe of the new gabion wall to be constructed at the north streambank.

59. Excavate for, demolish and remove the temporary stream bypass/diversion system including the gabion outlet and 60-inch pipe.

60. Backfill the trench excavation and stabilize the disturbed areas with hydromulch, temporary grassing, erosion control matting and other temporary erosion control measures.

61. Repair the concrete wall of the outlet structure at the connection of the 60-inch pipe. Remove and clean all construction debris from the work area within the outlet structure.

62. Remove the sand bag cofferdam at the repaired concrete wall of the outlet structure.

**Reconstruction of Concrete-Lined Ditch and Connection to the New Concrete Drop Structure:**

63. Reconstruct the concrete-lined ditch and connect it to the new concrete drop structure.

64. Remove the temporary sand bag cofferdam and pump (installed in Step 52) to redirect the runoff into reconstructed concrete-lined ditch and new concrete drop structure.

65. Stabilize the disturbed area with hydromulch, temporary grassing, erosion control matting and other temporary erosion control measures.

**Construction of Gabion Wall for Streambank Stabilization Measures:**

66. Install temporary sheeting (steel plates) along the toe of the new gabion walls and next to the temporary silt fence at the north streambank to minimize runoff within the excavation.

67. Excavate for the remaining, new gabion wall along the north streambank.

68. Haul and dispose the soil material that is not saturated with water.

69. Haul the excavated and saturated soil material to the onsite dewatering basin(s). Haul and dispose of the soil material after it has sufficiently dried.

70. Install geogrid, geotextile fabric and 2-feet thick of #3 rock cushion to construct the base for the new gabion wall.

71. Construct the gabion wall in 3-feet lifts.

72. Install filter fabric then backfill with 3B Fine material behind the gabion wall.

73. Stabilize the disturbed areas with hydromulch, temporary grassing, erosion control matting and other erosion control measures.

74. Install temporary silt fence along the top of the new gabion wall.

75. Remove the temporary sheeting and silt fence at the toe of the gabion wall.

**Site Grading, Landscape and Miscellaneous Improvements:**

76. Grade the project site to the finish grades indicated on the grading plans. This work may be done concurrently with the demolition of the residential structures and miscellaneous improvements, and the construction of the various drainage improvements and streambank stabilization measures.

77. Haul and dispose of the excess graded soil material.

78. Construct a CRM Wall along the property line at T.M.K.: 4-5-108: 068.

79. Install the 6-feet high vinyl fence and gates along the perimeter of the properties and as indicated on the construction plans.

80. Install landscape improvements. Native Hawaiian plants will be used to re-establish a native forest at the project site. The native Hawaiian plants that are being considered include Aku'awa and Ilie'e for the sedges and rushes, Naio for the shrubs and, Hala and Milo trees. Other areas will be grassed with Common Bermuda, Centipede and/or other non-invasive grass species.

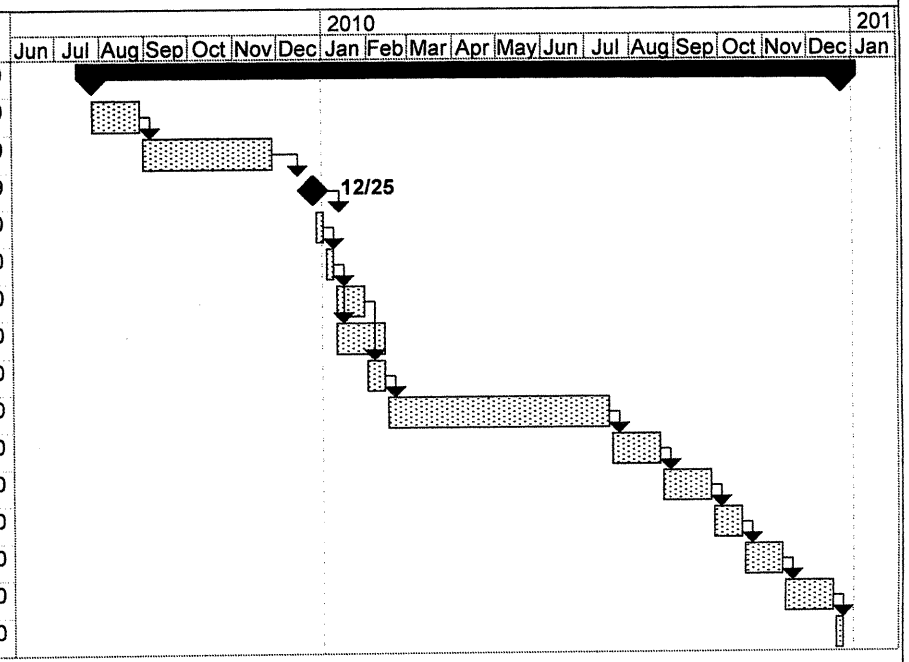
81. Install a temporary irrigation system.

**Removal of Temporary Water Pollution, Dust and Erosion Control Measures/BMP's:**

82. Remove the temporary BMP's after the landscaping is fully established and/or after the maintenance period has ended and at the completion of the project.

Castle Hills Access Road, Drainage Improvements
Tentative Construction Schedule

| ID | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 1 | **Project** | **370 days** | **Mon 7/27/09** | **Fri 12/24/10** |
| 2 | Advertise for Bids | 25 days | Mon 7/27/09 | Fri 8/28/09 |
| 3 | Award | 65 days | Mon 8/31/09 | Fri 11/27/09 |
| 4 | NTP | 0 days | Fri 12/25/09 | Fri 12/25/09 |
| 5 | Mobilize | 5 days | Mon 12/28/09 | Fri 1/1/10 |
| 6 | Install Erosion Control Measures | 5 days | Mon 1/4/10 | Fri 1/8/10 |
| 7 | Demolition | 15 days | Mon 1/11/10 | Fri 1/29/10 |
| 8 | Grading | 25 days | Mon 1/11/10 | Fri 2/12/10 |
| 9 | Construct Bypass/Diversion | 10 days | Mon 2/1/10 | Fri 2/12/10 |
| 10 | Construct Conc. Drop Structure | 110 days | Mon 2/15/10 | Fri 7/16/10 |
| 11 | Construct Gabion Walls and Apron | 25 days | Mon 7/19/10 | Fri 8/20/10 |
| 12 | Grading | 25 days | Mon 8/23/10 | Fri 9/24/10 |
| 13 | Install Perimeter Fence | 15 days | Mon 9/27/10 | Fri 10/15/10 |
| 14 | Landscaping | 20 days | Mon 10/18/10 | Fri 11/12/10 |
| 15 | Fully Protected | 25 days | Mon 11/15/10 | Fri 12/17/10 |
| 16 | Remove Erosion Control Measures | 5 days | Mon 12/20/10 | Fri 12/24/10 |




Project: CHAR Construction Schedule
Date: Sat 3/28/09

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline



Figure 10

# *Appendix* B

## Water Quality Monitoring Plan

Water Quality Monitoring Plan

Castle Hills Access Road
Drainage Improvements
Koolaupoko, Oahu, Hawaii
Project No. HWY-O-04-98

## INTRODUCTION

This water quality monitoring plan has been prepared to accompany the Section 401 Water Quality Certification (WQC) application for the proposed Castle Hills Access Road Drainage Improvements project (hereinafter referred to as "the Project"). This plan has been prepared in accordance with the water quality regulations promulgated in Hawaii Administrative Rules (HAR) Chapter 11-54. Specifically, this plan is designed to address water quality criteria presented in HAR §11-54-05.2(b)(1) for streams.

The Project involves dredge and fill activities along approximately 200 linear feet of the Kapunahala Stream. The project area is located on Tax Map Keys: 4-5-024: 002 to 005, 4-5-108: 068 to 074 for a total area of 1.978 acres (86,177 square feet). The project consists of the reconstruction of an existing outlet structure located east (makai) of Pookela Street, the addition of gabion walls and riprap downstream of the outlet structure, and the grubbing and grading of stream bank areas to allow a natural flowage and reduce or eliminate erosion of adjacent banks.

No discharge is expected, however, the character of the "discharge" activity primarily includes concrete grout and rock riprap. Potential discharge contaminants resulting from the use of these materials along the stream bank are fine sediment, silt, organic debris and concrete grout.

The receiving waters for the proposed construction activities is Kapunahala Stream. Kapunahala Stream at the project site is classified as Class 2 Inland Waters. During construction, a temporary silt fence will be installed. At all times while work is occurring, contactors will adhere to the erosion control plan, proper management techniques and the Best Management Practices (BMP) plan.

This monitoring program is designated to measure potential impacts from construction of the proposed outlet and bank stabilization and repair work. Section 10 of the 401 WQC application states that the tentative work schedule for the entire project is 12 months. Work within the stream is anticipated to run approximately from February to August 2010. The potential "discharge" occurs during this time period.

## PARAMETERS TO BE MEASURED

Receiving water quality parameters to be measured are those applicable to Class 2 Inland Waters (streams) that would potentially be affected by construction of the Project. These include dissolved oxygen, temperature, pH, turbidity, and total suspended solids (TSS). Visual

observations of physical characteristics of the stream in the project area, such as appearance and odor, will be recorded daily by the contractor's assigned representative.

## SAMPLING LOCATIONS

Sampling stations will be established immediately above and immediately below the project area. The project general layout plan shows the project limits which will also serve as the sampling locations.

## SAMPLING FEQUENCY

### Preconstruction Sampling

Prior to construction, samples will be collected a minimum of 5 times at the sampling locations in order to assess baseline receiving water quality. The samples may be collected on consecutive days or preferably once a week five weeks prior to the start of construction.

### During-Construction Sampling

The stations will be sampled daily during the first 10 days of construction or until notified by the Department of health (DOH), Clean Water Branch. After these initial analytical results are received and reviewed, a request will be made to the DOH, to reduce the frequency of sampling. Daily sampling will continue until a response from the DOH is received. Thereafter, depending on the DOH response, samples may be collected weekly during construction.

### Post-Construction Sampling

Post-construction sampling will occur for five consecutive, weekly sampling events after completion of the project. However, if there are no observable impacts during construction, then post-construction monitoring may not be necessary. Approval to forgo post-construction monitoring must be requested from the DOH.

## SAMPLING AND ANALYTICAL METHODS/QUALITY ASSURANCE

Weather conditions and relevant observations will be noted daily by the Project contractor's assigned individual and logged in a field notebook. Visual inspections of water quality by this individual will be made at least daily as long as work is occurring. This will insure that no physical change in the character of the receiving water occurs due to construction, or if any change is noted, that modification to existing BMP and erosion control plans are implemented in a timely manner. Results of the visual inspection will also be noted in the filed notebook. These notes will be provided to the contacted analytical laboratory for use in assessing impacts to water quality.

All water quality parameters excluding dissolved oxygen and temperature will be measured from grab samples collected by the contract laboratory's filed technicians or an individual assigned by

the contractor and trained by laboratory personnel. Dissolved oxygen and temperature will be measured *in situ*. The sampler(s) will also note any unusual site conditions and condition of any treatment device or facility at the time of collection, and will record the time and location of each sample.

Samples will be collected by filling one 250-ml plastic bottle (for pH, and turbidity determinations), and one-liter plastic bottle (for TSS) at each monitoring station. Samples will be obtained from just below the water's surface. Prior to collecting a sample, each plastic bottle will be pre-rinsed with the water to be sampled just prior to collection. After collection, samples will be placed on ice in a cooler and returned immediately to the laboratory for analysis. The table below lists the analytical methods and instrumentation to be used in the monitoring program.

Analytical methods and instruments to be used for the Project's water quality monitoring program

| Analysis | Method | Reference | Instrument* |
|---|---|---|---|
| Dissolved Oxygen | EPA 360.1 | EPA | YSI Dissolved Oxygen meter |
| pH | EPA 150.1 | EPA | Orion SA pY meter |
| Temperature | EPA 170.1 | EPA | YSI Dissolved Oxygen meter |
| Turbidity | EPA 180.1 | EPA | Turner nephelometer Or Hach Turbidimeter |
| Total Suspended Solids | EPA 160.2 (Method 2540D) | EPA Standard Methods 18th Ed. | Mettler balance |

* Typical instruments are listed; other manufacturers may be substituted.

The contract laboratory will participate in any DOH and Environmental Protection Agency (EPA) sponsored quality assurance (QA) programs available for all analyses conducted as part of this monitoring program. This presently should include either (or both) EPA Water Supply performance evaluation and/or EPA Water Pollution performance evaluation programs.

REPORTING

Results of sample testing will be available via facsimile from the laboratory upon completion of the analyses, usually within 24 to 48 hours for turbidity, TSS, and pH measurements. During the initial 10-day daily monitoring during construction, the contactor will submit available results to DOH via facsimile within two days of each sampling event. This will expedite DOH review and approval of decreased sampling frequency.

For all other sampling periods, a brief report for submittal to DOH will be prepared within one week of receipt of results. In addition to analytical results, the report will include time and date of sampling, name of the person who collected the samples, date each analysis was conducted, and identification of the laboratory and analyst(s) that conducted the work. The report will also include any pertinent observations noted by filed technicians and/or the contractor's assigned

individual. The laboratory will, retain, in its records, the analytical procedures used and any relevant QA/QC and instrument calibration information pertaining to the specific analysis.

All analytical results and field notes will be entered into a notebook or file established for this purpose, and provide in a final report prepared for the monitoring program. This file will be available for inspection by DOH-authorized personnel during normal business hours.

A final report and water quality assessment will be prepared upon completion of the monitoring program. This report will be submitted to the DOH within 60 days following post-construction monitoring. If post-construction monitoring is not required, the report will be submitted 60 days after construction is completed. The final report will identify the methods and procedures for analytical measurements and include all data collected as well as statistical summaries of results by station and activity phase (preconstruction, construction and post-construction). Upon completion of the monitoring program, the original data and field notebook will be retained by the contract laboratory for a minimum of five years.

Reference

AECOS, Inc., 1997. Water Quality Monitoring Plan, Castle Hills Access Road Kapunahala Stream Bank Repair and Stabilization