



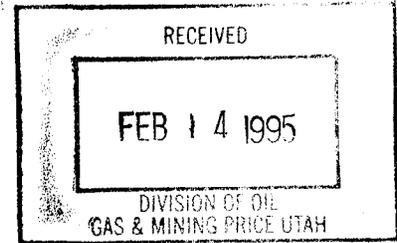
Coastal
The Energy People

pending

February 7, 1995

Mr. Steve Demczak
College of Eastern Utah
Division of Oil, Gas & Mining
451 East 400 North
P.O. Box 169
Price, Utah 84501

To: PIC



ACT/007/039# 2

Dear Steve,

Enclosed are three copies of the exploration plan to do exploration work at the old Knight - Ideal minesite in Dugout Canyon.

We have made application to MSHA to explore these old workings. As soon as MSHA approval is received we will forward you a copy of their plan and their approval.

We have also made application for a stream alternation permit to install the temporary culvert in Dugout Creek.

We have enclosed a copy of the letter from Miles Moretti of DWR concerning the recent raptor survey. We are initiating to recommend ground survey starting the week of February 15, 1995.

If you need any additional information, please contact Keith Zobell, 801-636-2643. We appreciate your assistance in the project and would appreciate a prompt review as we would like to start exploration by February 27, 1995.

Sincerely,

Keith Zobell

FOR R. W. "Rick" Olsen
General Manager
Soldier Creek Coal Company

RWO:KZ:dk
Enclosure

DOGMSC3.KZ

*2/10/95
Pam- Vickie S. brought this to me, she said the files only go back to '97.*

THANKS-

Tiffini

TO PIC

Utah Fuel Company

A SUBSIDIARY OF THE COASTAL CORPORATION
P O BOX 719 • HELPER UT 84526-0719 • 801/637-7925 • FAX 801/637-7929 • SALT LAKE 801/596-7111

EXPLORATION PLAN
DUGOUT CANYON MINE WORKINGS

The applicable regulation numbers will be listed and the appropriate responses given as follows:

R645-201-221

Applicant

This application for an exploration permit for the Blackhawk property is submitted by:

Soldier Creek Coal Company
P.O. Box 1029
Wellington, Utah 84542
801-637-6360
801-637-0108 Fax

The mining properties to be evaluated are held by Sage Point Coal Company, a holding Company for Soldier Creek Coal Company whose address is the same as aforementioned.

R645-201-222

Applicant's Representative

The representative for the Company present and responsible for conducting the exploration activities is:

Reid W. Olsen
Soldier Creek Coal Company
P.O. Box 1029
Wellington, Utah 84542
801-637-6360
801-637-0108 Fax

R645-201-223

Exploration Area

The exploration area is located adjacent to Dugout Creek in the SE 1/4, NW 1/4 Sec. 23,

T13S, R12E and the general location is shown on Exhibit 1. The specific areas of exploration with surface disturbance are shown on Exhibit 2.

There are three closed coal mines located on Sage Point Coal Company's fee property in Dugout Canyon of Carbon County, Utah. The mineral rights are also owned by Sage Point Coal Company. They were operated from the late 1950's through 1965 by Knight Ideal Coal Company who developed the mines in the Rock Canyon and Gilson coal seams. All known portals to the mines are now sealed with earth and rock fill.

Soldier Creek Coal Company is planning to initiate mining activities in the Dugout Canyon property in 1996. In order to develop mine plans for the area, select portals need to be reopened to allow access to examine the old working to visually evaluate current overall stability of roof, floor and rib and general mining conditions.

The portals of at least one of the mines were opened several times by Pacific Gas and Electric's subsidiary Eureka Energy (most recently in 1979). In addition, all three mines were reopened by Sun Company's subsidiary Sunedco in 1982. A minimum of six portals are planned to be reopened. Portal areas are shown on Exhibit 2.

R645-201-224

Period of Exploration

Soldier Creek Coal Company is requesting permits to explore the Dugout Canyon Mine for a period of one year with exploration activities to be on or after February 27, 1995. The majority of the exploration activities should be concluded by June 1, 1995. However, some of the portals may need to be left open while the findings are being evaluated. Any opening not resealed will have wire mesh installed over the opening to prevent unauthorized access until the portals are either closed or developed for coal production.

R645-201-225

Method of Exploration

The method of exploration is to reopen the existing mine portals (See Exhibit 2 for portal area locations) by using a trackhoe/backhoe to create an opening in the dirt/rock fill material of the seal. The material from the opening will be stacked adjacent to the opening (See Exhibit 2) so that it can be used to reseat the opening. Any loose material over the portal openings which present a hazard to personnel will also be removed.

Since all of the areas proposed to be used for this exploration project have previously been disturbed by pre-SMCRA mining activities, there is no salvageable top soil. However, each

pad area that will be used will be examined jointly by the permittee and the assigned DOGM inspector for salvageable growth material. If it is determined that such material exists it will be salvaged and stockpiled for use during reclamation (See Exhibit 2). Each pile will have sediment control measures such as strawbales and or silt fences installed downslope of the piles. If on site inspection determines there is no salvageable material then no salvage recovery will be attempted.

Surface access to the original portal area will be by way of existing roads (Exhibit 3). All of these roads are considered to be ancillary roads. These roads will be reopened by only grading off the rocks and bank slough so as to allow vehicular travel to the portal sites. The road crossing Dugout Creek has been washed out. A temporary culvert will need to be installed to gain access to the portals on the east side of the canyon. The design for this culvert is shown in Exhibit 3. No other culverts will be needed for the project. Surface runoff from all disturbances will be treated with sediment control measures such as silt fences, strawbales or other methods approved by the Division.

If the area is covered with snow when the exploration activities begin, clean snow will be sidecast over the banks. Snow containing soil or other debris will be stored in designed areas (See Exhibit 2) and will have either a silt fence or strawbales installed down slope to treat any runoff.

During the operational phase of the exploration, a barrier of chain link or wire mesh material will be established at the portal/portals to prevent public or large animal access when mine personnel are not underground. Appropriate signs and warning devices will be maintained at the portal. All sediment control measures will be maintained.

After each area is examined, a decision will be made as to whether the portal will need to be left open for further evaluation or to be resealed. If the portal is to be left open for further evaluation, chain link or wire mesh will be established and appropriate signs installed to prevent unauthorized access. If the portals are to be closed the disturbed site will have recent trash and debris removed and as much as possible of the old construction debris removed. The mine opening will be sealed with concrete block with sample tubes inserted. The portal will then be backfilled and the portal area returned to similar contour that it was found at the beginning of exploration. If growth material was removed from the pad area it will be redistributed. The entire disturbed area, including ancillary roads, will be roughened to eliminate compaction and enhance moisture retention. The area will then be mulched with a minimum of 2000 lbs.per acre and seeded with the approved seed mix shown in Table 1.

Ancillary roads used for access will be shaped for drainage control, including water bars if needed, roughened to relieve compaction and seeded with the approved seed mix.

Total estimated disturbance is 2.05 acres including ancillary roads (See Exhibit 2). Less than 250 tons of coal will be removed during this exploration.

R645-202-231

Since all of the areas proposed to be used for this exploration project have previously been disturbed before the SMCRA program, there are no critical or unique habitats for threatened and endangered wildlife or other species in the disturbed areas.

The disturbed area is on the upper range of critical winter deer habitat. Mr. Bill Bates, Nongame Program Manager with the Utah Division of Wildlife Resources, inspected the area during the week of January 16 - 20, 1995 and, via telephone, reported that due to the deep snow this winter that no deer are using the site and therefore critical winter deer habitat will not be a consideration this year.

Past history has shown that Golden eagles are known to inhabit the area on a yearlong basis. Golden eagles soaring in areas east and west of the project area were observed on two occasions during January and February, 1980. Golden eagles were also observed within the project area. A mature eagle was observed in flight over the cliffs between Soldier and Fish Creeks in December, 1979. A pair of Golden eagles is known to use the mine plan area as part of their breeding territory; only an alternate nest was found for this territory. The nest was located in NW1/4 Sec. 26, T.13S., R.12E. No active nests were found.

Current Survey Information

A helicopter survey was done on January 27, 1995. An area of 1/2 mile minimum from the project area was surveyed. Mr. Bill Bates of the Utah Division of Wildlife Resources assisted in the survey. No eagle nests were found. However, one golden eagle was observed to be frequenting the area. It has been recommended by Mr. Bates that ground observations be conducted to determine if eagles are nesting adjacent to the project area. Observations are to be conducted once a week starting during the week of February 15, 1995. Each observation period will be for a minimum of four hours. Observations are to continue until the week of April, 15, 1995. Any nesting sites located are to be reported to the Price Office of the Utah Division of Wildlife Resources.

There are no threatened or endangered fish species inhabiting the aquatic habitat in the mine plan or adjacent areas (UDWR, 1979a).

R645-202-232

The following regulations are referenced in R645-202-232:

R645-301-358

Refer to the response to R645-202-231 above.

R645-301-512.250

There are no primary roads in the project area.

R645-301-526.200

Since this is a short duration exploration program, no utilities are planned to be used. However, if some are needed the utility installation will be of short duration. All utility installations will be made in a manner which minimizes damage, destruction or disruption of services provided by oil, gas and water wells; oil, gas and other pipelines; railroads; electric and telephone lines; and water and sewage lines which pass over, under, or through the areas.

R645-301-527.100

All roads within the project area are ancillary roads. Access to the project area is via a public county road.

R645-301-527.230

All ancillary roads will be maintained in as near a pre-exploration condition as possible. It is not the responsibility of Soldier Creek Coal Company to repair any damage done by natural occurrences.

R645-301-534.100 through R645-301-534.300

R645-301-542.600 and R645-301-742.410 through R645-301-742.420

R645-301-752.200 and R645-301-762

Roads will be located, designed, constructed, reconstructed, used, maintained, and reclaimed so as to:

1. Prevent or control damage to public or private property.
2. Use nonacid or nontoxic-forming substances in surfacing.
3. No new roads will be constructed.
4. The culvert on one road will be removed at the end of the exploration project.
5. Control erosion, siltation, air pollution attendant to erosion by stabilizing the road in accordance with current prudent engineering practices.
6. To ensure environmental protection and safety appropriate for their intended use and the size of equipment to be used.
7. To return the area and attended roads to their pre-exploration condition.

R645-202-233

Since all of the areas to be used for exploration have been previously disturbed before the SMCRA laws were enacted, there was no topsoil used in reclamation of the areas. The medium used at the sites was the best available material consisting of natural soils, subsoils mixed with a combination of coal, rock, broken cinder blocks and miscellaneous debris. The areas have a stand of grasses and shrubs growing on them, therefore, the growth medium appears to be adequate for reclamation.

R645-202-234

Not applicable since there are no diversions of overland flows, ephemeral, perennial or intermittent streams.

R645-202-235

Coal exploration will be conducted in a manner which minimizes disturbance of the prevailing hydrologic balance.

R645-301-356.300 through R645-301-356.400

Siltation structures will be removed when the disturbed area is stabilized and revegetated. Since this is an exploration program, it is more practical to reclaim the disturbed areas at the same time. The area of the sediment control structure will be stabilized and revegetated upon removal. The revegetation mixtures will be those approved by the Division and shown in Table 1.

R645-301-512.240

Not Applicable since there are no impoundments.

R645-301-513.200

Not Applicable since there are no impoundments or sediment ponds.

R645-301-514.300

Not Applicable since there are no impoundments.

R645-301-515.200

Not Applicable since there are no impoundments.

R645-301-533.100 through R645-301-533.600

Not Applicable since there are no impoundments.

R645-301-731.100 through R645-301-731.522

Soldier Creek Coal Company will take all necessary precautions to protect the hydrologic balance. These regulations basically apply to active mining operations. The only actual displacement of materials (soil, rock or coal) will be opening the portals. Therefore, we believe that these regulations do not apply to this exploration application. The portal areas of the abandoned mine workings will be managed to prevent or control gravity discharge during the exploration program.

R645-301-731.800

There will be no consumptive use of water during this exploration.

R645-301-733.220 through R645-301-733.240

Not Applicable since there are no diversions or impoundments.

**R645-301-742.100, 742.110, 742-111, 742-112, 742-113
through 742.125**

Sediment control measures for this project will be strawbales and or silt fences and waterbars. Designs for these measures are shown on Exhibits 4, 5 and 6.

R645-301-742.200 through R645-742.300

Not Applicable since there are no siltation structures or diversions.

R645-301-743

Not Applicable since there are no impoundments.

R645-301-744.100 and 744.200

Not Applicable since there are no discharge structures.

R645-751

All water leaving the disturbed area will be in compliance with all Utah and Federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U.S. EPA set forth in 40 CFR Part 434.

R645-752

All sediment control measures will meet the appropriate R645 regulations.

R645-752.100

Not Applicable since there are no siltation structures or diversions.

R645-763

Not Applicable since there are no siltation structures.

R645-202-236

The exploration program to some degree will determine if there are any acid or toxic forming materials in the mining horizons of interest. At present, it is fairly certain that these types of materials are not in areas to be disturbed during this program. The coal seams were mined previously and there is no evidence that acid forming or toxic materials exist in the mining zone. If any acid or toxic forming materials are discovered they will be disposed of in accordance with R645-301-731.110, R645-301-731.300 and R645-301-553.260.

R645-202-240

Reclamation standards on completion of the exploration project will meet or exceed the standards of the Division. Should positive results indicate an economically viable mine, reclamation of certain improvements will be postponed until a mining and reclamation plan is formulated and implemented.

R645-202-241

All excavations, artificially created flat areas or embankments created during exploration will be returned to the approximate existing contour. The existing contour is the state of the surface prior to this (1995) exploration program. The disturbed areas will be mulched and reseeded with the appropriate seed mixture.

R645-202-242 and R645-202-242.100

The seed mixture referenced as Table 1 will be used to revegetate the areas disturbed by exploration activities. The mixture was derived from an area of comparable elevations, soils, and precipitation. This seed mixture should provide a prompt diverse and permanent vegetative cover. The areas included in this exploration program have all been previously disturbed by mining operations. No topsoil was salvaged by the original mining company, and therefore, reclamation done to date was accomplished with the best available plant growth medium.

R645-202-242.200

The seed mixture referenced as Table 1, plated at the rates specified, should provide the coverage capable of stabilizing the surface from erosion. The area to be planted will be scarified so as to provide a roughened surface to encourage vegetation growth and to minimize erosion.

R645-202-243

Exposed underground openings will be managed to prevent casual entry by the public.

R645-301-529

The drift openings to be used during the exploration program will be managed to prevent unauthorized entry. Management options may consist of, but are not limited to signs, fences and gates and keepout signs.

R645-301-551

Upon final abandonment of the drift or shaft openings used for exploration, the openings will be sealed in accordance with 30 CFR 75.1771, consistent with MSHA regulations. Drift openings will be sealed with solid, substantial, incombustible material, and backfilled with incombustible material for a distance of 25 feet.

R645-301-631, R645-301-738 and R645-301-765

Not Applicable since there are no exploration holes or boreholes.

R645-202-244

All facilities and equipment will be moved from the exploration site when they are no longer needed for exploration or other related activities.

R645-202-244.100

No facilities or equipment are anticipated to remain to provide environmental data after completion of the exploration program.

R645-202-244.200

Siltation structures and other structures will remain to reduce or control offsite effects of the exploration program until the disturbed areas are reclaimed.

R645-202-244.300

Should the exploration program prove successful, various items and improvements will remain to facilitate future coal mining and reclamation activities. The portals and associated structures will remain in preparation for the mining and reclamation plan. Power lines and roads will remain until superseded by the mining and reclamation plan. Fences and buildings will remain until superseded by the mining and reclamation plan. Additional permitting actions necessary to incorporate these facilities into an operational mine will be undertaken as required by the division.

TABLE 1

Disturbed Area Seed Mixture - Dugout Creek Exploration

	Pounds of PLS	Live Seeds
Great Basis Wildrye	1.0	130,000
Slender Wheatgrass	2.0	318,000
Western Wheatgrass	3.0	330,000
Indian Ricegrass	1.0	141,000
Mountain Brome	3.0	270,000
Orchard Grass	.5	327,000
Streambank Wheatgrass	2.0	312,000
Yellow Sweet Clover	1.0	260,000
Cicer Milk Vetch	.5	73,000
Mountain Sage Brush	1.0	2,500,000
	15.0 pounds	4,661,000
	PLS/Acre	PLS/Acre

Seedlings

* Douglas Fir	60
* Pinyon Pine	60
* Utah Juniper	200

320 Seedlings/Acre

* The Applicant retains the option of planting seeds if seedlings are not available.

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

DUGOUT CREEK PROJECT

by

Name: Gary E. Taylor

Company Name: UTAH FUEL COMPANY
File Name: D:\SEDCAD3\DUGOUT

Date: 01-30-1995

Exhibit 3

Company Name: UTAH FUEL COMPANY

Filename: D:\SEDCAD3\DUGOUT User: Gary E. Taylor

Date: 01-30-1995 Time: 13:16:04

Dugout Creek Project

Storm: 1.35 inches, 10 year- 6 hour, SCS Type II

Hydrograph Convolution Interval: 0.1 hr

=====
 SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE
 =====

-Hydrology-

JBS SWS	Area (ac)	CN UHS	Tc (hrs)	K (hrs)	X	Base- Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111 1	3654.82	63 S	3.551	0.000	0.000	0.0	1.55	2.12
Type: Null Label: Dugout								
111 Structure	3654.82						1.55	
111 Total IN/OUT	3654.82						1.55	2.12

SEDCAD+ CULVERT SIZING UTILITY

Dugout Creek Project

Design Discharge = 2.120 cfs
 Entrance Loss Coefficient = 0.7
 Pipe Length = 40.000 feet
 Pipe Slope = 1.000 %
 Manning's n = 0.015
 Maximum Headwater = 1.000 feet
 Tailwater Depth = 0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.10	0.13		0
0.20	0.25		0
0.30	0.38		0
0.40	0.51	Outlet (Subcritical)	1
0.50	0.64	Outlet (Subcritical)	1
0.60	0.76	Outlet (Subcritical)	1
0.70	0.89	Outlet (Subcritical)	1
0.80	1.02	Outlet (Subcritical)	1
0.90	1.15	Outlet (Subcritical)	2
1.00	1.28	Outlet (Subcritical)	2
1.10	1.41	Inlet (Supercritical)	3
1.20	1.54	Inlet (Supercritical)	4
1.30	1.67	Inlet (Supercritical)	4
1.40	1.80	Inlet	5
1.50	1.93	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.10	0.16		0
0.20	0.33	Outlet (Subcritical)	1
0.30	0.49	Outlet (Subcritical)	1
0.40	0.65	Outlet (Subcritical)	2
0.50	0.82	Outlet (Subcritical)	2
0.60	0.98	Inlet (Supercritical)	3
0.70	1.25	Inlet (Supercritical)	3
0.80	1.53	Inlet (Supercritical)	3
0.90	1.81	Inlet (Supercritical)	3
1.00	2.09	Inlet (Supercritical)	3
1.10	2.38	Inlet (Supercritical)	4
1.20	2.68	Inlet (Supercritical)	4
1.30	2.97	Inlet	5
1.40	3.18	Inlet	5
1.50	3.38	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.10	0.19	Outlet (Subcritical)	1
0.20	0.38	Outlet (Subcritical)	1
0.30	0.57	Outlet (Subcritical)	2
0.40	0.76	Outlet (Subcritical)	2
0.50	0.95	Inlet (Supercritical)	3
0.60	1.24	Inlet (Supercritical)	3
0.70	1.56	Inlet (Supercritical)	3
0.80	1.88	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.00	2.63	Inlet (Supercritical)	3
1.10	3.02	Inlet (Supercritical)	3
1.20	3.45	Inlet (Supercritical)	3
1.30	3.88	Inlet (Supercritical)	3
1.40	4.30	Inlet (Supercritical)	4
1.50	4.71	Inlet (Supercritical)	4

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.10	0.21	Outlet (Subcritical)	1
0.20	0.43	Outlet (Subcritical)	1
0.30	0.64	Outlet (Subcritical)	2
0.40	0.86	Inlet (Supercritical)	3
0.50	1.12	Inlet (Supercritical)	3
0.60	1.49	Inlet (Supercritical)	3
0.70	1.85	Inlet (Supercritical)	3
0.80	2.26	Inlet (Supercritical)	3
0.90	2.70	Inlet (Supercritical)	3
1.00	3.15	Inlet (Supercritical)	3
1.10	3.63	Inlet (Supercritical)	3
1.20	4.13	Inlet (Supercritical)	3
1.30	4.66	Inlet (Supercritical)	3
1.40	5.21	Inlet (Supercritical)	3
1.50	5.78	Inlet (Supercritical)	3

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.10	0.24	Outlet (Subcritical)	1
0.20	0.48	Outlet (Subcritical)	1
0.30	0.71	Outlet (Subcritical)	2
0.40	0.95	Inlet (Supercritical)	3
0.50	1.32	Inlet (Supercritical)	3
0.60	1.73	Inlet (Supercritical)	3
0.70	2.15	Inlet (Supercritical)	3
0.80	2.64	Inlet (Supercritical)	3
0.90	3.13	Inlet (Supercritical)	3
1.00	3.67	Inlet (Supercritical)	3

1.10	4.23	Inlet (Supercritical)	3
1.20	4.82	Inlet (Supercritical)	3
1.30	5.44	Inlet (Supercritical)	3
1.40	6.07	Inlet (Supercritical)	3
1.50	6.74	Inlet (Supercritical)	3

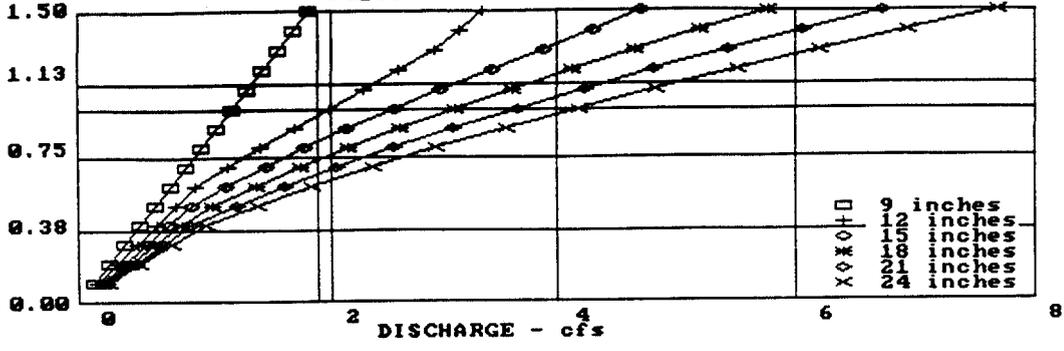
=====
Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.10	0.26	Outlet (Subcritical)	1
0.20	0.52	Outlet (Subcritical)	2
0.30	0.78	Outlet (Subcritical)	2
0.40	1.07	Inlet (Supercritical)	3
0.50	1.51	Inlet (Supercritical)	3
0.60	1.95	Inlet (Supercritical)	3
0.70	2.47	Inlet (Supercritical)	3
0.80	3.00	Inlet (Supercritical)	3
0.90	3.59	Inlet (Supercritical)	3
1.00	4.19	Inlet (Supercritical)	3
1.10	4.84	Inlet (Supercritical)	3
1.20	5.51	Inlet (Supercritical)	3
1.30	6.21	Inlet (Supercritical)	3
1.40	6.94	Inlet (Supercritical)	3
1.50	7.70	Inlet (Supercritical)	3

=====

REVISIONS

SEDCAD+ Culvert Sizing Utility Dugout Creek Project



SEDCAD+ CULVERT SIZING UTILITY

Dugout Creek Project

Design Discharge = 2.120 cfs
 Entrance Loss Coefficient = 0.7
 Pipe Length = 40.000 feet
 Pipe Slope = 1.000 %
 Manning's n = 0.015
 Maximum Headwater = 1.100 feet
 Tailwater Depth = 0.000 feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.11	0.14	Outlet (Subcritical)	1
0.22	0.27	Outlet (Subcritical)	1
0.33	0.41	Outlet (Subcritical)	2
0.44	0.54	Inlet (Supercritical)	3
0.55	0.68	Inlet (Supercritical)	3
0.66	0.81	Inlet (Supercritical)	4
0.77	0.95	Inlet	5
0.88	1.04	Inlet	5
0.99	1.11	Inlet	5
1.10	1.17	Inlet	5
1.21	1.24	Inlet	5
1.32	1.30	Inlet	5
1.43	1.37	Inlet	5
1.54	1.43	Inlet	5
1.65	1.50	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.11	0.14		0
0.22	0.28		0
0.33	0.42		0
0.44	0.56	Outlet (Subcritical)	1
0.55	0.70	Outlet (Subcritical)	1
0.66	0.84	Outlet (Subcritical)	1
0.77	0.98	Outlet (Subcritical)	1
0.88	1.12	Outlet (Subcritical)	2
0.99	1.26	Outlet (Subcritical)	2
1.10	1.41	Inlet (Supercritical)	3
1.21	1.55	Inlet (Supercritical)	4
1.32	1.69	Inlet (Supercritical)	4
1.43	1.83	Inlet	5
1.54	1.98	Outlet	6
1.65	2.06	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.11	0.18	Outlet (Subcritical)	1
0.22	0.36	Outlet (Subcritical)	1
0.33	0.54	Outlet (Subcritical)	2
0.44	0.72	Outlet (Subcritical)	2
0.55	0.90	Inlet (Supercritical)	3
0.66	1.14	Inlet (Supercritical)	3
0.77	1.44	Inlet (Supercritical)	3
0.88	1.75	Inlet (Supercritical)	3
0.99	2.06	Inlet (Supercritical)	3
1.10	2.38	Inlet (Supercritical)	4
1.21	2.71	Inlet (Supercritical)	4
1.32	3.02	Inlet	5
1.43	3.24	Inlet	5
1.54	3.46	Inlet	5
1.65	3.68	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.11	0.21	Outlet (Subcritical)	1
0.22	0.42	Outlet (Subcritical)	1
0.33	0.63	Outlet (Subcritical)	2
0.44	0.84	Inlet (Supercritical)	3
0.55	1.08	Inlet (Supercritical)	3
0.66	1.43	Inlet (Supercritical)	3
0.77	1.79	Inlet (Supercritical)	3
0.88	2.17	Inlet (Supercritical)	3
0.99	2.59	Inlet (Supercritical)	3
1.10	3.02	Inlet (Supercritical)	3
1.21	3.50	Inlet (Supercritical)	3
1.32	3.97	Inlet (Supercritical)	3
1.43	4.42	Inlet (Supercritical)	4
1.54	4.87	Inlet	5
1.65	5.27	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.11	0.24	Outlet (Subcritical)	1
0.22	0.47	Outlet (Subcritical)	1
0.33	0.71	Outlet (Subcritical)	2
0.44	0.94	Inlet (Supercritical)	3
0.55	1.31	Inlet (Supercritical)	3
0.66	1.71	Inlet (Supercritical)	3
0.77	2.13	Inlet (Supercritical)	3
0.88	2.61	Inlet (Supercritical)	3
0.99	3.10	Inlet (Supercritical)	3
1.10	3.63	Inlet (Supercritical)	3

1.21	4.19	Inlet (Supercritical)	3
1.32	4.77	Inlet (Supercritical)	3
1.43	5.38	Inlet (Supercritical)	3
1.54	6.00	Inlet (Supercritical)	3
1.65	6.66	Inlet (Supercritical)	3

=====
Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.11	0.26	Outlet (Subcritical)	1
0.22	0.52	Outlet (Subcritical)	2
0.33	0.78	Outlet (Subcritical)	2
0.44	1.08	Inlet (Supercritical)	3
0.55	1.52	Inlet (Supercritical)	3
0.66	1.97	Inlet (Supercritical)	3
0.77	2.49	Inlet (Supercritical)	3
0.88	3.03	Inlet (Supercritical)	3
0.99	3.62	Inlet (Supercritical)	3
1.10	4.23	Inlet (Supercritical)	3
1.21	4.88	Inlet (Supercritical)	3
1.32	5.56	Inlet (Supercritical)	3
1.43	6.27	Inlet (Supercritical)	3
1.54	7.00	Inlet (Supercritical)	3
1.65	7.77	Inlet (Supercritical)	3

=====

Typical Strawbale Installations
(Number of bales will vary depending on location)

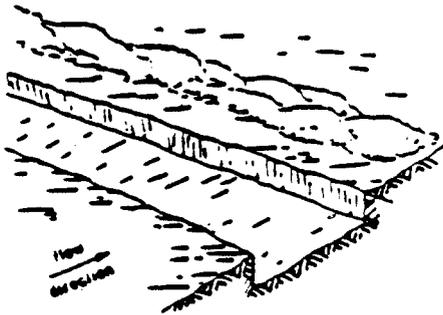


Figure 1
Excavate the trench.

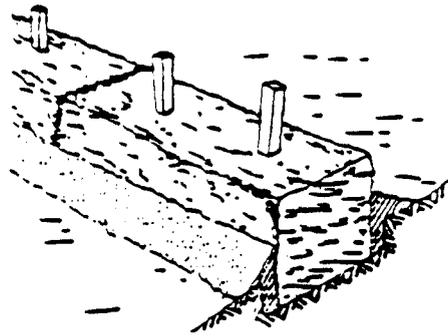


Figure 2
Backfill and compact soil.
(Metal or wooden stakes to be used
when needed.)

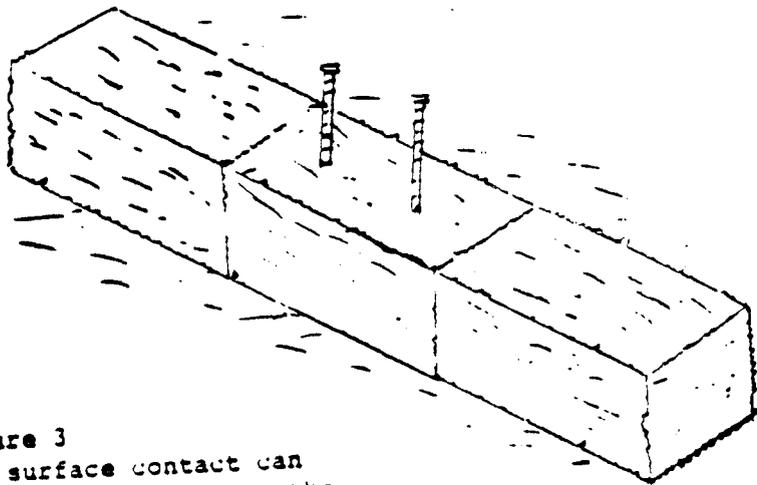
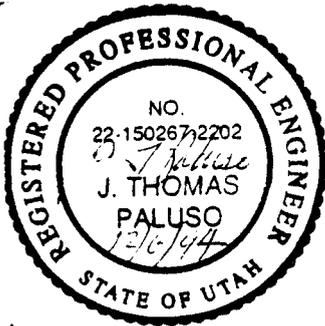


Figure 3
On areas where good surface contact can
be made, bales can be put directly on the
surface making sure ends are butted up tight.
Metal or wooden stakes to be used when needed.

Typical Silt Fence Installation

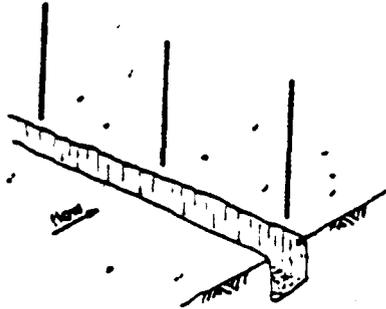


Figure 1
Set posts and excavate trench.

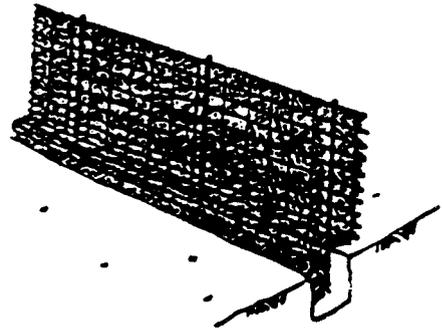


Figure 2
Attach filter fabric to posts with extension into trench as shown.

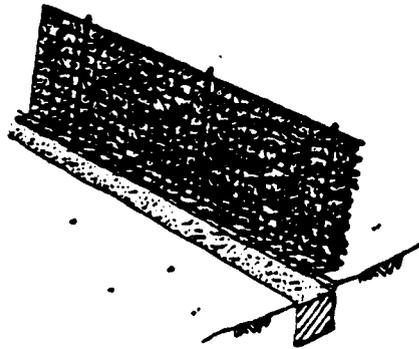
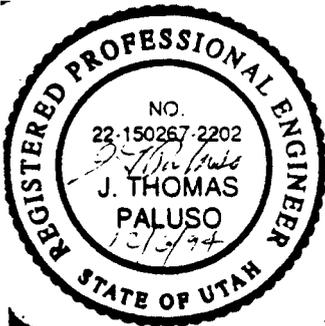


Figure 3
Backfill and compact excavated soil.



Typical water bar Installation

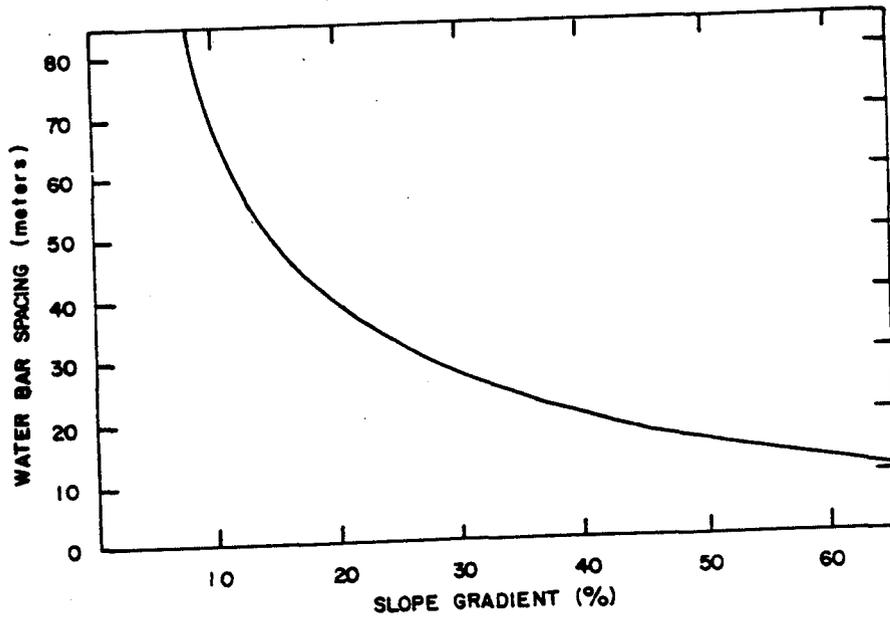
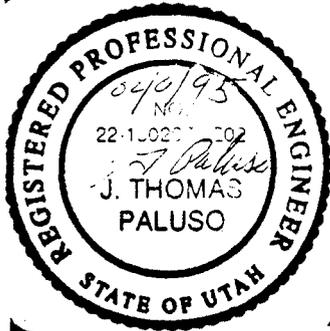
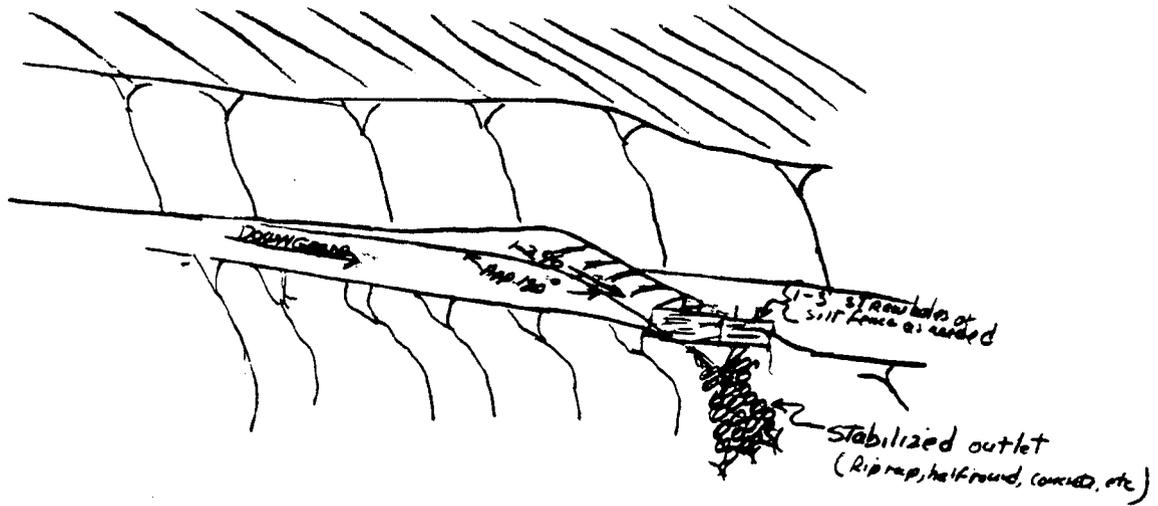


Figure 7.11. Maximum water bar spacing for various slope gradients. (adapted from White and Franks, 1978)