Pacific Gas and Electric Company
Power Generation
Fossil Plant Construction

Gateway Generating Station
3225 Wilbur Ave.
Antioch, CA 94509
(925) 459-7000

February 21, 2007
GGS-L-00005C

Mr. Christopher Meyer
Compliance Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Subject: Gateway Generating Station (Docket 00-AFC-1C)
Response to Data Requests #8

Dear Mr. Meyer:

On February 13, 2007, Pacific Gas and Electric Company (PG&E) submitted its responses to the California Energy Commission's Staff Data Requests 1-8 related to its petition to amend the license for the Gateway Generating Station (GGS) project. In that response, PG&E indicated it would submit a Drainage, Erosion, and Sedimentation Control Plan (DESCP) for the GGS project, as requested under Data Request #8, under separate cover. An original plus two copies of the DESCP are attached for docketing purposes.

If you have any questions regarding this submittal, please contact me at (916) 780-1171 or Jerry Salamy at (916) 286-0207.

Sincerely,

Andrea Grenier

Andrea Grenier
GGS Compliance Manager

Attachment

AEG/aeg
cc: Tom Allen, PG&E
Scott Galati, Galati & Blek LLP
Jerry Salamy, CH2MHill

Gateway Generating Station Drainage, Erosion, and Sedimentation Control Plan

Prepared for

Pacific Gas and Electric Company

Prepared by

Black and Veatch Construction, Incorporated

With technical assistance by

CH2MHILL

2485 Natomas Park Drive
Sacramento, California 95833

February 2007

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SECTION 1

Introduction

Pacific Gas and Electric (PG&E) has prepared this Drainage, Erosion and Sedimentation Control Plan (DESCP) for the Gateway Generating Station (GGS) project to demonstrate that construction activities associated with the project will not result in an increase in offsite flooding potential or sedimentation and that the project will meet all local, state, and federal regulatory requirements associated with the protection of water quality and soil resources.

1.1 Drainage, Erosion and Sedimentation Control Plan Elements

This DESCP has been prepared to address the new construction activity associated with PG&E's GGS project. The DESCP includes the following elements:

- A map showing the location of all project elements with depictions of all significant geographic features including swales, storm drains, and sensitive areas
- A site delineation that includes the boundary lines of all construction areas and the location of existing and proposed structures, pipelines, roads, and drainage facilities
- Topographic site maps showing existing and proposed drainage systems and nearby watercourses
- A description of the drainage measures to be taken to protect the site and downstream facilities, including a discussion of compliance with the Regional Water Quality Control Board (RWQCB) discharge order
- A delineation of all areas to be cleared of vegetation and areas to be preserved
- Identification of the quantities of material excavated or filled for the site and all project elements, including those materials removed from the site due to contamination
- An illustration of existing topography and site-specific Best Management Practices (BMPs) to be implemented during construction, as well as a schedule of the timing and implementation of erosion and sediment control measures
- Erosion control drawings and erosion and sedimentation control notes

1.2 Project Overview

The GGS project site consists of approximately 28 acres southeast of the existing Contra Costa Power Plant in Contra Costa County, California. Figure 1-1 shows a vicinity map of the project site and surrounding area and Figure 1-2 shows a detailed view of the areas expected to be disturbed during construction. The site is in a portion of Section 16, Township 2 North, Range 2 East, Mount Diablo Base and Meridian in the County of Contra

Costa, State of California. The GGS site is bounded by the San Joaquin River to the north; a commercial marina, industrial uses, and open space to the east; and industrial uses to the south and west.

The project site is essentially flat with elevations a few feet above sea level, and with hills and Mount Diablo rising rapidly to approximately 4,000 feet only a few miles to the south and southwest of the project area.

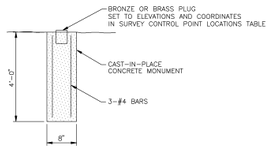
1.3 Watercourses and Critical Areas

The GGS site is near the San Joaquin River, and the plant storm water discharges are directed to an engineered drainage ditch, which conveys stormwater from the plant area to the river via stormwater outfall E-006. Immediately upstream of the drainage ditch, a sediment trap has been installed to provide stormwater treatment prior to discharge into the ditch. Other stormwater control features associated with the drainage ditch include check dams and oil-absorbent booms. The BMPs associated with this drainage area are presented on Figures 1-3a and 1-3b.

The northeastern laydown area drains via a catch basin; stormwater from this area is also directed to the river, and discharges at stormwater outfall E-010. This area is stabilized and will not be excavated or graded as part of the GGS project. Transformers currently stored in this area are contained within a bermed area.

1.4 Project Ownership

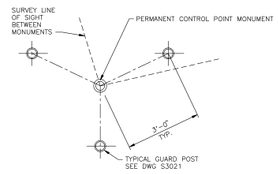
PG&E is currently developing and constructing the GGS project. The GGS will be owned and operated by PG&E. The water supply and wastewater discharge pipelines will be designed, constructed, and owned by the City of Antioch and Delta Diablo Sanitation District, respectively. PG&E will contract with these jurisdictions to provide water and wastewater services to the GGS.



ELEVATION

TYPICAL PERMANENT CONTROL POINT MONUMENT

NO SCALE

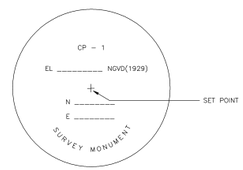


CONTROL POINT MONUMENT PROTECTION PLAN

NO SCALE

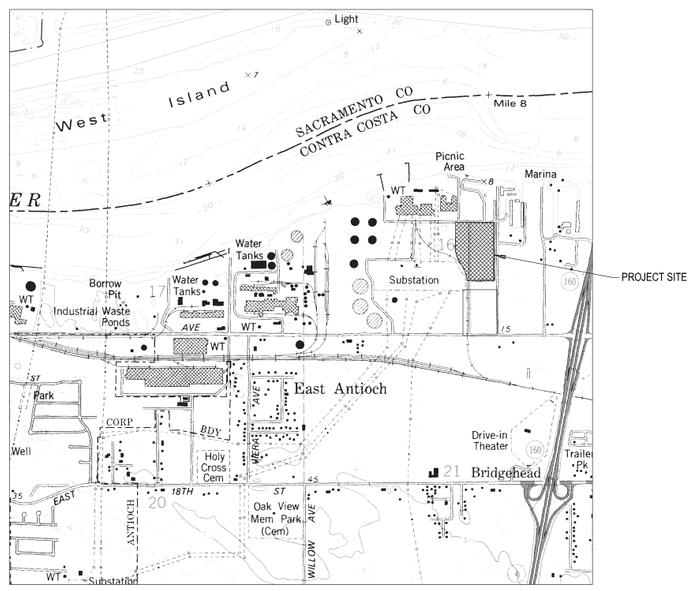
AS-BUILT SURVEY CONTROL POINT LOCATIONS TABLE			
CONTROL POINT NO.	PLANT COORDINATE SYSTEM		ELEVATION
	NORTH	EAST	
CP-1	3842.0000	4133.2087	14.42
CP-2	3671.0000	4133.2087	14.42
CP-3			

1. CONTRACT 70.0200 SHALL INSTALL PERMANENT CONTROL POINT MONUMENTS AFTER MAJOR EARTHWORK IS COMPLETED. AS-BUILT CONTROL POINT LOCATIONS SHALL BE SUBMITTED TO FIELD PROJECT MANAGER IMMEDIATELY AFTER MONUMENTS ARE SET.
2. SEE TYPICAL PERMANENT CONTROL POINT MONUMENT DETAIL FOR MONUMENT INSTALLATION.
3. COORDINATES ARE BASED ON CALIFORNIA STATE ZONE III, IN FEET (NAD 83) AT SEA LEVEL. ELEVATIONS ARE BASED ON NGVD 1929, IN FEET.
4. ACCURACY FOR MONUMENT LAYOUT SHALL BE:
   HORIZONTAL: 1 PART IN 100,000
   VERTICAL: $(4\sqrt{K})$ MILLIMETERS WHERE "K" IS THE DISTANCE IN KILOMETERS.



BRONZE OR BRASS PLUG IDENTIFICATION

PLAN



VICINITY MAP

LEGEND
APPLICABLE TO ALL S3000, S3100 & S3200 SERIES DRAWINGS

- EXISTING CONTOUR
- EXISTING SPOT ELEVATION
- EXISTING VEGETATION
- FINISH CONTOUR
- FINISH SPOT ELEVATION
- SITE CONSTRUCTION BOUNDARY
- SECTION LINE (APPROX)
- ROAD CENTERLINE
- GRADE TO DRAIN (DIRECTION OF ARROW) FLOW DIRECTION
- SECURITY FENCE
- LIMITS OF CUT/FILL
- DRAINAGE PIPING
- SLIDE GATE
- SWING GATE
- R=30 — HORIZONTAL CURVE RADIUS (FEET)
- NEW STRUCTURE
- GRASS SEEDING
- SUBGRADE
- EXISTING CONCRETE
- CONCRETE OR CONCRETE PAVEMENT
- ASPHALT CONCRETE PAVING
- AGGREGATE BASE
- AGGREGATE SURFACING
- RIP RAP
- RIP RAP BEDDING
- SAND
- C-1 — NEW CULVERT
- LP — EXISTING LIGHT POLE
- EXISTING POWER POLE
- MH — EXISTING MANHOLE
- 1 / S3000 — SECTION OR DETAIL NUMBER / DRAWING DESIGNATION NUMBER
- N 3500 / E 4000 — NORTH COORDINATE / EAST COORDINATE
- CP-1 — CONTROL POINT MONUMENT AND DESIGNATION
- CLEANOUT

ABBREVIATIONS
APPLICABLE TO ALL S3000, S3100 & S3200 SERIES DRAWINGS

A	–	ARC LENGTH	MATL	–	MATERIAL
AGG	–	AGGREGATE	MH	–	MANHOLE
APPROX	–	APPROXIMATE	MSL	–	MEAN SEA LEVEL
ASPH	–	ASPHALT	MW	–	MONITORING WELL
AVG	–	AVERAGE	N	–	NORTH
BLDG	–	BUILDING	NO.	–	NUMBER
BOC	–	BOTTOM OF CONCRETE	NTS	–	NOT TO SCALE
BOD	–	BOTTOM OF ELECTRICAL DUCT BANK	OD	–	OUTSIDE DIAMETER
BOP	–	BOTTOM OF PIPE	OWS	–	OIL/WATER SEPARATOR
BU	–	BELL UP	PC	–	POINT OF CURVATURE
CBC	–	CALIFORNIA BUILDING CODE (1998)	PI	–	POINT OF INTERSECTION
CJ	–	CONSTRUCTION JOINT	PL	–	PROPERTY LINE
CL	–	CENTERLINE	PRC	–	POINT OF REVERSE CURVE
CMP	–	CORRUGATED METAL PIPE	PT	–	POINT OF TANGENT
CO	–	CLEAN OUT	PVC	–	POINT OF VERTICAL CURVE
D	–	DEGREE OF CURVE	PVI	–	POINT OF VERTICAL INTERSECTION
Δ	–	DELTA ANGLE OF HORIZONTAL CURVE	PVT	–	POINT OF VERTICAL TANGENT
DI	–	DUCTILE IRON	R	–	RADIUS
DIA	–	DIAMETER	RCP	–	REINFORCED CONCRETE PIPE
DIM	–	DIMENSION	RD	–	ROOF DRAIN
DWG	–	DRAWING	RED	–	REDUCER
E	–	EAST	REQ'D	–	REQUIRED
EA	–	EACH	REV	–	REVISION
EF	–	EACH FACE	R/W	–	RIGHT-OF-WAY
EGP	–	EDGE OF PAVEMENT	S	–	SOUTH
EGS	–	EDGE OF SHOULDER	SE	–	SUPERELEVATION
EHH	–	ELECTRICAL HANDHOLE	SIM	–	SIMILAR
EL, ELEV	–	ELEVATION	SPCS	–	SPACES
EJ	–	EXPANSION JOINT	STA	–	STATION
EW	–	EACH WAY	T	–	TANGENT LENGTH
EXP	–	EXPANSION	TMH	–	TOP OF MANHOLE
FD	–	FLOOR DRAIN	TOC	–	TOP OF CONCRETE
FDN	–	FOUNDATION	TOG	–	TOP OF GRATING
FF	–	FINISHED FLOOR	TOP	–	TOP OF PAVEMENT
FG	–	FINISHED GRADE	TYP	–	TYPICAL
FL	–	FLOW LINE	UPC	–	UNIFORM PLUMBING CODE
FRP	–	FIBER REINFORCED PIPE	V	–	DESIGN SPEED
FT	–	FOOT	VC	–	VERTICAL CURVE
GALV	–	GALVANIZED	W	–	WEST
HC	–	HANDICAPPED	W/	–	WITH
HDPE	–	HIGH DENSITY POLYETHYLENE	W/O	–	WITHOUT
HVCM	–	HORIZ & VERT CONTROL MONUMENT	WP	–	WORK POINT
IP	–	INSIDE POINT			
ID	–	INSIDE DIAMETER			
IN	–	INCH			
INV	–	INVERT			
L	–	LENGTH			
LC	–	LENGTH OF VERTICAL CURVE			
LS	–	LIFT STATION			
LTR	–	LATER			

GENERAL NOTES
APPLICABLE TO ALL S3000, S3100 & S3200 SERIES DRAWINGS

1. EXISTING ROADS AND UTILITY LOCATIONS ARE SUBJECT TO FIELD VERIFICATION BY CONTRACTOR.
2. ALL PLAN DIMENSIONS SHOWN ON S3000 AND S3200 SERIES DRAWINGS ARE IN FEET UNLESS NOTED OTHERWISE.
3. PLANT COORDINATE SYSTEM BASED ON CALIFORNIA STATE PLANE ZONE III, IN FEET (NAD 83) AT SEA LEVEL. GRADE ELEVATIONS ARE SHOWN IN FEET (NGVD 1929). ALL COORDINATES HAVE BEEN TRUNCATED. ADD 2,191,473.47 TO ALL NORTH COORDINATES AND 6,194,747.2663 TO ALL EAST COORDINATES TO OBTAIN STATE PLANE COORDINATES.
4. EXISTING CONTOURS WERE GENERATED FROM X, Y, Z DATA POINTS PROVIDED BY MERIDIAN SURVEYING ENGINEERING, INC. 1812 UNION STREET SAN FRANCISCO, CA 94123. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE ACCURACY OF THIS INFORMATION FOR USE IN PERFORMING WORK ON THIS PROJECT. THE ENGINEER NEITHER TAKES NOR ACCEPTS ANY RESPONSIBILITY FOR THE ACCURACY OF THE EXISTING DATA.
5. CONTOURS AND SPOT ELEVATIONS SHOWN INDICATE FINISHED GRADE. SUBTRACT SURFACING MATERIAL THICKNESSES ACCORDINGLY WHERE TOP OF SUBGRADE ELEVATION IS REQUIRED.
6. GRADE SHALL SLOPE UNIFORMLY BETWEEN FINISH SPOT ELEVATIONS AND CONTOURS SHOWN ON THE PLANS.
7. TRANSITION PAVEMENT UNIFORMLY BETWEEN TOP OF PAVEMENT (TOP) ELEVATIONS SHOWN ON THE PLANS.
8. A SMOOTH VERTICAL TRANSITION SHALL BE PROVIDED AT ROAD INTERSECTIONS AND VERTICAL ALIGNMENT CHANGES. A MINIMUM VERTICAL CURVE LENGTH OF 50' SHALL BE USED AT VERTICAL ALIGNMENT CHANGES.
9. SEE S3100 SERIES DRAWINGS FOR ROADS, FENCE, AND SURFACING PLANS, SECTIONS AND DETAILS.
10. "CALTRANS SS" REFERS TO THE CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS.
11. SEE INDIVIDUAL DRAWINGS IN THE S3000, S3100 AND S3200 SERIES FOR WORK SCOPE FOR VARIOUS SUBCONTRACT PACKAGES.

REFERENCE

1. GEOTECHNICAL AND GEOLOGY REPORT DATED JUNE 29, 2001.

APPROVED FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BD	SK	DJP	DJP	DCM
3	08-30-2002	GENERAL REVISIONS	BD	SK	DJP	DJP	DCM
2	02-11-2002	GENERAL REVISIONS	RN	SK	JAR	DJP	DCM
1	09-21-2001	GENERAL REVISIONS	RN	SK	MUS	DJP	DCM
0	07-17-2001	ISSUED FOR PERMIT	RN	SK	JLC	DJP	DCM
5	01-09-2007	GENERAL REVISIONS	ARB	ARB	DRT	DRT	DVW
4	11-03-2006	REVISED NOTE 11	ARB	ARB	PLN	PLN	DVW

NO | DATE | REVISIONS AND RECORD OF ISSUE | DRN | DES | CHK | PDE | APP

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.
SIGNED DEAN R. TRACY
DATE 01-09-2007 REG NO. 54003 EXP 12-31-2007

BLACK & VEATCH CONSTRUCTION, INC.
ENGINEER SK DRAWN RN
CHECKED JLC DATE 07-17-2001

PACIFIC GAS & ELECTRIC CO.
GATEWAY GENERATING STATION
SITE – GRADING AND DRAINAGE
GENERAL NOTES AND LEGEND

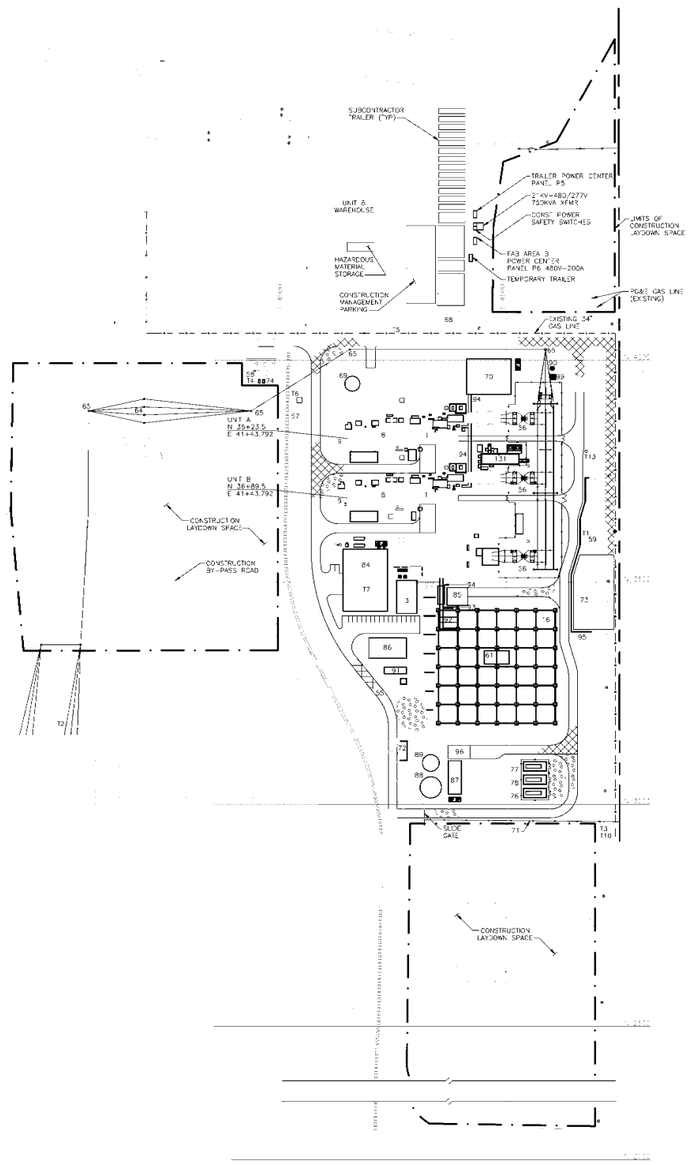
PROJECT DRAWING NUMBER 065108-8STF-S3000 REV 5
CODE
AREA

FIGURE 1-1
REGIONAL LOCATION AND PROJECT VICINITY
GATEWAY GENERATING STATION DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN

CH2MHILL

REF:S3576 ACAD 16.1s (LMS Tech)
A:FAS2017 Plot: Jan 9, 2007 11:41 by: afint

ES122006002SAC Figure_1-1.ai 02/20/07 afint



FACILITIES LEGEND	
D	FACILITY
1	COMBUSTION TURBINE
3	STEAM TURBINE MAINTENANCE AREA
8	HEAT RECOVERY STEAM GENERATOR
9	HRSG EXHAUST STACK
16	AIR COOLED CONDENSER
55	ACCESS ROAD
56	SWITCHYARD
57	OIL/WATER SEPARATOR (EXISTING)
58	AMMONIA STORAGE TANKS (EXISTING)
59	GAS METERING STATION (EXISTING)
61	ACC AREA SWITCHGEAR & MCC ENCLOSURE
64	230KV FLAT LINE AREA
65	230KV TUBULAR STEEL POLES
68	UNIT 6 & 7 GAS CONDITIONING STATION (EXISTING)
69	OIL/WATER SEPARATOR DISCHARGE HOLDING TANK
70	CT INLET AIR CHILLER
71	SECURITY FENCE (NEW)
72	GUARDHOUSE (EXISTING)
73	UNIT 8 GAS CONDITIONING STATION
74	AMMONIA TRANSFER PUMPS
76	HYDROGEN BULK STORAGE
77	CO2 BULK STORAGE
78	NITROGEN BULK STORAGE TRAILER
84	ADMIN/PLANT SERVICES BUILDING
85	MOBILE CRANE ACCESS FOR ST MAINTENANCE
86	CLOSED CYCLE COOLING WATER HEAT EXCHANGER
87	FIRE WATER PUMP ENCLOSURE
88	FIRE/SERVICE WATER STORAGE TANK (48'-0" DIA)
89	DEMIN WATER STORAGE TANK (38'-0" DIA)
90	21 KV SWITCHGEAR
91	WET SURFACE AIR COOLER
92	CONDENSATE TANK
93	CONDENSATE PUMPS
94	PIPE RACK
95	RETAINING WALL
96	MOBILE WATER TREATMENT EQUIPMENT
99	21KV/416SW ALTERNATE FEED TRANSFORMER
131	MAIN ELECTRICAL CONTROL ENCLOSURE
140	SANITARY LIFT STATION (EXISTING)

GENERAL LEGEND	
ASPHALT PAVING	NEW FENCE
AGGREGATE SURFACING	EXISTING FENCE
CONCRETE	LIMITS OF CONSTRUCTION LAYDOWN SPACE

TERMINAL POINTS	
T1	FUEL GAS
T2	ELECTRICAL TRANSMISSION
T3	POTABLE WATER (AT WILBUR AVE)
T4	AMMONIA
T5	STORMWATER DISCHARGE
T6	CONSTRUCTION POWER
T7	TELEPHONE
T10	SANITARY (AT WILBUR AVE)
T13	ALTERNATE POWER FEED

ISSUED FOR INFORMATION

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	DSG	APP
A	02-09-07	ISSUED FOR INFORMATION	ARB	ARB		DRT	JVM

SCALE: 1" = 100'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.
SIGNED
DATE REG NO.

BLACK & VEATCH CONSTRUCTION, INC.
ENGINEER DRAWN
CHECKED DATE

PACIFIC GAS & ELECTRIC CO.
GATEWAY GENERATING STATION
SITE-ARRANGMENT
CONSTRUCTION FACILITIES

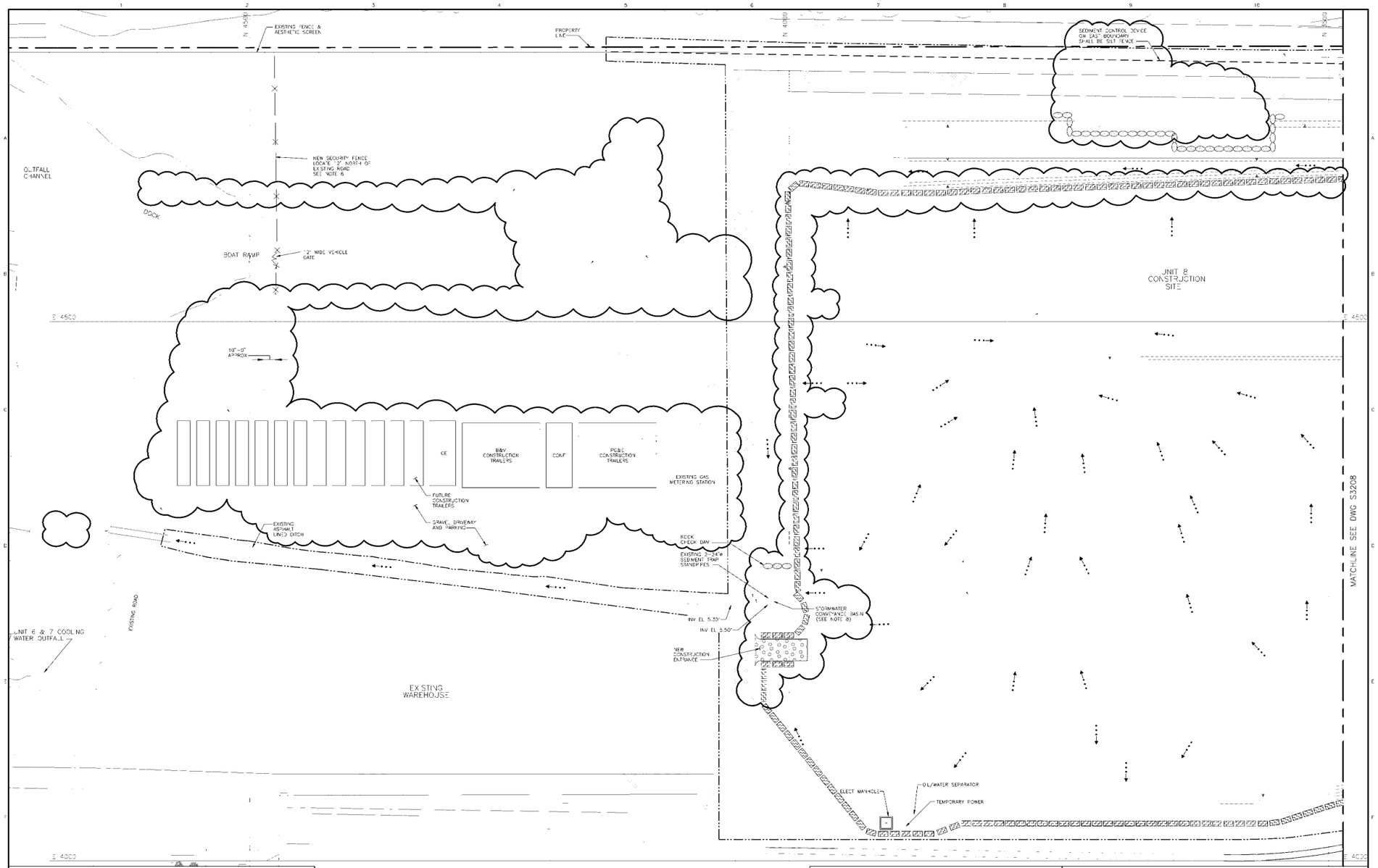
PROJECT DRAWING NUMBER: 065108-SS-1001 REV: A
CODE
AREA

FIGURE 1-2
AREA OF CONSTRUCTION DISTURBANCE

GATEWAY GENERATING STATION DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN

CH2MHILL

ES122006002SAC Figure_1-2.ai 02/20/07 afint



SEQUENCE OF GRADING CONSTRUCTION ACTIVITIES

1. INSPECT AND REPAIR ALL EXISTING SILT FENCES AND REMOVE ANY SEDIMENT. INSTALL ADDITIONAL SILT FENCES AND STRAW BALES AS SHOWN ON DRAWINGS S3207 AND S3208.
2. EXISTING STABILIZED ENTRANCE/EXITS WILL REMAIN IN PLACE.
3. REPAIR EXISTING DITCHES AND REPLACE ANY DAMAGED EROSION BLANKETS AND INSTALL EROSION BLANKETS AT THE BOTTOM OF DITCH.
4. GRADE THE SOIL STOCKPILE AS NOTED ON DRAWING S3208.
5. HYDROSEED AND HYDROMULCH ALL DISTURBED AREAS AND THE SOIL STOCKPILE (INCLUDING STOCKPILE SLOPES) INSIDE THE CONSTRUCTION AREA. AGGREGATE SURFACING SHALL BE PLACED ON DISTURBED PORTIONS OF THE CONSTRUCTION AROUND WARE AS DIRECTED BY THE EWG SITE MANAGER.
6. INSTALL ANY REMAINING EROSION AND SEDIMENT CONTROL MEASURES.
7. PROVIDE AGGREGATE STABILIZATION FOR ENTIRE LAYDOWN AREA.
8. REMOVE ACCUMULATED SEDIMENT FROM THE STORMWATER CONVEYANCE BASIN AND LINE THE BASIN WITH AGGREGATE 12" THICK (MINIMUM).
9. REINFORCE SILT FENCE WITH STRAW BALES WHERE THE SLOPES ALONG THE NORTH DITCH FAILED.

LEGEND

- SAND BAG/CHECK DAM
- SILT FENCE
- FLOW LINE
- CONSTRUCTION DELINEATION
- OE — EXISTING OVERHEAD LINE
- EXISTING GAS LINE
- EXISTING CHAIN LINK FENCE
- NEW CHAIN LINK FENCE
- STRAW BALE
- SILT FENCE WITH STRAW BALE
- ASPHALT PAVING
- AGGREGATE SURFACING
- CONCRETE

NOTES

1. THE EROSION CONTROL SHOWN ON THIS DRAWING IS THE MINIMUM REQUIRED. THE SUBCONTRACTOR SHALL INSTALL ADDITIONAL MEASURES AS REQUIRED TO CONTROL EROSION AND SEDIMENT ACCORDING TO THE SWPPP FOR CONSTRUCTION ACTIVITY AVAILABLE IN THE CONSTRUCTION OFFICE ON SITE.
2. DITCH SIDE SLOPES SHALL BE 2:1 (H:V) UNLESS NOTED.
3. SEE DRAWING S3209 FOR TYPICAL CHANNEL SECTION AND FOR EROSION AND SEDIMENT CONTROL DETAILS.
4. FOR CONSTRUCTION SEQUENCE SEE THIS DRAWING.
5. FOR EROSION AND SEDIMENT CONTROL PRACTICES SEE DRAWING S3209.
6. NEW SECURITY FENCE SHALL BE 6 FOOT TALL NON-REFLECTIVE, GALVANIZED CHAIN LINK WITH 3 STRANDS OF BARBED WIRE ON TOP.
7. DRAWING REFLECTS AND NO SITE GRADE AND INSTALLED EROSION CONTROL DEVICES. ALL CONTRACTORS SHALL PARTICIPATE AND ADHERE TO CONDITIONS OF THE SWPPP FOR THE DURATION OF THEIR CONTRACT.

APPROVED FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRN	DES	CHK	PE	APP
8	01-30-2007	GENERAL REVISIONS	ARE	ARS	ERT	DRT	DVW
7	01-09-2007	GENERAL REVISIONS	ARE	ARS	ERT	DRT	DVW
6	11-03-2006	ADDED NOTE 7	ARE	ARS	ERT	LPA	DVW
5	05-06-2005	GENERAL REVISIONS	RDF	SK	DJP	LJP	DCW
4	03-26-2002	GENERAL REVISIONS	RDF	SK	DJP	LJP	DCW
3	03-15-2002	GENERAL REVISIONS	RDF	SK	DJP	LJP	DCW
2	02-28-2002	APPROVED FOR CONSTRUCTION	RDF	SK	JAR	LJP	DCW
1	02-26-2002	GENERAL REVISIONS	RDF	SK		LJP	DCW
0	02-14-2002	INITIAL ISSUE	RA	SK		LJP	DCW

SCALE: 1"=30'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.
SIGNED: DEAN R. TRACY
DATE: 01-28-2007 REG NO: 54633

BLACK & VEATCH CONSTRUCTION, INC.
ENGINEER SK DRAWN BN
CHECKED JAR DATE 02-28-2002

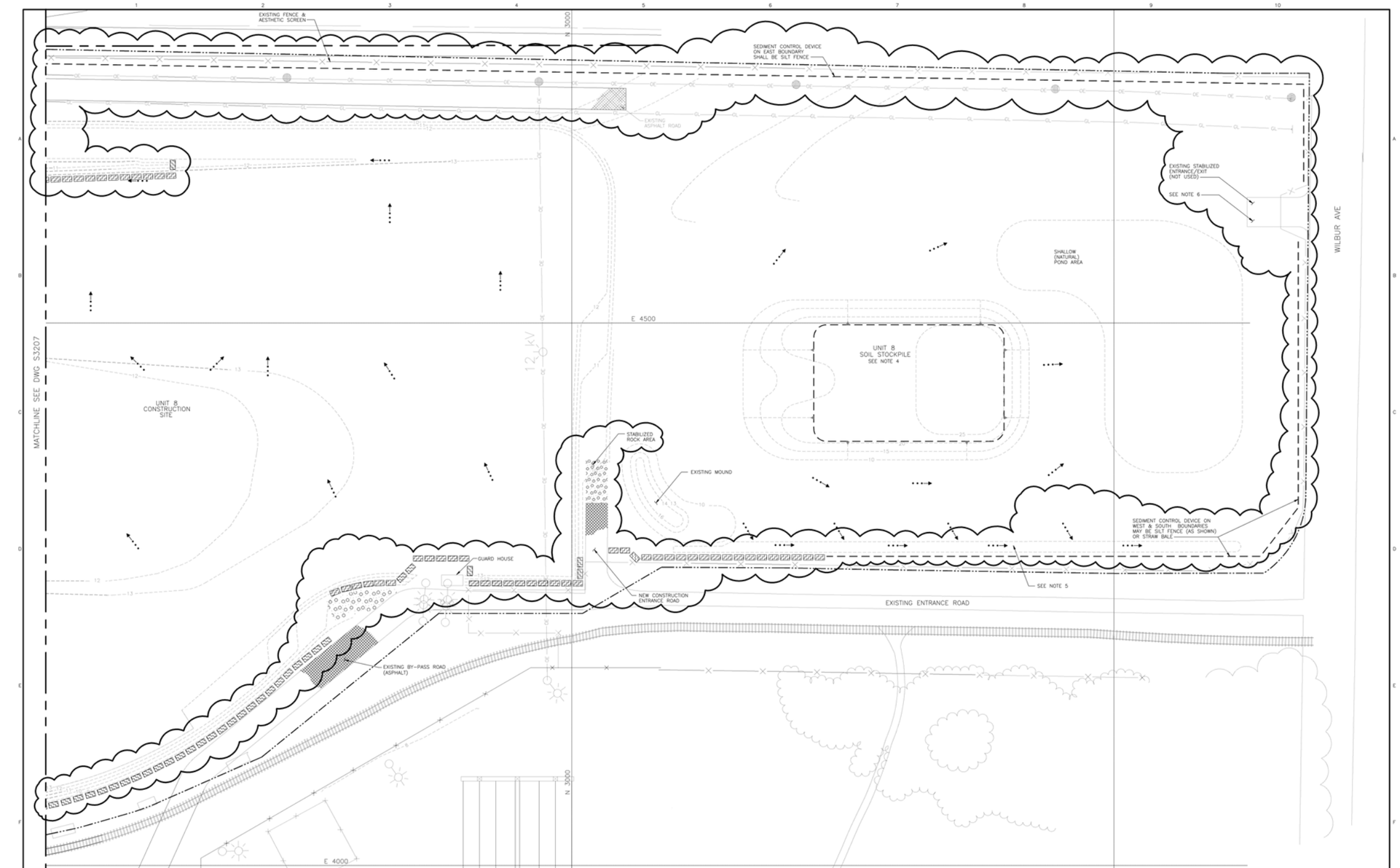
PACIFIC GAS & ELECTRIC CO.
GATEWAY GENERATING STATION
SITE – EROSION & SEDIMENT CONTROL PLAN – CONSTRUCTION RESTART
PROJECT: 065108-8STF-S3207
DRAWING NUMBER: S3207
REV: 8
COST
AREA

ACAD 16.1s (LMS Tech)
REL30576
A2F00317 07-JAN-2007

FIGURE 1-3a
EROSION, SEDIMENTATION, AND CONTROL MEASURES

GATEWAY GENERATING STATION DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN

CH2MHILL



NOTES

1. FOR NOTES AND LEGEND SEE DRAWING S3207.
2. FOR EROSION AND SEDIMENT CONTROL DETAILS AND PRACTICES SEE DRAWING S3209.
3. CONTOUR SOIL STOCKPILE AREA SUCH THAT THE RUNOFF FROM THE PILE WILL FLOW TO THE SHALLOW (NATURAL) POND AREA.
4. STOCKPILE SIDE SLOPES SHALL NOT EXCEED A SLOPE OF 3 HORIZONTAL TO 1 VERTICAL.
5. PROVIDE A V-DITCH ALONG THE WEST SIDE OF THE STOCKPILE TO PREVENT RUNOFF FROM CROSSING THE EXISTING ENTRANCE ROAD.
6. RESTORE THE CONSTRUCTION ENTRANCE FROM WILBUR ROAD TO ITS ORIGINAL CONDITION. SEE DRAWING S3209 FOR DETAIL.
7. DRAWING REFLECTS EXISTING SITE GRADE AND INSTALLED EROSION CONTROL DEVICES. CONTRACT 71.0402.2 SHALL MAINTAIN EROSION CONTROL DEVICES AS INDICATED AND FOLLOW THE SWPPP FOR THE DURATION OF THE 71.0402.2 CONTRACT.

APPROVED FOR CONSTRUCTION

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
7	01-30-2007	GENERAL REVISIONS	ARB	ARB	RRT	RRT	DVM
6	01-09-2007	GENERAL REVISIONS	ARB	ARB	RRT	RRT	DVM
5	11-03-2006	ADDED NOTE 7	ARB	ARB	PLN	PLN	DVM
4	03-26-2002	GENERAL REVISIONS	REP	SK	DJP	DJP	DCM
3	03-15-2002	GENERAL REVISIONS	REP	SK	DJP	DJP	DCM
2	02-28-2002	APPROVED FOR CONSTRUCTION	REP	SK	JAR	DJP	DCM
1	02-26-2002	GENERAL REVISIONS	REP	SK		DJP	DCM
0	02-14-2002	INITIAL ISSUE	RN	SK		DJP	DCM

30' 20' 10' 0 30' 60'
SCALE: 1"=30'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.
SIGNED DEAN R. TRACY
DATE 01-09-2007 REG NO. 54003

BLACK & VEATCH CONSTRUCTION, INC.
ENGINEER SK DRAWN RN
CHECKED JAR DATE 02-28-2002

PACIFIC GAS & ELECTRIC CO.
GATEWAY GENERATING STATION
SITE – EROSION & SEDIMENT CONTROL
PLAN – CONSTRUCTION RESTART

PROJECT DRAWING NUMBER 065108-8STF-S3208
REV 7
CODE
AREA

ACAD 16.1s (LMS Tech)
REL:30576
A:ISO.017 D:2.1
D:ISO.017 D:2.1

FIGURE 1-3b
EROSION, SEDIMENTATION, AND CONTROL MEASURES
GATEWAY GENERATING STATION DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN

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SECTION 2

Drainage

This section describes the site conditions and drainage associated with the GGS project.

2.1 Soils

The northern portion of the proposed project site is classified as peat with a low revegetation potential and very poor drainage. The southern portion of the proposed project site is classified as a poorly graded sand or silty sand that has a low revegetation potential and excessive drainage.

Soil and groundwater at the site has been extensively investigated as part of the original sale of the Contra Costa Power Plant from PG&E to Mirant in 1998, conducted as part of the electric industry deregulation.[1] The area of investigation for the sale included the portion of the site comprising the Gateway parcel. The results of the investigation have been provided to the California Energy Commission (CEC) as part of the original permitting for the project.

The excavations to be conducted associated with the development of GGS are not anticipated to contain contaminated soil, based on review of the previous investigations. In the event contaminated soil is encountered, proper notifications and the required actions described in the CEC compliance conditions for the project will be followed. In addition, appropriate BMPs for the management of contaminated soil will be implemented. These BMPs would include covering the contaminated soil stockpile with plastic, ensuring that runoff and run-on are controlled by using diversion berms, and not stockpiling soil at locations near stormwater drains or watercourses. Additional BMPs for contaminated soil management will be implemented as needed.

2.2 Climate

The climate of the Carquinez Strait region, along with much of the west coast of the United States, is controlled by a semi-permanent high-pressure system that is centered over the northeastern Pacific Ocean. In the summer, the relatively northern location of this strong high-pressure system results in clear skies inland and coastal fog. During the summer, the project site typically experiences temperatures similar to inland areas with very little precipitation. Beginning in the fall and continuing through the winter, the high-pressure system weakens and moves south, allowing storm systems to move through the area. During the spring, summer, and fall the winds are stronger and westerly. These strong westerly winds are caused by the combination of high pressure off shore and a thermal low pressure resulting from high temperatures in the Central Valley. The project site receives an average of 13 inches of rain annually. About 80 percent of the precipitation in the area occurs from November through March, generally in association with storm systems that move through the region.

[1] Fluor Daniel-GTI, Phase II Environmental Site Assessment, PG&E Contra Costa Power Plant, June 1998.

2.3 Runoff Water Quality

No surface water exists on the project site; therefore, no water quality data is available for the site.

2.4 Receiving Waters

The GGS project site is in the western Delta area near the confluence of the Sacramento and San Joaquin rivers. The San Joaquin River is north of the project site. The southern bank of the San Joaquin River is industrial and receives effluent from several industrial facilities along the riverfront. The San Joaquin River receives its freshwater input from tributaries that originate in the Sierra Nevada range, flowing though the San Joaquin Valley and Delta. The San Joaquin River is approximately 3,700 feet wide as it passes the project site, with a deep-water commercial ship channel parallel to the north bank of the river, approximately 3,000 feet from the project site. Water from the San Joaquin River is used for industrial, commercial, domestic, irrigation, recreation, and wildlife preservation uses.

The San Joaquin River is strongly influenced by tidal and river flows, with river flows westerly during ebb tides and periods of high Delta flow. Incoming tides reverse the river's flow to the east. The mean tidal range at Antioch is 3.3 feet and the mean flow past the project site is 170,000 cubic feet per second, with currents in the shipping channel as high as 1.1 to 1.5 feet per second.

The San Joaquin River salinity is generally low, ranging from 0 to 7 parts per thousand, with variation due to tidal influences and freshwater inflow. Saltwater intrusion and influence in the area increases during periods of low freshwater flow.

The San Joaquin River water temperature varies based on location, season, depth, ambient air temperature, upstream inflow water temperature, and tidal influence. Mean daily intake water temperatures from the adjacent Mirant facility taken during 1991 and 1992 indicate winter temperatures of 48.9 degrees Fahrenheit (°F) and summer temperatures of 73°F.

Water quality in the San Joaquin River is also variable due to most of the same conditions that affect water temperature. The San Joaquin River Basin Plan provides water quality objectives and notes that achieving these objectives does not require improvement over naturally occurring background concentrations.[2]

[2] California Regional Water Quality Control Board, Central Valley Region, Water Quality Control Plan (Basin Plan) for the Sacramento River Basin and Jan Joaquin River Basin, 1998.

SECTION 3

Site Construction

The GSS site will require additional earthwork to construct the generating and associated facilities. The site was excavated and graded during the previous construction activity authorized by the CEC in 2001. Soil disturbing activities will include grubbing and clearing, rough grading, excavating, filling, and final grading. Access to the site for construction craft will be by the existing asphalt access road located near the western boundary of the power block area. Management personnel will access the site through the plant's eastern gate and a temporary asphalt bypass road.

3.1 Construction Sequence

A majority of the earthmoving construction activities were previously performed in 2001 when the plant was still owned by Mirant. Major foundations for the turbines (both combustion and steam) and electrical transformers have already been pored. A schedule for the following remaining project construction activities is presented in Figure 3-1.

- Maintain and/or update previously installed erosion and sediment control measures shown on Figures 1-2, 1-3a, and 1-3b.
- Install underground piping, ductbanks, and other utilities for previously designed equipment. Dewater as required.
- Install foundations for previously designed equipment and retaining walls.
- Install piling, foundations, and underground utilities for new equipment.
- Grading work:
  - Backfill soil over underground piping, ductbanks, and other utilities
  - Backfill soil around foundations
  - Install storm drain system and culverts
  - Grade the site to the final contours shown on Figure 3-2
  - Place riprap in ditches and temporary aggregate surfacing on the roads
  - Install all remaining erosion and sediment control measures shown on the drawings
- Construct mechanical equipment, electrical equipment, buildings, and structures.
- Construct secondary containment systems around areas with spill potential.
- Place new oil-water separator into service.
- Start-up and test equipment.
- Install asphalt paving on roads, and aggregate surfacing on site.
- Decommission sediment control system.

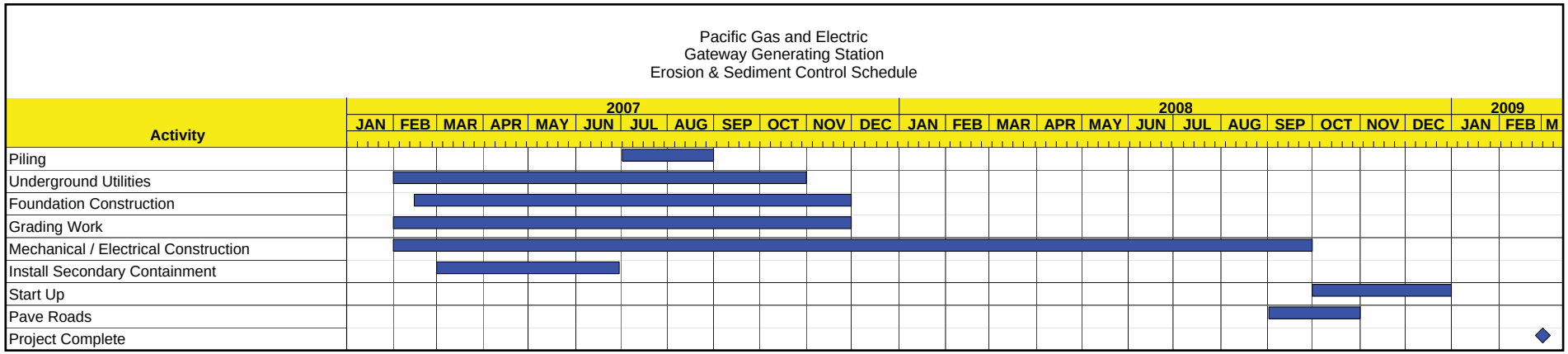

FIGURE 3-1
PROPOSED CONSTRUCTION SCHEDULE
GATEWAY GENERATING STATION DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN

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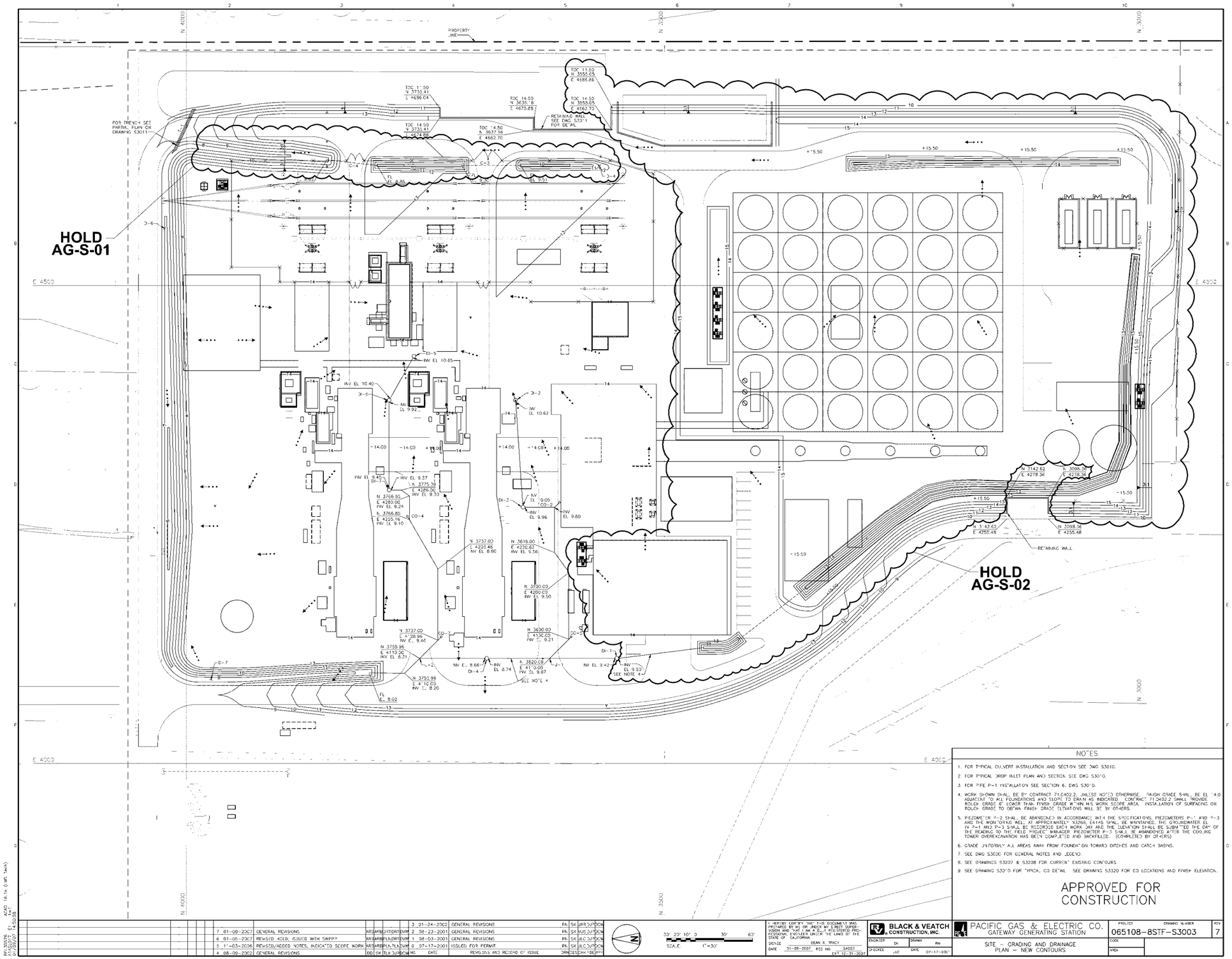

FIGURE 3-2
FINAL SITE SHEET FLOW
GATEWAY GENERATING STATION DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN

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SECTION 4

Drainage, Erosion, and Sedimentation Control Management

The stormwater management system for the GGS project site was designed following U.S. Environmental Protection Agency (EPA), State Water Resources Control Board, and Contra Costa County guidelines. Control of site runoff will be the main means of stormwater management. Stormwater controls will be installed as construction progresses over the site. Appendix A presents the BMPs that will be employed during the construction phase of the project.

When the project is complete, a Notice of Termination of the Construction General Permit will be filed with the State Water Resources Control Board. When the plant is complete, stormwater discharges will be managed and regulated under an Industrial Stormwater General Permit. Final drainage measures are shown on Figure 4-1 for the completed project construction.

4.1 General Description of Stormwater Management System

Approximately 28 acres will be developed for the Project. The potential for stormwater runoff pollution will be minimized through the use of several control measures implemented during the construction sequence.

The stormwater management system was designed in accordance with the EPA's guidance document entitled *Storm Water Management for Construction Activities – Developing Pollution Prevention Plans And Best Management Practices (EPA 832-R-92-005, September 1992),* the *California Storm Water Best Management Practices Handbook,* and the *Bay Region Erosion and Sediment Control Field Manual.*

It will be the responsibility of Black & Veatch's Site Manager to have the Site Grading Plan and Erosion & Sediment Control Plan revised if the location or types of control measures indicated are changed in the field.

4.2 Runoff Calculations

Under the National Pollutant Discharge Elimination System (NPDES) *General Permits for Storm Water Discharges from Construction Sites,* it is necessary to estimate the runoff coefficient C of the site before and after construction is complete. The runoff coefficient was calculated according to the Contra Costa County Hydrology Manual and was calculated for 10 year frequency of average recurrence interval runoff for sites less than 1 square mile (Title 9 914-2.010 (3)).

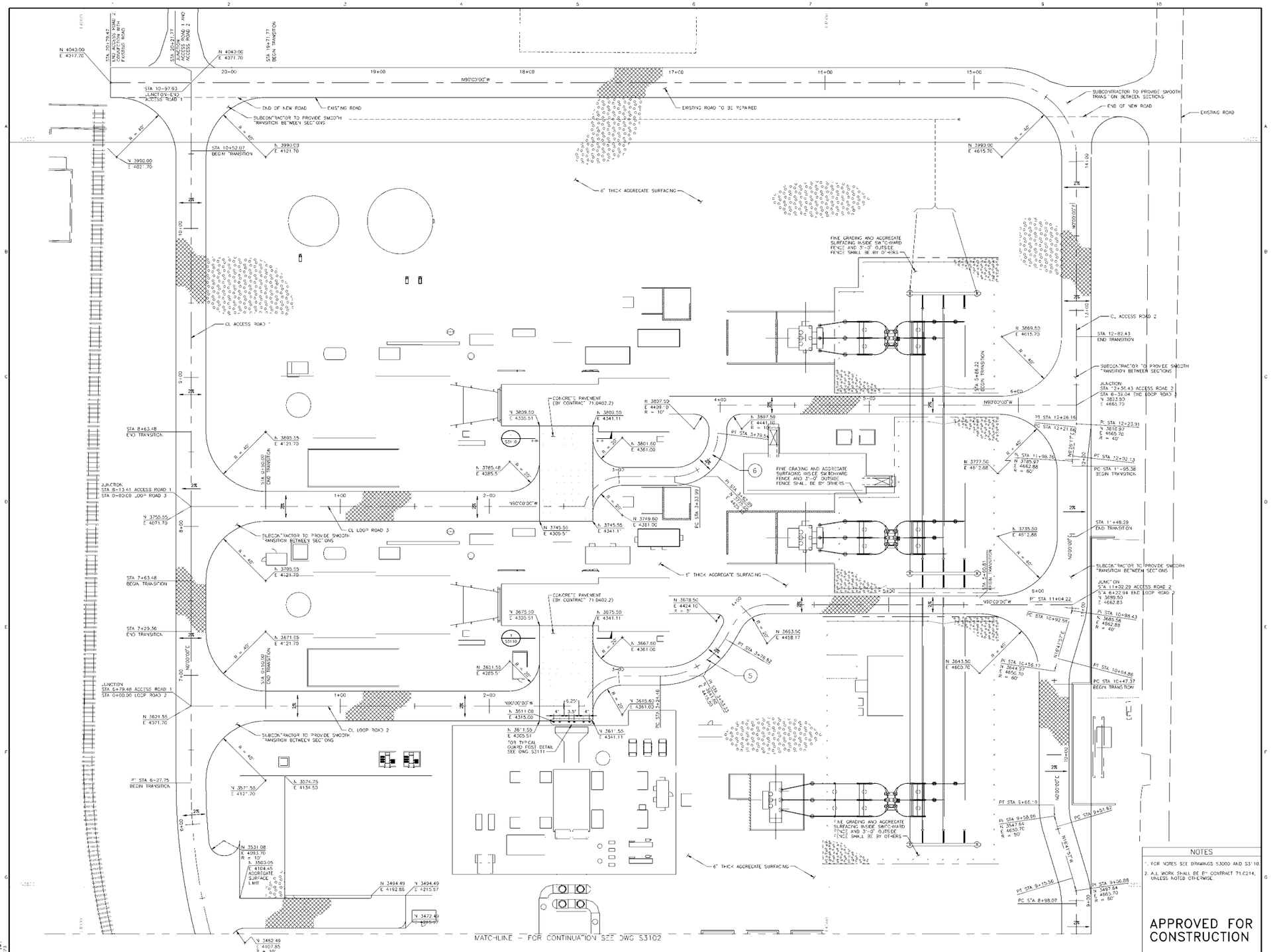

FIGURE 4-1
FINAL SITE DRAINAGE MEASURES
GATEWAY GENERATING STATION DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN

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The northern portion of the project site consists of paved asphalt and aggregate surfaces, while the southern portion is primarily undeveloped. The typical runoff coefficients used by Contra Costa County for rational method are:

Industrial: 0.60 - 0.90	Street: 0.75 - 0.95
Roofs: 0.75 - 0.95	Open: 0.20 - 0.40

For the preconstruction condition, the runoff coefficient is C = 0.50.

The existing site consists of different surface cover. Runoff coefficient C was calculated as weighted average (refer to Appendix B, Hydrology and Hydraulics Calculations):

$$C = \frac{C1 * A1 + C2 * A2 + C3 * A3 + C4 * A4}{A1 + A2 + A3 + A4} = \frac{12.76}{25.30} = 0.50$$

Using same methodology, the runoff coefficient for the post-construction condition was calculated. Because proposed site consists of different surface cover, runoff coefficient C was calculated as weighted average:

$$C = \frac{C1 * A1 + C2 * A2 + \ldots + C8 * A8}{A1 + A2 + \ldots + A8} = \frac{13.96}{25.35} = 0.55$$

where: C1 = 0.95, for asphalt
C2 = 0.81, for industrial
C3 = 0.40, for grass/open space
C4 = 0.80, for aggregate

For the post-construction condition, the runoff coefficient is C = 0.55, which is almost equal to the runoff coefficient for the preconstruction condition.

4.3 Plant Site

Silt fence protection will be provided on the perimeter of all construction areas to remove sediment and help prevent erosion. The plant site is an active construction site with most major foundations previously installed. The surface water management system for construction will be the same as during plant operation. Stormwater runoff from site will be collected by grass- or riprap-lined open ditches, catch basins, and culverts, and conveyed to an existing concrete-lined ditch and discharged to the San Joaquin River. Stormwater flows from areas with potential for oil contamination will be directed to an oil-water separator. Oily wastes resulting from the separation process will be disposed of offsite. Resulting wastewater will be discharged into the GGS wastewater system, which will be connected to the local sanitary district sewer.

4.3.1 Stabilization Practices

Temporary and permanent stabilization methods will be used at the GGS site. Stabilization practices may include temporary or permanent seeding, mulching, geotextiles, and aggregate surfacing. Each site access facility (entrances/exits) will be surfaced with aggregate to reduce sediment tracking during construction. Temporary construction parking areas will be surfaced with aggregate to avoid soil erosion. After completion of

construction, all roads and parking areas will be paved. Sitewide stabilization during construction will consist of temporary seeding, mulching, and placement of aggregate.

4.3.2 Structural Practices

Temporary and permanent structural devices to divert, store, or limit runoff from disturbed areas will be used at the GGS site. Such devices may include silt fences, sediment traps, straw bale dikes, sand bag berms, and drainage interceptor swales.

4.4 Construction Silt and Dust Control

The existing site is essentially flat with an elevation from 10 to 14 feet above mean sea level and sloping down to existing grade at elevation 8 with a 3:1 slope.

The GGS project will be constructed in this area with the main access from the existing access road at the western portion of the site. Site earthwork could generate silt and fugitive dust.

During activities associated with project construction, control measures will be implemented to minimize the potential for impacts of erosion and sedimentation. With proper installation and maintenance of silt fence and the implementation of temporary and permanent soil stabilization procedures, the amount of silt leaving the site will be greatly reduced and/or eliminated.

The concept behind silt fencing is to provide a barrier that traps the silt before it can leave the site. The contractor will be required to maintain and remove accumulated silt as described in Section 7.1 of its *Storm Water Pollution Prevention Plan*.

Silt fences and/or straw bales will be installed along the construction boundaries of the disturbed site to control potential offsite discharges (refer to Figures 1-2, 1-3a, 1-3b). The silt barrier will remain in place until the surface is stabilized. If construction in a particular area ceases temporarily (for more than 21 days), temporary soil stabilization (seeding, mulching) will be implemented no more than 14 days after the construction has ceased. Permanent stabilization will take place no later than 14 days after construction activities have permanently ceased in an area.

Table 4-1 shows recommended grass types for temporary and permanent seeding.

TABLE 4-1
Recommended Grass Types for Seeding

Grass Type	Description	Recommended Seeding Rate
Barley and Annual Rye	Contra Costa County Standard Specification	3 lb per 1,000 square feet 3 lb per 1,000 square feet
Blando Brome and Annual Rye	Contra Costa County Standard Specification	3 lb per 1,000 square feet 3 lb per 1,000 square feet
Centipede Grass	Low maintenance grass for warm season planting areas	12 to 45 lb per acre
Bermuda Grass	Extensively used for lawns, pastures, erosion, and road sides	45 to 90 lb per acre

TABLE 4-1
Recommended Grass Types for Seeding

Grass Type	Description	Recommended Seeding Rate
Rye Grass	Used in permanent and temporary sites which provide stabilization coverage	15 to 30 lb per acre
Bahia Grass	Drought resistant turf; does well in lawns and along highways, and is best used in sunny areas; roots extend to 8 feet deep	100 lb per acre

Fugitive dust may be generated during dry weather conditions. Black & Veatch's Site Manager will direct dust control activities and will comply with temporary arid permanent stabilization methods. Water sprinkling will be used for dust control.

4.5 Offsite Sediment Tracking

Site roads will be aggregate surfaced during the construction phase of the project to reduce offsite sediment tracking. Each site entrance/exit will be stabilized according to California Storm Water BMP Handbook. The paved street adjacent to the site entrance will be swept daily to remove any excess mud, dirt, or rock tracked from the site. Dump trucks hauling material from the construction site will be covered with a tarpaulin.

4.6 Construction Dewatering

Dewatering will be in compliance with the California RWQCB Central Valley Region Erosion and Sediment Control Field Manual. If ground water is encountered in excavations during construction, the contractor will install a dewatering system. The Project Engineer will determine the method of dewatering, which will depend on groundwater level, depth of excavation, and amount of water to be pumped.

If necessary, groundwater from excavations will be pumped into the existing fuel oil secondary containment pond owned by Mirant, located south of the switchyard. If contaminants are discovered in the contained groundwater, it will be treated prior to discharge into the existing fuel oil secondary containment pond. Prior to discharge to the pond, the RWQCB will be consulted regarding appropriate treatment practices and regulatory requirements. It is anticipated that the overall approach for managing contaminated groundwater would be similar to that used by the former developer (Mirant).

4.7 Petroleum Products

Construction equipment will require use of diesel fuel and oil on a regular basis. While a potential exists for spills or leaks, all onsite vehicles will be monitored for leaks and receive regular preventive maintenance to ensure proper operation and reduce the chance of leakage. To further reduce the possibility of spills, no "topping off' of fuel tanks will be allowed.

Petroleum products will be stored in clearly labeled and tightly sealed containers or tanks. Any asphalt used onsite will be applied according to the manufacturer's recommendations. Any soil impacted by fuel or oil spills will be removed and disposed of by the Contractor at an approved disposal site. Several oil-filled transformers will be utilized for construction power and several additional oil-filled transformers will be temporarily stored on-site. The transformers shall be provided with temporary secondary containment. All stormwater discharged from the temporary secondary containments shall be checked for any evidence of petroleum impacts (such as sheens or product) prior to release.

It will be the Contractor's responsibility to ensure that secondary containment around fuel/oil tanks (stationary or mobile) and oil filled transformers will meet the minimum requirements of EPA 40 CFR Part 112 with regard to secondary containment or more stringent state requirements, if applicable. Any spills will be contained and cleaned up immediately.

4.8 Sanitary Wastes

A licensed sanitary waste management contractor will collect all construction or temporary sanitary wastes from the portable units. The units will be maintained on a regular basis.

4.9 Hazardous Wastes

Potentially hazardous waste associated with construction of the GGS project will be limited to small quantities of liquids and solids such as lubricating oils, acids for equipment cleanup, concrete curing compounds, and waste paint. These wastes are typical of industrial construction activities and will be placed in containers onsite and disposed of in accordance with applicable laws, ordinances, regulations, and standards and with the manufacturer's recommendations. Hazardous wastes will be either recycled or disposed of in a licensed Class I disposal facility, as appropriate. Waste oil and used oil filters will be recycled if the maintenance activities will take place onsite. Waste generated during each chemical cleaning operation will be temporarily stored onsite in portable tanks and disposed of offsite by the chemical cleaning contractor at an appropriate disposal facility. Site personnel will be instructed in these procedures and the Black & Veatch's Site Manager will be responsible for implementing these practices.

To prevent contact of hazardous wastes with stormwater runoff, secondary containment will be provided (such as curbs and berms). As much as possible, all materials will be kept in a dry covered area.

4.10 Paints

All containers will be tightly sealed and properly stored to prevent leaks or spills. Excess paint will not be discharged to the stormwater system. Unused paints will be disposed of in labeled original containers according to applicable local, state, and federal laws and regulations. Spray painting will not occur on windy or rainy days, and a drop cloth will be used to collect and dispose of drips associated with painting activities. All paints will be

mixed indoors, in a containment area. If using water-based paints, equipment will be cleaned in a sink that is connected to the sanitary sewer.

4.11 Concrete Trucks

Concrete trucks will not be allowed to discharge surplus concrete and drum wash at the site, unless these materials are fully contained in an engineered structure that can contain all free liquid until dry. Dried concrete shall then be removed and disposed of at an offsite location. Alternatively, concrete washout will be taken offsite for disposal by the concrete contractor. No surplus concrete or drum wash water will be disposed of onto the ground surface.

4.12 Waste Materials

All construction waste material, trash, and construction debris will be collected and stored in a metal dumpster, leased from a licensed solid waste management contractor. The dumpster will meet all local and state solid waste management regulations. The dumpster will be emptied a minimum of twice per week or more often if necessary, and the trash will be hauled to the local dump. No construction waste will be buried onsite. All site personnel will be instructed regarding the correct procedure for waste disposal. Black & Veatch's Site Manager will be responsible for ensuring that these procedures are followed. All dumpsters will be covered, where possible.

4.13 Allowable Non-stormwater Discharges

The following sources of non-stormwater discharges may be combined with stormwater discharges from project construction activities:

- Pavement wash waters and dust control water not containing toxic or hazardous substances
- Uncontaminated dewatering discharges
- Firefighting waters
- Vegetation watering
- Potable or spring water discharges

SECTION 5

Best Management Practices

Chemicals, petroleum products, and other materials will be used and stored at the construction site. BMPs, such as good housekeeping measures, inspections, containment, and spill prevention practices will be used to limit contact between stormwater and potential pollutants.

5.1 Good Housekeeping

Good housekeeping practices are designed to maintain a clean and orderly work environment. The good housekeeping practices listed below will be followed to reduce the risk of potential pollutants entering stormwater discharges. All construction personnel will be responsible for monitoring and maintaining housekeeping tasks and reporting potential problems to Black & Veatch's Site Manager:

- Store only enough products required for doing the job.
- Store all materials in a neat and orderly manner in the appropriate containers. Materials that may adversely impact stormwater, such as paint, oils, greases, sealers, etc., will be stored in covered areas such as temporary/permanent buildings or trailers, in accordance with the Storm Water Pollution Prevention Plan.
- Keep products in the original container with the original manufacturer's label.
- Do not mix products unless recommended by the manufacturer.
- Use all of a product before disposing of the container.
- Use and dispose of products according to Black & Veatch's Site Manager's direction or manufacturer's recommendations.
- Perform regular inspections of the stormwater system and the material storage areas.
- When and where appropriate, use posters, bulletin boards, or meetings to remind and inform construction personnel of required procedures.
- Preventive maintenance includes regular inspection and maintenance of structural stormwater controls (catch basins, oil-water separators, etc.) as well as other facility equipment and systems.

5.2 Hazardous Products

Storage areas for hazardous materials such as oils, greases, paints, fuels, and chemicals will be provided with secondary containment to ensure that spills in these areas are captured and controlled. All hazardous chemical storage areas will be surrounded by curbs or dikes to contain the chemicals in the event of leaks or spills. The Contractor shall establish

contingencies for the proper disposal of contaminated soils (use of licensed hauler, approved landfill) early in the construction period. Secondary containment will be designed to hold the entire contents of the largest single storage container plus rainfall for a 50-year 24-hour storm for all outdoor storage areas. Curbs and dikes will be provided around all chemical storage areas, hazardous waste products, areas with possibility of oil spill (i.e., transformers) and washout areas.

5.3 Spill Prevention and Response

Spills and leaks are one of the largest potential sources of stormwater pollutants at industrial facilities. Chemicals will be stored in chemical storage facilities appropriately designed for their individual characteristics. Bulk chemicals will be stored outdoors in aboveground storage tanks. Other chemicals will be stored and used in their delivery containers. All hazardous chemical storage areas will be surrounded by curbs or dikes to contain the chemicals in the event of leaks or spills. Secondary containment will be sized to hold the entire contents of the largest single storage tank. All drains and vent piping for volatile chemicals will be trapped and isolated from other drains. Containment areas for bulk storage tanks will not be drained. Any chemical spills in these areas will be removed with portable equipment and reused or properly disposed of. It is anticipated that all substances will be applied/dispensed at manufacturer's recommendations.

In addition to the housekeeping and hazardous materials storage procedures described above, spill prevention and cleanup practices will be as follows:

- Black & Veatch's Site Manager or appointee is responsible for informing construction personnel of the manufacturer's recommended spill cleanup methods, and the location of that information and cleanup supplies.
- Materials and equipment for the cleanup of a relatively small spill will be kept in the materials storage area. These facilities may include brooms, rags, gloves, shovels, goggles, sand, sawdust, absorbent, plastic or metal trash containers, and protective clothing.
- All containers will be labeled, tightly sealed, and stacked or stored neatly and securely.

Spill response procedures will be as follows:

- Step 1: Upon discovery of a spill, stop the source of the spill.
- Step 2: Cease all spill material transfer until the release is stopped and waste removed from the spill site.
- Step 3: Initiate containment to prevent spill from reaching State waters.
- Step 4: Notify Supervisor and Black & Veatch's Site Manager of the spill.
- Step 5: Black & Veatch's Site Manager will immediately notify the PG&E emergency coordinator, and coordinate further cleanup activities

- Step 6: Any significant spill of hazardous material will be reported to the appropriate state and/or local agencies by PG&E personnel or qualified contractors. Table 5-1 lists the project's environmental emergency contacts.

TABLE 5-1
Environmental Emergency Telephone List

Contact	Telephone No.
PG&E	
Primary Facility Emergency Coordinator	
Thomas Allen, Manager:	(925) 459-7201
24-Hour Telephone No.:	(415) 317-4463
Alternate Facility Emergency Coordinator	
Hoc Phung, Principal Engineer:	(925) 459-7204
24-Hour Telephone No.:	(510) 316-0567
PG&E Environmental Specialist:	(800) 774-4389
PG&E Media Representative:	(415) 973-5930
PG&E Headquarters Telephone Operator:	(415) 973-7000
PG&E Safety Health & Claims Hotline:	(415) 973-8700
Other Resources	
3E Company (MSDS by FAX):	(800) 451-8346
Chemtrec (emergency chemical information)	(800) 424-9300
Poison Control Center:	(800) 662-9886
Federal Agency	
U.S. Coast Guard/National Response Center:	(800) 424-8802
State Agencies	
California Office of Emergency Services (OES):	(800) 852-7550
California Department of Toxic Substances Control (DTSC)*:	(800) 852-7550
California Department of Fish and Game*:	(800) 852-7550
California State Lands Commission:	(562) 590-5201
Regional Water Quality Control Board (RWQCB)*:	(800) 852-7550
Local Contacts	
Administering Agency – Contra Costa County Health Services Department:	(925) 646-1112
Fire – Contra Costa County Fire Protection District:	911 or (925) 933-1313
Sheriff – Contra Costa County Sheriff's Department:	911 or (925) 646-2441
Hospital – Sutter Delta Medical Center:	911 or (925) 779-7200
Ambulance/Paramedics:	911

* DTSC, RWQCB and California Department of Fish and Game have requested that emergency notifications to these offices be made through the OES 800 number.

Black & Veatch's Site Manager
Stephen Fawcett: (913) 636-4828

Project Resident Engineer
Mahmood Ghori, P.E.: (925) 658-2638

- Step 7: Submit a Notice of Discharge Form within 7 days of the discharge event.
- Step 8: Review the construction Stormwater Pollution Prevention Plan and amend, if needed. Record a description of the spill, cause, and cleanup measures taken.

SECTION 6

Inspection, Maintenance, and Recordkeeping Procedures

Site inspection and facility maintenance are important features of an effective stormwater management system. The Contractor's qualified personnel will inspect disturbed areas of the site that have not been stabilized, storage areas exposed to precipitation, all control measures, and site access areas to determine if the control measures and stormwater management system are effective in preventing significant impacts to receiving waters.

Inspections will be performed after storm events and once each 24-hour period during extended storm events to identify BMP effectiveness and implement repairs or design changes as soon as feasible depending on field conditions. The discharger will complete an inspection checklist, which will include the following information:

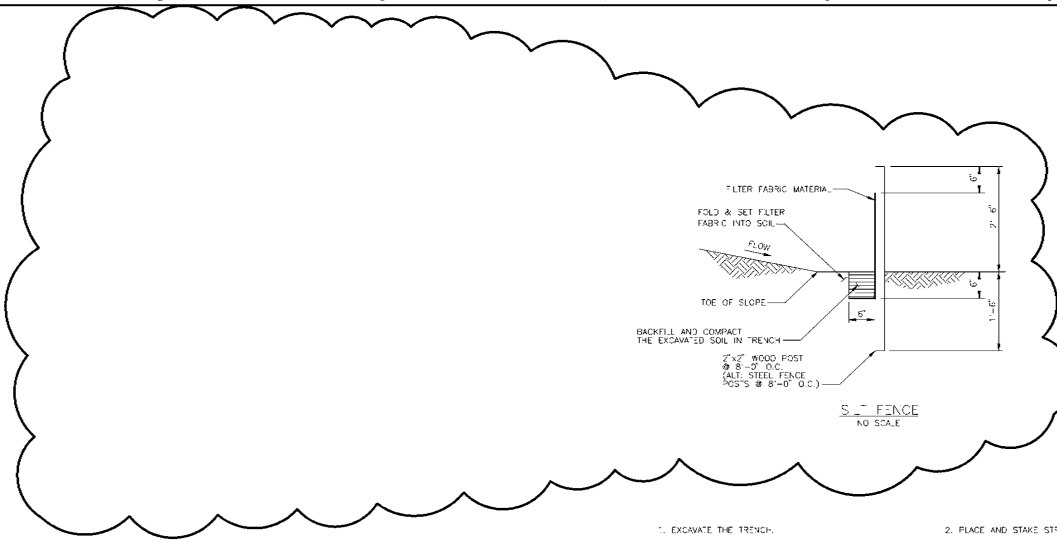
- Inspection date
- Weather conditions
- A description of any inadequate BMPs
- List of observations of all BMPs
- Corrective actions required, including any changes to DESCP
- Inspector name, title, and signature

Figure 6-1 presents the maintenance and monitoring measures to be implemented.

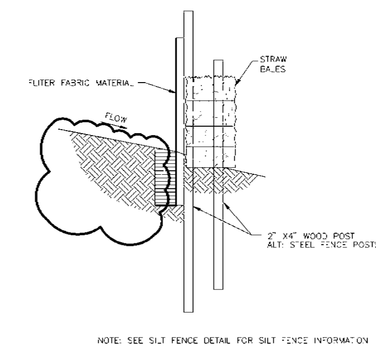
6.1 Erosion and Sediment Controls

The following procedures will be used to maintain erosion and sedimentation controls:

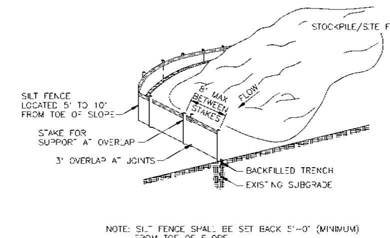
- All control measures will be inspected before and after storm events and once each 24-hour period during extended storm events.
- All measures will be maintained in good working order; if a repair is necessary, that repair will be initiated within 24 hours of the report.
- Sediment will be removed from the silt barriers when it has reached one-third of the height of the barrier.
- Silt barriers will be inspected for depth of accumulated sediment, tears, attachment to posts, and stability on a weekly basis.
- Aggregate-covered areas will be inspected for bare spots and washouts.
- The Black & Veatch Site Manager will select individuals to be responsible for inspections, maintenance, repairs, and reporting. The designated inspectors will receive the necessary training from Black & Veatch's Site Manager to properly inspect and maintain the controls in good working order.



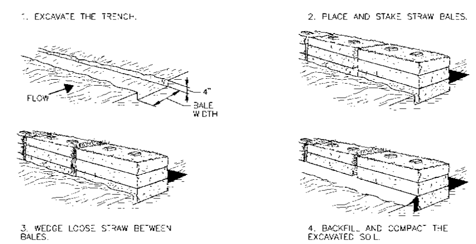
SILT FENCE
NO SCALE



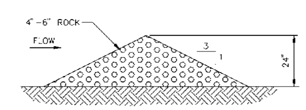
SILT FENCE WITH STRENGTHENING
NO SCALE



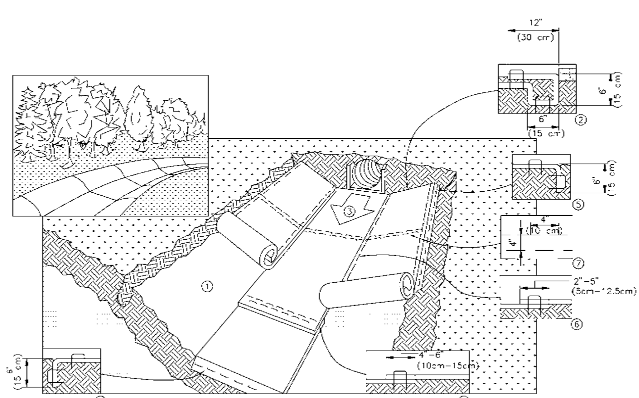
TOE OF SLOPE
APPLICATION
NO SCALE

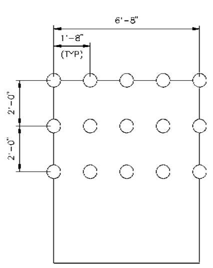


STRAW BALE BARRIER CONSTRUCTION
NO SCALE

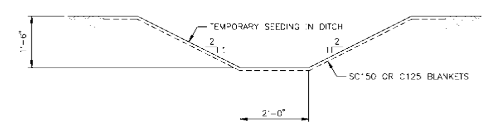


ROCK CHECK DAM CROSS SECTION
NO SCALE



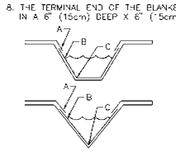


STAPLE PATTERN "D" FOR EROSION BLANKET
NO SCALE
SEE THIS DWG



SECTION 1
NO SCALE

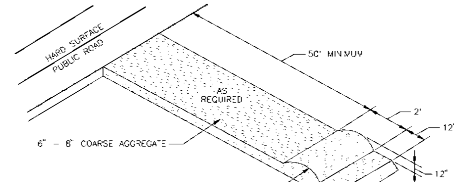
1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL CENTER BLANKET IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM™ STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. PLACE CONSECUTIVE BLANKETS END OVER END (SHINGLE STYLE) WITH A 4"-6" (10cm-15cm) OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER TO SECURE BLANKETS.
5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. ADJACENT BLANKETS MUST BE OVERLAPPED APPROXIMATELY 2"-5" (5cm-12.5cm) (DEPENDING ON BLANKET TYPE) AND STAPLED. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE BLANKET BEING OVERLAPPED.
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT (9m-12m) INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
8. THE TERMINAL END OF THE BLANKETS MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.



CRITICAL POINTS
A. OVERLAPS AND SEAMS
B. PROJECTED WATER LINE
C. CHANNEL BOTTOM/SIDE SLOPE VERTICES

NOTE:
• HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.
•• IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 cm) MAY BE NECESSARY TO PROPERLY ANCHOR THE BLANKETS.

SC150 OR C125 EROSION BLANKET INSTALLATION (DITCH SLOPES ONLY)
NO SCALE
SEE THIS DWG



TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
NO SCALE

SEDIMENT & EROSION CONTROL PLAN NOTES

GENERAL:

THESE GUIDELINES SHALL APPLY TO ALL WORK CONSISTING OF ANY AND ALL TEMPORARY AND/OR PERMANENT MEASURES TO CONTROL WATER POLLUTION AND SOIL EROSION, AS MAY BE REQUIRED, DURING THE CONSTRUCTION OF THE PROJECT.

IN GENERAL, ALL CONSTRUCTION ACTIVITIES SHALL PROCEED IN SUCH A MANNER SO AS NOT TO POLLUTE ANY WETLANDS, WATERCOURSE, WATERBODY, AND CONDUIT CARRYING WATER, ETC. THE CONTRACTOR SHALL LIMIT, INSOFAR AS POSSIBLE, THE SURFACE AREA OF EARTH MATERIALS EXPOSED BY CONSTRUCTION METHODS AND IMMEDIATELY PROVIDE PERMANENT AND TEMPORARY POLLUTION CONTROL MEASURES TO PREVENT CONTAMINATION OF ADJACENT WETLANDS, WATERCOURSES, AND WATERBODIES, AND TO PREVENT, INSOFAR AS POSSIBLE, EROSION ON THE SITE.

HYDROSEEDING / HYDROMULCHING

1. HYDRAULIC MULCHING SHALL CONSIST OF THE MIXING OF WOOD FIBER MULCH, TACKIFIER, GRASS SEED, FERTILIZER AND WATER.
2. MIXTURE SHALL BE MIXED IN STANDARD HYDRAULIC MULCHING EQUIPMENT TO FORM A HOMOGENOUS SLURRY.
3. SPRAY UNDER PRESSURE UNIFORM OVER THE SOIL SURFACE IN ONE-STEP OPERATION.
4. MULCH SHALL BE GREEN COLORED, FIBROUS, WOOD CELLULOSE MATERIAL CONTAINING NO GROWTH OR GERMINATION INHIBITING FACTORS, AND SHALL BE APPLIED AT THE RATE OF 35 LB PER 1000 SQ FT (1500 LB/ACRE).
5. FERTILIZER SHALL CONTAIN SMALL PORTION OF UNCOATED, DOUBLE PELLETS FOR BEST GREEN-UP, AND SHALL BE APPLIED AT THE RATE OF 4.6 LB PER 1000 SQ FT (200 LB/ACRE).
6. SEED SHALL CONFORM TO THE PROVISIONS OF THE CALIFORNIA AGRICULTURAL CODE AND THE FEDERAL SEED ACT. RATES:

RECOMMENDED GRASS TYPE FOR SEEDING

GRASS TYPE	DESCRIPTION	RECOMMENDED SEEDING RATE
BARLEY AND 25% ANNUAL AND 75% PERENNIAL RYE	CONTRA COSTA COUNTY STANDARD SPECIFICATION	3 LB PER 1000 SQ FT 3 LB PER 1000 SQ FT
BLANDO BROME AND 25% ANNUAL AND 75% PERENNIAL RYE	CONTRA COSTA COUNTY STANDARD SPECIFICATION	3 LB PER 1000 SQ FT 3 LB PER 1000 SQ FT
CENTIPEDE GRASS	CONTRA COSTA COUNTY STANDARD SPECIFICATION	12 - 45 LB PER ACRE
BERMUDA GRASS (PERENNIAL)	EXTENSIVELY USED FOR PASTURES, LAWNS, EROSION AND ROAD SIDES	45 - 90 LB PER ACRE
RYE GRASS	USED IN PERMANENT AND TEMPORARY SITES WHICH PROVIDE STABILIZATION COVERAGE	15 - 30 LB PER ACRE
BAHIA GRASS	DROUGHT RESISTANT TURF; DOES WELL IN LAWNS AND ALONG HIGHWAYS, AND IS BEST USED IN SUNNY AREAS; ROOTS EXTEND TO 8 FEET DEEP	100 LB PER ACRE

7. WATER SHALL BE OF SUCH QUALITY AS TO PROMOTE THE GERMINATION AND GROWTH OF THE SEED.
8. TACKIFIER SHALL ENHANCE GERMINATION BY HOLDING SEED IN PLACE AND PREVENTING WASHOUTS. APPLICATION RATE OF 100 LB PER ACRE.

WOOD FIBER MULCH SPECIFICATIONS

PERCENT MOISTURE CONTENT (MAXIMUM)	12.5% ±3.0%
PERCENT ORGANIC MATTER (WOOD FIBER)	96.2% ±0.8% O.D. BASIS
PERCENT ORGANIC MATTER (TACKIFIER)	3.0% ±0.5% O.D. BASIS
PERCENT ASH CONTENT	0.8% ±0.2% O.D. BASIS
PH	4.8 ±0.5
WATER HOLDING CAPACITY (MINIMUM) GRAMS OF WATER PER 100 GRAMS OF FIBER	1000

APPLICATION

TERRAIN	MULCH APPLICATION RATE
FLAT SOIL SURFACES (MINIMUM)	4000 LB PER ACRE
SLOPES 2 TO 1 OR LESS	4000 LB PER ACRE

EROSION AND SEDIMENT MAINTENANCE AND MONITORING NOTES

1. THE FOLLOWING PROCEDURES SHALL BE USED TO MAINTAIN EROSION AND SEDIMENTATION CONTROLS:
   A. ALL CONTROL MEASURES SHALL BE INSPECTED BEFORE AND AFTER STORM EVENTS AND ONCE EACH 24 HOUR PERIOD DURING EXTENDED STORM EVENTS.
   B. ALL CONTROL MEASURES SHALL BE MAINTAINED IN GOOD WORKING ORDER; IF A REPAIR IS NECESSARY THAT REPAIR WILL BE INITIATED WITHIN 24 HOURS OF THE REPORT.
   C. SEDIMENT SHALL BE REMOVED FROM THE SILT BARRIERS WHEN IT HAS REACHED ONE-THIRD OF THE HEIGHT OF THE BARRIER.
   D. SILT BARRIERS SHALL BE INSPECTED FOR DEPTH OF ACCUMULATED SEDIMENT,TEARS, ATTACHMENT TO POST AND STABILITY ON A MONTHY BASIS.
   E. INSPECT AGGREGATE COVERED AREAS FOR BARE SPOTS AND WASHOUTS.
   F. INSPECT SEEDED AREAS FOR UNIFORM COVERAGE AND RE-SEED IF REQUIRED.
   G. THE COMPLIANCE ENGINEER WILL SELECT INDIVIDUALS TO BE RESPONSIBLE FOR INSPECTIONS, MAINTANCE REPAIRS AND REPORTING. THE DESIGNATED INSPECTORS WILL RECIEVE THE NECESSARY TRAINING FROM THE COMPLIANCE ENGINEER TO PROPERLY INSPECT AND MAINTAIN THE CONTROLS IN GOOD WORKING ORDER.
   H. AN INSPECTION FORM SHALL BE COMPLETED AFTER EACH INSPECTION.
   I. THE COMPLETED INSPECTION FORMS SHALL BE KEPT ON THE SITE.

APPROVED FOR CONSTRUCTION

NO	DATE	REVISIONS AND RECORD OF ISSUE	DRN	DES	CHK	PDE	APP
6	01-30-2007	GENERAL REVISIONS	ARB	ARB	DRT	CRT	DVW
5	01-09-2007	GENERAL REVISIONS	ARB	ARB	DRT	CRT	DVW
4	03-27-2002	GENERAL REVISIONS	REP	SK	DJP	DJP	DCW
3	03-26-2002	GENERAL REVISIONS	REP	SK	DJP	DJP	DCW
2	02-28-2002	APPROVED FOR CONSTRUCTION	REP	SK	JAR	DJP	DCW
1	02-26-2002	GENERAL REVISIONS	REP	SK		DJP	DCW
0	02-14-2002	INITIAL ISSUE	RN	SK		DJP	DCW

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.
SIGNED DEAN R. TRACY
DATE 01-09-2007 REG NO. 54003
EXP 12-31-2007

BLACK & VEATCH CONSTRUCTION, INC.
ENGINEER SK | DRAWN RN
CHECKED JAR | DATE 02-28-2002

PACIFIC GAS & ELECTRIC CO.
GATEWAY GENERATING STATION
SITE - EROSION & SEDIMENT CONTROL DETAILS - CONSTRUCTION RESTART

PROJECT DRAWING NUMBER 065108-8STF-S3209 REV 6
CODE
AREA

FIGURE 6-1
MAINTENANCE AND MONITORING MEASURES
GATEWAY GENERATING STATION DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN

CH2MHILL

- An Inspection Form will be completed after each inspection.
- The completed Inspection Forms will be retained onsite.

6.2 Non-stormwater Controls

The following procedures will be used to maintain the non-stormwater controls:

- All control measures will be inspected before and after storm events and once each 24-hour period during extended storm events.
- All measures will be maintained in good working order; if a repair is necessary, that repair will be initiated within 24 hours of the report.
- The designated inspector will visually observe all drainage areas for the presence of unauthorized non-stormwater discharges and their sources.
- If a spill occurs that cannot be cleaned up before the next rain event, or under other circumstances warranting sample collection, the designated inspector will collect stormwater samples during the first two hours (even including weekends or holidays) of discharge. Similarly, if it appears that BMPs have failed or been damaged to the extent that they could result in discharge of pollutants in stormwater; and are discharging potentially impacted water, samples should be collected. Another instance that requires sampling is where stormwater comes in contact with exposed materials that are not covered and are in contact with stormwater. The samples should be analyzed for visible and non-visible compounds with the analytical testing suite determined from the specific materials spilled or not contained properly, and for any constituents in the spill that occur in high enough concentrations to cause an impact to water quality.
- The Black & Veatch Site Manager will select individuals to be responsible for inspections, maintenance, repairs, and reporting. The designated inspectors will receive the necessary training from Black & Veatch's Site Manager to properly inspect and maintain the controls in good working order.
- An Inspection Form will be completed after each inspection.
- The completed Inspection Forms will be retained onsite.

6.3 Recordkeeping

Two inspection forms will be completed demonstrating that inspections and maintenance of the control measures are implemented: Erosion and Sedimentation Controls, and Non-stormwater Source Controls. All disturbed areas and materials storage areas require inspection at least every 7 days before and after storm events and once each 24-hour period during extended storm events. After each inspection, the inspector completes an inspection report and retains a copy of the report. Any maintenance required is initiated within 24 hours of the inspection.

A copy of this DESCP and any supporting materials must be maintained at the construction site from the date of CEC approval to the date of final stabilization. All records and

supporting documents will be compiled in an orderly manner, and maintained onsite until final site stabilization is completed.

The generation of reports, as part of the construction process and inspection or amendment procedures, provides accurate records, which can be used to evaluate the effectiveness of this DESCP and document compliance. Changes in design or construction of the stormwater management system are documented and included with the DESCP to facilitate review or evaluation.

M A N U A L

Pacific Gas and Electric Company®

WATER QUALITY CONSTRUCTION BEST MANAGEMENT PRACTICES MANUAL

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Table 2 Best Management Practice Selection Worksheet for Utility Activities 6

Appendices

Appendix A Definitions and Acronyms

1. BMP PROGRAM OVERVIEW

Water Quality Construction BMP Manual

This *Manual* provides standardized best management practices (BMPs) to reduce or eliminate pollutants in runoff from PG&E construction projects for water quality protection. This *Manual* applies to projects conducted by Pacific Gas and Electric Company (PG&E) and our contractors. There are 20,300 employees who carry out PG&E's primary business—the transmission and delivery of energy. The company provides natural gas and electric service to approximately 14 million people throughout a 70,000-square-mile service area in northern and central California. Many of these projects throughout the service area are subject to a variety of National Pollutant Discharge Elimination System (NPDES) permits.

Because of the breadth of jurisdictions and applicable permits that apply to utility projects, this *Manual* has been developed to provide a consistent approach to water quality management to be followed by PG&E and its contractors throughout our service areas. Most construction projects performed by PG&E and its contractors are linear pipeline or electric installations, which are usually short-term, fast moving, and have low impact on narrow corridor sections of land. Many of the BMPs presented in this Manual have used the best and most practical pollution prevention features from several sources (such as the State of California, California Storm Water Quality Association, San Francisco Estuary Project, ABAG, and Caltrans BMPs) that integrate well into our unique utility construction activities.

This *Manual* is organized into three main sections: BMP Program Overview; BMP Selection and Implementation; and BMP Details. The BMP Details section is divided into five functional BMP categories: Sediment Controls, Waste Management and Materials Controls, Non-Storm Water Discharge Controls, Erosion Control and Soil Stabilization, and Vehicle and Equipment Maintenance. Within each of these categories, specific information, including when and how to implement the BMP and maintenance and inspection information are provided for each BMP. Pictures and diagrams are also provided on several BMPs for easy reference.[1]

The *Manual* identifies BMPs appropriate for specific sites or projects and guides PG&E's support of water quality goals and regulatory compliance. The BMP selection process applies to standard PG&E construction projects, but users should remember to take into account the benefits and limitations of each of the BMPs considered in the context of the site conditions. BMP success is contingent not only on appropriate design and implementation, but on the coordination and communication between the designers, engineers, and the field construction teams.

[1] Photographs provided in this *Manual* are from S.F Estuary Institute and Caltrans.

2. BMP SELECTION AND IMPLEMENTATION

Utility Type Projects

Most Utility projects are very different from commercial or residential developments, building sites, gas/electric transmission and distribution, and Caltrans projects. Utility projects are smaller, short-term, and of long and thin dimensions, impacting narrow corridors of land. Utility projects move or progress along the route and involve minimal exposure of soil or transportable materials to storm water at any one time. Often, utility projects are in the rights-of–way of streets or along utility corridors that must be maintained to ensure safe access to electric and gas lines. BMPs usually are only in place for a few days or even hours. BMPs are typically implemented before, during, and after a project.

Training Program

The importance of training and of integrating the elements of employee and contractor training for pollution prevention controls into a comprehensive training program is part of the PG&E's Water Quality Pollution Prevention Program. All applicable company employees and contractors hired by the company have the responsibility to comply with environmental laws, rules, and regulations. Training for the prevention of environmental related incidents is conducted for applicable employees who perform any operation or activity that has the potential to cause a pollutant to be released into the environment. Records are maintained as to when employees receive this training. Verification of contractor training should also be obtained.

Applicable employees should know and contact their local Environmental Representatives for support and guidance on any aspects of the Training Program.

General Protocol

To select BMPs that are appropriate for a given project, follow these steps:

1. Identify activities, pollutants, and issues of concern.
2. Evaluate site conditions and select BMPs.
3. Implement, monitor, and maintain the BMPs.

Step 1. Identify Activities, Pollutants, and Issues of Concern

The first step in BMP selection is to identify the project activities, the potential pollutants of concern, and the local issues of concern. Project activities may include saw cutting, trenching, excavation, stockpiling of soil, grading and grubbing, access road maintenance, paving, or other activities with the potential to impact storm water and non-storm water discharges. Pollutants of concern may include sediment; petroleum products such as fuel, oil, and grease from vehicle and equipment operation; paving materials such as concrete and asphalt components; other materials used or stored on site, such as pesticides, herbicides, fertilizer, detergents, paint, adhesives, and solvents; and project wastes such as litter, debris, hazardous wastes, and liquid wastes. The local issues of concern may include:

- Proximity to sensitive receiving waters (environmentally sensitive areas or Clean Water Act Section 303(d) listed water bodies such as San Francisco Bay, Petaluma River, Fall River, Russian River, Pajaro River, and Panoche Creek).
- Local regulatory requirements influencing BMP selection or timing of BMP implementation.

Step 2. Evaluate Site Conditions and Select BMPs

To assist in BMP selection, this *Water Quality Construction BMP Manual* presents BMPs that are anticipated to be most applicable to utility construction projects. Utility projects are unique, because they are typically very short-term and fast-moving, and involve minimal exposure of soil or transportable materials to storm water at any one time. The selector should consider any project-specific requirements

or factors such as BMP effectiveness, cost, availability, feasibility, and suitability for the site. For example, important site conditions include the amount of soil disturbance, anticipated weather conditions, soil type and erodibility, flow path length, and slope of exposed soil. Selected BMPs can and should be modified to suit the scope of the project and site conditions. Table 1 presents guidelines for BMP selection and implementation at a construction site. Table 2 presents a BMP selection worksheet for utility activities. A selector might also discover a better BMP for a situation that is not listed in Tables 1 or 2. Environmental Affairs may recommend creative and practical pollution prevention techniques. These new techniques can be shared with others to support the water quality goals of the regional water quality control board.

Step 3. Implement, Monitor, and Maintain the BMP System

It is important that selected BMPs are implemented in a sequence that maximizes protection of water quality, are monitored regularly for effectiveness, and are maintained as necessary throughout the project. Most BMPs will only be implemented when needed, and/or when a storm event is forecast or occurs. Table 1 presents a suggested schedule for BMP implementation and sequencing. Steps in this schedule should be reviewed for each project as applicable. All BMPs should be monitored and inspected regularly, and particularly before and after rain events. BMPs should be maintained during a project in accordance with the procedures outlined in the BMP Details section.

BMP Installation Contractors

This *Water Quality Construction BMP Manual* identifies some Utility activities and operations that may require installation of BMPs by outside contractors. However, the utility crews will implement most BMPs. Most types of BMP materials are readily available from local suppliers and are available through the company's Purchasing Program.

2. BMP SELECTION AND IMPLEMENTATION

Table 1
BMP Selection and Sequencing Guide

Step No.	Description	What to Do	BMP Options
1.	Before Construction	Before construction, evaluate, mark, and protect important trees and associated rooting zones, unique areas (e.g., wetlands), and other areas to be preserved, especially in perimeter areas.	4-01, other user-defined BMPs
2.	Site Access Areas (construction entrances/exits, roadways, equipment parking/fueling areas)	Before earthwork, stabilize site entrances and access roads, if applicable. Minimize development of new access roads or ROW's, and vehicle access. Designate parking and fueling areas. Control vehicle speed and access near sensitive areas or waterways.	1-07, other user-defined BMPs
3.	Storm Drain Inlet Protection	Install inlet protection at down-gradient inlets that project runoff or vehicle tracking might impact.	1-06, other user-defined BMPs
4.	Perimeter Sediment Control	Before land-disturbing activities, install perimeter sediment controls (silt fence, fiber rolls, etc.), as applicable. Install additional run-off/run-on control measures during construction, as needed.	1-02, 1-03, 1-04, 1-05, other user-defined BMPs
5.	Material and Waste Storage Areas	Before storing materials on site, prepare staging areas, material storage, and disposal areas, as applicable. Grade to reduce run-on and runoff, install perimeter controls, obtain clean-up materials, plastic covers for stockpiles, etc.	2-01 through 2-08, 1-08, other user-defined BMPs
6.	Earthwork (trenching, excavation, grading, surface roughening, grubbing)	Begin excavation, trenching, or grading after installing applicable sediment and runoff control measures. Install additional control measures as work progresses, as needed.	1-01 through 1-08, other user-defined BMPs
7.	Surface Stabilization (temporary and permanent seeding, mulching)	Apply temporary or permanent soil stabilization measures as applicable on all disturbed areas where work is delayed or completed. Only 'certified weed free' products will be used.	4-01 through 4-08, other user-defined BMPs
8.	Construction and Paving (install utilities, buildings, paving)	Implement applicable control practices as work takes place.	3-01 through 3-9, other user-defined BMPs
9.	Final Stabilization and Landscaping	Stabilize open areas as applicable. Remove temporary control measures and install final stabilization controls appropriately (topsoil, trees and shrubs, permanent seeding, mulching, sodding, and riprap).	3-07, 4-03, 4-04, other user-defined BMPs

2. BMP SELECTION AND IMPLEMENTATION

Table 2
BMP Selection Worksheet for Utility Activities

PG&E Utility BMP No.	BMP Options	Construction				Maint. And Repair				
		Potholing	Overhead Electric	Underground Electric	Underground Gas	Gen. Maint. and Repair	Inspect and Repair Elect. and Gas Equip.	Tree Trimming	Veg. Control	Insulator Washing
Category 1 Sediment Controls										
Choose from one or more of the following BMP options when applicable:										
BMP-1-01	Scheduling									
BMP-1-02	Silt Fence									
BMP-1-03	Fiber Rolls									
BMP-1-04	Gravel Bag Berm									
BMP-1-05	Sand Bag Barrier									
BMP-1-06	Storm Drain Inlet Protection									
BMP-1-07	Tracking Controls									
BMP-1-08	Stockpile Management									
Other-User Defined	BMP Description:									
Category 2 Waste Management and Material Controls										
Choose from one or more of the following BMP options when applicable:										
BMP-2-01	Material Delivery and Storage									
BMP-2-02	Material Use									
BMP-2-03	Spill Control									
BMP-2-04	Solid Waste Management									
BMP-2-05	Hazardous Materials/Waste Management									
BMP-2-06	Contaminated Soil Management									
BMP-2-07	Sanitary/Septic Waste Management									
BMP-2-08	Liquid Waste Management									
Other-User Defined	BMP Description:									

2. BMP SELECTION AND IMPLEMENTATION

Table 2
BMP Selection Worksheet for Utility Activities

PG&E Utility BMP No.	BMP Options	Construction				Maint. And Repair				
		Potholing	Overhead Electric	Underground Electric	Underground Gas	Gen. Maint. and Repair	Inspect and Repair Elect. and Gas Equip.	Tree Trimming	Veg. Control	Insulator Washing
Category 3 Non-Storm Water Discharge Controls										
Choose from one or more of the following BMP options when applicable:										
BMP-3-01	Dewatering Operations									
BMP-3-02	Paving Operations									
BMP-3-03	Concrete/Coring/Sawcutting and Drilling Waste Management									
BMP-3-04	Dewatering Utility Substructures and Vaults									
BMP-3-05	Vegetation Management including Mechanical and Chemical Weed Control									
BMP-3-06	Over-Water Protection									
BMP-3-07	Removal of Utility Location/Mark-Out Paint									
Other-User Defined	BMP Description:									
Category 4 Erosion Control and Soil Stabilization										
Choose from one or more of the following BMP options when applicable:										
BMP-4-01	Preservation of Existing Vegetation									
BMP-4-02	Temporary Soil Stabilization									
BMP-4-03	Hydraulic Mulch									
BMP-4-04	Hydroseeding									
BMP-4-05	Soil Binders									
BMP-4-06	Straw Mulch									
BMP-4-07	Geotextiles, Plastic Covers and Erosion Control Blankets/Mats									

Table 2
BMP Selection Worksheet for Utility Activities

PG&E Utility BMP No.	BMP Options	Construction				Maint. And Repair				
		Potholing	Overhead Electric	Underground Electric	Underground Gas	Gen. Maint. and Repair	Inspect and Repair Elect. and Gas Equip.	Tree Trimming	Veg. Control	Insulator Washing
Category 4 Erosion Control and Soil Stabilization (continued)										
Choose from one or more of the following BMP options when applicable:										
BMP-4-08	Dust (Wind Erosion) Control									
Other-User Defined	BMP Description:									
Category 5 Vehicle and Equipment Managements										
BMP-5-01	Vehicle and Equipment Cleaning									
BMP-5-02	Vehicle and Equipment Fueling									
BMP-5-03	Vehicle and Equipment Maintenance									

3. BMP DETAILS

This chapter provides details for the selection and implementation of BMPs for the most common utility construction activities. Once the BMP objectives are defined, categories of BMPs must be selected that are best suited to meet each objective. There are five categories that group BMPs by how they prevent pollution:

1. Sediment Controls
2. Waste Management and Material Controls
3. Non-Storm Water Discharge Controls
4. Erosion Control and Soil Stabilization
5. Vehicle and Equipment Maintenance

CATEGORY 1. SEDIMENT CONTROLS

Sediment particles (soil/dust) from utility activities can be transported to a different location by wind or water flow. Once these particles are detached, they are considered pollutants. Sediment Controls include any method that traps the soil particles after they are detached and moved by wind or water. Sediment Controls are usually passive systems that rely on filtering or settling the particles out of the water or wind that is transporting them. The sediment that has been accumulated by the BMPs can be incorporated in the earthwork on the site or disposed at an appropriate location. Sediment Controls presented in this *Manual* include the following:

- BMP 1-01 Scheduling
- BMP 1-02 Silt Fence
- BMP 1 03 Fiber Rolls
- BMP 1-04 Gravel Bag Berm
- BMP 1-05 Sand Bag Barrier
- BMP 1-06 Storm Drain Inlet Protection
- BMP 1-07 Tracking Controls
- BMP 1-08 Stockpile Management

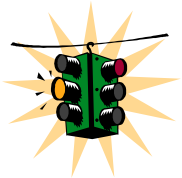
When

Scheduling must be considered for applicable projects year-round.

How

Use the following measures as applicable:

- Consider scheduling major soil disturbing activities or activities near environmentally sensitive areas (e.g., adjacent to water bodies, vernal pools) during the non-rainy season.
- Monitor the weather forecast for seasonable and unseasonable rain events. Weather information is available from the following sources:
  - PG&E Weather Website, http://gosqlwx02/weather/Stndrd/legacy/WebProd/SAF/SAF_temps1.htm
  - Telephone Number (415) 973-3223, Co. 8-223-3223, from 5 a.m. to 3 p.m.
  - AccuWeather: www.accuweather.com
- Always be prepared to deploy erosion and sediment control and soil stabilization BMPs. **Off-site sediment discharges can occur during the non-rainy season because of unseasonable rainfall, wind, non-storm water discharges, and vehicle tracking, and must be prevented.**



DURING THE RAINY SEASON (Most of California: October 1–May 1; Desert regions: August 1–May 30)

- Sequence work to minimize soil-disturbing activities during forecast rain events.
- Limit disturbed soil area to the amount of acreage that can be protected before a forecasted rain event.
- Stabilize disturbed soil areas as soon as practical, and, at a minimum, before a forecasted rain event.
- Protect environmentally sensitive areas, such as drainage channels, streams, and natural watercourses.
- When rainfall is forecasted, adjust the construction schedule to implement soil stabilization and sediment controls on all disturbed areas before the onset of rain.

Maintenance and Inspection

- Review applicable scheduling and sequencing of construction activities throughout the project to minimize the time that soil is exposed and the total area of exposed soil.
- Inspect erosion and sediment controls before and after each storm event and routinely throughout the rainy season (to be consistent with all the other BMPs).

When

Silt fences are temporary linear sediment barriers of permeable fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff. Silt fences allow sediment to settle from runoff before water leaves the construction site.

Silt fences are placed:

- Below the toe of exposed and erodible slopes.
- Down slope of exposed soil areas.
- Around temporary stockpiles.
- Along streams and channels.
- Along the perimeter of a project.

How

- Construct silt fences with a setback of at least 3 feet from the toe of a slope in areas suitable for temporary ponding or deposition of sediment. Where a 3-foot setback is not practicable, construct as far from the toe of the slope as practicable.
- Generally, use silt fences in conjunction with soil stabilization source controls up slope to provide effective control, particularly for slopes adjacent to water bodies or Environmentally Sensitive Areas.
- Construct the length of each reach (length of fence) so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; each reach should not exceed 500 feet. The last 6 feet of the reach should be turned up slope.
- The maximum length of slope draining to the silt fence should be 200 ft or fewer.
- Excavate a trench for the bottom of the silt fence that is not wider or deeper than necessary.
- Key in, or bury the bottom of silt fence fabric in trench and tamp into place. If it is not feasible to trench along the slope contour, use sand bags or backfilling to key in the bottom of the fabric.
- Install fence post at least 12 inches below grade on down slope side of trench.
- **Silt fences should not be considered for installation below slopes steeper than 1:1 (horizontal:vertical) or that contain a high number of rocks or loose dirt clods.**

Maintenance and Inspection

- Repair or replace split, torn, slumping, undercut, or weathered fabric.
- Inspect silt fences before and after each storm event and routinely throughout the rainy season.
- Remove accumulated sediment when it reaches 1/3 of the barrier height. Incorporate removed sediment into the project at appropriate locations or dispose of at a PG&E-approved site.
- Remove and dispose of silt fences that are damaged and become unsuitable for the intended purpose and replace with new silt fence barriers.
- Remove silt fence when no longer needed. Fill and compact post-holes and anchorage trench, remove sediment accumulation, and grade fence alignment to blend with adjacent ground.

Silt fence installed at the toe of an erodible slope. Use is combined with fiber rolls and serves as perimeter control.

When

A fiber roll consists of straw, flax, or other similar bio-degradable materials that are rolled and bound into a tight roll or stuffed in a photo-degradable open weave netting or burlap that is generally placed on the face of slopes at regular intervals to intercept runoff, reduce flow velocity, release the runoff as sheet flow, and provide the removal of sediment.

- May be used along the top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- May be used as check dams in unlined ditches.
- May be used where flows are moderately concentrated, such as ditches, swales, and unpaved storm drain inlets (Storm Drain Inlet Protection to divert and/or detain flows.).
- Are appropriate in unpaved areas for perimeter site control or along streams, channels, storm drain inlets, or around stockpiles to intercept sediment laden storm water and non-storm water runoff.

How

Installation - Follow the manufacturer's recommendations for installation. In general:

- Locate fiber rolls on level contours spaced 8 to 20 feet apart along the face of the slope.
- Stake fiber rolls into a 2 to 4 inch deep trench with a width equal to the diameter of the fiber roll.
- Drive stakes into fiber rolls at a minimum of 4-foot intervals
- If more than one fiber roll is placed in a row, fiber rolls should be tightly abutted not overlapped to ensure no sediment escapes.

Removal

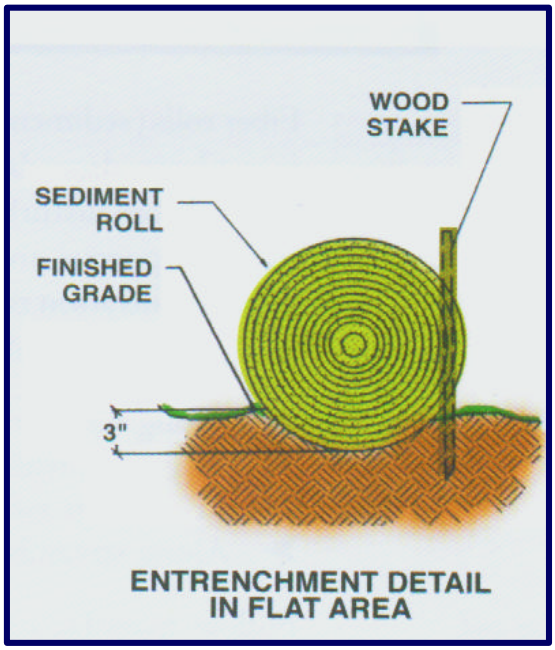
- If used on slopes, leave fiber rolls in place.
- If used as Storm Drain Inlet Protection, stockpile control, or other temporary control measures, remove fiber rolls at the completion of the construction project.
- If removed, collect and dispose of fiber rolls and sediment accumulation as appropriate. Fill and compact holes, trenches, depressions, or any other ground disturbance to blend with adjacent ground.

Maintenance and Inspection

- Repair or replace spilt, torn, unraveling, or slumping fiber rolls.
- Inspect fiber rolls if rain is forecasted and perform maintenance as needed.
- Inspect fiber rolls before and after each storm event, and routinely during throughout the rainy season.
- Sediment should be removed when sediment accumulations reaches one-third the distance from the top of the fiber roll and the adjacent ground surface. Sediment removed during maintenance may be incorporated into earthwork on the site or dispose at an appropriate location.

Limitations

- Fiber rolls are not effective unless trenched.
- When working in a habitat/species sensitive area:
    - Use a 'certified weed free' wattles
    - Use burlap covered wattles in-lieu of plastic netting



Fiber roll installation on the face of a slope.

When

A gravel bag berm consists of a single row of gravel bags that are installed end-to-end to form a barrier across a slope to intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide some sediment removal. Gravel bags can also be used where flows are moderately concentrated, such as ditches, swales, and storm drain inlets (Storm Drain Inlet Protection to divert and/or detain flows). Gravel bag berms are appropriate for perimeter site control or along streams, channels, storm drain inlets, or around stockpiles to intercept sediment laden storm water and non-storm water runoff.

- Where it is desirable to filter sediment in runoff. Note that gravel bag berms are generally more permeable than sand bags. Sand bag barriers should be used where it is desirable to block and pond flows (e.g., for containment of non-storm water flows).
- Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- On a project-by-project basis to maximize effectiveness.
- With other BMPs to maximize sediment containment.

How

- When used as a linear control for sediment removal:
  - Install along a level contour.
  - Turn ends of gravel bag row up slope to prevent flow around the ends.
  - Use in conjunction with temporary soil stabilization controls up slope to provide effective control.
- When used for concentrated flows:
  - Stack gravel bags to required height. When the height requires 3 rows or more, use a pyramid approach.
  - Overlap upper rows of gravel bags with overlap joints in lower rows.
- Construct gravel bag barriers with a setback of at least 3 feet from the toe of a slope. Where a 3-foot setback is not practicable, construct as far from the toe of the slope as practicable.

Maintenance and Inspection

- Inspect gravel bag berms before and after each storm event and routinely throughout the rainy season.
- Reshape or replace gravel bags as needed.
- Repair washouts or other damages as needed.
- Inspect gravel bag berms for sediment accumulations and remove sediments when accumulation reaches 1/3 of the berm height. Incorporate removed sediment into the project at appropriate locations or dispose of it at a PG&E-approved site.
- Remove gravel bag berms when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Incorporate removed sediment into the project at appropriate locations or dispose of it at a PG&E-approved site.

Gravel bags and fiber rolls used as a perimeter sediment control system.

Gravel bags used as perimeter control.

When

A sand bag barrier is a temporary linear sediment barrier consisting of stacked sand bags, designed to intercept and slow sediment-laden storm water and non-storm water runoff. Sand bag barriers allow sediment to settle from runoff before water leaves the construction site.

- Sand bags can be used where flows are moderately concentrated, such as ditches, swales, and storm drain inlets to divert and/or detain flows. See BMP on Storm Drain Inlet Protection.
- To divert or direct flow away from disturbed slopes or create a temporary sediment basin.
- During construction activities in streambeds when the contributing drainage area is 1 to 5 acres.
- To capture and detain non-storm water flows until proper cleaning operations occur.
- When site conditions or construction sequencing require adjustments or relocation of the barrier to meet changing field conditions and needs during construction.
- To temporarily close or continue broken, damaged or incomplete curbs.

Sand bag barriers are used:

- Where it is desirable to block and pond flow (e.g., for containment of non-storm water flows). Use caution when using sand bag barriers in traffic areas or other areas where potential flooding is not desirable.
- Along the perimeter of a site, vehicle and equipment fueling and maintenance areas, chemical storage areas, or stockpiles.
- Below the toe or down slope of exposed and erodible slopes.
- Parallel to streams, channels, and roadways.
- Across channels to serve as a barrier for utility trenches or provide a temporary channel crossing for construction equipment, or to reduce stream impacts.

How

- When used as a linear control for sediment removal:
  - Install along a level contour.
  - Turn ends of sand bag row up slope to prevent flow around the ends.
  - Generally, use sand bag barriers in conjunction with temporary soil stabilization controls up slope to provide effective control.
- When used for concentrated flows:
  - Stack sand bags to required height. When the required height is three rows or more, use a pyramid approach. Overlap rows of sand bags with overlap joints in lower rows.
  - Construct sand bag barriers with a setback of at least 3 feet from the toe of a slope. Where a 3-foot setback is not practicable, construct as far from the toe of the slope as practicable.

Maintenance and Inspection

- Inspect sand bag barriers before and after each storm event and routinely throughout the rainy season.
- Repair washouts or other damages as needed, or as directed by the projects Environmental Representative.
- Inspect sand bag barriers for sediment accumulations and remove sediments when accumulation reaches 1/3 the barrier height.
- Remove sand bags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Incorporate removed sediment at appropriate project locations or dispose of at a PG&E-approved site.

Sand bags used as perimeter control.

When

A device used at storm drain inlets to protect against the discharge of sediment-laden storm water and non-storm water runoff from construction activities. The device develops a pond behind it, giving the sediment time to settle out before discharging to the storm drain. Do not construct such that runoff will result in:

- Ponding into road traffic or onto erodible surfaces or slopes.
- Overflowing onto the sidewalk.

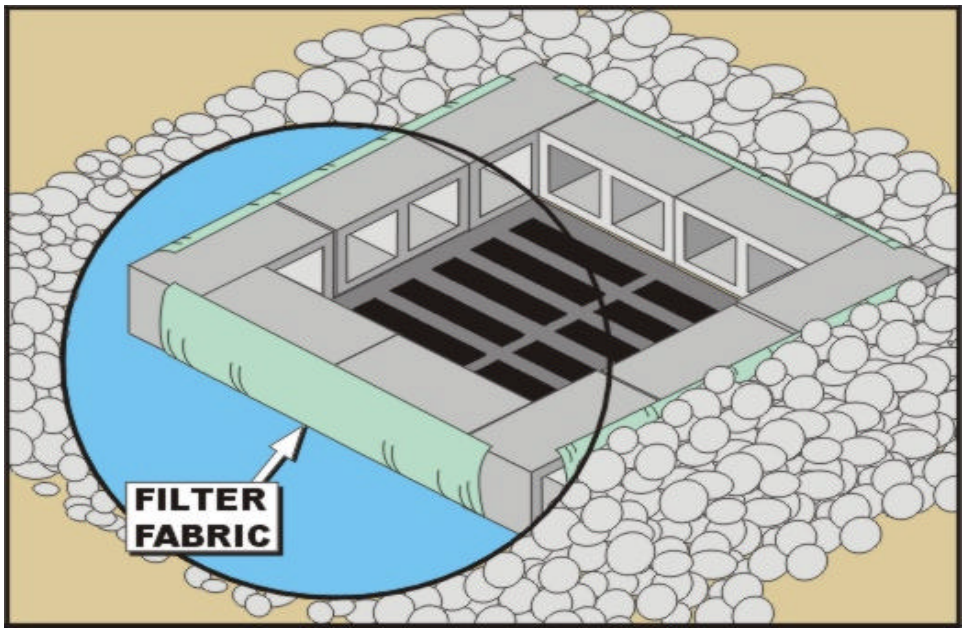
This BMP is required on all construction projects where sediment laden surface runoff may enter a storm drain inlet and watercourses.

How

- Identify downstream storm drain inlets that have the potential to run off from construction activities.
- Where a storm drain inlet is on or at the bottom of a slope, a series of small check dams (i.e., gravel bags) constructed at intervals along the slope may be required to slow the runoff.
- Select appropriate protection and construct inlet protection based on the configuration of inlets at the site.

Maintenance and Inspection

- Inspect inlet protection devices before and after each storm event and routinely throughout the rainy season.
- Remove inlet protection devices at the end of the construction period, or when the project can no longer impact the inlet.
- During inspections:
  - Inspect bags, silt fence, or filter fabric for holes, gashes, and snags.
  - Check gravel bags for proper arrangement and displacement.
  - Remove the sediment behind the barrier when it reaches 1/3 the height of the barrier. Removed sediment should be incorporated in the project or disposed of at a PG&E-approved disposal site.



Block and gravel-type inlet protection.

Inlet protection that blocks flow is good for preventing non-storm water discharges from entering the drain.

Gravel bag inlet protection.

Inlet protection of fiber rolls and filter fabric.

When

Tracking controls reduce off-site tracking of sediment and other pollutants by providing a stabilized entrance at defined construction site entrances and exits and/or providing methods to clean up sediment or other materials to prevent them from entering a storm drain by sweeping or vacuuming.

- Stabilize entrances on a project-by-project basis in addition to other BMPs.
- Implement sweeping or vacuuming when sediment is tracked from the project site onto public or private paved roads, typically at points of site exit.
- Use stabilized entrances and/or sweeping at construction sites:
  - Where dirt or mud is tracked onto public roads adjacent to water bodies.
  - Where poor soils are encountered, such as soils containing clay.
  - Where dust is a problem during dry weather conditions.

How

Stabilized Construction Entrances

- Limit the points of entrance/exit to the construction site by designating combination or single-purpose entrances and exits. Require all employees, subcontractors, and others to use them. Limit speed of vehicles to control dust.
- Grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment-trapping device before discharge.
- Design stabilized entrance/exit to support the heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphaltic concrete, and concrete) based on longevity, required performance, and site conditions.
- Use of constructed or constructed/manufactured steel plates with ribs for entrance/exit access is permitted.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 inches deep, or place aggregate to a depth recommended by a geotechnical engineer. Use crushed aggregate of more than 3 inches but fewer than 6 inches.

Street Sweeping and Vacuuming

- Routinely inspect potential sediment tracking locations.
- Sweep or vacuum visible sediment tracking as needed. Manual sweeping is appropriate for small jobs.
- Manual sweeping is appropriate for small projects. For larger projects, use sweeping methods that collect removed sediment and material.

If not mixed with debris or trash, incorporate the removed sediment into the project or dispose of it at a PG&E-approved disposal site.

Maintenance and Inspection

Stabilized Construction Entrance

- Inspect routinely for damage and assess effectiveness. Repair if access is clogged with sediment.
- Sweep where tracking has occurred on roadways and on the same day. Do not use water to wash sediment off the streets. If water must be used, it should be captured to prevent sediment-laden water from running off the site.
- Keep all temporary roadway ditches clear.

Street Sweeping and Vacuuming

- Inspect inlet and outlet access points routinely and sweep tracked sediment as needed.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- After sweeping, properly dispose of sweeper wastes.

Manufactured metal plates knock dirt off vehicles before exiting a site.

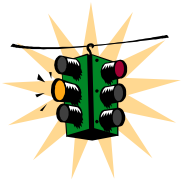
When

Use this BMP when projects require stockpiled soil and paving materials. The stockpile management practices differ based on forecasted weather or terrain.

- Protection of stockpiles must be implemented whenever there is a potential for transport of materials by a water source (forecast precipitation or any non-storm water runoff).

How

- Use one or more of the following options to manage stockpiles and prevent stockpile erosion and sediment discharges for storm water and non-storm water runoff/run-on:
  - Return stockpile to the excavation if precipitation is forecast.
  - Protect stockpiles from storm water run-on with temporary perimeter sediment barriers such as berms, silt fences, fiber rolls, covers, sand/gravel bags, or straw bale barriers, as appropriate.
  - Remove or temporarily store stockpiles in a protected location off site.
- Keep stockpiles organized and surrounding areas clean.
- Protect storm drain inlets, watercourses, and water bodies from stockpiles, as appropriate.
- Implement dust control practices as appropriate on all stockpiled material.
- **Stockpiles should be covered, stabilized, or protected with a perimeter sediment barrier before the onset of precipitation.**



Maintenance and Inspection

Repair and/or replace covers and perimeter containment structures as needed.

Stockpile covered with plastic and secured with large rocks.

Silt fence as stockpile perimeter control.

Federal, state, and local laws; regulations; ordinances; and permits prohibit the discharge of contaminated storm water to storm drains and surface waters. Transport of sediment and other pollutants, such as litter, paint, solvents, fuel, lubricants, and demolition wastes, can be carried away from a construction site in storm water. BMPs should be used for those construction activities that could cause pollution to ensure that pollutants are properly managed and are not discharged to storm drains and surface waters.

Waste Management and Materials Controls are source control BMPs that reduce or prevent contact between wastes and/or materials and storm water:

- BMP 2-01 Material Delivery and Storage
- BMP 2-02 Material Use
- BMP 2-03 Spill Control
- BMP 2-04 Solid Waste Management
- BMP 2-05 Hazardous Materials/Waste Management
- BMP 2-06 Contaminated Soil Management
- BMP 2-07 Sanitary/Septic Waste Management
- BMP 2-08 Liquid Waste Management

When

If it is necessary to store materials at a construction site. This BMP does not apply to materials and supplies stored on trucks that are driven on site and off site daily.

How

Use the following measures as appropriate:

- Store only the minimum amount of material that is needed for the job.
- Locate storage areas away from storm drain inlets, drainage systems, and watercourses to prevent storm water run-on from reaching the materials.
- If practical, store materials in enclosed storage containers such as cargo containers.
- Store materials on impervious surfaces or use plastic groundcovers to prevent spills or leakage from contaminating the ground.
- For known hazardous materials, keep materials covered with plastic of other waterproof materials.
- If necessary, provide secondary containment systems around material storage areas to prevent contaminated run-off/run-on from leaving storage area(s).
- Keep an adequate supply of spill kit materials nearby.
- Ensure that qualified personnel are available when hazardous materials are delivered to guarantee proper delivery and storage in designated area.
- When the storage area is no longer needed, return it to original condition.
- Place bagged materials with the potential to pollute runoff, such as cold patch, concrete mix, and other materials, on pallets and under cover.

Maintenance and Inspection

Repair or replace covers, containment structures, or perimeter controls as needed to ensure proper functioning. Routinely inspect designated delivery and storage areas.

Materials are covered and neatly stored within a curbed area.

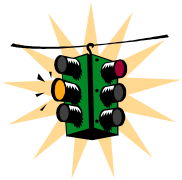
When

Apply this BMP when the following materials are used or prepared on site:

- Pesticides and herbicides.
- Fertilizers and soil amendments.
- Detergents.
- Petroleum products such as fuel, oil, and grease.
- Asphalt and other concrete components.
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds.
- Mastic, pipe wrap, primers, and paint.
- Concrete compounds.
- Welding material.
- Other materials that may be detrimental if released to the environment.

How

- Reduce or eliminate use of hazardous materials on site when practical. Contact your Environmental Representative for additional information.
- Empty latex paint and paint cans, used brushes, paint rags, absorbent materials, and drop cloths. When these items are thoroughly dry and are no longer hazardous, dispose of them with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- When possible, mix paint indoors; otherwise use secondary containment structures. Do not clean paintbrushes or rinse paint containers into a street, gutter, storm drain, sanitary sewer, or watercourse.
- Dispose as hazardous waste those paint thinners, residue, and sludge(s) that cannot be recycled. For water-based paint, clean brushes to the extent practical, and rinse into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practical and filter and reuse thinners and solvents.



- If possible, recycle residual paints, solvents, non-treated lumber, and other materials.
- **Do not over apply fertilizers, pesticides, and soil amendments. Prepare only the amount needed. Strictly follow the recommended usage instructions.**
- Keep an ample supply of spill clean up material near use areas. Instruct employees in spill cleanup procedures.
- Avoid exposing applied materials to rainfall unless they have had sufficient time to dry or cure.
- Manage hazardous materials in accordance with the BMP on Hazardous Materials/Waste Management.

Maintenance and Inspection

- Spot check employees and contractors regularly throughout the job duration to ensure that appropriate practices are employed.

When

This BMP applies to all construction sites at all times. Implement spill control procedures any time chemicals and/or hazardous substances are stored. Substances may include, but are not limited to, fuels, lubricants, solvents, fertilizers, pesticides, herbicides, soil binders, coolants, paints, and sewage.

To the extent that work can be accomplished safely, contain spills of materials or chemicals and clean up immediately.

How

Stop the spillage of material if it can be done safely. Clean the contaminated area, and properly dispose of contaminated materials. For all spills, notify the project foreman and/or the Environmental Representative. Use the following spill prevention and controls when applicable:

- To the extent that it does not compromise clean up activities, cover and protect spills from storm water run-on during rainfall.
- Do not bury or dilute spills with wash water.
- Store and dispose of used cleanup materials, contaminated materials, and recovered spill material in accordance with federal, state, and local regulations. (Refer to BMP on Hazardous Materials/Waste Management.)
- Use absorbent materials to clean up spills. So not hose down a spill with water.
- Collect and dispose appropriately all water used for cleaning and decontamination of a spill. So not wash it into storm drain inlets or watercourses. Coordinate disposal of these wastes with the Environmental Representative.
- Keep spill cleanup kits in areas where any materials are used and stored.

Maintenance and Inspection

- Routinely confirm that spill control cleanup materials are available near material storage, unloading, and use areas.

When

These BMPs should be used on all construction projects that generate solid waste. Solid wastes may include, but are not limited to, concrete, cement, asphalt rubble, masonry brick/block, vegetation debris, steel and scrap metals, pipe and electrical cuttings, non-hazardous equipment parts, Styrofoam, general trash, and other materials used to transport and package construction materials. BMP materials, like sand bags, gravel bags, and silt fence stock, should be separated for reuse or disposal.

How

- Practice good housekeeping and keep site clean.
- Use dry methods for site clean up such as sweeping, vacuuming, and hand pick-up.
- Designate a waste storage area on site. If a designated waste storage area is not feasible, remove wastes from the site regularly.
- Prohibit littering by employees, contractors, and visitors.
- Keep trash receptacles available on site and/or on construction vehicles.
- Protect wastes from being washed away by rainfall, storm water run-on, or other waters (irrigation, water line breaks, etc.).
- To prevent storm water run-on from contacting stored solid waste (stockpiled materials) use berms, secondary containment, covered dumpsters/roll-offs, or other temporary diversion structures or measures.
- For materials with the potential for spills or leaks, stockpile on impervious surfaces or use plastic groundcovers to prevent spills or leaks from infiltrating the ground.
- Do not hose out or clean out dumpsters or containers at the construction site.
- Prevent solid waste and trash from entering and clogging storm drain inlets.
- As practical, incorporate any removed clean sediment and soil back into the project.
- Reference BMP on Stockpile Management.

Maintenance and Inspection

- Collect site trash regularly, especially before rainy or windy conditions.
- Perform routine inspections of site, including storage areas, dumpsters, stockpiles, and other areas where trash and debris are collected.
- Close trashcan lids and dumpster covers before rainy or windy conditions.

When

Use this BMP when projects involve the storage and use of hazardous materials and the generation of waste byproducts from the following:

- Petroleum products such as oils, fuels, greases, cold mix, and tars.
- Glues, adhesives, and solvents.
- Herbicides, pesticides, and fertilizers.
- Paints, stains, and curing compounds.
- Other hazardous or toxic substances.

How

Manage hazardous materials and wastes in accordance with the following procedures:

- Minimize the amount of hazardous materials stored at the construction site, and the production and generation of hazardous waste at the construction site.
- Cover or containerize and protect from vandalism any hazardous materials and wastes.
- Clearly mark all hazardous materials and wastes. Place hazardous waste containers in secondary containment systems if stored at the construction site.
- Place on and cover with plastic all stockpiled cold mix.
- Do not mix waste materials, because this complicates or inhibits disposal and recycling options and can result in dangerous chemical reactions.
- Inspect storm water that collects within secondary containment structures before being discharging to ensure that no pollutants are present. Contaminated storm water must be managed according to PG&E Environmental Practices (EPs), including Vault Dewatering and SPCC pond drainage.
- Do not discharge spills from a secondary containment system. See BMP on Spill Control.
- Segregate hazardous waste from other solid waste and dispose of it properly.
- In addition to following this BMP, employees or contractors are responsible for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous waste.

Maintenance and Inspection

- Routinely inspect the covers on hazardous material storage areas for tears or flaws, and repair as necessary.
- Ensure that all secondary containment systems can hold the volume of the largest container in the storage area; provide sufficient additional capacity for storm events.
- Routinely inspect to ensure that no hazardous materials or waste are improperly exposed to storm water.

When

This contaminated soil management BMP should be used whenever soil contamination is suspected or contaminated soil is encountered. Construction crews should be extra vigilant on projects located in highly urbanized or industrial areas, where soil contamination may have occurred because of spills, illicit discharges, and leaks from underground storage tanks.

Contaminated soils may also be encountered during digging and trenching activities on highways and roadways.

How

Contaminated soil wastes should be managed in accordance with the following procedures:

- Identify contaminated soil and look for the following:
  - Soil that is discolored, black, gray, white.
  - Soil that has an unusual odor, such as, petroleum, acid, alkaline, sewage, solvent, or any other chemical smell.
- If potentially contaminated soil is detected, discontinue the activity and contact the project's Environmental Representative.
- Manage contaminated soils properly, according to PG&E Environmental Practices (EPs).

Maintenance and Inspection

- Perform routine inspections of digging and trenching operations to look for contaminated soils.
- Manage all contaminated soils as hazardous substances, if applicable, in accordance with applicable federal, state, and local laws.

When

Use this BMP on all construction sites that use temporary or portable sanitary/septic waste systems.

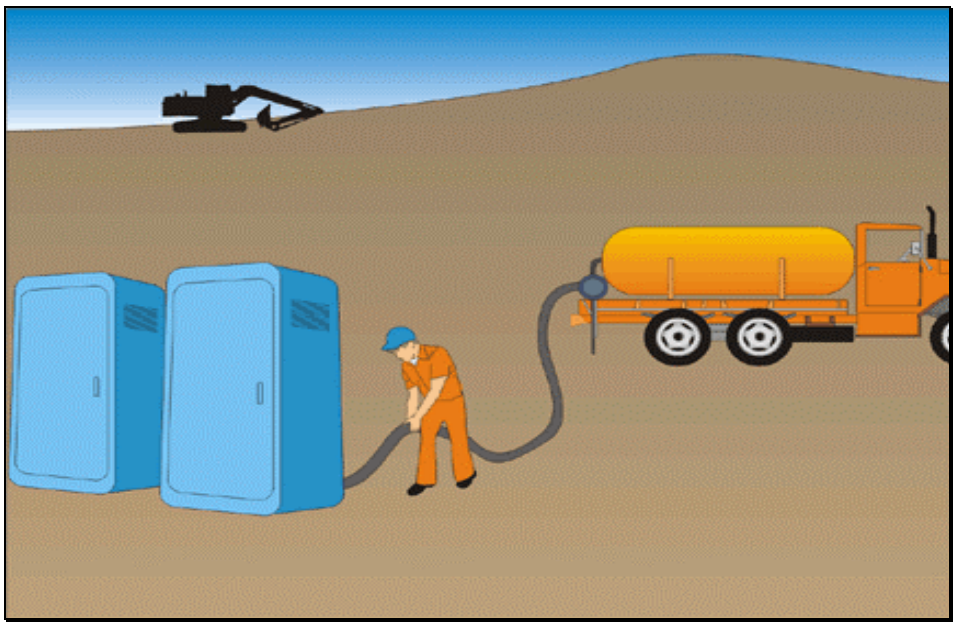
How

Manage sanitary/septic wastes in accordance with the following procedures:

- Incorporate into regular safety meetings the education of employees, contractors, and suppliers on:
  - Potential dangers to humans and the environment from sanitary/septic wastes.
  - Approved sanitary/septic waste storage and disposal procedures.
- Locate temporary sanitary facilities away from drainage facilities, watercourses, and traffic circulation. When subjected to high winds or risk of high winds, secure temporary sanitary facilities to prevent overturning.
- Do not bury or discharge sanitary wastewater, except to a properly permitted sanitary sewer discharge facility. The local Sanitation District might require a permit.
- Use only reputable, licensed sanitary/septic waste haulers.
- Empty temporary sanitary facility's holding tanks before transport.

Maintenance and Inspection

- Routinely inspect onsite sanitary/septic waste storage and disposal.
- Ensure that sanitary/septic facilities are maintained in good working order and are routinely serviced by a licensed service.



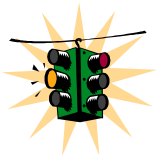
Good septic waste management.

When

- Liquid waste management is applicable to construction projects that generate any of the following non-hazardous byproducts, residuals, or wastes, such as:
  - Drilling slurries and drilling fluids.
  - Grease-free and oil-free wastewater and rinse water.
  - Dredging spoils.
  - Other non-storm water liquid discharges not permitted by separate permits.
- Separate BMPs should also be referenced for the following onsite liquid wastes:
  - Dewatering operations.
  - Liquid hazardous wastes.
  - Concrete slurry residue.

How

- Do not use water to clean vehicles and equipment on site.
- Dispose of drilling residue and drilling fluids in accordance with PG&E procedures at an approved disposal site. Coordinate the disposal of these wastes with your Environmental Representative.
- Contain wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, so that they cannot flow into drainage channels or receiving waters.
- Contain non-hazardous liquid wastes in a controlled area, such as a lined holding pit, lined sediment basin, roll-off bin, or portable tank.
- Ensure that containment devices are of sufficient quantity or volume to completely contain the liquid wastes generated and any addition volume based on anticipated rainfall.

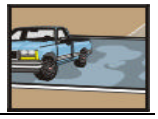


- **Do not locate containment areas or devices where accidental release of the contained liquid can threaten health or safety or discharge to watercourses, storm drain system, or to receiving water.**
- Capture all liquid wastes running off a surface that has the potential to affect the storm drainage system (for example, wash water and rinse water from cleaning walls or pavement).
- If the liquid waste is sediment-laden, use a sediment trap or capture in a containment device and allow sediment to settle.
- Disposal of liquid wastes are subject to specific laws and regulations, or to requirements of other permits secured for the construction project. Contact your Environmental Representative for further information.

Maintenance and Inspection

- Remove deposited solids from containment areas and containment systems as needed, and at the completion of the project.
- Inspect containment areas and containment systems routinely for damage, and repair as needed.

CATEGORY 3. NON-STORM WATER DISCHARGE CONTROLS



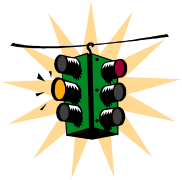
Non-Storm Water Discharge Controls include general site and operations BMP measures that minimize pollution of water:

- BMP 3-01 Dewatering Operations
- BMP 3-02 Paving Operations
- BMP 3-03 Concrete/Coring/Sawcutting and Drilling Waste Management
- BMP 3-04 Dewatering Utility Substructures and Vaults
- BMP 3-05 Vegetation Management Including Mechanical and Chemical Weed Control
- BMP 3-06 Over-Water Protection
- BMP 3-07 Removal of Underground Utility Location/Mark-Out Paint

When

This BMP is applicable to trench or excavation dewatering.

- Discharges of non-storm water from a trench or excavation that contain sediments or other pollutants to the sanitary sewer, storm drain systems, creek bed (even if dry), or receiving waters is prohibited. Water from dewatering activities is generally allowed to be discharged if the water does not contain any sediment or other pollutants. Verify with your local jurisdiction.
- Generally, non-contaminated discharges of non-storm water to lands (such as infiltration) are allowed. Some areas may require a permit or other regulatory approval. Verify with your local jurisdiction.



- **This BMP is not applicable to utility vault or sub-structure dewatering. For these applications, refer to the BMP on Dewatering Utility Substructures and Vaults.**
- **This BMP is not applicable if the water is known, or suspected to be contaminated. Under these conditions, contact your Environmental Representative.**

How

Manage water generated by dewatering activities in accordance with the following procedures:

- Use water where possible for construction activities such as compaction and dust control. If used for these applications, ensure that the water will infiltrate and not run off from the land to storm drain systems, to creek beds (even if dry), or to receiving waters.
- If allowed, infiltrate to an appropriate landscaped, vegetated, or soil area. Infiltration may be prohibited in accordance with local requirements. See **When** above.
- If water is to be discharged to land for infiltration:
  - The water may contain sediments, but must not be contaminated with other pollutants.
  - The water must not run off from the land to storm drain systems, to creek beds (even if dry), or other surface waters.
  - Permission may be needed from the property owner on which the infiltration will occur.
- Water from dewatering that contains only sediment may be discharged if the sediment is allowed to settle out or the sediment is filtered out first. Alternatively, a vacuum truck may be used to remove the water and haul it to an authorized discharge location.
- If a permit is required, provide temporary onsite storage (Baker tanks, etc.) of water removed from trenches, excavations, etc., until a permit to discharge is obtained.
- If a permit is obtained for discharge to a storm water or sanitary sewer system, conduct all dewatering discharge activities in accordance with permit requirements.

Maintenance and Inspection

- Inspect pumps, hoses, and all equipment before use. Monitor dewatering operations to ensure they do not cause offsite discharge or erosion.
- Inspect routinely when applicable activities are under way.

When

Use this BMP for projects that involve pavement surfacing, resurfacing, removal, or patching applications of the following:

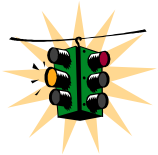
- Cold mix.
- Asphalt.
- Chip seal, seal coat, tack coat, slurry seal, or fog seal.
- Portland cement concrete.

For pavement grinding, sawcutting, coring or drilling, refer to BMP on Concrete/Coring/Sawcutting and Drilling Waste Management.

How

Use the following methods as applicable:

- Protect storm drain inlets near work and down gradient of the area to be paved.
- Design an area for conducting onsite mixing, if planned. Pave the area or make it impervious (e.g., plastic or wood sheeting) and locate it away from storm drain inlets or watercourses.
- Minimize overspray of tackifying emulsions or placement of other paving materials beyond the limits of the area to be paved.
- Use dry methods to clean equipment and conduct cleaning in accordance with the BMP on Vehicle and Equipment Washing.
- Manage material use and stockpiles in accordance with BMPs on Material Use and Stockpile Management.
- Collect and remove all broken asphalt and concrete, recycle when feasible, and dispose of materials in accordance with local, state, and federal requirements.



- **Do not apply asphalt, concrete paving, seal coat, tack coat, slurry seal, or fog seal if rain is expected during the application or curing period.**
- **Avoid, if possible, transferring, loading, or unloading paving materials near storm drain inlets or watercourses. If not possible, use BMP on Storm Drain Inlet Protection.**

Maintenance and Inspection

- Routinely inspect and maintain equipment and machinery to minimize leaks and drips.
- Routinely inspect inlet protection measures.

When

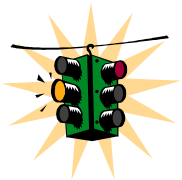
Projects where concrete and asphalt are used or where slurry or pavement/concrete wastes are generated by construction activities, including:

- Saw cutting.
- Coring/drilling.
- Grinding, re-paving, or patching.
- Encasing conduit in concrete.
- Tower footings.

For managing concrete curing compounds, use the BMP on Hazardous Materials/Hazardous Waste Management. For managing paving operations, use BMP on Paving Operations.

How

- Install storm drain protection at any down gradient inlets that the activity might impact. See the BMP on Storm Drain Inlet Protection.
- Minimize the amount of water used during coring/drilling or sawcutting. During wet coring or sawcutting, use a shovel or wet vacuum to lift the slurry from the pavement. If wet vacuuming is not adequate to capture wastewater from the activity, also use sand bag barriers or other containment.
- If concrete residue remains after drying, sweep the area and remove residue to prevent contact with storm water or entering a storm drain or water body via the wind.



- **Do not wash residue or particulate matter into a storm drain inlet or watercourse**.
- The following options should be used for concrete truck chute and/or pump and hose washout:
  - If available, arrange to use an existing concrete washout station. Upon entering the site, concrete truck drivers should be instructed about onsite practices.
  - **Concrete Washouts:** Washout stations can be a plastic lined temporary pits or bermed areas designed with sufficient volume to completely contain all liquid and waste concrete materials plus enough capacity for rainwater. The designated area must be located away from storm drain inlets or watercourses.
  - **Washout in Trench:** Manually rinse the concrete truck chute into the trench itself.
  - **Bucket Washout:** Manually rinse the chute into a wheelbarrow, plastic bucket, or pail, and then empty the bucket into the concrete truck barrel or on top of the placed concrete.

Maintenance and Inspection

- Responsible personnel should ensure that all concrete truck drivers are instructed about project practices when the trucks arrive onsite.
- Clean designated washout areas as needed, or minimally when the washout is 75 percent full, to maintain sufficient capacity throughout the project duration.
- Clean any designated onsite washout areas and remove all debris upon project completion. Dispose of concrete waste according to the BMP on Solid Waste Management.
- Inspect routinely, when applicable activities are underway, to ensure that concrete washout does not overflow.

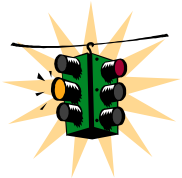
When

This BMP is applicable to utility substructure (vault) dewatering. It does not apply to trench, excavation, or other general dewatering associated with construction activities.

How

The discharge of water from dewatering of vaults and substructures to the storm drain is allowed under an existing NPDES permit (General Permit CAG990002, Order No. 2001-11-DWQ). General requirements for discharge under this permit are listed below:

- All dewatering discharges conducted by utility crews, including contractors, shall follow the latest versions of PG&E Environmental Practice (EP) on Vault and Substructure Dewatering.
- Discharges to land require prior approval from the landowner.
- If the water to be discharged conforms to the practices within the EP, the discharge is allowed.



- **During discharge, do not allow pollutants (e.g., sediment) to come in contact with the discharge. For example, if there is pre-existing soil in the path of the discharge (i.e., gutter), it must be swept up or avoided before discharging the substructure water.**

Maintenance and Inspection

- Implement applicable provisions of the Environmental Practice.
- Inspect pumps, hoses, and equipment before use and routinely when applicable activities are underway.
- Observe dewatering activities to ensure that they do not cause erosion or discharge of potential pollutants.

When	Use this BMP whenever vegetation control is used. Vegetation control may consist of manual or mechanical removal of vegetation and/or chemical treatment.

How

General Vegetation Management Procedures:

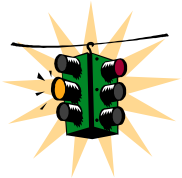
- Do not allow vegetation debris to enter storm drain inlets and watercourses.
- Identify drain inlets and watercourses, both upstream and downstream of the work site(s).
- Pre-plan the work to protect storm water drainage systems and watercourses from discharge of potential pollutants; maintain equipment in good operating condition.
- Set up the work area to minimize the tracking of material by vehicles and equipment in or out of the work area.

Practice Good Housekeeping at the Work Site(s):

- Properly collect and dispose of litter and debris.
- Secure containers of liquids with lids until needed.
- Transport collected non-hazardous materials for proper disposal. If the material is a hazardous waste, follow the BMP on Hazardous Materials & Hazardous Waste Management. Contact your Environmental Representative.
- If a leak or spill occurs, protect drainage systems and watercourses from spilled material; follow the BMP on Storm Drain Inlet Protection.

Mechanical Weed Control Procedures

Mechanical weed control is the physical removal of weeds or unwanted vegetation growing around electric utility poles, and electric distribution or transmission structures for fire control.

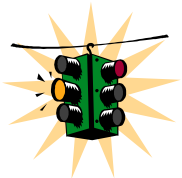


- **Do not stack or leave removed weeds or vegetation or other debris on or near drain inlets or in the storm water drainage system or watercourses.**
- **Do not fuel equipment next to drain inlets or place fuel or oil cans near or in watercourses, the storm drainage system, or next to a drain inlet.**
- **Because of fire control requirements, do not leave cut vegetation around structures.**

Chemical Weed Control Procedures

This method of weed and vegetation control uses herbicides to eliminate and prevent weed growth. The purpose is to control vegetation growth year-round, as needed, for effective fire control.

To achieve effective vegetation control through chemical means and protect the environment, application personnel should:



- Use the correct herbicide for the application.
- Consider the seasonal timing of the application, as applicable.
- **Do not use chemical vegetation control before a forecast rain event.**

The applicators shall follow the following procedures:

- Only use herbicides approved by PG&E.
- Application of herbicides must conform to the PG&E herbicide application protocol in addition to any Contractor-owned protocols and label instructions. Contact your Environmental Representative for additional information. Only de minimus amounts according to manufacturer specifications can be used, mixing of concentrated applications is prohibited per Company policy (generally pre-mixed may used).

How (continued)

- Apply pesticides only as specified on the Pesticide Use Recommendation on the label. The pesticide label is considered the law, and use of an herbicide inconsistent with the label is considered a violation. Follow safety and application methods as specified in the Annual Pesticide Safety Training.
- Follow the herbicide/pesticide application protocol when near storm water drainage system or watercourses.
- Calibrate the spray rig as needed, to ensure accurate application of herbicides.
- Record the use of all herbicides.
- Avoid using overhead irrigation for as long as recommended by the chemical manufacturer after applying pesticides or post-emergents.
- Avoid applying post-emergents before a predicted rain event.

Maintenance and Inspection

- Ensure that spraying equipment is maintained to prevent malfunctions.
- Inspect to confirm that mechanical and chemical weed control procedures have not created an erosion problem.

When

Before conducting over-water activities, confirm the need for permits with appropriate local and state agencies.

This BMP applies to projects where:

- Construction, maintenance, or repair activities will be conducted above surface waters. These activities include, but are not limited to, chipping, grinding, scraping, welding/burning, painting, wrapping, and coating of pipes and conduits.
- Surface waters (dry or running) include creeks, streams, rivers, lakes and wetlands, bays, estuaries, and oceans.

How

Use the following measures as applicable:

- Properly design an install containment systems before the beginning of any operation that may impact a water body, to prevent discharge of pollutants to surface waters.
- Keep the work area clean of all trash and potential pollutants.
- Place containment booms around the area of work as necessary to contain the discharge of potential contaminants such as oil and hydraulic fluid.
- Give special attention to existing and forecasted wind and weather conditions to prevent pollutant discharges to surface waters.
- Use shrouds to prevent paint overspray, welding slag, and other pollutants from entering surface waters and being dispersed into the air. Shrouding may not be effective during periods of high wind.
- Shrouds should be large enough to adequately enclose or segregate the working area from surface waters. This may include a plywood barrier, visqueen, and scaffolding to help prevent fugitive material from entering surface waters.
- Use support structures such as scaffolding in conjunction with shrouding to withstand potential wind stress.
- Thoroughly clean or properly dispose of contaminated shrouding material and equipment.

Maintenance and Inspection

- Routinely inspect the containment systems and shrouds during work activities to ensure their integrity.

When

Use this BMP when utility projects involve mark-out by painting surfaces where underground utilities are located and where paint is required to be removed by local jurisdictions or another authority.

How

Use the following methods and options to remove Utility Mark-Out Paint:

- Use non-toxic, light degradable mark-out paint when possible.
- Hydro pressure wash.
- Dry abrasive blast/grinding.
- Wet abrasive blast/grinding.
- Wet/dry vacuum.
- Dry sweep.
- Install storm drain inlet protection at adjacent down gradient inlets during wet hydro pressure washing and wet abrasive blasting and grinding.
- Minimize the amount of water used during hydro washing.
- Use shovel or wet vacuum to lift the paint slurry from the pavement or surface.
- If wet vacuuming is not adequate to capture all wastewater from these activities, use additional containment methods (sand bags, booms, or other containment devices) near the work area to prevent the discharge to a storm drain inlet or watercourse.
- If paint residue remains after drying, sweep the area and remove residue to avoid contact with storm water.
- If paint residue remains after sweeping, water wash the area, as long as the water containing the paint residue does not enter storm drain inlets or watercourses.
- Dispose all waste using the BMPs for Liquid Waste Disposal.

CATEGORY 4. EROSION CONTROL AND SOIL STABILIZATION

Erosion is the detachment of soil by water or wind, and is a natural process that can be accelerated by construction activities such as grading and trenching. For example, when a site is cleared and grubbed, protective vegetation is removed, and the disturbed soil is directly exposed to wind and water. Erosion Controls protect the soil surface and prevent the soil particles from being detached by rainfall or wind. Preservation of Existing Vegetation is an example of an Erosion Control BMP.

Soil Stabilization is a form of erosion control that protects the exposed soil surface from rain and wind, thereby preventing erosion. Hydroseeding is an example of a Soil Stabilization BMP. Erosion Control and Soil Stabilization BMPs in this *Manual* are:

- BMP 4-01 Preservation of Existing Vegetation
- BMP 4-02 Temporary Soil Stabilization (General)
- BMP 4-03 Hydraulic Mulch
- BMP 4-04 Hydroseeding
- BMP 4-05 Soil Binders
- BMP 4-06 Straw Mulch
- BMP 4-07 Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats
- BMP 4-08 Dust (Wind Erosion) Control

When

This BMP is applicable to projects when:

- There are areas on site where no construction activity is planned or will occur later.
- Areas to be preserved are in the immediate vicinity of the construction site. Mark as appropriate before clearing and grubbing or other soil disturbance activities begin.
- Areas with vegetation that can be preserved to protect against soil erosion, such as on steep slopes, watercourses, and building sites in wooded areas.
- Areas designated as Environmentally Sensitive Areas (ESAs), or where federal, state, or local government regulations require preservation, such as wetlands, vernal pools, marshes, etc. These areas are typically flagged by a qualified biologist.

How

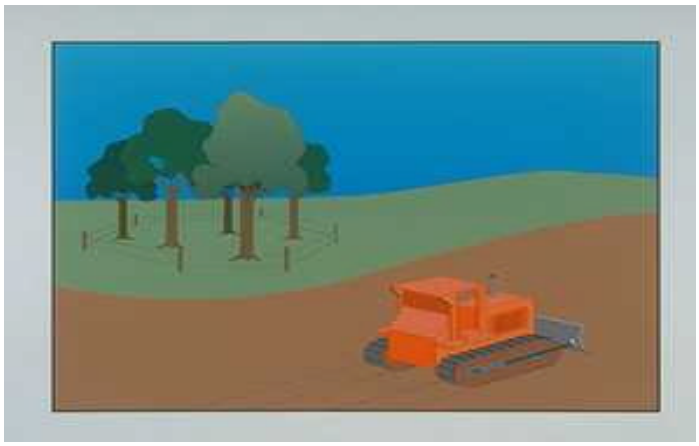
Use the following measures as applicable:

- Preserve existing vegetation whenever possible.
- If necessary, contact the project Environmental Representative for clarification regarding areas to be preserved.
- Whenever possible, minimize disturbed areas by locating temporary roadways to avoid stands of trees and shrubs, and follow existing contours to reduce cutting and filling.
- Locate construction materials, equipment storage, and parking areas outside the drip line of any tree to be retained.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Remove any markings, barriers, or fencing after project is completed.

Maintenance and Inspection

- To preserve vegetation, maintain the clearly marked limits of disturbance during construction.
- Routinely inspect barriers during construction.

Pictures



Mark vegetation to be preserved and make sure it is outside the work area.

When

This BMP is applicable to major projects when steep slopes are disturbed.

- For surface protection methods to prepare or protect the soil surface from the combined erosive effects of wind, rain, and storm water runoff.
- One or more Soil Stabilization BMPs may be required to be implemented on slopes where the soil has been exposed because of construction activities.

How

- Use one or more of the below temporary soil stabilization practices, when applicable, as described above:
  - Hydraulic mulch.
  - Hydro seeding.
  - Soil binders.
  - Straw mulch.
  - Geotextiles, plastic covers and erosion control blankets/mats.
- Implement before the onset of precipitation.
- Implement BMPs such as fiber rolls or gravel bag berms to break up the slope lengths as follows:
  - On steep slopes, place BMPs on slopes 100 feet and greater at intervals no greater than 50 feet.
  - On very steep slopes, place BMPs on slopes 50 feet and greater at intervals no greater than 25 feet.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.
- Refer to individual Soil Stabilization BMPs for specific instructions for use.

Maintenance and Inspection

- Refer to individual temporary soil stabilization BMPs for maintenance and inspection requirements.

Applying a tackifier using a trailer mounted pump and hose.

Applying soil stabilization manually in harder to reach areas.

When

- Hydraulic mulch is typically applied to disturbed areas requiring temporary protection until permanent vegetation is established, or to disturbed areas that must be re-disturbed following an extended period of inactivity.
- Avoid use in areas where the mulch would be incompatible with immediate earthwork activities and would have to be removed.

How

- Before application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Use track walking only where other methods are impractical.
- Avoid mulch over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.
- Hydraulic mulches:
  - Apply as liquid slurry using a hydraulic application machine (hydroseeder) at rates of mulch and stabilizing emulsion recommended by the manufacturer. Wood fiber hydraulic mulches are generally short-lived (last only a part of a growing season) and must be applied 24 hours before rainfall to dry and become effective.
- Hydraulic matrices:
  - Apply a combination of wood fiber and/or paper fiber mixed with acrylic polymers as binders. Apply as liquid slurry using a hydraulic application machine (hydroseeder) at rates recommended by the manufacturer. Hydraulic matrices must be applied 24 hours before rainfall to dry and become effective.
- Bonded fiber matrix (BFM)
  - Apply BFM using a hydraulic application machine (mulch and tackifier are pre-mixed in a single bag) in accordance with manufacturer's instructions. Do not apply immediately before, during, or after a rainfall.

Maintenance and Inspection

- Maintain an unbroken, temporary, mulched ground cover throughout the period of construction when the soils are not being reworked. Inspect before expected rainstorms, repair any damaged ground cover, and re-mulch exposed areas of bare soil.
- After any rainfall event, maintain all slopes to prevent erosion.

Applying hydraulic mulch.

Close up of bonded fiber matrix.

When

Hydroseeding typically consists of applying a mixture of fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, which temporarily protects disturbed soil areas from erosion. It is applied on:

- Disturbed soil areas (DSAs) requiring temporary protection until permanent vegetation is established.
- DSAs that must be re-disturbed following an extended period of inactivity.

How

- Avoid use of hydroseeding in areas where the BMP would be incompatible with future earthwork activities and would have to be removed, such as:
  - Steep slopes are difficult to protect with temporary seeding.
  - Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
  - Temporary vegetation may have to be removed before permanent vegetation is applied.
  - Temporary vegetation is not appropriate for short-term inactivity.
- Hydroseeding can be accomplished using a multiple-step (with straw mulch) or a one-step process (mixed with hydraulic mulch, hydraulic matrix, or bonded fiber matrix). When the one-step process is used to apply the mixture of fiber, seed, etc., the seed rate shall be increased to compensate for all seed not having direct contact with the soil.
- Before application, roughen the slope, fill area, or area to be seeded with the furrows trending along the contours.
- Apply straw mulch, as necessary, to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- Make follow-up applications, as needed, to cover weak spots and to maintain adequate soil protection.
- Avoid over-spray onto the travel way, sidewalks, drainage channels, and existing vegetation.

Maintenance and Inspection

- Inspect for failures, reseed, fertilize, and mulch all seeded areas within the planting season, using not less than 1/2 the original application rates. Any temporary revegetation efforts that do not provide adequate cover must be revegetated.
- After any rainfall event, maintain all slopes to prevent erosion.

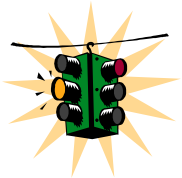
Applying hydroseed.

When

Soil binders are typically applied to disturbed soil areas that require short-term temporary protection. Because soil binders can often be incorporated into the work, they may be a good choice for areas where grading activities will soon resume.

How

- Selection of soil binders should be approved by the project's Environmental Representative or SWET member after an evaluation of site-specific factors. Binders have the following limitations:
  - Generally experience spot failures during heavy rainfall and may need reapplication after a storm; they do not hold up to pedestrian or vehicular traffic.
  - May not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted.
  - May not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
  - May not cure if low temperatures occur within 24 hours of application.
- Follow manufacturer's recommendations for application procedures and cleaning of equipment after use. Use appropriate BMPs for pollution prevention plans for onsite cleaning.
- Before application, roughen embankment and fill areas. Use track walking only where rolling is impractical.
- Do not apply soil binders during or immediately before rainfall; they require a minimum of 24 hours of curing time before they are fully effective.
- Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.



- **Do not apply soil binders to frozen soil, areas with standing water, under freezing conditions, or when the temperature is below 4ºC (40ºF) during the curing period.**
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 150 to 300 mm (6 to 12 in).
  - Allow treated area to cure for the time recommended by the manufacturer (at least 24 hours).
  - Apply the second treatment before first treatment becomes ineffective, using a 50 percent application rate.
  - In low humidity, reactivate chemicals by re-wetting, according to the manufacturer's recommendations.

Maintenance and Inspection

- Reapplying the selected soil binder may be needed for proper maintenance. Traffic areas should be inspected routinely.
- After any rainfall event, maintain all slopes to prevent erosion, crimping with a steel-tracked vehicle.

When

Straw mulch is used when:

- Temporary soil stabilization surface cover is needed on disturbed areas until soils can be prepared for re-vegetation and permanent vegetation is established.
- In combination with temporary and/or permanent seeding strategies to enhance plant establishment.
- Straw has a potential for introduction of weed-seed and unwanted plant material.

How

- A tackifier is the preferred method for anchoring straw mulch to the soil on slopes. Tackifiers glue the straw fibers together and to the soil surface. Select the tackifier based on longevity and ability to hold the fibers in place. Soil binders (tackifier) will generally experience spot failures during heavy rainfall events.
- A tackifier is typically applied at a rate of 125 pounds per acre. In windy conditions, the rates are typically 150 pounds per acre.
- Crimping, punch roller-type rollers, or track-walking may also be used to incorporate straw mulch into the soil on slopes.
- Avoid placing straw onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.
- Do not apply straw mulch with tackifier during or immediately before rainfall.
- Apply loose straw at a minimum rate of 4,000 pounds per acre, either by machine using a straw blower or by hand.
- Evenly distribute the straw mulch on the soil surface.
- Anchor the mulch in place by using a tackifier or by punching it into the soil mechanically. Straw punching does not work in sandy soils.
- Methods for holding the straw mulch in place depend on the slope steepness, accessibility, soil conditions, and longevity. If the selected method is incorporation of straw mulch into the soil, then follow these guidelines:
  - Use a spade or shovel on small areas.
  - On slopes with soils, which are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be punched into the ground using a knife-blade roller or a straight bladed coulter, known commercially as a crimper.
  - On small areas and/or steep slopes, straw can also be held in place using plastic netting or jute. Use 11 gauge wire staples, geotextile pins, or wooden stakes (as described in BMP on Geotextiles, Plastic Covers, and Erosion Control Blankets/Mat) to hold the netting in place.
- Remove straw as necessary before permanent seeding or soil stabilization.

Maintenance and Inspection

- The key consideration in maintenance and inspection is that the straw needs to last long enough to achieve erosion control objectives.
- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.
- After any rainfall event, maintain all slopes to prevent erosion,_____

Straw mulch.

When

- Use the following methods when disturbed soils may be particularly difficult to stabilize or access, including the following situations:
  - Steep slopes, generally steeper than 1:3 (V:H).
  - Slopes where the erosion hazard is high.
  - Slopes and disturbed soils where mulch must be anchored.
  - Disturbed areas where plants are slow to develop adequate protective cover.
  - Channels with high flows.
  - Channels intended to be vegetated.
  - Slopes adjacent to water bodies of Environmentally Sensitive Areas (ESAs).
- Blankets and mats are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (because staples and netting can catch in mowers).
- Plastic results in 100 percent runoff; their use is limited to:
  - Covering stockpiles.
  - Covering small graded areas for short periods, such as through an imminent storm event, until alternative measures can be installed.

How

Proper site preparation is essential to ensure complete contact of the blanket or matting with the soil:

- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation, or other obstructions, so that the installed blankets or mats have complete, direct contact with the soil.
- Prepare seedbed by loosening topsoil.
- Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding before blanket installation, re-seed all check slots and other areas disturbed during installation. Where soil filling is specified, seed the matting and the entire disturbed area after installation and before filling the mat with soil.
- Use u-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes to anchor mats and blankets to the ground surface.
- Drive wire staples and metal stakes flush to the soil surface.
- All anchors should be 6 in to 18 in long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils.
- For installation on slopes, consult the manufacturer's recommendations. Generally:
  - Begin at the top of the slope and anchor the blanket in a 6 in deep by 6 in wide trench. Backfill trench and tamp earth firmly.
  - Unroll the blanket down slope in the direction of water flow.
  - Overlap the edges of adjacent parallel rolls 2 in to 3 in and staple every 3 ft.
  - When blankets must be spliced, place blankets end-over-end (shingle style) with 6-in overlap. Staple through overlapped area, approximately 12 in apart.
  - Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
  - Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Place staples down the center and stagger with the staples placed along the edges.
- Remove and dispose of blankets and mats before applying permanent soil stabilization measures.

Maintenance and Inspection

- Routinely inspect areas treated with temporary soil stabilization before and after significant forecasted storm events. Immediately repair any failures. Maintain areas treated with temporary soil stabilization to provide adequate erosion control. Re-apply or replace temporary soil stabilization on exposed soils when greater than 10 percent of the previously treated area becomes exposed or exhibits visible erosion.
- If washout or breakage occurs, reevaluate the original materials installation. Repair damage to the slope or channel. If appropriate, re-install the material or implement a revised BMP.

Several types of Erosion Control Blankets.

When

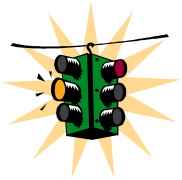
This practice is implemented on exposed soils or materials subject to wind erosion.

How

Use the following measures as applicable:

- Apply water for dust control evenly and in a manner that does not generate runoff.
- Appropriate methods of applying dust control (covers or water and the means to apply it) should be available for projects with the potential to create dust.
- Implement dust control in accordance with local air quality requirements.
- Dust control methods should be approved by an Environmental Representative.
- Obtain prior approval to use any chemical dust suppressant from the projects Environmental Representative.

(dry or running)



- Non-potable water should not be conveyed in tanks or drainpipes that will be used to convey potable water, and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked **"NON-POTABLE WATER–DO NOT DRINK."**
- If reclaimed wastewater is used for dust control, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board (RWQCB) requirements. Approval for use of reclaimed wastewater must be obtained from the project's Environmental Representative.

Maintenance and Inspection

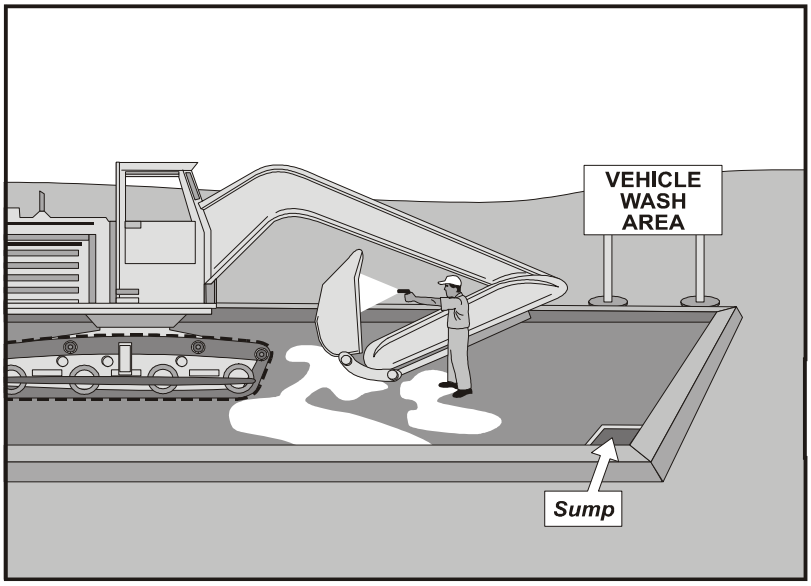
- Check areas protected to ensure coverage.
- Reapply water or maintain covers, as necessary, to maintain their effectiveness.

Water being applied for dust control.

CATEGORY 5. VEHICLE AND EQUIPMENT MANAGEMENT

Vehicle and equipment management is necessary for protection of storm water runoff. Vehicle fuel or runoff from washing can pollute storm water run-off and enter a water way if not contained. Vehicle and Equipment BMPs is this manual are:

- BMP 5-01 Vehicle and Equipment Washing
- BMP 5-02 Vehicle and Equipment Fueling
- BMP 5-03 Vehicle and Equipment Maintenance



When

Use these procedures on all construction sites where vehicle and equipment cleaning is performed. Onsite vehicle and equipment washing is not typically performed on utility-type construction projects and requires specific approval of a PG&E Environmental Representative.

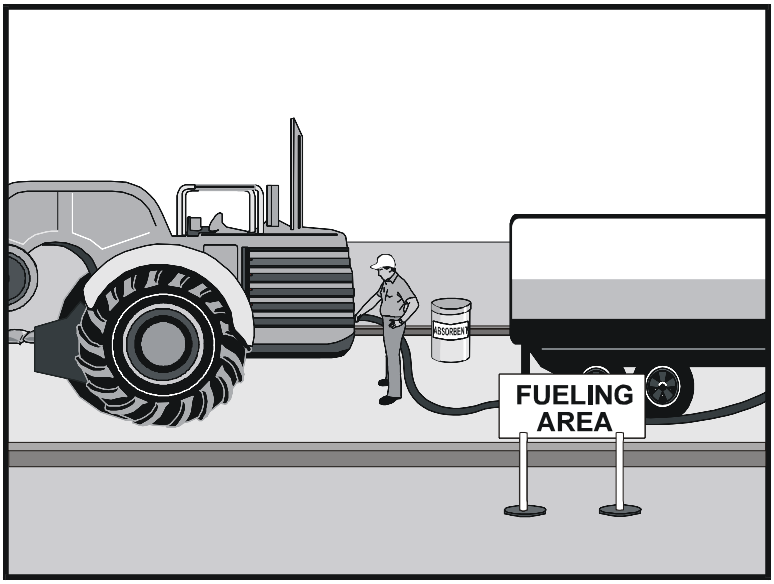
How

Use the following methods as applicable:

- Use dry cleaning methods such as wiping down, rather than water washing vehicles or equipment.
- Whenever possible, do not wash at the construction site.
- If onsite vehicle washing is authorized by the Environmental Representative, use the following general methods:
  - Vehicle and equipment washing must be located away from storm drain inlets, drainage systems, or watercourses.
  - Place sand bags or another type of berm around storm drain inlets and drainage systems to prevent wash water from entering a storm inlet, drainage system, or watercourse.
  - Never discharge wash water to the storm drain system.
  - Use as little water as possible. High-pressure sprayers may use less water than a hose.
  - Use a positive shutoff valve to minimize water usage.

Maintenance and Inspection

Monitor employees and contractors through the duration of the construction project to ensure implementation of appropriate practices.



When

Use this BMP for projects where onsite fueling of vehicles and equipment, including handheld equipment, is planned.

Vehicle and equipment fueling, except for handheld equipment, is typically not done on the construction site. Onsite fueling of vehicles and equipment may be planned if it is impractical to send vehicles and equipment off site for fueling.

Handheld equipment is treated separately from other equipment. Handheld equipment includes those smaller, manually operated pieces of equipment such as trenchers, mowers, chainsaws, generators, and other equipment that need fueling during regular daily operation.

How

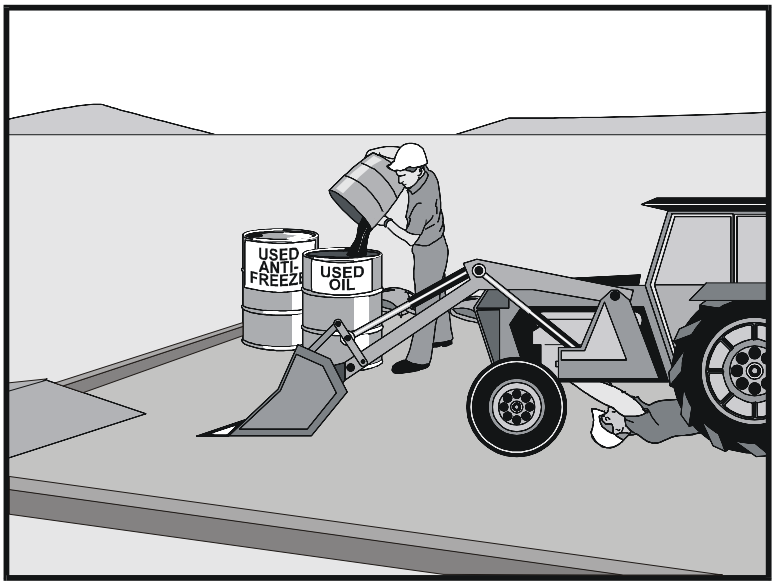
Use the following measures, as applicable:

Fueling Vehicles and Handheld Equipment:

- If practical, fuel vehicles and equipment off site.
- Mobile fueling equipment is the preferred equipment used for onsite fueling.
- Locate fuel storage and fueling areas away from storm drain inlets, drainage systems, and watercourses.
- Conduct all fueling with the fueling operator in attendance at all times, even if fuel nozzles are equipped with automatic shutoff features.
- Do not top off fuel tanks.
- All fueling operators should have readily available spill containment and cleanup equipment and materials.
- Immediately clean up any spills and properly dispose of contaminated materials.
- Properly store and dispose of rags and absorbent material used to clean up any spilled fuel.
- Mobile fueling trucks and operators must have all necessary permits, licenses, and training.

Maintenance and Inspection

- Check to ensure adequate supply of spill cleanup materials is available.
- Routinely inspect designated fueling areas.
- Immediately report all spills to the project Supervisor or the Environmental Representative.


USED
ANTI-
FREEZE
USED
OIL

APPENDIX A. DEFINITIONS AND ACRONYMS

BMP	Best Management Practice
Caltrans	California Department of Transportation
Discharger	Any person who discharges waste that could affect the quality of California waters.
DSA	Disturbed Soil Area
EP	Environmental Practice
FCD	Formal Communication Document
Non-rainy Season	April 1 to October 1
Rainy Season	October 1 to April 1
RWQCB	Regional Water Quality Control Boards—nine Water Boards located throughout California that are responsible for enforcing water quality standards within their boundaries.
Runoff	Rainfall or snow melt that is not absorbed by soil, evaporated, or transpired by plants, but finds its way into streams as surface flow.
ROW	Right of way
SWRCB	State Water Resources Control Board—the State Board responsible for protecting and preserving water quality and water rights in California.
SWPPP	Storm Water Pollution Prevention Plan
Watershed	The total land area that contributes water to a river, stream, lake, or other body of water. Synonymous with drainage area and drainage basin.
SWET	Storm Water Expert Team

BLACK & VEATCH

Calculation Record

_____ Nuclear Safety Related
x Not Nuclear Safety Related

Client Name: Mirant Delta

Page 1 of 23

Project Name: Contra Costa County Power Plant

Unit: _____

Project Number: 65108

File Number: _____

Calculation Title: HYDROLOGY

Calculation Is: ☒ Preliminary ☐ Final ☐ Other _____

Quality Record: ☐ Yes ☐ No

Objective HYDROLOGY CALCULATIONS FOR CCCPP

Unverified Assumptions Requiring Subsequent Verification			
No.	Assumption	Verified By	Date

See Page_____ of this calculation for additional assumptions.

Verification Method

- ☐ Detailed Review
- ☐ Alternate Calculation
- ☐ Conform Against Similar Previously Verified Calculations
- ☐ Other _____

This Section Used for Computer Generated Calculations

Program Number/Name: _____ Version: _____

Run Date: _____ Run Time: _____

Number of Pages: _____

Review and Approval							
Rev	Revised Pages	Prepared By	Date	Verified By	Date	Project Engineer Approval	Date
		Rashima Kingsby	7 / 02 / 01	[illegible]	7/5/01		

GENERAL PURPOSE

The purpose behind the following calculations is to model the discharge of water at various inlets. This discharge was calculated by using the rational method.

The values for each watershed's runoff coefficient was taken from reference number 7. A value of .95 was used for asphalt, .81 for industrial, .80 for aggregate, .40 for open areas, and .3 for farmland.

To calculate the intensity of the 10-year storm, reference number 5 was used. The area of Contra Costa receives about 13 inches of rain on average, so a mean seasonal precipitation of 15 inches was used when calculating the depth of precipitation. Once the depth was known for each watershed, it was converted into an intensity, in inches per hour.

All of the watersheds' areas were calculated using reference number 6.

The overall pre-construction discharge for this power plant is 30.37 cfs. The overall post-construction discharge for this power plant is 30.53 cfs.

REFERENCES

1. *Title 9 Subdivisions*, Contra Costa County Public Works Department

2. *Title 10 Public Works and Flood Control*, Contra Costa County Public Works Department

3. *Water Resources Engineering*, 2001, Larry W. Mays

4. *Design Hydrology and Sedimentology for Small Catchments*, 1994, C.T. Haan, B.J. Barfield, J.C. Hayes

5. *Precipitation Duration-Frequency-Depth Curves, Recurrence Interval 10 Years*, Contra Costa County Public Works Department

6. *Terramodel 9.7*, Spectra Precision Software Inc.

7. *Proposed CCFCD' Standard*, Contra Costa County Public Works Department

Contra Costa County Power Plant Watershed Discharges

ASPHALT =	0.95
INDUSTRIAL =	0.81
AGGREGATE =	0.80
GRASS =	0.40
FARMLAND =	0.30

PRECONSTRUCTION										
AREA	TOT AREA (ac)	TOT ASP (ac)	TOT INDUS (ac)	TOT AGG (ac)	TOT FARM (ac)	WEIGHTED C	TIME OF CONC (min)	DEPTH (in)	i (in/hr)	Q (ft^3/s)
AREA ***A***	10.70	0.11	0.00	0.00	10.59	0.31	8.00	0.270	2.03	6.72
AREA ***B***	5.00	2.05	0.00	0.00	2.95	0.57	5.50	0.225	2.45	6.95
AREA ***C***	4.60	0.79	0.00	0.00	3.81	0.41	6.00	0.235	2.35	4.45
AREA ***D***	5.00	5.00	0.00	0.00	0.00	0.95	5.00	0.215	2.58	12.26
	25.30									30.37

POSTCONSTRUCTION										
AREA	TOT AREA (ac)	TOT ASP (ac)	TOT INDUS (ac)	TOT AGG (ac)	TOT GRASS (ac)	WEIGHTED C	TIME OF CONC (min)	DEPTH (in)	i (in/hr)	Q (ft^3/s)
AREA ***A***	10.70	0.11	0.00	0.00	10.59	0.31	8.00	0.270	2.03	6.72
AREA 1	1.35	0.11	0.17	0.00	1.07	0.50	5.50	0.230	2.45	1.64
AREA 2	2.58	0.00	1.42	0.00	1.16	0.63	6.00	0.240	2.35	3.79
AREA 3	1.66	0.35	0.82	0.50	0.00	0.84	8.00	0.270	2.03	2.81
AREA 4	1.86	0.16	0.63	1.07	0.00	0.82	5.00	0.215	2.58	3.92
AREA 5	1.06	0.24	0.43	0.39	0.00	0.84	7.00	0.250	2.14	1.90
AREA 6	0.85	0.11	0.18	0.56	0.00	0.82	5.50	0.224	2.44	1.71
AREA 7	2.37	0.27	0.43	1.67	0.00	0.82	8.00	0.270	2.03	3.93
AREA 8	1.56	0.12	0.13	1.31	0.00	0.81	7.00	0.250	2.14	2.72
AREA 9	1.36	0.26	0.00	0.00	1.10	0.50	8.00	0.270	2.03	1.39
	25.35									30.53

PRECONSTRUCTION (AREAS *A-D*)

AREA *A*

TOTAL AREA ➔ A (acres) = 10.7

TOTAL ASPHALT = .1120

TOTAL INDUSTRIAL = 0

TOTAL AGGREGATE = 0

TOTAL GRASS = 10.6

INTENSITY ➔ i (in/hr) = 2.03 ✓

TIME OF CONCENTRATION = (assumed) 8.00 minutes

DEPTH = .270 inches

INTENSITY = (DEPTH in * 60 min/hr) / 8.00 min

(.270 * 60) / 8.00 = 2.03 (in/hr)

RUNOFF COEFFICIENT ➔ C = .31 ✓

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 6.72

Q = C * i * A

Q = .31 * 2.03 * 10.7 = **6.72 ft^3/s** ✓

BLACK & VEATCH

Owner: Mirant Delta
Plant: Contra Costa County Power Plant
Project No.: 065108 File:
Title: Contra Costa County Power Plant Hydrology

Computed By: R. J. Kingsby
Date: 02 July 2001
Verified By: JM Stawek
Date: 7/5/01

PRECONSTRUCTION

AREA *B*

TOTAL AREA ➔ A (acres) = 5.00

TOTAL ASPHALT = 2.05

TOTAL INDUSTRIAL = 0

TOTAL AGGREGATE = 0

TOTAL GRASS = 2.95

INTENSITY ➔ i (in/hr) = 2.45 ✓

TIME OF CONCENTRATION = (assumed) 5.50 minutes

DEPTH = .225 inches

INTENSITY = (DEPTH in * 60 min/hr) / 5.50 min

(.225 * 60) / 5.50 = 2.45 (in/hr)

RUNOFF COEFFICIENT ➔ C = .57 ✓

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 6.95

Q =C * i * A

Q = .57 * 2.45 * 5.00 = **6.95 ft^3/s** ✓

BLACK & VEATCH

Owner: Mirant Delta
Plant: Contra Costa County Power Plant
Project No.: 065108 File:
Title: Contra Costa County Power Plant Hydrology

Computed By: R. J. Kingsby
Date: 02 July 2001
Verified By: JM Stanek
Date: 7/5/01

PRECONSTRUCTION

AREA *C*

TOTAL AREA ➔ A (acres) = 4.60

TOTAL ASPHALT = .79

TOTAL INDUSTRIAL = 0

TOTAL AGGREGATE = 0

TOTAL GRASS = 3.81

INTENSITY ➔ i (in/hr) = 2.35 ✓

TIME OF CONCENTRATION = (assumed) 6.00 minutes

DEPTH = .235 inches

INTENSITY = (DEPTH in * 60 min/hr) / 6.00 min

(.235 * 60) / 6.00 = 2.35 (in/hr)

RUNOFF COEFFICIENT ➔ C = .41 ✓

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 4.45

Q = C * i * A

Q = .41* 2.35 * 4.60 = **4.45 ft^3/s** ✓

BLACK & VEATCH	Owner: Mirant Delta Plant: Contra Costa County Power Plant Project No.: 065108 File: Title: Contra Costa County Power Plant Hydrology	Computed By: R. J. Kingsby Date: 02 July 2001 Verified By: JM Stueck Date: 7/5/01

PRECONSTRUCTION

AREA *D*

TOTAL AREA ➔ A (acres) = 5.00

TOTAL ASPHALT = 5.00

TOTAL INDUSTRIAL = 0

TOTAL AGGREGATE = 0

TOTAL GRASS = 0

INTENSITY ➔ i (in/hr) = 2.58 ✓

TIME OF CONCENTRATION = (assumed) 5.00 minutes

DEPTH = .215 inches

INTENSITY = (DEPTH in * 60 min/hr) / 5.00 min

(.215 * 60) / 5.00 = 2.58 (in/hr)

RUNOFF COEFFICIENT ➔ C = .95 ✓

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 12.3

C * i * A = Q

Q = .95 * 2.58 * 5.00 = **12.3 ft^3/s** ✓

CALCULATIONS
POSTCONSTRUCTION (AREAS 1-9)

AREA 1

TOTAL AREA ➔ A (acres) = 1.35

TOTAL ASPHALT = .1099

TOTAL INDUSTRIAL = .1726

TOTAL AGGREGATE = 0

TOTAL GRASS = 1.07

INTENSITY ➔ i (in/hr) = 2.45 ✓

TIME OF CONCENTRATION = (assumed) 5.50 minutes

DEPTH = .230 inches

INTENSITY = (DEPTH in * 60 min/hr) / 5.50 min

(.230 * 60) / 5.50 = 2.45 (in/hr)

RUNOFF COEFFICIENT ➔ C = .50 ✓

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 1.65

Q = C * i * A

Q = .50 * 2.45 * 1.35 = **1.65ft^3/s** ✓

AREA 2

TOTAL AREA ➔ A (acres) = 2.58

TOTAL ASPHALT = 0

TOTAL INDUSTRIAL = 1.42

TOTAL AGGREGATE = 0

TOTAL GRASS = 1.16

INTENSITY ➔ i (in/hr) = 2.35 ✓

TIME OF CONCENTRATION = (assumed) 6.00 minutes

DEPTH = .240 inches

INTENSITY = (DEPTH in * 60 min/hr) / 6.00 min

(.240 * 60) / 6.00 = 2.35 (in/hr)

RUNOFF COEFFICIENT ➔ C = .63 ✓

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 3.79

Q = C * i * A = Q

Q = .63 * 2.35 * 2.58 = **3.79 ft^3/s** ✓

AREA 3

TOTAL AREA ➔ A (acres) = 1.66

TOTAL ASPHALT = .3469

TOTAL INDUSTRIAL = .8156

TOTAL AGGREGATE = .5007

TOTAL GRASS = 0

INTENSITY ➔ i (in/hr) = 2.03 ✓

TIME OF CONCENTRATION = (assumed) 8.00 minutes

DEPTH = .270 inches

INTENSITY = (DEPTH in * 60 min/hr) / 8.00 min

(.270 * 60) / 8.00 = 2.03 (in/hr)

RUNOFF COEFFICIENT ➔ C = .84 ✓

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 2.82

Q = C * i * A

Q = .84 * 2.03 * 1.66 = **2.82 ft^3/s** ✓

AREA 4

TOTAL AREA ➔ A (acres) = 1.86

TOTAL ASPHALT = .1573

TOTAL INDUSTRIAL = .6324

TOTAL AGGREGATE = 1.0703

TOTAL GRASS = 0

INTENSITY ➔ i (in/hr) = 2.58 ✓

TIME OF CONCENTRATION = (assumed) 5.00 minutes

DEPTH = .215 inches

INTENSITY = (DEPTH in * 60 min/hr) / 5.00 min

(.215 * 60) / 5.00 = 2.58 (in/hr)

RUNOFF COEFFICIENT ➔ C = .82 ✓

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 3.92

Q = C * i* A

Q = .82 * 2.58 * 1.86 = **3.92 ft^3/s** ✓

AREA 5

TOTAL AREA ➔ A (acres) = 1.06

TOTAL ASPHALT = .2438

TOTAL INDUSTRIAL = .4303

TOTAL AGGREGATE = .3818

TOTAL GRASS = 0

INTENSITY ➔ i (in/hr) = 2.14

TIME OF CONCENTRATION = (assumed) 7.00 minutes

DEPTH = .250 inches

INTENSITY = (DEPTH in * 60 min/hr) / 7.00 min

(.250 * 60) / 7.00 = 2.14 (in/hr)

RUNOFF COEFFICIENT ➔ C = .84

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 1.90

Q = C * i * A

Q = .84 * 2.14 * 1.06 = **1.90 ft^3/s**

AREA 6

TOTAL AREA ➔ A (acres) = 0.850

TOTAL ASPHALT = .1118

TOTAL INDUSTRIAL = .1792

TOTAL AGGREGATE = .5590

TOTAL GRASS = 0

INTENSITY ➔ i (in/hr) = 2.45

TIME OF CONCENTRATION = (assumed) 5.50 minutes

DEPTH = .224 inches

INTENSITY = (DEPTH in * 60 min/hr) / 5.50 min

(.224 * 60) / 5.50 = 2.45 (in/hr)

RUNOFF COEFFICIENT ➔ C = .82

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 1.71

Q = C * i * A

Q = .82 * 2.45 * 0.850 = **1.71 ft^3/s**

AREA 7

TOTAL AREA ➔ A (acres) = 2.37

TOTAL ASPHALT = .2714

TOTAL INDUSTRIAL = .4302

TOTAL AGGREGATE = 1.6688

TOTAL GRASS = 0

INTENSITY ➔ i (in/hr) = 2.03

TIME OF CONCENTRATION = (assumed) 8.00 minutes

DEPTH = .270 inches

INTENSITY = (DEPTH in * 60 min/hr) / 8.00 min

(.270 * 60) / 8.00 = 2.03 (in/hr)

RUNOFF COEFFICIENT ➔ C = .82

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 3.93

Q = C * i * A

Q = .82 * 2.03 * 2.37 = **3.93 ft^3/s**

AREA 8

TOTAL AREA ➔ A (acres) = 1.56

TOTAL ASPHALT = .1239

TOTAL INDUSTRIAL = .1293

TOTAL AGGREGATE = 1.3068

TOTAL GRASS = 0

INTENSITY ➔ i (in/hr) = 2.14

TIME OF CONCENTRATION = (assumed) 7.00 minutes

DEPTH = .250 inches

INTENSITY = (DEPTH in * 60 min/hr) / 7.00 min

(.250 * 60) / 7.00 = 2.14 (in/hr)

RUNOFF COEFFICIENT ➔ C = .81

$$C = \frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 2.72

Q = C * i * A

Q = .81 * 2.14 * 1.56 = **2.72 ft^3/s**

AREA 9

TOTAL AREA ➔ A (acres) = 1.36

TOTAL ASPHALT = .2573

TOTAL INDUSTRIAL = 0

TOTAL AGGREGATE = 0

TOTAL GRASS = 1.1028

INTENSITY ➔ i (in/hr) = 2.03

TIME OF CONCENTRATION = (assumed) 8.00 minutes

DEPTH = .270 inches

INTENSITY = (DEPTH in * 60 min/hr) / 8.00 min

(.270 * 60) / 8.00 = 2.03 (in/hr)

RUNOFF COEFFICIENT ➔ C = .50

$$\frac{A_{ASPHALT}C_{ASPHALT} + A_{INDUSTRIAL}C_{INDUSTRIAL} + A_{AGGREGATE}C_{AGGREGATE} + A_{OPEN}C_{OPEN}}{A_{TOTAL}}$$

DISCHARGE ➔ Q (ft^3/s) = 1.39

Q = C * i * A

Q = .50* 2.03 * 1.36 = **1.39 ft^3/s**

BLACK & VEATCH

Calculation Record

_____ Nuclear Safety Related
x Not Nuclear Safety Related

Client Name: MIRANT DELTA, LLC

Page 1 of 43

Project Name: CONTR COSTA POWER PLANT

Unit: _____

Project Number: 65108

File Number: _____

Calculation Title: HYDRAULICS

Calculation Is: ☐ Preliminary ☒ Final ☐ Other _____

Quality Record: ☐ Yes ☐ No

Objective HYDRAULIC CALCULATION FOR STORM DRAIN SYSTEM

Unverified Assumptions Requiring Subsequent Verification

No.	Assumption	Verified By	Date

See Page_____ of this calculation for additional assumptions.

Verification Method

- ☐ Detailed Review
- ☐ Alternate Calculation
- ☐ Conform Against Similar Previously Verified Calculations
- ☐ Other _____

This Section Used for Computer Generated Calculations

Program Number/Name: STORMCAD/FLOWMASTER

Version: _____

Run Date: _____

Run Time: _____

Number of Pages: _____

Review and Approval

Rev	Revised Pages	Prepared By	Date	Verified By	Date	Project Engineer Approval	Date
		Sebastian Kulesza	07/09/01	[illegible]	7/9/01		

GENERAL PURPOSE

The purpose behind the following calculations is to model the storm drain system for proposed Contra Costa Power Plant. Calculations are based on runoff obtained from hydrology calculation – Rational Method.

To calculate the capacity of storm drain calculated runoff for the 10-year storm, reference number 1, was used. Reference 1 - 914-2.010 (3) Minor drainage facilities less than one square mile shall have adequate capacity to contain with sufficient freeboard a ten-year frequency of average recurrence interval runoff.

The proposed storm drain system consists of 5 CHDPE culverts under roads, earth ditches, drop inlets and HDPE storm drain pipes.

REFERENCES

1. *Title 9 Subdivisions*, Contra Costa County Public Works Department

2. *Title 10 Public Works and Flood Control*, Contra Costa County Public Works Department

3. *Water Resources Engineering*, 2001, Larry W. Mays

4. *Design Hydrology and Sedimentology for Small Catchments*, 1994, C.T. Haan, B.J. Barfield, J.C. Hayes

5. *Precipitation Duration-Frequency-Depth Curves, Recurrence Interval 10 Years*, Contra Costa County Public Works Department

6. *Terramodel 9.7*, Spectra Precision Software Inc.

7. *Proposed CCFCD' Standard*, Contra Costa County Public Works Department

8. *FlowMaster, Haestad Methods Version 5.11*

9. *StormCAD, Haestad Methods Version 1.0*

10. *CulvertMaster, Haestad Methods Version 2.0*

1. Design criteria:

a) 10-year, 24-hr runoff volume

b) Hydraulics calculation performed using Manning Equation.

V - velocity ft/s
S - slope of the channel, pipe or culver ft/ft
R - hydraulic radius
n - Manning's roughness coefficient
A - area of flow sq.ft
Q - flow cfs

$$V := \frac{1.49 \cdot S^{\frac{1}{2}} \cdot R^{\frac{2}{3}}}{n}$$

$$Q := V \cdot A$$

2. Storm Drain Ditch *D-1* calculation using Manning Formula in Flowmaster.

From Hydrology calculation areas contributing to ditch *D-1 are:*

$A1 := 1.35$

$A2 := 2.58$

20% from area A2 is contribiuting to the Ditch *D-1*

$A20\% := 0.20 \cdot A2$

$A20\% = 0.52$

Total runoff in ditch *D-1* can be computed as:

$Q1 := 1.65$

$Q2 := 3.79$ $\quad Q20\% := 0.20 \cdot Q2$

$Q20\% = 0.76$

$Q_{T1} := Q1 + Q20\%$

$Q_{T1} = 2.41$ cfs

2.1. Ditch *D-1* geometry calculatin please see attached Flowmaster calculation sheet in Attachment 1.

Geometry:

Depth D=1.5 ft
Bottom width W=2 ft
Slope S=0.005 ft/ft
Manning's roughness coefficient n=0.035
Side Slope 2H:1V

3. Culvert *C-1* calculation please see attached CulvertMaster calculation sheet in Attachment 2.

Geometry:

Diameter D=15 inches
Slope S=0.005 ft/ft
Length L=87.00 ft

4. Storm Drain Ditch *D-2* calculation using Manning Formula in Flowmaster.

From Hydrology calculation areas contributing to ditch *D-2 are:*

$A3 := 1.66$

$A4 := 1.86$

56% from area A3 is contribiuting to the Ditch *D-2*

$A56\% := 0.56 \cdot A3$

$A56\% = 0.93$

6.0% from area A4 is contribiuting to the Ditch *D-2*

$A6\% := 0.06 \cdot A4$

$A6\% = 0.11$

Total runoff in ditch *D-2* can be computed as:

$Q3 := 2.82$ $\quad$ $Q4 := 3.92$

$Q56\% := 0.56 \cdot Q3$ $\quad$ $Q6\% := 0.06 \cdot Q4$

$Q56\% = 1.58$ $\quad$ $Q6\% = 0.24$

Carryover flow from Ditch D-1 - Culvert C-1

$Q_{T1} = 2.41$

$Q_{T2} := Q_{T1} + Q56\% + Q6\%$

$Q_{T2} = 4.22$ cfs

4.1. Ditch D-2 geometry calculation please see attached Flowmaster calculation sheet in Attachment 1.

Geometry:

Depth D=1.5 ft
Slope S=0.005 ft/ft
Manning's roughness coefficient n=0.035
Side Slope 2H:1V

5. Storm Drain Pipe System calculation (see Attachment 3).

a. Drop Inlet *DI-1*

From Hydrology calculation areas contributing to the drop Inlet *DI-1:*

$A3 := 1.66$

44% from area A3 is contribiuting to the Drop Inlet *DI-1*

$A44\% := 0.44 \cdot A3$

$A44\% = 0.73$

Runoff entering Drop Inlet *DI-1*

$Q3 := 2.82$ $\quad$ $Q44\% := 0.44 \cdot Q3$

$Q44\% = 1.24$

Carryover flow from system Ditch - Culvert

$Q_{T2} = 4.22$ cfs

Total flow at Drop Inlet *DI-1*

$Q_{DI1} := Q_{T2} + Q44\%$

$Q_{DI1} = 5.46$ cfs

b. Drop Inlet *DI-2*

From Hydrology calculation areas contributing to the drop Inlet *DI-2:*

$A5 := 1.06$

$A6 := 0.85$

5.7% from area A5 is contribiuting to the Drop Inlet *DI-2*

$A5\% := 0.057 \cdot A5$

$A5\% = 0.06$

6.5% from area A6 is contribiuting to the Drop Inlet *DI-2*

$A6\% := 0.065 \cdot A6$

$A6\% = 0.06$

Runoff entering Drop Inlet *DI-2*

$Q5 := 1.90$ $Q5\% := 0.057 \cdot Q5$

$Q5\% = 0.11$

$Q6 := 1.71$ $Q6\% := 0.065 \cdot Q6$

$Q6\% = 0.11$

Total runoff entering Drop Inlet *DI-2*

$Q_{DI2} := Q5\% + Q6\%$

$Q_{DI2} = 0.22$ cfs

c. Drop Inlet *DI-3*

From Hydrology calculation areas contributing to the drop Inlet *DI-3:*

$A5 := 1.06$

25% from area A5 is contribiuting to the Drop Inlet *DI-3*

$A25\% := 0.25 \cdot A5$

$A25\% = 0.27$

Runoff entering Drop Inlet *DI-3*

$Q5 := 1.90$ $\quad Q25\% := 0.25 \cdot Q5$

$Q25\% = 0.48$

Carryover flow from system DI-2 - DI-3

$Q_{DI2} = 0.22$ cfs

Total runoff entering Drop Inlet *DI-3*

$Q_{DI3} := Q25\% + Q_{DI2}$

$Q_{DI3} = 0.69$ cfs

d. Drop Inlet *DI-4*

From Hydrology calculation areas contributing to the drop Inlet *DI-4:*

$A5 := 1.06$

63.4% from area A5 is contribiuting to the Drop Inlet *DI-4*

$A63\% := 0.634 \cdot A5$

$A63\% = 0.67$

Runoff entering Drop Inlet *DI-4*

$Q5 := 1.90$ $\quad Q63\% := 0.694 \cdot Q5$

$Q63\% = 1.32$

Carryover flow from system DI-2 - DI-3 - DI-4

$Q_{DI3} = 0.69$ cfs

Carryover flow from system Ditch - Culvert - DI-1

$Q_{DI1} = 5.46$ cfs

Total runoff entering Drop Inlet *DI-4*

$$Q_{DI4} := Q63\% + Q_{DI1} + Q_{DI3}$$

$$Q_{DI4} = 7.48 \quad \text{cfs}$$

e. Drop Inlet *DI-5*

From Hydrology calculation areas contributing to the drop Inlet *DI-5:*

$$A5 := 1.06$$

$$A6 := 0.85$$

6% from area A5 is contribiuting to the Drop Inlet *DI-5*

$$A6\% := 0.06 \cdot A5$$

$$A6\% = 0.06$$

28.3% from area A6 is contribiuting to the Drop Inlet *DI-5*

$$A28\% := 0.283 \cdot A6$$

$$A28\% = 0.24$$

Runoff entering Drop Inlet *DI-5*

$$Q5 := 1.90 \qquad Q6\% := 0.06 \cdot Q5$$

$$Q6\% = 0.11$$

$$Q6 := 1.71 \qquad Q28\% := 0.283 \cdot Q6$$

$$Q28\% = 0.48$$

Total runoff entering Drop Inlet *DI-5*

$$Q_{DI5} := Q6\% + Q28\%$$

$$Q_{DI5} = 0.60 \quad \text{cfs}$$

f. Drop Inlet *DI-6*

From Hydrology calculation areas contributing to the drop Inlet *DI-6:*

$A7 := 2.37$

$A8 := 1.56$

2.5% from area A7 is contribiuting to the Drop Inlet *DI-6*

$A2\% := 0.025 \cdot A7$

$A2\% = 0.06$

3.5% from area A8 is contribiuting to the Drop Inlet *DI-6*

$A3\% := 0.035 \cdot A6$

$A3\% = 0.03$

Runoff entering Drop Inlet *DI-6*

$Q7 := 3.93$ $\quad Q2\% := 0.025 \cdot Q7$

$Q2\% = 0.10$

$Q8 := 2.72$ $\quad Q3\% := 0.035 \cdot Q8$

$Q3\% = 0.10$

Carryover flow from system DI-5 - DI-6

$Q_{DI5} = 0.60$ cfs

Total runoff entering Drop Inlet *DI-6*

$Q_{DI6} := Q2\% + Q3\% + Q_{DI5}$

$Q_{DI6} = 0.79$ cfs

g. Drop Inlet *DI-7*

From Hydrology calculation areas contributing to the drop Inlet *DI-7:*

$A7 := 2.37$

11.4% from area A7 is contribiuting to the Drop Inlet *DI-7*

$A11\% := 0.114 \cdot A7$

$A11\% = 0.27$

Runoff entering Drop Inlet *DI-7*

$Q7 := 3.93$ $\quad Q11\% := 0.114 \cdot Q7$

$Q11\% = 0.45$

Carryover flow from system DI-5 - DI-6 - DI-7

$Q_{DI6} = 0.79$ cfs

Total runoff entering Drop Inlet *DI-7*

$Q_{DI7} := Q11\% + Q_{DI6}$

$Q_{DI7} = 1.24$ cfs

h. Outlet from pipe system to the Ditch D-7

Calculation of total flow leaving storm drain system and entering Ditch D-7

$Q_{S1} := Q_{DI7} + Q_{DI4}$

$Q_{S1} = 8.72$ cfs

6. Storm Drain Ditch *D-7* calculation using Manning Formula in Flowmaster.

From Hydrology calculation areas contributing to ditch *D-7:*

$A7 := 2.37$

86% from area A7 is contribiuting to the Ditch *D-7*

$A86\% := 0.86 \cdot A7$

$A86\% = 2.04$

Total runoff in ditch D-7 can be computed as:

$Q7 := 3.93$ $Q86\% := 0.86 \cdot Q7$

$Q86\% = 3.38$

$Q_{S2} := Q_{S1} + Q86\%$

$Q_{S2} = 12.10$ cfs

6.1. Ditch *D-7* geometry calculatin please see attached Flowmaster calculation sheet in Attachment 1.

Geometry:

Depth D=1.5 ft (MIN)
Bottom width W=2 ft
Slope S=0.005 ft/ft
Manning's roughness coefficient n=0.035
Side Slope 2H:1V

7. Storm Drain Ditch *D-3* calculation using Manning Formula in Flowmaster.

From Hydrology calculation areas contributing to ditch *D-3:*

$A2 := 2.58$

80% from area A2 is contribiuting to the Ditch *D-3*

$A80\% := 0.80 \cdot A2$

$A80\% = 2.06$

Total runoff in ditch *D-3* can be computed as:

$Q2 := 3.79$ $\quad Q80\% := 0.80 \cdot Q2$

$Q80\% = 3.03$

$Q_{T3} := Q80\%$

$Q_{T3} = 3.03$ cfs

7.1. Ditch *D-3* geometry calculatin please see attached Flowmaster calculation sheet in Attachment 1.

Geometry:

Depth D=1.5 ft
Bottom width W=2 ft
Slope S=0.005 ft/ft
Manning's roughness coefficient n=0.035
Side Slope 2H:1V

8. Culvert C-2 calculation please see attached CulvertMaster calculation sheet in Attachment 2.

Geometry:

Diameter D=15 inches
Slope S=0.005 ft/ft
Length L=50 ft

9. Storm Drain Ditch *D-4* calculation using Manning Formula in Flowmaster.

From Hydrology calculation areas contributing to ditch *D-4:*

$A4 := 1.86$

94% from area A4 is contribiuting to the Ditch *D-4*

$A94\% := 0.94 \cdot A4$

$A94\% = 1.75$

Total runoff in ditch *D-4* can be computed as:

$Q4 := 3.92$ $\quad Q94\% := 0.94 \cdot Q4$

$Q94\% = 3.68$

Carryover flow from Ditch D-3 - Culvert C-2

$Q_{T3} = 3.03$ cfs

$Q_{T4} := Q_{T3} + Q94\%$

$Q_{T4} = 6.72$ cfs

9.1. Ditch *D-4* geometry calculatin please see attached Flowmaster calculation sheet in Attachment 1.

Geometry:

Depth D=1.5 ft
Bottom width W=2 ft
Slope S=0.005 ft/ft
Manning's roughness coefficient n=0.035
Side Slope 2H:1V

10. Culvert C-3 calculation please see attached CulvertMaster calculation sheet in Attachment 2.

Geometry:

Diameter D=18 inches
Slope S=0.005 ft/ft
Length L=44 ft

11. Storm Drain Ditch *D-5* calculation using Manning Formula in Flowmaster.

From Hydrology calculation areas contributing to ditch *D-5:*

$A6 := 0.85$

65.2% from area A6 is contribiuting to the Ditch *D-5*

$A65\% := 0.652 \cdot A6$

$A65\% = 0.55$

Total runoff in ditch *D-5* can be computed as:

$Q6 := 1.71$ $\quad Q65\% := 0.652 \cdot Q6$

$Q65\% = 1.11$

Carryover flow from Ditch D-4 - Culvert C-3

$Q_{T4} = 6.72$ cfs

$Q_{T5} := Q_{T4} + Q65\%$

$Q_{T5} = 7.83$ cfs

11.1. Ditch *D-4* geometry calculatin please see attached Flowmaster calculation sheet in Attachment 1.

Geometry:

Depth D=1.5 ft
Bottom width W=2 ft
Slope S=0.005 ft/ft
Manning's roughness coefficient n=0.035
Side Slope 2H:1V

12. Culvert C-4 calculation please see attached CulvertMaster calculation sheet in Attachment 2.

Geometry:

Diameter D=18 inches
Slope S=0.005 ft/ft
Length L=52 ft

13. Storm Drain Ditch *D-6* calculation using Manning Formula in Flowmaster.

From Hydrology calculation areas contributing to ditch *D-6:*

$A8 := 1.56$

96.5% from area A8 is contribiuting to the Ditch *D-6*

$A96\% := 0.965 \cdot A8$

$A96\% = 1.51$

Total runoff in ditch *D-6* can be computed as:

$Q8 := 2.72$ $\quad Q96\% := 0.965 \cdot Q8$

$Q96\% = 2.62$

Carryover flow from Ditch D-5 - Culvert C-4

$Q_{T5} = 7.83$ cfs

$Q_{S3} := Q_{T5} + Q96\%$

$Q_{S3} = 10.46$ cfs

13.1. Ditch *D-6* geometry calculatin please see attached Flowmaster calculation sheetin Attachment.

Geometry:

Depth D=1.5 ft
Bottom width W=2 ft
Slope S=0.005 ft/ft
Manning's roughness coefficient n=0.035
Side Slope 3H:1V

14. Culvert C-5 calculation please see attached CulvertMaster calculation sheet in Attachment 1.

Total design flow for Culvert *C-5* was calculated as a sum of total flow from storm drain system from the power plant site. Culvert *C-5* will connect proposed storm drain with existing concrete lined ditch and discharge pipe to the San Joaquin River

Total design flow for Culvert *C-5*

$$Q_S := Q_{S2} + Q_{S3}$$

$$Q_S = 22.55 \quad \text{cfs}$$

Geometry:

Diameter 2 Barrel 18 inches Diameter
Slope S=0.005 ft/ft
Length L=40 ft

ATTACHMENT 1

DITCH D-1
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\seb programs\haestad\fmw\costa_co.fm2
Worksheet	DITCH_NO.1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	2.00	ft
Discharge	2.41	cfs

Results		
Depth	0.52	ft
Flow Area	1.57	ft²
Wetted Perimeter	4.32	ft
Top Width	4.07	ft
Critical Depth	0.32	ft
Critical Slope	0.029831	ft/ft
Velocity	1.53	ft/s
Velocity Head	0.04	ft
Specific Energy	0.55	ft
Froude Number	0.43	
Flow is subcritical.		

DITCH D-2
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\seb programs\haestad\fmw\costa_co.fm2
Worksheet	DITCH_NO.2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	2.00	ft
Discharge	4.09	cfs

Results		
Depth	0.68	ft
Flow Area	2.30	ft²
Wetted Perimeter	5.06	ft
Top Width	4.73	ft
Critical Depth	0.43	ft
Critical Slope	0.027635	ft/ft
Velocity	1.78	ft/s
Velocity Head	0.05	ft
Specific Energy	0.73	ft
Froude Number	0.45	
Flow is subcritical.		

DITCH D-3
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\seb programs\haestad\fmw\costa_co.fm2
Worksheet	DITCH_NO.3
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	2.00	ft
Discharge	3.03	cfs

Results		
Depth	0.58	ft
Flow Area	1.85	ft^2
Wetted Perimeter	4.62	ft
Top Width	4.34	ft
Critical Depth	0.36	ft
Critical Slope	0.028846	ft/ft
Velocity	1.63	ft/s
Velocity Head	0.04	ft
Specific Energy	0.63	ft
Froude Number	0.44	
Flow is subcritical.		

DITCH D-4
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\seb programs\haestad\fmw\costa_co.fm2
Worksheet	DITCH_NO.4
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	2.00	ft
Discharge	6.72	cfs

Results		
Depth	0.88	ft
Flow Area	3.31	ft^2
Wetted Perimeter	5.93	ft
Top Width	5.52	ft
Critical Depth	0.58	ft
Critical Slope	0.025810	ft/ft
Velocity	2.03	ft/s
Velocity Head	0.06	ft
Specific Energy	0.94	ft
Froude Number	0.46	
Flow is subcritical.		

DITCH D-5
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\seb programs\haestad\fmw\costa_co.fm2
Worksheet	DITCH_NO.5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	2.00	ft
Discharge	7.83	cfs

Results		
Depth	0.95	ft
Flow Area	3.70	ft²
Wetted Perimeter	6.24	ft
Top Width	5.80	ft
Critical Depth	0.63	ft
Critical Slope	0.025287	ft/ft
Velocity	2.12	ft/s
Velocity Head	0.07	ft
Specific Energy	1.02	ft
Froude Number	0.47	
Flow is subcritical.		

DITCH D-6
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\seb programs\haestad\fmw\costa_co.fm2
Worksheet	DITCH_NO.6
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	2.00	ft
Discharge	10.46	cfs

Results		
Depth	1.09	ft
Flow Area	4.58	ft^2
Wetted Perimeter	6.89	ft
Top Width	6.37	ft
Critical Depth	0.74	ft
Critical Slope	0.024340	ft/ft
Velocity	2.29	ft/s
Velocity Head	0.08	ft
Specific Energy	1.17	ft
Froude Number	0.48	
Flow is subcritical.		

DITCH D-7
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\seb programs\haestad\fmw\costa_co.fm2
Worksheet	DITCH_NO.7
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.005000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	2.00	ft
Discharge	12.10	cfs

Results		
Depth	1.17	ft
Flow Area	5.10	ft^2
Wetted Perimeter	7.24	ft
Top Width	6.69	ft
Critical Depth	0.80	ft
Critical Slope	0.023882	ft/ft
Velocity	2.37	ft/s
Velocity Head	0.09	ft
Specific Energy	1.26	ft
Froude Number	0.48	
Flow is subcritical.		

ATTACHMENT 2

Culvert Designer/Analyzer Report

c-1

Peak Discharge Method: User-Specified			
Design Discharge	2.41 cfs	Check Discharge	2.41 cfs

Grades Model: Inverts			
Invert Upstream	10.60 ft	Invert Downstream	10.19 ft
Length	87.00 ft	Slope	0.004713 ft/ft
Drop	0.41 ft		

Headwater Model: Allowable HW/Height	
Headwater Depth/Height	1.00

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-15 inch Circular	2.41 cfs	11.51 ft	

Culvert Designer/Analyzer Report

c-1

Design:Trial-1

Solve For: Section Size

Culvert Summary					
Allowable HW Elevation	11.85	ft	Storm Event	Design	
Computed Headwater Eleva	11.51	ft	Discharge	2.41	cfs
Headwater Depth/Height	0.73		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	11.47	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	11.51	ft			

Grades					
Upstream Invert	10.60	ft	Downstream Invert	10.19	ft
Length	87.00	ft	Constructed Slope	0.004713	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.62	ft
Slope Type	Mild		Normal Depth	0.63	ft
Flow Regime	Subcritical		Critical Depth	0.62	ft
Velocity Downstream	3.96	ft/s	Critical Slope	0.004849	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.25	ft
Section Size	15 inch		Rise	1.25	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	11.51	ft	Upstream Velocity Head	0.24	ft
Ke	0.20		Entrance Loss	0.05	ft

Inlet Control Properties					
Inlet Control HW Elev.	11.47	ft	Flow Control	Unsubmerged	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	1.2	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Culvert Designer/Analyzer Report

c-2

Peak Discharge Method: User-Specified			
Design Discharge	3.03 cfs	Check Discharge	3.03 cfs

Grades Model: Inverts			
Invert Upstream	11.00 ft	Invert Downstream	10.75 ft
Length	50.00 ft	Slope	0.005000 ft/ft
Drop	0.25 ft		

Headwater Model: Allowable HW/Height	
Headwater Depth/Height	1.00

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-15 inch Circular	3.03 cfs	12.04 ft	

Culvert Designer/Analyzer Report

c-2

Design:Trial-1

Solve For: Section Size

Culvert Summary					
Allowable HW Elevation	12.25	ft	Storm Event	Design	
Computed Headwater Eleva	12.04	ft	Discharge	3.03	cfs
Headwater Depth/Height	0.83		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	11.99	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	12.04	ft			

Grades					
Upstream Invert	11.00	ft	Downstream Invert	10.75	ft
Length	50.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.70	ft
Slope Type	Mild		Normal Depth	0.71	ft
Flow Regime	Subcritical		Critical Depth	0.70	ft
Velocity Downstream	4.28	ft/s	Critical Slope	0.005152	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.25	ft
Section Size	15 inch		Rise	1.25	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	12.04	ft	Upstream Velocity Head	0.28	ft
Ke	0.20		Entrance Loss	0.06	ft

Inlet Control Properties					
Inlet Control HW Elev.	11.99	ft	Flow Control	N/A	
Inlet Type	Groove end w/headwall		Area Full	1.2	ft^2
K	0.00180		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	2	
C	0.02920		Equation Form	1	
Y	0.74000				

Project Engineer:

Culvert Designer/Analyzer Report

c-3

Peak Discharge Method: User-Specified			
Design Discharge	6.72 cfs	Check Discharge	6.72 cfs

Grades Model: Inverts			
Invert Upstream	9.51 ft	Invert Downstream	9.30 ft
Length	44.00 ft	Slope	0.004773 ft/ft
Drop	0.21 ft		

Headwater Model: Allowable HW/Height	
Headwater Depth/Height	1.00

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Description	Discharge	HW Elev.	Velocity
x	Trial-1	1-18 inch Circular	6.72 cfs	11.04 ft	

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Culvert Designer/Analyzer Report

c-3

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	11.01	ft	Storm Event	Design	
Computed Headwater Eleva	11.04	ft	Discharge	6.72	cfs
Headwater Depth/Height	1.02		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	10.98	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	11.04	ft			

Grades					
Upstream Invert	9.51	ft	Downstream Invert	9.30	ft
Length	44.00	ft	Constructed Slope	0.004773	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.00	ft
Slope Type	Mild		Normal Depth	1.07	ft
Flow Regime	Subcritical		Critical Depth	1.00	ft
Velocity Downstream	5.35	ft/s	Critical Slope	0.005628	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	11.04	ft	Upstream Velocity Head	0.39	ft
Ke	0.20		Entrance Loss	0.08	ft

Inlet Control Properties					
Inlet Control HW Elev.	10.98	ft	Flow Control	N/A	
Inlet Type	Groove end w/headwall		Area Full	1.8	ft^2
K	0.00180		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	2	
C	0.02920		Equation Form	1	
Y	0.74000				

Culvert Designer/Analyzer Report

c-4

Peak Discharge Method: User-Specified			
Design Discharge	7.83 cfs	Check Discharge	7.83 cfs

Grades Model: Inverts			
Invert Upstream	8.86 ft	Invert Downstream	8.62 ft
Length	52.00 ft	Slope	0.004615 ft/ft
Drop	0.24 ft		

Headwater Model: Allowable HW/Height	
Headwater Depth/Height	1.00

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	1-18 inch Circular	7.83 cfs	10.56 ft	

Culvert Designer/Analyzer Report

c-4

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	10.36	ft	Storm Event	Design	
Computed Headwater Eleva	10.56	ft	Discharge	7.83	cfs
Headwater Depth/Height	1.13		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	10.50	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	10.56	ft			

Grades					
Upstream Invert	8.86	ft	Downstream Invert	8.62	ft
Length	52.00	ft	Constructed Slope	0.004615	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.08	ft
Slope Type	Mild		Normal Depth	1.25	ft
Flow Regime	Subcritical		Critical Depth	1.08	ft
Velocity Downstream	5.73	ft/s	Critical Slope	0.006225	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	10.56	ft	Upstream Velocity Head	0.40	ft
Ke	0.20		Entrance Loss	0.08	ft

Inlet Control Properties					
Inlet Control HW Elev.	10.50	ft	Flow Control	N/A	
Inlet Type	Groove end w/headwall		Area Full	1.8	ft^2
K	0.00180		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	2	
C	0.02920		Equation Form	1	
Y	0.74000				

Culvert Designer/Analyzer Report

c-5

Peak Discharge Method: User-Specified			
Design Discharge	22.55 cfs	Check Discharge	22.55 cfs

Grades Model: Inverts			
Invert Upstream	5.50 ft	Invert Downstream	5.30 ft
Length	40.00 ft	Slope	0.005000 ft/ft
Drop	0.20 ft		

Headwater Model: Allowable HW/Height	
Headwater Depth/Height	1.00

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

Name	Description	Discharge	HW Elev.	Velocity
x Trial-1	2-18 inch Circular	22.55 cfs	7.84 ft	

Culvert Designer/Analyzer Report
c-5

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	7.00	ft	Storm Event	Design	
Computed Headwater Eleva	7.84	ft	Discharge	22.55	cfs
Headwater Depth/Height	1.56		Tailwater Elevation	N/A	ft
Inlet Control HW Elev.	7.73	ft	Control Type	Outlet Control	
Outlet Control HW Elev.	7.84	ft			

Grades					
Upstream Invert	5.50	ft	Downstream Invert	5.30	ft
Length	40.00	ft	Constructed Slope	0.005000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	1.28	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	1.28	ft
Velocity Downstream	7.01	ft/s	Critical Slope	0.009161	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	7.84	ft	Upstream Velocity Head	0.63	ft
Ke	0.20		Entrance Loss	0.13	ft

Inlet Control Properties					
Inlet Control HW Elev.	7.73	ft	Flow Control	N/A	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	3.5	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

ATTACHMENT 3

```
----------------- Beginning Calculation Cycle -------------------
Discharge: 4.22 cfs  at node DI-0
Discharge: 5.46 cfs  at node DI-1
Discharge: 0.22 cfs  at node DI-2
Discharge: 0.70 cfs  at node DI-3
Discharge: 0.70 cfs  at node J-3
Discharge: 0.70 cfs  at node J-4
Discharge: 6.16 cfs  at node J-2
Discharge: 7.48 cfs  at node DI-4
Discharge: 0.60 cfs  at node DI-5
Discharge: 0.80 cfs  at node DI-6
Discharge: 1.25 cfs  at node DI-7
Discharge: 1.25 cfs  at node J-6
Discharge: 1.25 cfs  at node J-7
Discharge: 8.73 cfs  at node J-1
Discharge: 8.73 cfs  at node J-8
Discharge: 8.73 cfs  at node Outlet
Beginning iteration 1
Discharge: 4.22 cfs  at node DI-0
Discharge: 5.46 cfs  at node DI-1
Discharge: 0.22 cfs  at node DI-2
Discharge: 0.70 cfs  at node DI-3
Discharge: 0.70 cfs  at node J-3
Discharge: 0.70 cfs  at node J-4
Discharge: 6.16 cfs  at node J-2
Discharge: 7.48 cfs  at node DI-4
Discharge: 0.60 cfs  at node DI-5
Discharge: 0.80 cfs  at node DI-6
Discharge: 1.25 cfs  at node DI-7
Discharge: 1.25 cfs  at node J-6
Discharge: 1.25 cfs  at node J-7
Discharge: 8.73 cfs  at node J-1
Discharge: 8.73 cfs  at node J-8
Discharge: 8.73 cfs  at node Outlet
Discharge Convergence Achieved in 1 iterations: relative error:  0.0

--------------------- Calculations Complete ----------------------

** Analysis Options **
Friction method:  Manning's Formula
HGL Convergence Test:  0.001000
Maximum Network Traversals:  5
Number of Flow Profile Steps:  5
Discharge Convergence Test:  0.001000
Maximum Design Passes:  3


 ----------------- Network Quick View  ------------------------
```

Label	Length	Size	Discharge	Hydraulic Grade Upstream	Hydraulic Grade Downstream
HDPE-10	116.00	12 inch	0.80	10.29	9.82
HDPE-2	65.00	18 inch	5.46	10.32	10.24
HDPE-7	66.00	18 inch	6.16	10.03	9.96
HDPE-8	70.00	18 inch	7.48	9.72	9.57
HDPE-3	116.00	12 inch	0.22	10.81	10.36
HDPE-14	21.00	24 inch	8.73	9.36	9.46
HDPE-15	36.00	24 inch	8.73	9.25	8.92
HDPE-11	77.00	12 inch	1.25	9.73	9.64

HDPE-12	70.00	12 inch	1.25	9.61	9.60
HDPE-13	29.00	12 inch	1.25	9.59	9.57
HDPE-4	76.00	12 inch	0.70	10.30	10.26
HDPE-5	70.00	12 inch	0.70	10.24	10.24
HDPE-6	28.00	12 inch	0.70	10.24	10.24
HDPE-9	68.00	12 inch	0.60	10.62	10.35
HDPE-1	80.00	16 inch	4.22	10.72	10.51

		Elevations		
Label	Discharge	Ground	Upstream HGL	Downstream HGL
DI-1	5.46	13.50	10.51	10.32
DI-4	7.48	13.50	9.96	9.72
DI-3	0.70	13.50	10.36	10.30
DI-2	0.22	13.50	10.84	10.81
DI-7	1.25	13.50	9.82	9.73
DI-6	0.80	13.50	10.35	10.29
Outlet	8.73	13.50	8.87	8.87
J-1	8.73	13.50	9.57	9.36
J-2	6.16	13.50	10.24	10.03
J-3	0.70	13.50	10.26	10.24
J-4	0.70	13.50	10.24	10.24
J-6	1.25	13.50	9.64	9.61
J-7	1.25	13.50	9.60	9.59
J-8	8.73	13.50	9.46	9.25
DI-5	0.60	13.50	10.67	10.62
DI-0	4.22	13.50	10.89	10.72

Elapsed: 0 minute(s) 1 second(s)

Node Report

Node	Upstream Flow Time (min)	System Flow Time (min)	Discharge (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	HGL In (ft)	HGL Out (ft)	Sump Elevation (ft)
DI-5	0.00	0.00	0.60	13.50	13.50	10.67	10.62	10.30
DI-6	0.45	0.45	0.80	13.50	13.50	10.35	10.29	9.92
DI-7	1.19	1.19	1.25	13.50	13.50	9.82	9.73	9.27
J-6	1.69	1.69	1.25	13.50	13.50	9.64	9.61	8.85
J-7	2.41	2.41	1.25	13.50	13.50	9.60	9.59	8.50
DI-2	0.00	0.00	0.22	13.50	13.50	10.84	10.81	10.62
DI-3	1.27	1.27	0.70	13.50	13.50	10.36	10.30	9.96
J-3	1.91	1.91	0.70	13.50	13.50	10.26	10.24	9.55
J-4	3.11	3.11	0.70	13.50	13.50	10.24	10.24	9.20
DI-0	0.00	0.00	4.22	13.50	13.50	10.89	10.72	9.90
DI-1	0.32	0.32	5.46	13.50	13.50	10.51	10.32	9.42
J-2	3.70	3.70	6.16	13.50	13.50	10.24	10.03	9.07
DI-4	3.94	3.94	7.48	13.50	13.50	9.96	9.72	8.66
J-1	4.17	4.17	8.73	13.50	13.50	9.57	9.36	8.31
J-8	4.25	4.25	8.73	13.50	13.50	9.46	9.25	8.20
Outlet	4.35	4.35	N/A	13.50	13.50	8.87	8.87	8.02

DOT Report

Pipe	-Node- Upstream Downstream	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Slope- Energy Constructed (ft/ft)	-Section- Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
HDPE-9	DI-5	13.50	10.62	0.004303	0.60	Circular	68.00	2.51	
	DI-6	13.50	10.35	0.004412	4.02	12 inch			
HDPE-1	DI-6	13.50	10.29	0.004470	0.80	Circular	116.00	2.62	
	DI-7	13.50	9.82	0.004655	4.13	12 inch			
HDPE-1	DI-7	13.50	9.73	0.002900	1.25	Circular	77.00	2.57	
	J-6	13.50	9.64	0.005455	4.47	12 inch			
HDPE-1	J-6	13.50	9.61	0.000436	1.25	Circular	70.00	1.62	
	J-7	13.50	9.60	0.005000	4.28	12 inch			
HDPE-1	J-7	13.50	9.59	0.000427	1.25	Circular	29.00	1.41	
	J-1	13.50	9.57	0.006552	4.90	12 inch			
HDPE-3	DI-2	13.50	10.81	0.004263	0.22	Circular	116.00	1.53	
	DI-3	13.50	10.36	0.004914	4.24	12 inch			
HDPE-4	DI-3	13.50	10.30	0.002009	0.70	Circular	76.00	1.98	
	J-3	13.50	10.26	0.005395	4.44	12 inch			
HDPE-5	J-3	13.50	10.24	0.000151	0.70	Circular	70.00	0.97	
	J-4	13.50	10.24	0.005000	4.28	12 inch			
HDPE-6	J-4	13.50	10.24	0.000132	0.70	Circular	28.00	0.79	
	J-2	13.50	10.24	0.004643	4.12	12 inch			
HDPE-1	DI-0	13.50	10.72	0.004206	4.22	Circular	80.00	4.22	
	DI-1	13.50	10.51	0.005000	7.84	16 inch			
HDPE-2	DI-1	13.50	10.32	0.003824	5.46	Circular	65.00	4.32	
	J-2	13.50	10.24	0.005385	11.13	18 inch			
HDPE-7	J-2	13.50	10.03	0.003517	6.16	Circular	66.00	4.58	
	DI-4	13.50	9.96	0.005000	10.73	18 inch			
HDPE-8	DI-4	13.50	9.72	0.004135	7.48	Circular	70.00	5.16	
	J-1	13.50	9.57	0.005000	10.73	18 inch			
HDPE-1	J-1	13.50	9.36	0.002366	8.73	Circular	21.00	4.69	
	J-8	13.50	9.46	0.005238	23.65	24 inch			
HDPE-1	J-8	13.50	9.25	0.003521	8.73	Circular	36.00	5.77	
	Outlet	13.50	8.92	0.005000	23.10	24 inch			

Combined Pipe/Node Report

Pipe	Upstream Node	Downstream Node	Length (ft)	Section Size	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	System Flow Time (min)	Upstream HGL (ft)	Downstream HGL (ft)
HDPE-9	DI-5	DI-6	68.00	12 inch	2.51	10.30	10.00	0.004412	0.00	10.62	10.35
HDPE-10	DI-6	DI-7	116.00	12 inch	2.62	9.92	9.38	0.004655	0.45	10.29	9.82
HDPE-11	DI-7	J-6	77.00	12 inch	2.57	9.27	8.85	0.005455	1.19	9.73	9.64
HDPE-12	J-6	J-7	70.00	12 inch	1.62	8.85	8.50	0.005000	1.69	9.61	9.60
HDPE-13	J-7	J-1	29.00	12 inch	1.41	8.50	8.31	0.006552	2.41	9.59	9.57
HDPE-3	DI-2	DI-3	116.00	12 inch	1.53	10.62	10.05	0.004914	0.00	10.81	10.36
HDPE-4	DI-3	J-3	76.00	12 inch	1.98	9.96	9.55	0.005395	1.27	10.30	10.26
HDPE-5	J-3	J-4	70.00	12 inch	0.97	9.55	9.20	0.005000	1.91	10.24	10.24
HDPE-6	J-4	J-2	28.00	12 inch	0.79	9.20	9.07	0.004643	3.11	10.24	10.24
HDPE-1	DI-0	DI-1	80.00	16 inch	4.22	9.90	9.50	0.005000	0.00	10.72	10.51
HDPE-2	DI-1	J-2	65.00	18 inch	4.32	9.42	9.07	0.005385	0.32	10.32	10.24
HDPE-7	J-2	DI-4	66.00	18 inch	4.58	9.07	8.74	0.005000	3.70	10.03	9.96
HDPE-8	DI-4	J-1	70.00	18 inch	5.16	8.66	8.31	0.005000	3.94	9.72	9.57
HDPE-14	J-1	J-8	21.00	24 inch	4.69	8.31	8.20	0.005238	4.17	9.36	9.46
HDPE-15	J-8	Outlet	36.00	24 inch	5.77	8.20	8.02	0.005000	4.25	9.25	8.92

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Pipe Report

Pipe	Up Node	Dn Node	Q (cfs)	Length (ft)	S (ft/ft)	Size	Roughness	Up Invert (ft)	Dn Invert (ft)	Up Gr Elev (ft)	Dn Gr Elev (ft)	Up Cover (ft)	Dn Cover (ft)	Up HGL (ft)	Dn HGL (ft)
HDPE-9	DI-5	DI-6	0.60	68.00	0.004412	12 inch	0.009	10.30	10.00	13.50	13.50	2.14	2.44	10.62	10.35
HDPE-10	DI-6	DI-7	0.80	116.00	0.004655	12 inch	0.009	9.92	9.38	13.50	13.50	2.52	3.06	10.29	9.82
HDPE-11	DI-7	J-6	1.25	77.00	0.005455	12 inch	0.009	9.27	8.85	13.50	13.50	3.17	3.59	9.73	9.64
HDPE-12	J-6	J-7	1.25	70.00	0.005000	12 inch	0.009	8.85	8.50	13.50	13.50	3.59	3.94	9.61	9.60
HDPE-13	J-7	J-1	1.25	29.00	0.006552	12 inch	0.009	8.50	8.31	13.50	13.50	3.94	4.13	9.59	9.57
HDPE-3	DI-2	DI-3	0.22	116.00	0.004914	12 inch	0.009	10.62	10.05	13.50	13.50	1.82	2.39	10.81	10.36
HDPE-4	DI-3	J-3	0.70	76.00	0.005395	12 inch	0.009	9.96	9.55	13.50	13.50	2.48	2.89	10.30	10.26
HDPE-5	J-3	J-4	0.70	70.00	0.005000	12 inch	0.009	9.55	9.20	13.50	13.50	2.89	3.24	10.24	10.24
HDPE-6	J-4	J-2	0.70	28.00	0.004643	12 inch	0.009	9.20	9.07	13.50	13.50	3.24	3.37	10.24	10.24
HDPE-1	DI-0	DI-1	4.22	80.00	0.005000	16 inch	0.009	9.90	9.50	13.50	13.50	2.27	2.67	10.72	10.51
HDPE-2	DI-1	J-2	5.46	65.00	0.005385	18 inch	0.009	9.42	9.07	13.50	13.50	2.58	2.93	10.32	10.24
HDPE-7	J-2	DI-4	6.16	66.00	0.005000	18 inch	0.009	9.07	8.74	13.50	13.50	2.93	3.26	10.03	9.96
HDPE-8	DI-4	J-1	7.48	70.00	0.005000	18 inch	0.009	8.66	8.31	13.50	13.50	3.34	3.69	9.72	9.57
HDPE-14	J-1	J-8	8.73	21.00	0.005238	24 inch	0.009	8.31	8.20	13.50	13.50	3.19	3.30	9.36	9.46
HDPE-15	J-8	Outlet	8.73	36.00	0.005000	24 inch	0.009	8.20	8.02	13.50	13.50	3.30	3.48	9.25	8.92

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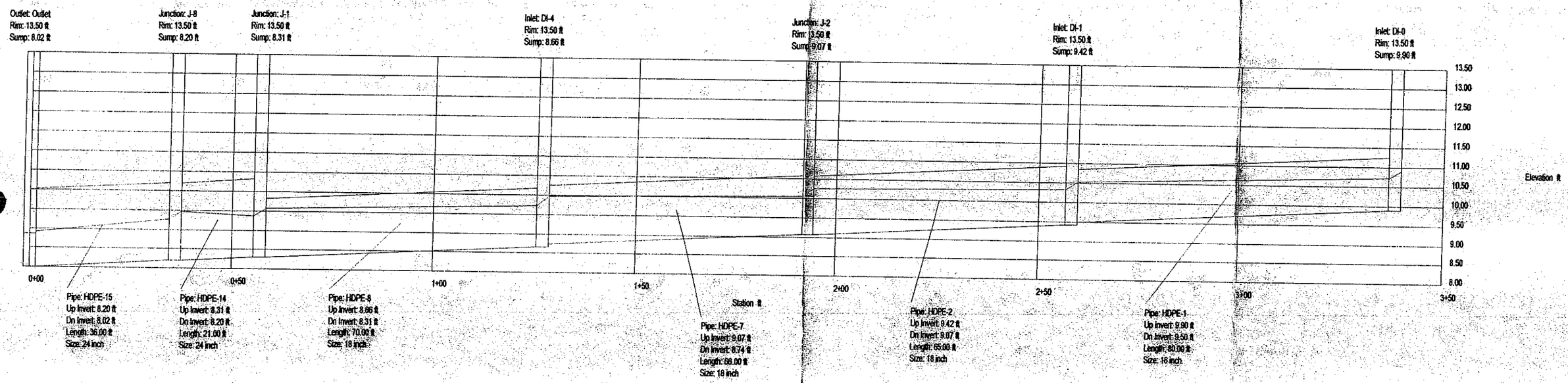

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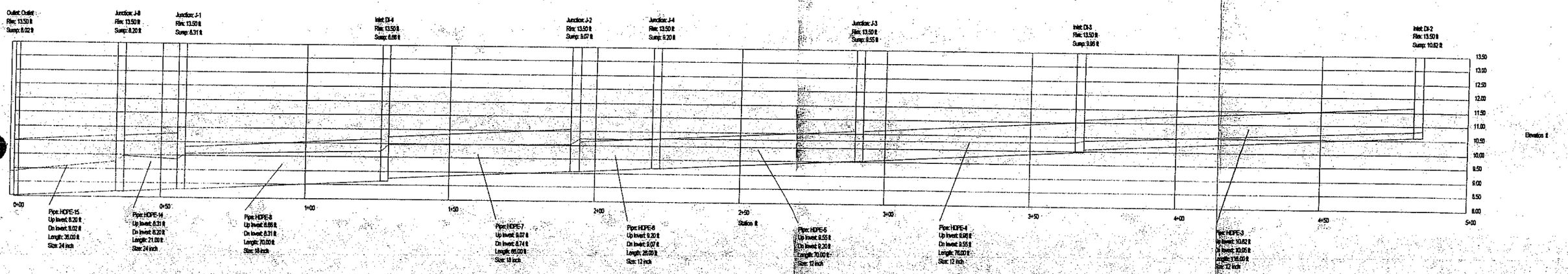
Project Engineer: Black & Veatch
StormCAD v1.0



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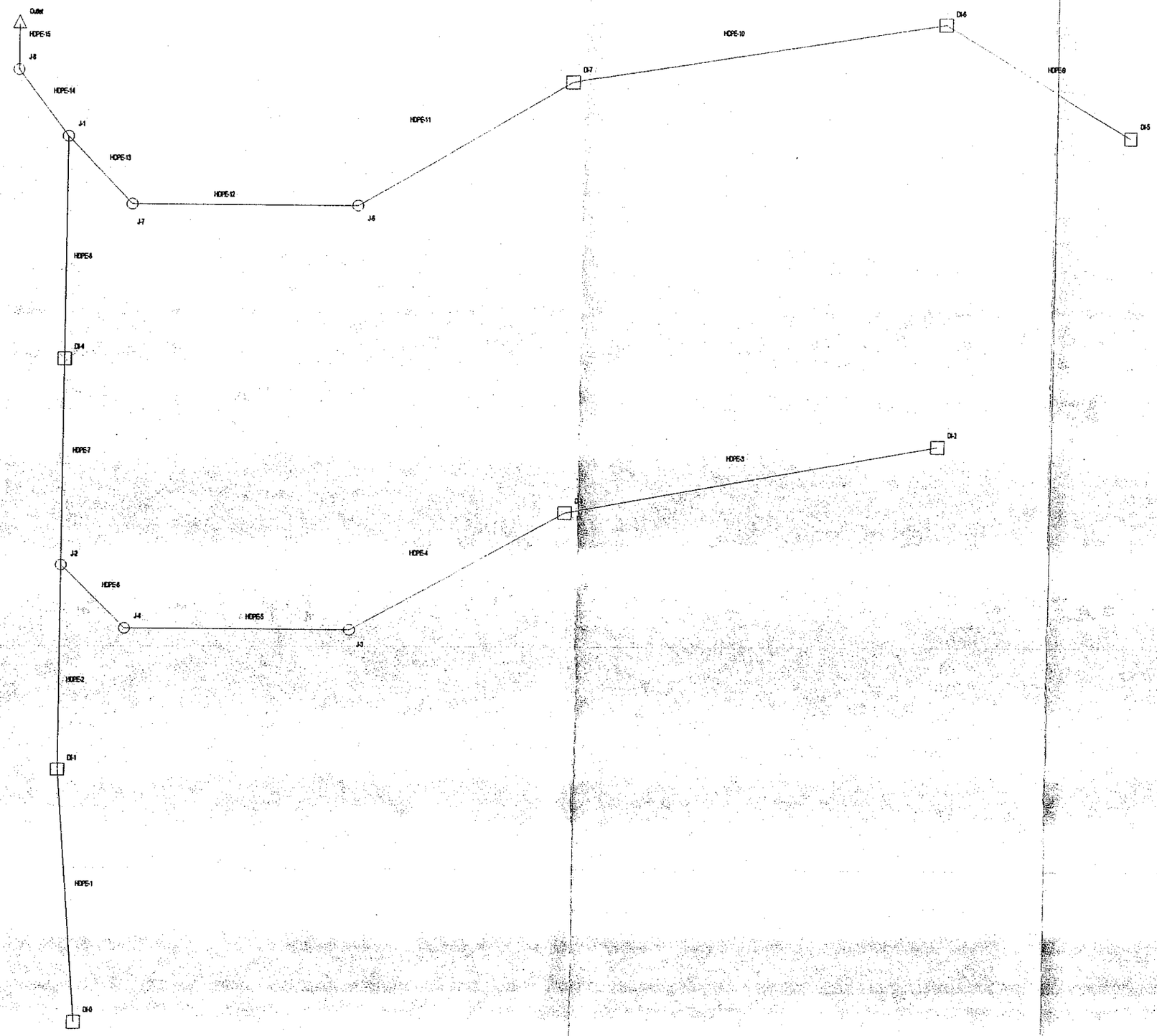
Project Engineer: Black & Veatch
StormCAD v1.0



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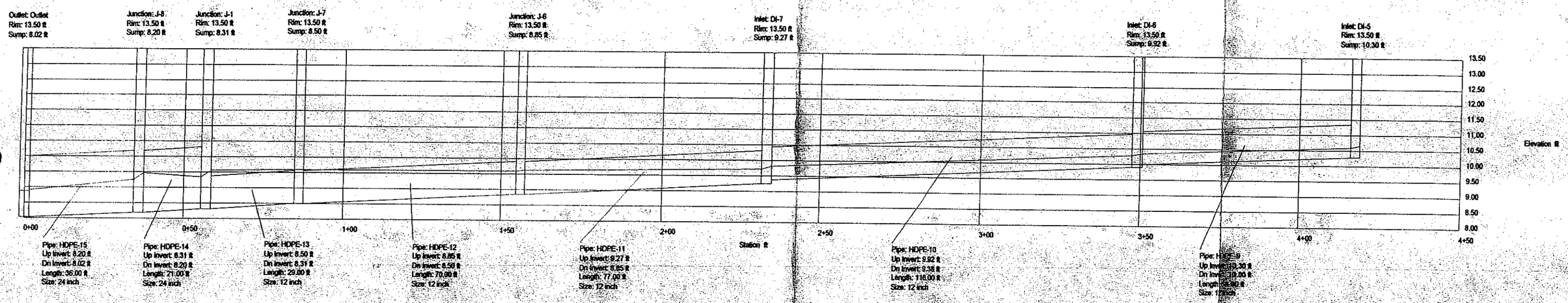
Project Engineer: Black & Veatch
StormCAD v1.0



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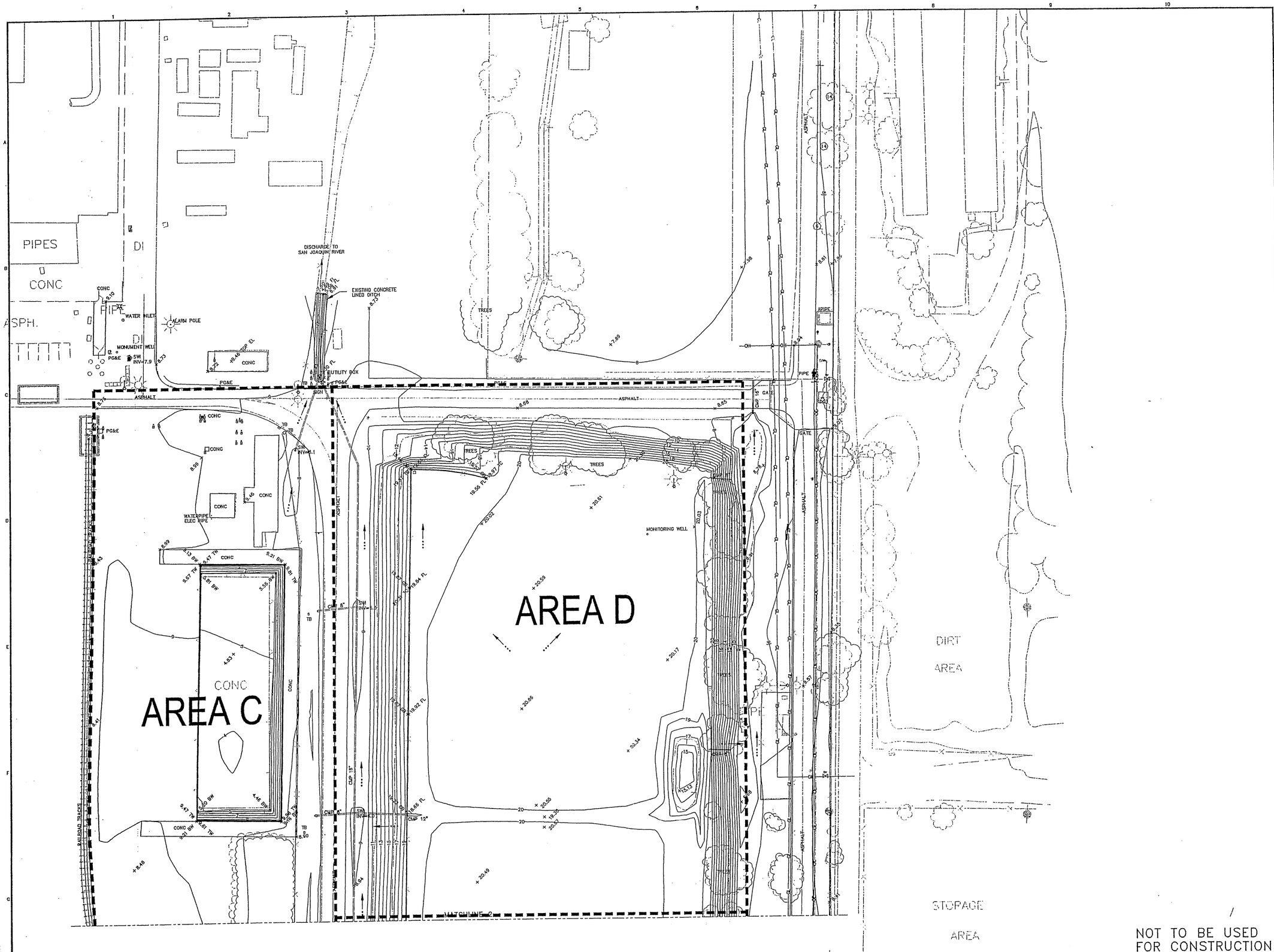
Project Engineer: Black & Veatch
StormCAD v1.0



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SIGNED
DATE REG NO.

BLACK & VEATCH CONSTRUCTION, INC.
ENGINEER SK DRAWN RN
CHECKED DATE

MIRANT CORPORATION
MIRANT CONTRA COSTA UNIT 8

HYDROLOGY
PRE-CONSTRUCTION

PROJECT 065108-DS-0006
DRAWING NUMBER
REV
CODE
AREA
MIRANT PJN 60033

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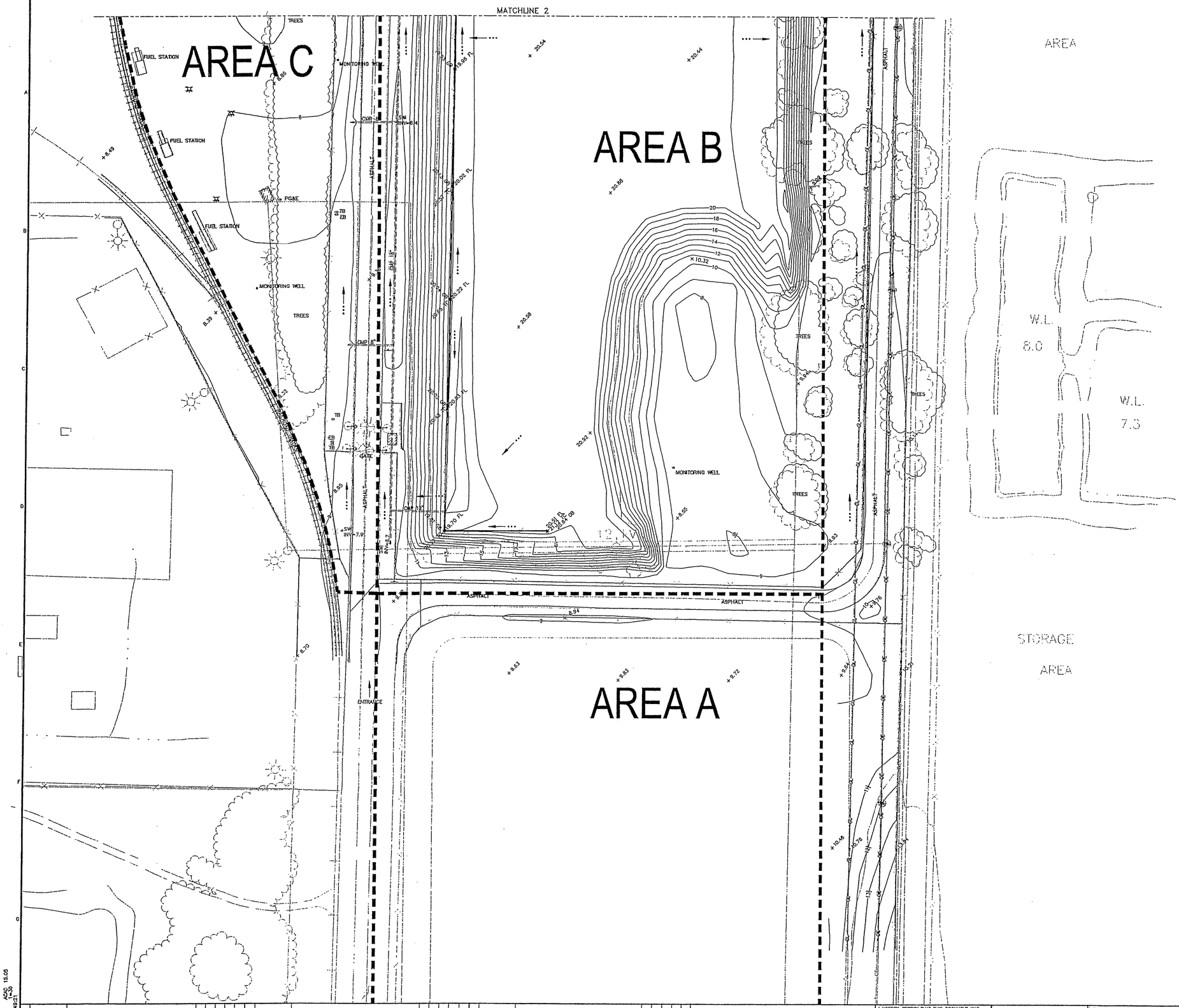

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MIRANT CONTRA COSTA UNIT 8
HYDROLOGY
PRE-CONSTRUCTION

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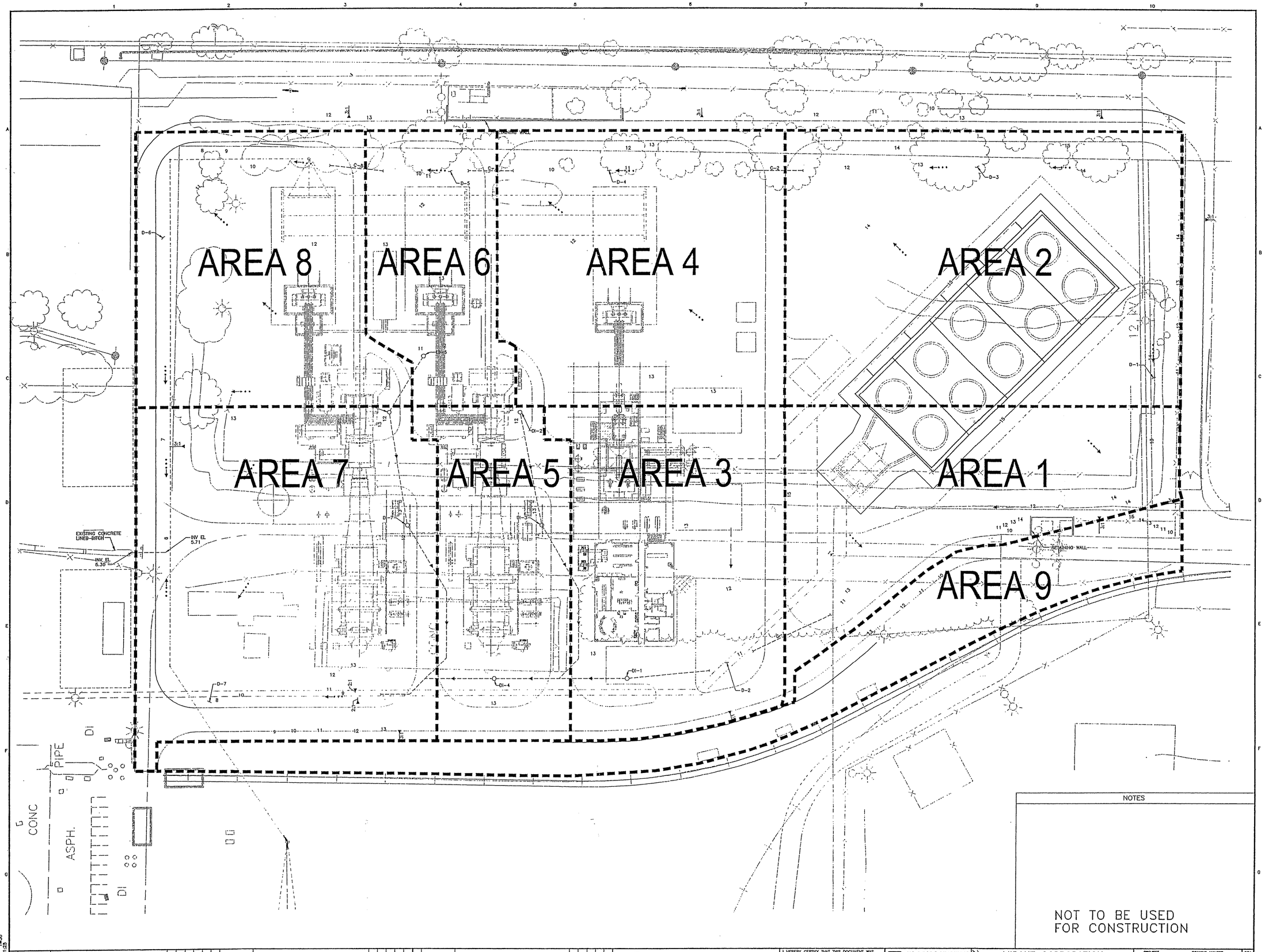

NOTES

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MIRANT CONTRA COSTA UNIT 8

HYDROLOGY
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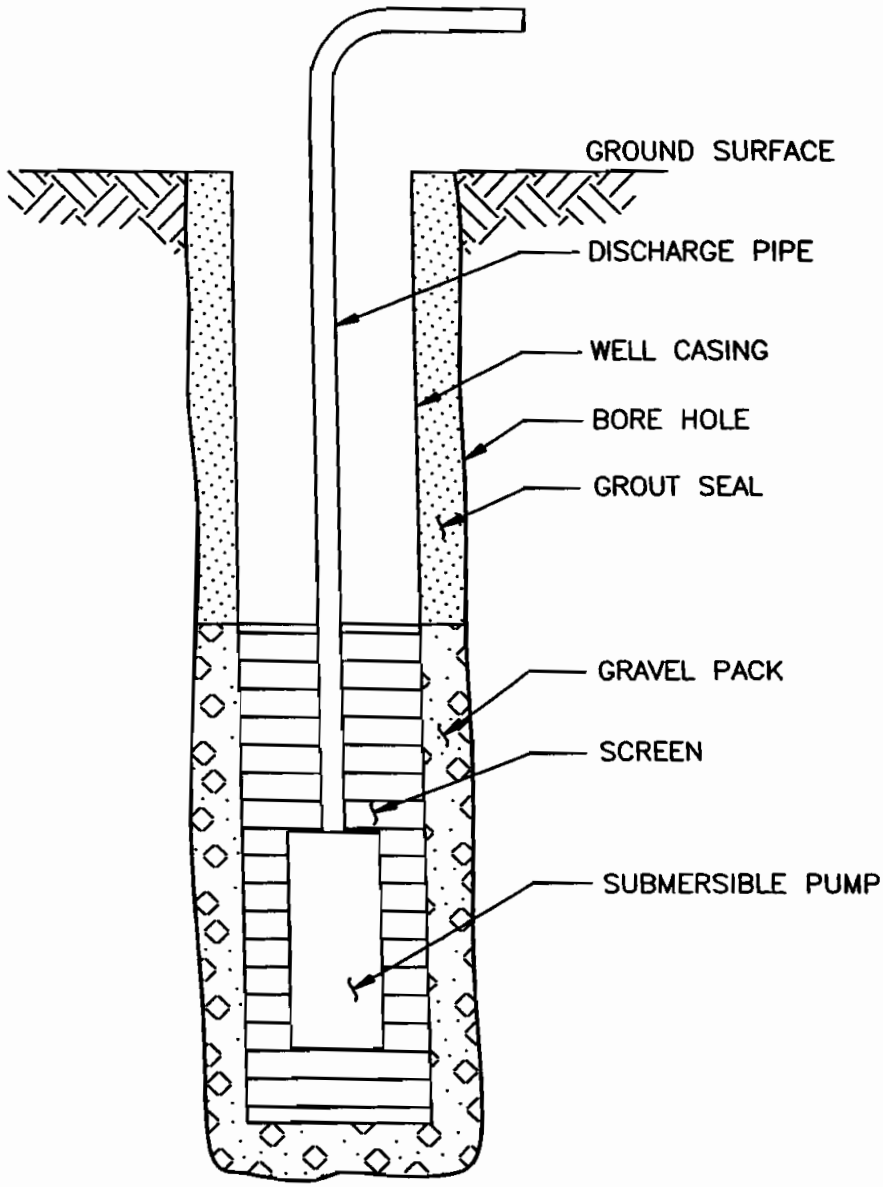
Appendix D
Drawings



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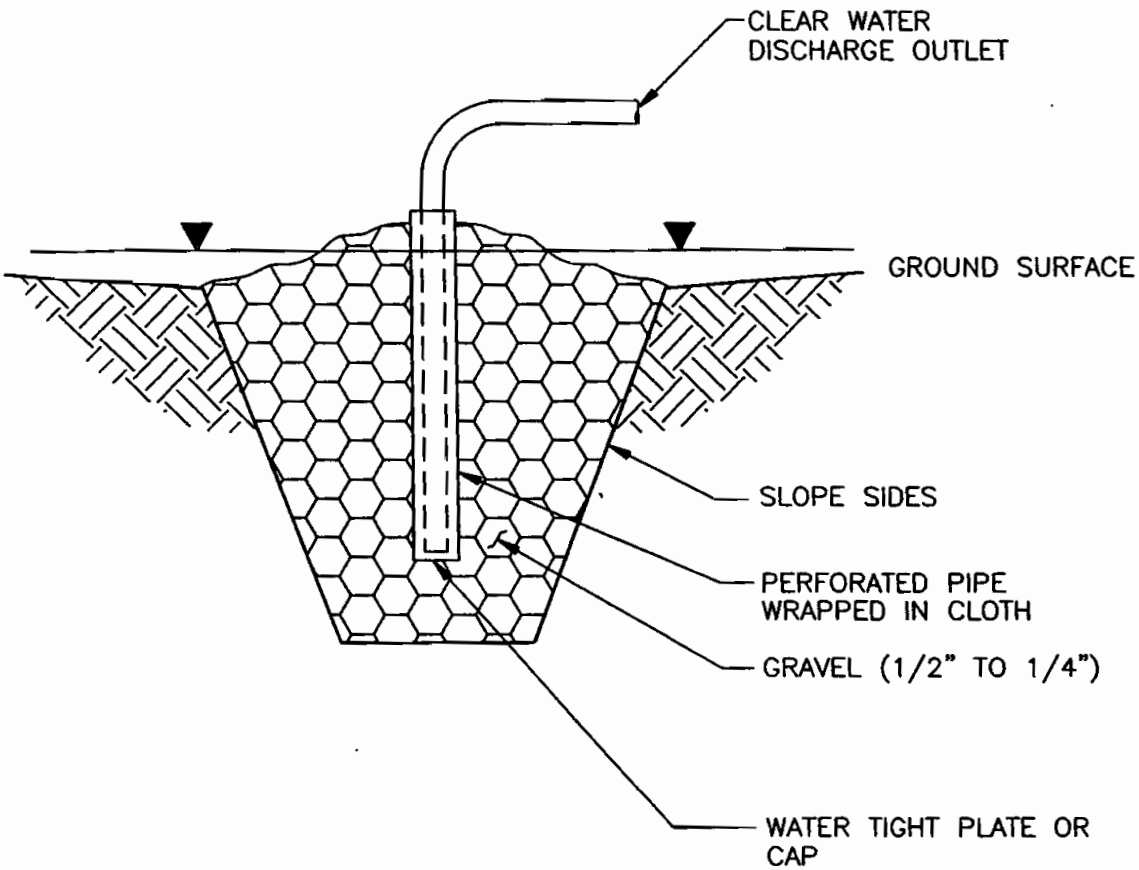

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CONSTRUCTION, INC.

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CHECKED | DATE

MIRANT COPRORATION
CONTRA COSTA UNIT 8

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