MARSHALL RANCH FLOW ENHANCEMENT PROJECT (APN 220-061-011)
90% DESIGN PLANS
HUMBOLDT COUNTY, CA

PROJECT DESCRIPTION:

CONSTRUCTION OF 15.5 MILLION GALLON OFF-CHANNEL POND & WATER CHILLER DESIGNED TO DELIVER APPROXIMATELY 50 GALLONS PER MINUTE OF FLOW AUGMENTATION TO REDWOOD CREEK DURING THE 5-MONTH DRY SEASON TO IMPROVE INSTREAM AQUATIC HABITAT. POND WILL BE FILLED WITH RAINWATER CATCHMENT AND WATER PUMPED DURING THE WET SEASON FROM A PROPOSED OFFSET WELL ADJACENT TO REDWOOD CREEK (APPROPRIATIVE WATER RIGHT APPLICATION IN PROCESS).

OTHER PROPOSED PROJECT COMPONENTS INCLUDE:
- 7.5 KW SOLAR ARRAY, MICRO-HYDRO TURBINE, BACKUP BATTERY BANK, INVERTER, GRID INTER-TIE SYSTEM & CONTROL CENTER BUILDING.
- INSTREAM HABITAT ENHANCEMENT FEATURES INCLUDING APPROXIMATELY FOUR LARGE WOOD STRUCTURES & TWO ROCK WEIRS IN REDWOOD CREEK.
- GULLY STABILIZATION TREATMENTS INCLUDING INSTALLATION OF APPROXIMATELY 20 ROCK ARMOR GRADE CONTROL STRUCTURES IN THREE CLASS III DRAINAGES.
- UPGRADE ACCESS ROADS TO PROJECT AREA WITH DRAINAGE FEATURES AND GRAVEL SURFACING TO PROVIDE ACCESS YEAR-ROUND.
- INSTALL ONE FIRE HYDRANT

INCLUDED IN CEQA (NOT PART OF WCB PROPOSAL)

INSTALLATION OF WATER CATCHMENT TANKS WITH WATER STORAGE TOTALING UP TO APPROXIMATELY 150,000 GALLONS TO SUPPLY DOMESTIC WATER FOR APN 220-061-011 AND FOR COMMUNITY FIRE SUPPRESSION.

ADDITIONAL NOTES:
1. PARCEL EXTENT TAKEN FROM HUMBOLDT COUNTY GIS AND ASSESSORS PARCEL MAPS; MODIFIED BASED ON FIELD CONDITIONS, APPROXIMATE ONLY.

EARTHWORK ESTIMATES:
90,000 CY CUT/FILL BALANCED ON SITE

ABBRéviationS AND SYMBOLS:

(D) EXISTING
(F) PROPOSED

DETAIL # ON SHEET

SHEET #
SITE PLAN (SEE SHEET 3)

(E) ACCESS ROAD

(P) RESERVOIR GRADING EXTENTS

(E) SHOP (1,800 SF)

(P) RESIDENCE (2,000 SF)

(P) POWER LINES TO SUPPLY ENERGY TO WATER PUMP & TRANSFER SOLAR ENERGY TO GRID

(E) PARKING & TURNAROUND AREA

(E) RESIDENCE (2,000 SF)

(E) PARKING & TURNAROUND AREA

100' STREAMSIDE MANAGEMENT AREA

50' STREAMSIDE MANAGEMENT AREA

100' STREAMSIDE MANAGEMENT AREA

SITE PLAN (SEE SHEET 3)

LEGEND

PROPERTY LINE

ROAD

SOLAR ARRAY

EXISTING

PROPOSED

SCALE: 1" = 140' FEET

SCALE: AS NOTED

DATE: 8/2/2020

APN 220-061-011

MARSHALL RANCH FLOW ENHANCEMENT PROJECT

HUMBOLDT COUNTY, CA

OVERVIEW

DESIGN: JM

DRAWN: CL

CHECKED: JM

APPROVED: JM

PROJECT NUMBER: 603.01

2855 TELEGRAPH AVENUE, SUITE 400
BERKELEY, CA 94705

P: (510) 848-8098

APR 22-061-011

2

OVERVIEW

GAL ENHANCEMENT PROJECT

HUMBOLDT COUNTY, CA

APN 220-061-011

MARSHALL RANCH FLOW ENHANCEMENT PROJECT

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HUMBOLDT COUNTY, CA

APN 220-061-011

MARSHAL
**Plot Title:** Marshall Ranch Flow Enhancement Project

**Site Plan:**
- **APN 220-061-011 Parcel Boundary**
- **Boulder Weir Access Road Parking & Turnaround Area**
- **Additional Fill Areas**
- **Old Somerville Creek Rd.**
- **Output to Redwood Creek**
- **APN 220-061-011 Parcel Boundary**
- **French Drain**
- **End of Grade Control in Gully**
- **Residence (2,000 SF)**
- **Current PG&E Power Supply**
- **Shop (1,800 SF)**
- **Start of Grade Controls in Gully**
- **Intermittent Watercourse**
- **Spillway**
- **End of Grade Control in Gully**
- **Intermediate Watercourse**
- **Spillway**
- **Proposed Project Includes Instream Habitat Enhancement and Erosion Control Features Resulting in 10' Setback from Stream. All Proposed Work to Be Minimum 30' from Property Boundaries Except for Instream Features.**

**Legend:**
- Property Line
- Road
- Solar Array
- Streamside Management Area
- Existing
- Proposed

**Scale:** 1" = 80' FEET

**Project Number:** 603.01

**Design:** JM

**Drawn:** CL

**Checked:** JM

**Approved:** JM

**Date:** 8/2/2020

**Location:**
- 2855 Telegraph Avenue, Suite 400
- Berkeley, CA 94705

**Phone:** (510) 848-8098

**Sheet:** 3 of 22
SITE PROTECTION, STAGING & TEMPORARY ACCESS

MARSHALL RANCH FLOW ENHANCEMENT PROJECT
APN 220-061-011
HUMBOLDT COUNTY, CA

PROJECT NUMBER: 603.01
SCALE: AS NOTED
DATE: 8/2/2020
DESIGN: JM
DRAWN: CL
CHECKED: JM
APPROVED: JM

STAGING AREA

(P) IMPROVE (E) ACCESS ROAD TO UTILIZE DURING CONSTRUCTION

(P) IMPROVE (E) ACCESS ROAD TO UTILIZE DURING CONSTRUCTION

(P) ACCESS ROAD

(P) ACCESS ROAD

(P) Silt Fencing (~1,250 LF)

(P) Silt Fencing (~500 LF)

(P) Staging Area

(P) Staging Area

SCALE: 1" = 60'

120' FEET

2855 TELEGRAPH AVENUE, SUITE 400
BERKELEY, CA 94705

P: (510) 848-8098

DESIGN:

DRAWN:

CHECKED:

APPROVED:

SHEET 4 OF 22
(P) EARTHERN BERM GRADING
(SEE SECTIONS ON SHEET 7)

(P) ADDITIONAL FILL GRADING

(P) 2' THICK 7 TO 1-TON ROCK ARMOR ON SOUTH SIDE OF EARTHERN BERM
(+150 CY TOTAL)

(P) 2' HIGH BERM

(P) INSTALL ROCK ARMOR GRADE CONTROL STRUCTURES IN GULLY TO REDUCE INCISION RATES

(P) ADD MOTION SENSORS TO POND BERM

(P) 6" DOUBLE WALLED HOPE FRENCH DRAIN OUTFLOW
(VIA HORIZONTAL BOREHOLE)

(P) FRENCH DRAIN

(P) RESERVOIR GRADING
(SEE SHEET 6 FOR SECTIONS & DETAILS)

(P) NEED FOR NE SLOPE STABILITY CROSS SECTION

(P) NW SLOPE STABILITY CROSS SECTION

(P) EAST GULLY GRADING
(SEE SHEET 12)

(P) 60,000 SF UNDERDRAIN AREA
Dewatering and Construction Sequencing Notes:

1. The entire length of channel within the limit of work shall be electro-fished by DFW staff prior to any construction activity that could disturb the channel.
2. Construct new channel and all features except upstream and downstream connections to existing channel. De-water excavations as needed during construction to insure that no turbid water runs off the site.
3. Construct downstream connection between new and current channel. Install temporary diversion dam as shown in the figure above.
4. Construct upstream connection between new and current channel. Install temporary dewatering and bypass flow system as shown in the figure above. Place cobbles around pump outflow to prevent turbidity.
5. Construct pump intake sized to divert flow around work area.
6. Construct fish exclusionary fencing upstream of pump to prevent biological resources from entering work area.

Support and stabilize pipe as necessary.

Visqueen or plastic as needed.

Diversion pipe adequately sized for typical flow (5 CFS). Engineer to approve final diameter.

Tough pump intake sized to divert flow around work area.

Fish screen upstream of pump to prevent biological resources from entering work area.

Flow (5 CFS Max).

1/2" pipe mesh.

Attach wire mesh securely to upstream side of post.

Steel or wood post set Min 1/2" into ground.

Visqueen or plastic as needed.

Section View: Spacing and layout.

1. Cover drain and pump intake.

2. Fish exclusionary fencing.
MARSHALL RANCH FLOW ENHANCEMENT PROJECT

APN 220-061-011
HUMBOLDT COUNTY, CA

DESIGN: JM
DRAWN: CL
CHECKED: JM
APPROVED: JM

REDWOOD CREEK - INSTREAM COMPONENTS

PROJECT NUMBER: 603.01
SCALE: AS NOTED
DATE: 8/2/2020

INPUT TO STORAGE TANKS (2" DIAMETER PVC)

INPUT/OUTFLOW TO POND (6" DIAMETER HDPE)

(P) OPERATION CENTER BUILDING

(P) BOULDER WEIR, RIGHT BANK STABILIZATION & HABITAT ENHANCEMENT

(P) BOULDER WEIR, RIGHT BANK STABILIZATION & HABITAT ENHANCEMENT

(P) CAST-IN-PLACE 10' X 4' VAULT WITH (2) 2' X 4' HENDRICKS FISH SCREENS

(P) RIGHT BANK STABILIZATION & HABITAT ENHANCEMENT

(P) NEW SOLAR ARRAY

(P) OPERATION CENTER BUILDING

(P) OUTFLOW TO CAST-IN-PLACE VAULT

(P) PUMP IN CAST-IN-PLACE VAULT

(P) OUTFLOW TO REDWOOD CREEK

(P) BOULDER WEIR, RIGHT BANK STABILIZATION & HABITAT ENHANCEMENT

(P) WEST GULLY GRADE CONTROL (SEE SHEET 13)

INPUT/OUTFLOW TO POND (6" DIAMETER HDPE)

INPUT TO STORAGE TANKS (2" DIAMETER PVC)

SCALE: 1" = 20'

SHEET 10 OF 22
REDWOOD CREEK - ALIGNMENT PROFILE

(P) GRADE CONTROL FEATURE

(P) EXCAVATE POOL

YEARLY CHANNEL SLOPE = 0.3%

(P) GRADE CONTROL FEATURE

(P) LARGE WOODY DEBRIS FEATURE

(P) BOULDERS PLACED OVER COBBLES & GRAVEL

(P) 6" DIAMETER PIPE TO CONTROL CENTER BUILDING

(P) GRADE CONTROL FEATURE

(P) GRADE CONTROL FEATURE

avorite (Feet)

Offset (Feet)

VERTICAL EXAGGERATION = 1H:3V

ELEVATION (FT- LOCAL DATUM)

ELEVATION (FT- LOCAL DATUM)

STATION (FT)

DATE: 8/2/2020

DESIGN: JM
DRAWN: CL
CHECKED: JM
APPROVED: JM

REDWOOD CREEK - INSTREAM COMPONENTS - PROFILE & SECTIONS

SHEET 11 OF 22
(P) START OF GRADE CONTROLS IN GULLY

(P) END OF GRADE CONTROLS IN GULLY

(P) FILL BEHIND NATURAL ROOT BARRIER (AVERAGE AREA 6'X2')

(P) FULL ROCK ARMORING THROUGH STEEP SECTION

(P) SMALL HAND PLACED GRADE CONTROL FEATURES

(P) GRADE CONTROL STRUCTURES (TYP.) (10'X2'X2')

(P) GRADE CONTROL STRUCTURES

(P) CHANNEL FILL (AVERAGE AREA 6'X2')

(P) CULVERT CROSSING UPGRADE

(P) CULVERT CROSSING UPGRADE

(P) UPGRADE ACCESS ROAD & CULVERT

(P) UPGRADE CULVERT CROSSING

ELEVATION IN FEET (LOCAL DATUM)

STATION (FEET)

HORIZONTAL SCALE: 1" = 60'

VERTICAL SCALE: 1" = 60'

EAST GULLY - ALIGNMENT PROFILE

ELEVATION IN FEET (LOCAL DATUM)

STATION (FEET)

HORIZONTAL SCALE: 1" = 60'

VERTICAL SCALE: 1" = 60'

EAST GULLY PLAN & PROFILE

DESIGN: JM
DRAWN: CL
CHECKED: JM
APPROVED: JM

SHEET 12 OF 22
(P) START OF ACCESS ROAD

(P) POND DIKE

ACCESS ROAD

CULVERT CROSSINGS
(24" CMPS)

ACCESS ROAD FOR USE DURING CONSTRUCTION THEN LONG TERM RANCH ACTIVITY

(HUMBOLDT COUNTY, CA)

APN 220-061-011

MARSHALL RANCH FLOW ENHANCEMENT PROJECT

2855 TELEGRAPH AVENUE, SUITE 400
BERKELEY, CA 94705

P: (510) 848-8098

DESIGN:
DRAWN:
CHECKED:
APPROVED:

SHEET 14 OF 22

PERMANENT ACCESS ROAD PLAN

SCALE: AS NOTED
DATE: 8/2/2020
PROJECT NUMBER: 603.01

JM
CL
JM
JM

14
22

SCALE: 1" = 60' FEET

0 30 60 90

0 30 60 90

FT

FT
CURRENT PG&E POWER SUPPLY
SINGLE PHASE ONLY, MAY NEED UPGRADE TO 3-PHASE
LAT: 40.1052 LONG: -123.8971

UNDERGROUND POWER LINES
OLD SUMMERVILLE CREEK ROAD
HUMBOLDT COUNTY APN 220-061-011

3-PHASE LOW VOLTAGE UNDERGROUND POWER TO CONTROL CENTER BUILDING

CONTROL CENTER BUILDING
NEM SOLAR ARRAY

PROJECT NUMBER: 603.01
SCALE: AS NOTED
DATE: 8/2/2020
DESIGN: JM
DRAWN: CL
CHECKED: JM
APPROVED: JM
ELECTRICAL PLAN

MARSHALL RANCH FLOW ENHANCEMENT PROJECT
HUMBOLDT COUNTY, CA
APN 220-061-011

SCALE: 1" = 80' FEET
NEAR CHANNEL WET WELL with electric pump, fed by screened inlet pipe located under gravel filter on bank of Redwood Creek.

OUTFLOW TO REDWOOD CREEK

OPERATION CENTER BUILDING

INPUT/OUTFLOW VIA 6" PIPE TO POND (~900 LF)

INPUT/OUTFLOW FROM RESERVOIR

4" FRENCH DRAIN

6" DOUBLE WALLED HDPE FRENCH DRAIN OUTFLOW (VIA HORIZONTAL BOREHOLE)

INPUT/OUTFLOW VIA 6" PIPE TO POND
CATTLE FENCING LAYOUT

SECURITY FENCING LAYOUT

FENCE GATE

CATTLE FENCING TIE INTO EXISTING CATTLE FENCE

SECURITY FENCING

2855 TELEGRAPH AVENUE, SUITE 400
BERKELEY, CA 94705

P: (510) 848-8098

DESIGN:

DRAWN:

CHECKED:

APPROVED:

SHEET 17 OF 22
### Monitoring & Instrumentation Locations

<table>
<thead>
<tr>
<th>Point Name</th>
<th>Northing</th>
<th>Easting</th>
<th>Description</th>
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<tbody>
<tr>
<td>PT #1</td>
<td>1926734.26</td>
<td>6030363.87</td>
<td>New Groundwater Well housed in conduit</td>
</tr>
<tr>
<td>PT #2</td>
<td>1926970.85</td>
<td>6030419.22</td>
<td>New Groundwater Well housed in conduit</td>
</tr>
<tr>
<td>PT #3</td>
<td>1926896.04</td>
<td>6030198.79</td>
<td>New Groundwater Well housed in conduit</td>
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<td>PT #4</td>
<td>1927063.01</td>
<td>6029944.91</td>
<td>New Groundwater Well housed in conduit</td>
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<tr>
<td>PT #5</td>
<td>1927235.24</td>
<td>6030159.36</td>
<td>New Groundwater Well housed in conduit</td>
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<td>PT #6</td>
<td>1927347.25</td>
<td>6029738.88</td>
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<td>PT #7</td>
<td>1927380.90</td>
<td>6029774.58</td>
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</tr>
<tr>
<td>PT #8</td>
<td>1927425.62</td>
<td>6029786.38</td>
<td>New Groundwater Well housed in conduit</td>
</tr>
</tbody>
</table>

(P) Data Logger Connection to PG&E Power Source
(P) Conduit Connection from Pressure Transducer to Data Logger
(P) Conduit Connection from Pressure Transducer to Data Logger
(P) Data Logger
MARSHALL RANCH FLOW ENHANCEMENT PROJECT
APN 220-061-011
HUMBOLDT COUNTY, CA

SEEDING TABLE:

<table>
<thead>
<tr>
<th>Type of Seed</th>
<th>Scientific name</th>
<th>Common name</th>
<th>Species Composition</th>
<th>Amount of Seed (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native grasses</td>
<td>Bromus carinatus subsp.</td>
<td>California brome</td>
<td>40%</td>
<td>44.0</td>
</tr>
<tr>
<td>Native grasses</td>
<td>Elymus glaucus subsp.</td>
<td>blue wild rye</td>
<td>40%</td>
<td>44.0</td>
</tr>
<tr>
<td>Native grasses</td>
<td>Achillea millefolium</td>
<td>Common yarrow</td>
<td>2%</td>
<td>2.2</td>
</tr>
<tr>
<td>Native Forbs</td>
<td>Eschscholzia californica</td>
<td>California poppy</td>
<td>5%</td>
<td>5.5</td>
</tr>
<tr>
<td>Native Forbs</td>
<td>Lupinus bicolor</td>
<td>miniature lupine</td>
<td>8%</td>
<td>8.8</td>
</tr>
<tr>
<td>Native Forbs</td>
<td>Sisyrinchium bellum</td>
<td>western blue-eyed-grass</td>
<td>5%</td>
<td>5.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100%</td>
<td>110.0</td>
</tr>
</tbody>
</table>

TOTAL AREA (ACRES): 4.4
1-AND 2-PIECE WOOD STRUCTURE DETAILS

NOTES:
1. LOG STRUCTURES SHALL BE INSTALLED AS SHOWN ON PLAN VIEW SHEETS
2. WHERE BANKS ARE STEEP, LOG STRUCTURES MAY BE TRENCHED INTO THE BANK TO ALLOW FOR A LOWER ANGLE AND PROVIDE MORE WOOD VOLUME IN THE ACTIVE CHANNEL
3. LOG STRUCTURE CONSTRUCTION DETAILS MAY BE MODIFIED IN THE FIELD AS APPROVED BY THE PROJECT MANAGER AND ENGINEER

LOG-LOG OR LOG-TREE ANCHORING

NOTES:
1. NOTCHING NOT REQUIRED ON LIVE TREES TO REDUCE IMPACTS TO TREE HEALTH

LOG-BOULDER ANCHORING

NOTES:
1. SECURE THREADED REBAR TO 2 TON BOULDER USING EPOXY ADHESIVE (HILTI HT-RE 500-SD (TUBE) EPOXY CARTRIDGE, OR APPROVED EQUAL). HOLE DEPTH MUST BE SUFFICIENT TO REACH COMPETENT, UN-FRACTURED ROCK IN ORDER TO OBTAIN MAXIMUM BONDING STRENGTH. A MINIMUM OF 12 INCHES IS RECOMMENDED; 1" DIAMOND-TIPPED DRILL (TIGHT FIT).
1. **Pond Liner Detail**

- **Intake Screen Pump Risers**: M-L130 or equivalent
- **Poured Concrete Slab**: On top of pond liner

2. **French Drain Detail**

- **Drain Rock**: 6" diameter, double-walled HDPE pipe, ~2.5' long
- **Native Material**: Bottom of pond liner (BTL-40), ~1' min.
- **Drain Rock**: ~4' to 6' thickness of drain rock; geotextile fabric (Mirafi N Series non-woven top and bottom)
- **Native Material**: ~1' min.

3. **Pond Inflow-Outflow Detail**

- **Intake Screen Pump Risers**: M-L130 or equivalent
- **Poured Concrete Slab**: On top of pond liner

4. **Gravel Access Road**

- **Compacted Subgrade**: Max 5% cross slope
- **Drain Rock**: 4" to 6" thick layer of drain rock; geotextile fabric on bottom (Mirafi N Series non-woven top and bottom)
- **Native Material**: ~4.5' min. gravel thickness (subgrade material may require thicker section or geotextile fabric)

5. **Grade Control Structure**

- **Buried Tree**: ~2' into bank to reduce risk of flanking
- **Native Material**: Bottom of pond liner (BTL-40), ~1' min.
- **Drain Rock**: ~4' to 6' thickness of drain rock; geotextile fabric (Mirafi N Series non-woven top and bottom)
- **Native Material**: ~1' min.

---

**Design:** JM  **Drawn:** CL  **Checked:** JM  **Approved:** JM  **Date:** 8/2/2020  **Project Number:** 603.01  **Scale:** As Noted  **Sheet:** 21 of 22  **Project:** Marshall Ranch Flow Enhancement Project  **Location:** Humboldt County, CA  **Contact:** 2855 Telegraph Avenue, Suite 400, Berkeley, CA 94705  **Phone:** (510) 848-8098
**SILT FENCING**
- Steel or wood post set 12" into ground.
- Attach erosion fabric securely to upslope side of post.
- Erosion fabric secured to post with metal fabric.
- Dig 6" trench & bury bottom 1/2" above ground.
- 4' max spacing, 12" min, 18" min.

**STRAW WATTLE**
- Straw wattle inbed 3" into existing ground surface to provide cutoff.
- Fill 3" height.

**CATTLE FENCING**
- Metal top pipe at structural sections.
- Concrete pier (1' ∅).
- 3" steel end rail clamp.
- 3' 4 metal top pipe at structural sections.
- Wire support with tensioning turnbuckle.
- 2'x4" no climb wire mesh.
- 2-strand wire.

**SECURITY FENCING**
- Control center building, concrete slab floor & concrete block walls with 6' height, insulated wood roof with 30-year asphalt shingles & ventilation fan.

**CONTROL CENTER**
- Electrical room:
  - Batteries
  - Electric switchboards
  - Inverter - net energy metering (NEM) grid
  - Water meter controls
  - Data recorder control center
  - Internet connection

**INPUT/OUTFLOW TO POND**
- Input from Redwood Creek.
- Outflow to Redwood Creek.
- Input/Outflow to pond.