STATE OF COLORADO

DIVISION OF RECLAMATION, MINING AND SAFETY
Department of Natural Resources

1313 Sherman St
Denver, C
Phone: (3
FAX: (303)

M2019-018
SJM/thm

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DIVISION OF RECLAMATION MINING AND SAFETY

COLORADO DIVISION OF RECLAMATION MINING & SAFETY

CONSTRUCTION MATERIALS
REGULAR (112) OPERATION
RECLAMATION PERMIT APPLICATION FORM

CHECK ONE: ☐ **There is a File Number Already Assigned to this Operation**

Permit # M -2019018 (Please reference the file number currently assigned to this operation)

☑ **New** Application (Rule 1.4.5) ☐ **Amendment** Application (Rule 1.10)

☐ **Conversion** Application (Rule 1.11)

Permit # M -_____-_____-____ (provide for **Amendments** and **Conversions** of existing permits)

The application for a Construction Materials Regular 112 Operation Reclamation Permit contains three major parts: (1) the application form; (2) Exhibits A-S, Addendum 1, any sections of Exhibit 6.5 (Geotechnical Stability Exhibit; and (3) the application fee. When you submit your application, be sure to include one (1) complete signed and notarized **ORIGINAL** and one (1) copy of the completed application form, two (2) copies of Exhibits A-S, Addendum 1, appropriate sections of 6.5 (Geotechnical Stability Exhibit, and a check for the application fee described under Section (4) below. Exhibits should **NOT** be bound or in a 3-ring binder; maps should be folded to 8 1/2" X 11" or 8 1/2" X 14" size. To expedite processing, please provide the information in the format and order described in this form.

GENERAL OPERATION INFORMATION

Type or print clearly, in the space provided, ALL information requested below.

1. **Applicant/operator or company name (name to be used on permit)**: J Graff Enterprises, LLC
   - 1.1 Type of organization (corporation, partnership, etc.): Limited liability corporation

2. **Operation name (pit, mine or site name)**: Best Rock Sand & Gravel Pit 1

3. **Permitted acreage (new or existing site)**: 256.2 permitted acres
   - 3.1 Change in acreage (+) _____ acres
   - 3.2 Total acreage in Permit area _____ acres

4. **Fees**:

4.1	New Application	$2,696.00 application fee
4.2	New Quarry Application	$3,342.00 quarry application
4.4	Amendment Fee	$2,229.00 amendment fee
4.5	Conversion to 112 operation (set by statute)	$2,696.00 conversion fee

5. **Primary commoditie(s) to be mined**: sand gravel _____ _____ _____
   - 5.1 Incidental commoditie(s) to be mined: 1. _____ - _____ lbs/Tons/yr 2. _____ / _____ lbs/Tons/yr
     3. _____ / _____ lbs/Tons/yr 4. _____ / _____ lbs/Tons/yr 5. _____ / _____ lbs/Tons/yr
   - 5.2 Anticipated end use of primary commoditie(s) to be mined: _____
   - 5.3 Anticipated end use of incidental commoditie(s) to be mined: _____

6. **Name of owner of subsurface rights of affected land**: refer to Exhibit O
   If 2 or more owners, "refer to Exhibit O".

7. **Name of owner of surface of affected land**: refer to Exhibit O

8. **Type of mining operation**: ☑ Surface ☐ Underground

9. **Location Information**: The center of the area where the majority of mining will occur:

   COUNTY: Delta

   PRINCIPAL MERIDIAN (check one): ☑ 6th (Colorado) ☐ 10th (New Mexico) ☐ Ute

   SECTION (write number): S 14

   TOWNSHIP (write number and check direction): T 15 ☐ North ☑ South

   RANGE (write number and check direction): R 96 ☐ East ☑ West

   QUARTER SECTION (check one): ☐ NE ☑ NW ☐ SE ☐ SW

   QUARTER/QUARTER SECTION (check one): ☑ NE ☐ NW ☐ SE ☐ SW

   GENERAL DESCRIPTION: (the number of miles and direction from the nearest town and the approximate elevation):
   Half a mile west of Delta, CO at an elevation of roughly 4920'

10. **Primary Mine Entrance Location** (report in either Latitude/Longitude **OR** UTM):

    Latitude/Longitude:

    Example: (N) 39° 44′ 12.98″
    (W) 104° 59′ 3.87″

    Latitude (N): deg _____ min _____ sec ____._____ (2 decimal places)

    Longitude (W): deg _____ min _____ sec ____._____ (2 decimal places)

    OR

    Example: (N) 39.73691°
    (W) -104.98449°

    Latitude (N) 38 . 74592 (5 decimal places)

    Longitude(W) 108 . 08686 (5 decimal places)

    OR

    Universal Tranverse Mercator (UTM)

    Example: 201336.3 E NAD27 Zone 13
    4398351.2 N

    UTM Datum (specify NAD27, NAD83 or WGS 84) Nad 83 Zone 13

    Easting _____

    Northing _____

11. **Correspondence Information**:

APPLICANT/OPERATOR (name, address, and phone of name to be used on permit)

Contact's Name: **Jard Graff** Title: President

Company Name: J Graff Enterprises, LLC

Street/P.O. Box: 6454 Graff Road P.O. Box: _____

City: Delta

State: CO Zip Code: 81416

Telephone Number: (970) - 201-3250

Fax Number: (_____) - _____

PERMITTING CONTACT (if different from applicant/operator above)

Contact's Name: Ben Langenfeld Title: Manager

Company Name: Greg Lewicki and Associates

Street/P.O. Box: 3375 W Powers Circle P.O. Box: _____

City: Littleton

State: CO Zip Code: 80123

Telephone Number: (720) - 842-5321

Fax Number: (_____) - _____

INSPECTION CONTACT

Contact's Name: Jard Graff Title: President

Company Name: J Graff Enterprises, LLC

Street/P.O. Box: 6454 Graff Road P.O. Box: _____

City: Delta

State: CO Zip Code: 81416

Telephone Number: (970) - 201-3250

Fax Number: (_____) - _____

CC: STATE OR FEDERAL LANDOWNER (if any)

Agency: _____

Street: _____

City: _____

State: _____ Zip Code: _____

Telephone Number: (_____) - _____

CC: STATE OR FEDERAL LANDOWNER (if any)

Agency: _____

Street: _____

City: _____

State: _____ Zip Code: _____

Telephone Number: (_____) - _____

12. **Primary future (Post-mining) land use (check one)**:

- [ ] Cropland(CR)
- [ ] Pastureland(PL)
- [x] General Agriculture(GA)
- [ ] Rangeland(RL)
- [ ] Forestry(FR)
- [ ] Wildlife Habitat(WL)
- [ ] Residential(RS)
- [ ] Recreation(RC)
- [ ] Industrial/Commercial(IC)
- [ ] Developed Water Resources(WR)
- [ ] Solid Waste Disposal(WD)

13. **Primary present land use (check one)**:

- [x] Cropland(CR)
- [ ] Pastureland(PL)
- [ ] General Agriculture(GA)
- [ ] Rangeland(RL)
- [ ] Forestry(FR)
- [ ] Wildlife Habitat(WL)
- [ ] Residential(RS)
- [ ] Recreation(RC)
- [ ] Industrial/Commercial(IC)
- [ ] Developed Water Resources(WR)

14. **Method of Mining**: Briefly explain mining method (e.g. truck/shovel): Excavation of sand and gravel via truck and shovel.

15. **On Site Processing**: [x] Crushing/Screening

13.1 Briefly explain mining method (e.g. truck/shovel): Excavation of sand and gravel via truck and shovel.

List any designated chemicals or acid-producing materials to be used or stored within permit area: N/A

16. **Description of Amendment or Conversion**:

If you are amending or converting an existing operation, provide a brief narrative describing the proposed change(s).

Maps and Exhibits:

Two (2) complete, unbound application packages must be submitted. One complete application package consists of a signed application form and the set of maps and exhibits referenced below as Exhibits A-S, Addendum 1, and the Geotechnical Stability Exhibit. Each exhibit within the application must be presented as a separate section. Begin each exhibit on a new page. Pages should be numbered consecutively for ease of reference. If separate documents are used as appendices, please reference these by name in the exhibit.

With each of the two (2) signed application forms, you must submit a corresponding set of the maps and exhibits as described in the following references to Rule 6.4, 6.5, and 1.6.2(1)(b):

EXHIBIT A	Legal Description
EXHIBIT B	Index Map
EXHIBIT C	Pre-Mining and Mining Plan Map(s) of Affected Lands
EXHIBIT D	Mining Plan
EXHIBIT E	Reclamation Plan
EXHIBIT F	Reclamation Plan Map
EXHIBIT G	Water Information
EXHIBIT H	Wildlife Information
EXHIBIT I	Soils Information
EXHIBIT J	Vegetation Information
EXHIBIT K	Climate Information
EXHIBIT L	Reclamation Costs
EXHIBIT M	Other Permits and Licenses
EXHIBIT N	Source of Legal Right-To-Enter
EXHIBIT O	Owners of Record of Affected Land (Surface Area) and Owners of Substance to be Mined
EXHIBIT P	Municipalities Within Two Miles
EXHIBIT Q	Proof of Mailing of Notices to County Commissioners and Conservation District
EXHIBIT R	Proof of Filing with County Clerk or Recorder
EXHIBIT S	Permanent Man-Made Structures
Rule 1.6.2(1)(b)	ADDENDUM 1 - Notice Requirements (sample enclosed)
Rule 6.5	Geotechnical Stability Exhibit (any required sections)

The instructions for preparing Exhibits A-S, Addendum 1, and Geotechnical Stability Exhibit are specified under Rule 6.4 and 6.5 and Rule 1.6.2(1)(b) of the Rules and Regulations. If you have any questions on preparing the Exhibits or content of the information required, or would like to schedule a pre-application meeting you may contact the Office at 303-866-3567.

Responsibilities as a Permittee:

Upon application approval and permit issuance, this application becomes a legally binding document. Therefore, there are a number of important requirements which you, as a permittee, should fully understand. These requirements are listed below. Please read and initial each requirement, in the space provided, to acknowledge that you understand your obligations. If you do not understand these obligations then please contact this Office for a full explanation.

1. Your obligation to reclaim the site is not limited to the amount of the financial warranty. You assume legal liability for all reasonable expenses which the Board or the Office may incur to reclaim the affected lands associated with your mining operation in the event your permit is revoked and financial warranty is forfeited;

2. The Board may suspend or revoke this permit, or assess a civil penalty, upon a finding that the permittee violated the terms or conditions of this permit, the Act, the Mineral Rules and Regulations, or that information contained in the application or your permit misrepresent important material facts;

3. If your mining and reclamation operations affect areas beyond the boundaries of an approved permit boundary, substantial civil penalties, to you as permittee can result;

4. Any modification to the approved mining and reclamation plan from those described in your approved application requires you to submit a permit modification and obtain approval from the Board or Office;

5. It is your responsibility to notify the Office of any changes in your address or phone number;

6. Upon permit issuance and prior to beginning on-site mining activity, you must post a sign at the entrance of the mine site, which shall be clearly visible from the access road, with the following information (Rule 3.1.12):

   a. the name of the operator;

   b. a statement that a reclamation permit for the operation has been issued by the Colorado Mined Land Reclamation Board; and,

   c. the permit number.

7. The boundaries of the permit boundary area must be marked by monuments or other markers that are clearly visible and adequate to delineate such boundaries prior to site disturbance.

8. It is a provision of this permit that the operations will be conducted in accordance with the terms and conditions listed in your application, as well as with the provisions of the Act and the Construction Material Rules and Regulations in effect at the time the permit is issued.

9. Annually, on the anniversary date of permit issuance, you must submit an annual fee as specified by Statute, and an annual report which includes a map describing the acreage affected and the acreage reclaimed to date (if there are changes from the previous year), any monitoring required by the Reclamation Plan to be submitted annually on the anniversary date of the permit approval. Annual fees are for the previous year a permit is held. For example, a permit with the anniversary date of July 1, 1995, the annual fee is for the period of July 1, 1994 through June 30, 1995. Failure to submit your annual fee and report by the permit anniversary date may result in a civil penalty, revocation of your permit, and forfeiture of your financial warranty. It is your responsibility, as the permittee, to continue to pay your annual fee to the Office until the Board releases you from your total reclamation responsibility.

10. <u>For joint venture/partnership operators</u>: the signing representative is authorized to sign this document and a power of attorney (provided by the partner(s)) authorizing the signature of the representative is attached to this application.

NOTE TO COMMENTORS/OBJECTORS:

It is likely there will be additions, changes, and deletions to this document prior to final decision by the Office. Therefore, if you have any comments or concerns you must contact the applicant or the Office prior to the decision date so that you will know what changes may have been made to the application document.

The Office is not allowed to consider comments, unless they are written, and received prior to the end of the public comment period. You should contact the applicant for the final date of the public comment period.

If you have questions about the Mined Land Reclamation Board and Office's review and decision or appeals process, you may contact the Office at (303) 866-3567.

Certification:

As an authorized representative of the applicant, I hereby certify that the operation described has met the minimum requirements of the following terms and conditions:

1. To the best of my knowledge, all significant, valuable and permanent man-made structure(s) in existence at the time this application is filed, and located within 200 feet of the proposed affected area have been identified in this application (Section 34-32.5-115(4)(e), C.R.S.).

2. No mining operation will be located on lands where such operations are prohibited by law (Section 34-32.5-115(4)(f), C.R.S.;

3. As the applicant/operator, I do not have any extraction/exploration operations in the State of Colorado currently in violation of the provisions of the Colorado Land Reclamation Act for the Extraction of Construction Materials (Section 34-32.5-120, C.R.S.) as determined through a Board finding.

4. I understand that statements in the application are being made under penalty of perjury and that false statements made herein are punishable as a Class 1 misdemeanor pursuant to Section 18-8-503, C.R.S.

This form has been approved by the Mined Land Reclamation Board pursuant to section 34-32.5-112,C.R.S., of the Colorado Land Reclamation Act for the Extraction of Construction Materials. Any alteration or modification of this form shall result in voiding any permit issued on the altered or modified form and subject the operator to cease and desist orders and civil penalties for operating without a permit pursuant to section 34-32.5-123, C.R.S.

Signed and dated this 26th day of March, 2019.

J Graff Enterprises LLC
Applicant/Operator or Company Name

If Corporation Attest (Seal)

Signed: _____

Title: President

Signed: _____
Corporate Secretary or Equivalent
Town/City/County Clerk

State of Colorado)
) ss.
County of Delta)

The foregoing instrument was acknowledged before me this 26th day of March, 2019 by Jared Graff as President of J. Graff Enterprises LLC

BRENDA SLAGG
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID #19944013509
My Commission Expires August 22, 2022

Brenda Slagg
Notary Public

My Commission expires: 8/22/2022

SIGNATURES MUST BE IN BLUE INK

You must post sufficient Notices at the location of the proposed mine site to clearly identify the site as the location of a

Business Database Search

- No results found for the specified name.

Business paper documents processed through: 04/08/2019

Search by business name, trademark, trade name, ID or document number

J Graff Enterprises, LLC

More search options

- Name availability search
- Advanced search
- Business survey information search
- Trademark advanced search

Search Back

BRS&G Pit 1

March, 2019

112(c) Application to the Colorado Division of Reclamation, Mining, and Safety

By:

J Graff Enterprises, LLC

Represented by:

Greg Lewicki And Associates, PLLC

3375 W. Powers Circle
Littleton, CO 80123

Phone: (720) 842-5321
E-mail: info@lewicki.biz

Fax (303) 346-6934

TABLE OF CONTENTS

Introduction

The Best Rock Sand and Gravel Pit 1 (BRS&G Pit 1) is located approximately 0.5 miles west of Delta, CO in Delta County. The permit covers an area of 256.2 acres. It is located at the confluence of the Gunnison and Uncompaghre River. Currently it is a set of farm fields and associated irrigation ditches. The pre mine land use is cropland.

The operator and permittee will be J Graff Enterprises, LLC, also known as Graff.

The permit area for this operation is 256.2 acres.

EXHIBIT A LEGAL DESCRIPTION

The site is approximately 0.5 miles west of Delta, CO, on the immediate western edge of the city limits. The property is bounded by the North Fork of the Gunnison River, the Uncompaghre River, and the Union Pacific Railroad. A legal description is shown on Map C-1 which is included in Appendix 2. A general location map is enclosed as Map B-1.

The total permit and affected area is 256.2 acres.

1. Legal Description

A tract of land located within Section 11, 14, Township 15 South, Range 96 West of the 6th Principal Meridian, County of Delta, State of Colorado and being more particularly described as follows:

With the north line of Section 14, being N 88°17'44" W, as a basis of bearing.

From the northwest corner of Section 14, S 89°05'40" E a distance of 1586.4', to the point of beginning:

thence S 88°06'17" E a distance of 378.2';
thence N 73°04'40" E a distance of 591.7';
thence S 87°46'47" E a distance of 381.5';
thence S 64°34'04" E a distance of 468.2';
thence S 89°41'38" E a distance of 274.6';
thence S 19°47'24" E a distance of 915.0';
thence S 18°52'08" E a distance of 40.4';
thence S 18°52'08" E a distance of 736.1';
thence S 32°37'22" E a distance of 90.5';
thence S 31°34'57" E a distance of 572.9';
thence S 31°41'02" E a distance of 626.7';
thence S 34°35'41" E a distance of 558.3';
thence S 25°34'41" E a distance of 720.1';
thence S 82°38'40" W a distance of 127.5';
thence S 65°52'09" W a distance of 60.6';
thence S 62°30'56" W a distance of 53.7';
thence S 82°58'37" W a distance of 139.3';
thence S 89°36'35" W a distance of 227.3';
thence N 79°51'40" W a distance of 96.7';
thence N 78°43'55" W a distance of 134.7';
thence N 69°53'03" W a distance of 575.3';
thence N 07°19'38" W a distance of 59.0';

thence N 31°20'00" W a distance of 50.0';
thence N 54°23'28" W a distance of 45.0';
thence N 68°55'27" W a distance of 70.2';
thence N 73°17'28" W a distance of 415.3';
thence N 68°42'27" W a distance of 77.5';
thence N 60°19'00" W a distance of 160.7';
thence S 65°17'27" W a distance of 48.8';
thence S 31°51'38" W a distance of 59.9';
thence N 67°20'16" W a distance of 379.4';
thence N 69°01'23" W a distance of 687.5';
thence N 68°53'33" W a distance of 773.7';
thence N 68°56'14" W a distance of 665.2';
thence N 76°42'13" W a distance of 558.6';
thence N 79°24'50" W a distance of 460.3';
thence N 01°53'40" W a distance of 18.1';
thence N 83°56'37" E a distance of 68.8';
thence N 45°34'50" E a distance of 120.9';
thence N 52°50'48" E a distance of 277.9';
thence N 04°54'02" W a distance of 49.2';
thence N 25°37'39" E a distance of 61.0';
thence N 43°17'29" E a distance of 181.1';
thence N 24°41'29" E a distance of 27.3';
thence N 29°26'48" E a distance of 153.9';
thence N 34°11'21" E a distance of 229.5';
thence N 47°02'32" E a distance of 172.1';
thence S 87°57'44" E a distance of 267.2';
thence S 88°53'00" E a distance of 168.5';
thence N 01°46'19" E a distance of 499.7';
thence N 90°00'00" E a distance of 6.8';
thence N 42°48'17" E a distance of 27.2';
thence N 01°28'34" E a distance of 75.2';
thence N 00°00'00" W a distance of 94.7';
thence N 10°02'48" E a distance of 55.5';
thence N 25°56'44" E a distance of 623.7';
having an area of 256.2 acres

EXHIBIT B **LOCATION MAP**

*all small maps

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DIVISION OF RECLAMATION
MINING AND SAFETY

EXHIBIT C PREMINE AND MINE PLAN MAPS

Map C-1 Current Conditions

Map C-2 Mine Plan

Map C-3 Cross Sections

All maps can be found in Appendix 2.

EXHIBIT D MINING PLAN

1. General Mining Plan

The permit and property boundary will be surveyed prior to any site disturbance. Map C-2 shows the mining plan.

The gravel zone is approximately 30 feet thick in an alluvial deposit and is overlain by soil and overburden ranging from 4 to 6 feet. The underlying geological layer is the Mancos Shale which underlies all alluvium in this valley. Therefore, no excavation will come within two feet of the shale. If any shale is exposed, it will be buried under two feet of backfill, and that depth will be the new pit floor. In general, the area will be mined by first excavating soil/overburden with front end loaders which will take that material to be used to backfill the slopes of mined out areas to a 3H:1V slope as shown on Map F-1. The raw gravel material will then be loaded into a crusher/screen plant where various sizes of product will be made and placed in separate stockpiles. Dozers may also be used to move topsoil/overburden or gravel. Mining activities are expected to occur approximately 3 to 5 months per year, while the processing operations including screening/crushing and washing can occur any time of the year. Mining will proceed from Area 1 to Area 5 in the West Pit to Area 6 to Area 10 in the East Pit, as shown on Map C-2. The mining of the deposit will occur to the limits shown on Map C-2 and will be mined to a slope no steeper than 2H:1V in order to maximize gravel recovery. Backfilling with overburden will create the shallower reclaimed slopes.

J Graff Enterprises, LLC mines using a 0.5H:1V to near vertical slope on the active mining face. Highwall mining will progress to an offset line from the crest line, which marks the mid-slope of the 2H:1V mining slope. Both boundaries will be staked prior to mining in the area. This offset serves two purposes. First, the volume of material left in the highwall will allow the crest to be pushed towards the toe with the final mining slope of 2H:1V, which will maximize gravel recovery and additionally will reduce the required backfill material to bring the slopes to 3H:1V. Secondly, this offset provides additional slope safety. A failure would be governed by the internal angle of friction of the material. This would limit the failed slope to an angle of 38 degrees or ~1.3H:1V. This failure would not only stay within the permit area, it would stay within the final slope envelope. Such a failure is unlikely given that only the active slope is near vertical.

Roughly 200,000 tons of material is planned to be mined per year. The raw material will be sold as various products: crushed rock, chips, road base, concrete, and asphalt. A breakdown of the mined tonnages can be seen in **Table D-1**. A breakdown of the estimated areas is included in **Table D-2.** Both topsoil and overburden may be sold onsite on an as needed basis, however Graff commits to keeping enough material onsite to be able to reclaim the site. The amounts of topsoil and overburden sold are incidental commodities and are not therefore included in the table below or the annual tonnage sold from the site.

Each pit serves as a sediment pond for the operations that take place in it. Pit dewatering will be conducted using a pump located at least two feet below the operating floor, in order to intercept water before it can pick up sediment from the pit. A gravel berm around the pump will also help ensure that the discharge from pit dewatering is clean. The West Pit will then pump to a discharge point on the west end of the property that drains to the Gunnison River. The East Pit will be pumped into the West Pit, as the West Pit will become a lake once it is mined out. This will allow the entire operation to use the same NPDES discharge points on the west side throughout the life of the operation. Further details may be found in Exhibit G.

Clean water from dewatering will be used during mining in order to water trees and other vegetation around the pits that would otherwise be negatively affected by the lowered water table.

The wash plant which will be used onsite will consist of a system to handle sediment from the washing operation. This system will consist of two settling ponds. Water will be pumped from the ponds to the plant. Removal of settled material will be conducted as necessary and the settled material will be dried and used for fill where necessary or placed on the bottom of the pit.

Mining will progress through the areas numerically. The topsoil and overburden from a new area will be used to reclaim the previous are. This will reduce material moving as well as reduce the maximum area to be reclaimed. Any fines from the crushing/screening operation and removed from the settling pond will also be salvaged and used in the reclamation. A table of expected mining lives for each Pit is included in **Table D-1**. The life of each pit is based on the anticipated annual <u>average</u> tonnage.

No explosives will be used in conjunction with the mining and reclamation operation.

2. Mining Timetable

The following timetable is a best estimate of the sequence of operations for the life of the mine after May 2019 and is based on mining and selling 200,000 tons of total product per year:

Table D-1 Mining Timetable

Area	Mining Time		Material Quantity	
1	**3.9**	**Years**	**780,000**	**Tons**
2	3.3	Years	660,000	Tons
3	**3.6**	**Years**	**720,000**	**Tons**
4	5.2	Years	1,030,000	Tons
5	**4.9**	**Years**	**970,000**	**Tons**
West Pit Subtotal	*20.8*	*Years*	*4,160,000*	*Tons*
6	**2.7**	**Years**	**540,000**	**Tons**
7	5.1	Years	1,030,000	Tons
8	**6.4**	**Years**	**1,270,000**	**Tons**
9	7.1	Years	1,430,000	Tons
10	**8.3**	**Years**	**1,670,000**	**Tons**
East Pit Subtotal	*29.7*	*Years*	*5,930,000*	*Tons*
Total	**50.5**	**Years**	**10,090,000**	**Tons**

The mining schedule is planned to minimize disturbance by reclaiming areas as additional mining is undertaken. If large contracts are awarded to the site, production could increase, thereby curtailing the life of the pit. On the other hand, if contracts are less than anticipated, the life of the pit could be extended. This table is based on a reasonable projection of production rates.

3. Mine Facilities and Operation

The site will contain the following facilities; it is noted where applicable whether or not the facility is portable and whether it will have any fuel storage associated with it. A summary of equipment and related tanks is shown below.

- A portable asphalt plant with associated tanks
- A concrete plant with associated tanks

- Truck scales
- Mine office
- A portable crusher with associated tanks
- A portable wash plant with associated tanks
- Off-road diesel tanks (fuel farm)

The following list is the best estimate as to the mobile equipment which will be used onsite throughout the mine life:

- 2-3 Front end loaders
- 1 D-8 Bulldozer
- 1 40G Motor grader
- 1 4000 gallon water truck
- Volvo off road haul trucks (number will depend upon production needs)
- 15 and 24 ton on-road haul trucks (number will depend upon production needs)

All fuel tanks will have secondary containment. Some are double walled, others will be located within bermed or lined areas that have over 110% of the volume of the largest stored tank. All such tanks will be kept at the fuel farm as shown on Map C-2. A Spill Prevention, Control, and Countermeasure plan will be in-place onsite for all fuel tanks.

No night mining activity is scheduled for the operation; however portable lighting may be used within the pit from time to time. The portable lights will only be used at the bottom of the pit for the purpose of after hour equipment maintenance. Portable toilets will be used for employees and be located above the static water table in case of pump failure. Bottled water will be brought onsite for all employees. All mining structures on site are shown on Map C-2. The portable mining equipment such as loaders, dozers, trucks and excavators will be serviced on an as-needed basis onsite. Upon reclamation, all portable equipment will be removed from the site.

There will be no new fence around the operation, since it is inside private property. No problems are expected with vandalism. It is extremely unlikely that any toxic or acid-producing materials will be encountered during the mining operation since exploration shows that the material is alluvial in nature. However, in the event that any such toxic materials are encountered, they will

be covered with subsoil and topsoil from the stockpiles to the same depths outlined in the reclamation plan and no more mining will occur in this area.

The operator commits to clearly marking the permit boundary with stakes surveyed on site.

The site will use all existing roads to haul the product to its final destination. It is planned that the material may be used to re-surface existing roads, make concrete aggregate or provide new road base for any new roads within an economic distance to the site.

Several hazardous materials will be stored and used onsite throughout the project. These materials include products which are associated with diesel motors, and products associated with asphalt and concrete production. All such materials will be stored in a safe manner consistent with the site's Spill Prevention, Control, and Countermeasure Plan.

4. Topsoil and Overburden Handling

Topsoil ranges from 4 to 22 inches thick on site, 13 inches is the anticipated average. Overburden is anticipated to be 4-6 feet thick based on landowner experience. Both topsoil and overburden are used on site for reclamation of mined out areas. In the event that Graff needs to store topsoil or overburden in a berm, it will store this material within the active pit area. Any topsoil or overburden stockpile that is to be in place longer than 90 days will be vegetated to prevent wind erosion. Anticipated topsoil and overburden quantities are shown in Table D-2. These are estimates based on soil survey data and the landowner's experience with their property.

Table D-2 Estimated Topsoil and Overburden Quantities

Pit	Topsoil	Overburden
West	**113000 CY**	**569000 CY**
East	140500 CY	705000 CY
Total	**253,500 CY**	**1,274,000 CY**

5. Water Information, Rights and Augmentation

All water rights issues such as availability of water for this operation, consumption rates, dust control, etc. is presented in Exhibit G - Water Information.

6. Schedule of Operations

Mining operations will only occur as dictated by demand up to the maximum rates described earlier in the mine plan. Mining, screening and processing will be conducted with portable equipment at various times of the year. Product will be sold from this activity throughout the year, although little is expected to be sold in winter months. The operator will not have night gravel mining operations, although minor truck activity or repairs may occur after hours. Hours of operation will reflect those approved in any local permits.

7. Delta County Impacts and Environmental Impacts

The impacts to Delta County will be limited. Noise and traffic will be mitigated by best management practices and requirements in the local use permit.

EXHIBIT E RECLAMATION PLAN

1. General Reclamation Plan

The total permit area is 256.2 acres. The post-mining land use for the BRS&G Pit 1 will be lakes with surrounding dryland fields. The rough breakdown of these areas can be seen below:

Table E-1 Reclaimed Areas

Post Mine Land Use	Area (acres)
Fields	12.1
Lakes	145.2
Roads	3.0
Undisturbed	95.9
Total Permit	256.2

As described in the mining plan, reclamation will occur concurrently with mining. Topsoil and overburden from the current mining area will be used to reclaim the mined out areas. Topsoil will be replaced on all graded areas except those areas that are at least 10 feet below expected water level. By doing this the distance that the topsoil and overburden will have to be transported as well as the amount of material which will have to be rehandled will be minimized. Additionally, the acreage which is unreclaimed will be minimized, which will make the worst case reclamation smaller and thus, the bond will be smaller. The existing irrigated crop fields will be maintained until it is time to mine them.

All reclamation slopes will be 3H:1V or shallower. No more than 2000' of highwall will remain unbackfilled at any time.

The access to the site will remain following mining and reclamation as it is the only property access. Internal roads that are used by the farming operation will remain as well, if undisturbed by mining.

2. Reclamation Timetable

The time for reclamation is shown below. Exhibit L: Reclamation Costs describes the worst case bond scenario.

Table E-2 Reclamation Timetable

Task	Description	Reclamation Time	
1	**Install access improvements**	**0.1**	**Years**
2	Mine Area 1	3.9	Years
3	**Mine Areas 2-10 while reclaiming each previous area as mining progresses.**	**46.6**	**Years**
4	Reclaim Area 10 and remove all facilities and plants.	0.3	Years
	Revegetate facilities area.	**0.2**	**Years**
Total		51.1	Years

3. Revegetation Plan

For all revegetation areas, the soil will be disced to loosen the soil. Due to the mild grade, seed can be drilled. All will be seeded with the mix listed below. Certified weed free mulch will be crimped into the surface at 2000 lbs per acre. Heavy furrows will be left in the tilled topsoil to provide moisture concentration and shade areas in order to promote better conditions for successful vegetation establishment. Seeding will take place the fall after which a slope has been retopsoiled. Slopes will be regraded, backfilled, and retopsoiled as soon as they are able to be reclaimed. Revegetation will take place to a point 10 feet below the anticipated water level of the lakes.

3.1 Dryland Seed Mix

Species	Pounds of pure live seed per acre
Four Wing Saltbush	0.25
Rabbitbrush	0.25
Skunkbush Sumac	0.25
Yellow Sweetclover	1.5
Fairway Wheatgrass	1.5
Thickspike Wheatgrass	3
Streambank Wheatgrass	3
Total	**9.8**

4. Post-Reclamation Site Drainage

Map F-1 shows arrows indicating the approximate direction of drainage throughout the pit. The creation of lakes will reduce the amount of surface runoff that leaves the site. Most areas around the lakes will drain to them.

5. Weed Control

Measures will be employed for the control of any noxious weed species. The objective of this weed management plan is to control undesirable plants on the BRS&G Pit 1 property. Plants identified through the Colorado Noxious Weed Act (C.R.S. 35-5.5) and the Delta County Noxious Weed List as undesirable and designated for management within the county will be removed. These plants identified as noxious weeds will be managed by control measures. A Weed Control Plan will be utilized as follows:

1) Each April, a weed survey will be taken of the permit area.

2) If any patches or plants have been identified, they will be sprayed by backpack sprayer or 4-wheeler using chemicals approved for use by the weed control staff of Delta County.

3) After reclamation, weed surveys and spraying will continue until the perennial cover and production of the site have met DRMS requirements and bond release has been obtained.

The Division and Delta County staff will be consulted regarding any weed infestation areas and any control measures prior to their initiation. Weeds tend to provide shade for new grasses, are a means of holding snow on the seedbed longer and protecting it from wind and water erosion until the planted species have taken hold.

During all phases of the mining operation the permit area will be monitored closely every year, through which the operator may determine if any additional weeds have grown. If any new species of weeds are found, Delta County and the Division will be consulted in order to formulate the best plan for the new infestation.

6. Revegetation Success Criteria

Revegetation success will be deemed adequate when the dryland vegetation has been established in order to control erosion and noxious weeds are not present in any significant amounts and all of the conditions of Rule 3.1.10 have been met.

7. Land Use Plans

No state land use plans are in place for this property. Local land use plans will be address with the Delta County Specific Development Permit.

8. Monitoring Reclamation Success

Monitoring the reclamation on an ongoing basis will allow minor revisions to assure successful reclamation. The operator plans to use the local NRCS office to assist in determining the ability of the reclaimed land to control erosion. If minor changes or modifications are needed to the seeding and reclamation plan, revision plans will be submitted to the Division as required. It is hoped that the Division will provide assistance in evaluating the success of the ongoing reclamation process. All areas disturbed and reclaimed and any other important items regarding the reclamation will be submitted in the annual reports to the Division

EXHIBIT F RECLAMATION MAPS

Map F-1 Reclamation Plan

All maps can be found in Appendix 2.

EXHIBIT G WATER INFORMATION

1. General

Prior to mining the site was a mixture of alfalfa and corn fields. Some portions of the property outside the mining area have naturally occurring oxbows and other low topography that facilitate riparian habitats. The ground water is within six feet of the surface. Surface water flows on the property are bound by the various irrigation ditches for the crop fields. The North Fork of the Gunnison River runs along the north and west sides of the property, over 200 feet away. The Uncompaghre River runs along the east side of the property, also over 200 feet away.

The two principal ways that the gravel pit could affect the water quality of the area downstream are a) through poor sediment control within the site causing increased sedimentation downstream, and b) by fuel leakage from a ruptured tank. All activity that can generate sediment will take place in areas that drain to either sediment ponds or gravel filter berms. The vast majority of the operation will take place in the dewatered pit, allowing the entire pit to act as a large sediment pond. Fuel leakage is also not a problem since all fuel tanks on site will have secondary containment as well as strict SPCC Plan procedures for spill prevention and control.

According to searches on the Division of Water Resources database, there are no wells within 600 feet of the mining pits. Map C-1 shows the nearest wells.

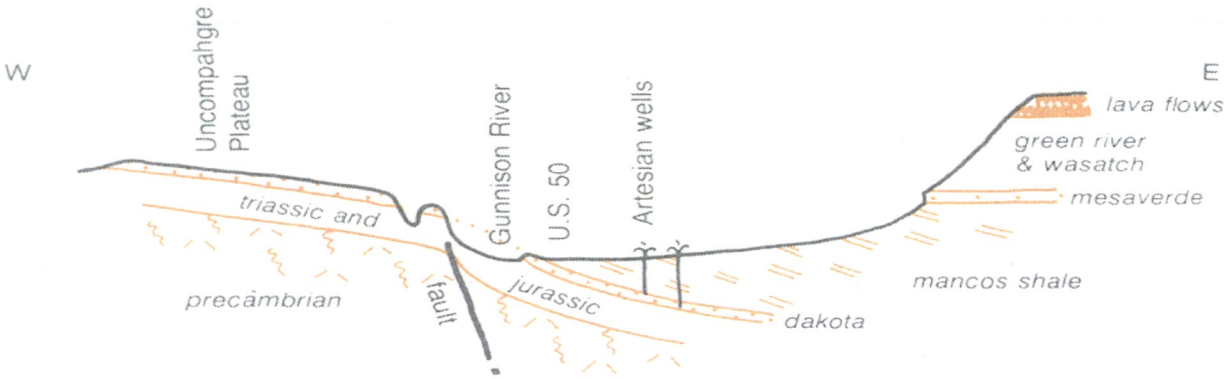
A CDPHE discharge permit will be necessary for the dewatering of the mining pits.

2. Groundwater

The site will mine a sand and gravel deposit which is an alluvial from the recent period of Quaternary age formed on a bend of the Gunnison River. The alluvium is relatively shallow (averaging 30 feet thick in this region) and is underlain by Mancos Shale. The Gunnison River itself is actually cutting in the Morrison Formation, which is also known for its purple and green shales. Figure 1 below shows an example cross section of the regional geology.

Figure 1 – Cross Section of Regional Geology

This geology causes the groundwater level to be very close to the surface. Water is expected to be



encountered 4 to 6' below the surface. While the pit is being pumped down the water table will drop, but after reclamation this level is expected to return. The quality of the water is similar to the Gunnison River at this point. A substitute water supply plan will be in place to cover out of priority depletions during mining, with a permanent plan for augmentation eventually put in place for the permanent lakes. A gravel well permit will be necessary for the dewatering operations and lakes.

Ground water quality is protected by dewatering below the operational floor in all of the pits, in addition to gravel filter berms around the pumps. During the mining of the east pit (Areas 6-10), groundwater from said pit will be pumped to the west pit, which will act as a large-scale sediment pond. All dewatering water will discharge through an approved NPDES before flowing to local waterways.

3. Water Consumption for the Operation and Water Rights

A Gravel Well Permit will be needed for the mining of the BRS&G Pit 1. Susbstitute Water Supply Plans and an Augmentation Plan will also be necessary. The landowner owns significant water rights for irrigating the fields on their property, and as the fields are mined out the irrigation water will be converted to augmentation water to cover the reclaimed lakes.

3.1 Depletions

Two scenarios exist for depletions:

3.1.1 During Mining

During the mining phase, losses will occur in three areas:

Depletions for moisture lost in the mined material has been calculated to be 4% of the material mined below the water surface level. It is estimated that 200,000 tons of material will be mined below the water table per year. It has been calculated that moisture will be lost in the mined material in the amount of 5.9 acre-feet per year.

Depletions for gravel washing operations have been calculated to be 750 gallons per day based upon previous experience. It is expected that the gravel washing operations will be in operation a maximum of 52 weeks per year and 5 days per week. This would result in a consumption of 6.2 acre-feet per year.

Dust will be controlled by both magnesium chloride and water. 3.0 acre-feet per year will be allocated to dust control.

Total annual depletions from the gravel mining operations are estimated to be 15.1 acre-feet per year during the mining phase.

3.1.2 After Mining

Once mining has completed, the only loss will be an evaporative loss from the exposed water surface which the gravel mining operation creates.

Annual evaporative depletion at mining completion from 145.2 acres of exposed water surface at the BRS&G Pit 1 is calculated to be 414.5 acre-feet.

Total annual depletions from the gravel mining operations are estimated to be 414.5 acre-feet during the post mining phase of the operation.

EXHIBIT H WILDLIFE INFORMATION

1. Significant Game Resources on the Affected Lands

Mule deer are probably the most critical game resource in this area. The current landscape offers very little ground cover which is useful for deer and other small mammals.

2. Significant Non-Game Resources On the Affected Lands

Turkey and black bear are probably the most critical non-game resource in this area. The use of the property as for crops over the years has created some ground cover and led to some bear-human conflict. There are no known raptor nests on the permit area or in the immediate vicinity. CPW has identified roosts and nests further along the North Fork of the Gunnison River to both the west and east.

3. Seasonal Use of Affected Lands

No important seasonal use.

4. Presence and Estimated Population of Threatened or Endangered Species in the Area.

CPW has identified potential yellow-billed cuckoo areas. The US Figh and Wildlife (USFW) service will be consulted regarding the proposed operation. A CPW letter is attached to this Exhibit.

5. Fish Resources

None.

6. General Effects of the Operation on the Existing Wildlife of the Area

Gravel extraction and crushing activities will no doubt create some disturbance to animals near the site. However, resident wildlife will generally become habituated to these activities. Migrating animals will probably avoid the site, but the proposed pit does not block any known migratory routes, and wildlife should be able to move through the area unimpeded. Due to the possibility for animal/vehicle collisions, hauling activities will probably pose the biggest threat to wildlife. Haul trucks should keep to posted speeds and drivers need to remain aware of the potential for collisions.

The landowner commits to not stocking the lake with any species that is not desirable to the CPW.

EXHIBIT I SOILS INFORMATION

A custom soil survey for the mining area is found in Appendix 1.

EXHIBIT J VEGETATION INFORMATION

1. Existing Vegetation Community

The pre-mine vegetation community at the BRS&G Pit 1 has been the crops grown within the fields for many decades. The following photos show the community as generally seen on site.

Figure 2 – Irrigated alfalfa fields on the northern end of the site (Uncompaghre River through the trees to the left)

Figure 3 - Rangeland between crop fields and the Uncompaghre River (other side of trees)

The majority of the vegetation on site is within the fields that are operated for crop production. In 2018 this was corn and alfalfa. Typical cover on the fields is 80-90%. Outside of the fields it is 70-90% depending on location. Significant tree growth is present along the river banks around the permit perimeter.

EXHIBIT K CLIMATE INFORMATION

1. General Information

The following climate information is presented for Delta, Colorado. The elevation of the weather station that following climate data is from is approximately 5120 feet above sea level. The BRS&G Pit 1 is less than a mile west of Delta, CO.

Table K-1 Climate Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Avg Max. Temperature (F)	38.7	47.0	57.4	67.6	77.5	87.9	93.1	90.1	82.4	69.9	53.4	40.6	67.1
Avg Min. Temperature (F)	12.2	19	26.1	33.8	41.9	48.5	54.8	53.1	44.1	33.4	22.8	14.6	33.7
Avg Total Precipitation (in.)	0.48	0.43	0.56	0.61	0.75	0.48	0.72	1.12	0.94	0.93	0.53	0.44	8.01
Avg Total SnowFall (in.)	4.6	2.7	2.0	0.5	0.0	0.0	0.1	0.0	0.0	0.2	1.5	3.7	15.2

EXHIBIT L WORST CASE RECLAMATION SCENARIO

The worst-case reclamation scenario for the BRS&G Pit 1 is at the end of mining of Area 10, when the largest amount of dewatering would be necessary. The steps of reclamation at this point are outline below:

Area 10 Reclamation

- East Pit dewatering = 1900 ac-ft at $60/ac-ft = $114,000.
- Area 10 final highwall backfilling
    - Vertical to 2H:1V via slope knockdown over 2000 feet of highwall = 841 sq. ft. x 2000 ft = 62,296 CY. At a dozer push cost of $0.50/CY = $31,148.
    - Backfill 2H:1V to final reclaimed slope (3H:1V down to 10 feet below water line and then 2H:1V to the pit floor) = 336 sq. ft. x 2000 ft = 24,889 CY. Backfilling via front-end loader at a cost of $1.50/CY = $37,334.
- Topsoiling of all disturbed areas above waterline (excluding roads) = 12.1 ac by 13 inches deep via front-end loader at $1.50/CY = $31,722
- Dryland revegetation = 12.1 ac at $800/ac = $9,680
- Facility removal (office trailer, truck scale, etc.) = $5,000

Given the length of the mine life (roughly 50 years), it will take significant time to create the lakes. Assuming that the lakes are created at roughly the same rate over time, if the me is phased over 1o years of the 50 year mine life, it would require accounting for one-fifth of the lake dewatering cost, one-fifth of the topsoil and revegetation cost, and the whole facility removal and whole backfill and grading cost. See Table L-1 for the determination of this phased bond.

Since the bond is phased, the operator cannot have a total lake area greater 29 acres (one-fifth the total) during the first ten years of mining. Additionally, associated dryland disturbance is capped at 2.4 acres.

Table L-1 Reclamation Task and Cost Estimate for Phased Bond

Activity Description	Time (Months)	Cost ($)
Dewatering 29 acre lake.	1.0	22800
Final backfill and grading of active highwall.	3.0	62482
Facility removal.	0.5	5000
Topsoil of all disturbed areas above waterline (2.4 acres).	1.0	6344
Dryland revegetation (2.4 acres).	1.0	1936
Totals	**6.5**	**$98,562**
DRMS Costs (28% x direct costs)	**1.8**	**$27,597**
Total Bond Amount	**8.3**	**$126,159**

The bond for the first ten years of the BRS&G Pit 1 will be $126,159.

EXHIBIT M OTHER PERMITS REQUIRED

The following permits are necessary for the full operation of the BRS&G Pit 1:

1. Local permits – Delta County Specific Development Permit
2. NPDES combined process water/storm water discharge permit – A NPDES permit will be needed from the Colorado Department of Public Health and Environment since water will be pumped offsite to the Gunnison River.
3. APEN – A fugitive air emissions permit is needed from the Colorado Department of Public Health and Environment since the site will mine more than 70,000 tons per year. Air emissions permits will be in place for all equipment utilized on site which requires a permit.
4. Gravel Well Permit – A Gravel Well Permit with the Colorado Division of Water Resources must be obtained since the site will partially be reclaimed as a lake. This permit includes an augmentation plan and substitute water supply plan for the evaporation from the lake surface created.

EXHIBIT N RIGHT OF ENTRY

The surface and mineral owner of the property which will be mined is J Graff Enterprises, LLC. Proof of right of entry is attached.

Property Record Card

DELTA COUNTY Delta County Assessor

J GRAFF ENTERPRISES
7021 1900 RD
DELTA, CO 81416-8304

Account: R014531
Tax Area: F1- - - F1-
Acres: 55.780

Parcel: 345714100001
Situs Address:
GRAFF RD
DELTA, 81416

Value Summary

Value By:	Market	Override
Land (1)	$35,903	N/A
Land (2)	$82	N/A
Total	**$35,985**	**$35,985**

Legal Description

GRAFF RD DELTA 81416 S: 14 T: 15S R: 96W TOTAL AC 55.78+- SEC 14 T15S R96W 6PM NW4NE4& N2SW4NE4 SEC 14 LESS 4.22 A BK 420 PG 338 BK 454 PG 829 BK 520 PG 349 & 641 BK 637 PG 8 BK 798 PG 426 BK 868 PG 533 BK 961 PG 533 R-570123 R- 574739 R-707547

Public Remarks

Entry Date	Model	Remark
08/04/2011		EFFECTIVE 2012, CORRECT THE AMOUNT OF IRRIGATED ACREAGE FROM 5 ACRES TO 50 ACRES-JG
		3/17/87 JIM

Land Occurrence 1

LVal	417300 - IIIB 1&2 AC	Abstract Code	4173 - 4173 - irrigated IIIB, areas 1 & 2
Lot Front	0	Lot Depth	0
Adj 1	100	Adj 2	100
Adj 3	100	Adj 4	100
Neighborhood	80001 - DELTA RURAL WEST	Road	0 - N/A
TOPO	0 - N/A	Utilities	0 - N/A
Appr Dist	1 - DELTA - JESSIE	Subdivision	0 - N/A
Ag Subdivision	80000 - DELTA RURAL (WEST)	Use Code	4000
Review Date	201202 - Feb-12		

SubArea	ADJUSTED	HEATED	PRIME	ACTUAL
AC	50			50

Property Record Card

DELTA COUNTY Delta County Assessor

Land Occurrence 1

Total		50.00			50 00
	Value	**Rate**	**Rate**	**Rate**	**Rate**
	$35,903	718.06			718 06

Land Occurrence 2

LVal	447200 - GRAZE VII AC	Abstract Code	4472 - 4472 - graze VII
Lot Front	0	Lot Depth	0
Adj 1	100	Adj 2	100
Adj 3	100	Adj 4	100
Neighborhood	80001 - DELTA RURAL WEST	Road	0 - N/A
TOPO	0 - N/A	Utilities	0 - N/A
Appr Dist	1 - DELTA - JESSIE	Subdivision	0 - N/A
Ag Subdivision	80000 - DELTA RURAL (WEST)	Use Code	4000
Review Date	201202 - Feb-12		

SubArea		**ADJUSTED**	**HEATED**	**PRIME**	**ACTUAL**
AC		5.78			5.78
Total		5.78			5.78
	Value	**Rate**	**Rate**	**Rate**	**Rate**
	$82	14.19			14.19

Abstract Summary

Code	Classification	Actual Value	Taxable Value	Actual Override	Taxable Override
4173	4173 - irrigated IIIB, areas 1 & 2	$35,903	$10,412	NA	NA
4472	4472 - graze VII	$82	$24	NA	NA
Total		**$35,985**	**$10,436**	**NA**	**NA**

Property Record Card

DELTA COUNTY Delta County Assessor

J GRAFF ENTERPRISES
7021 1900 RD
DELTA, CO 81416-8304

Account: R022770
Tax Area: H2- - - H2-
Acres: 160.000

Parcel: 319520100007
Situs Address:
OAK CREEK RD
CEDAREDGE, 81413

Value Summary

Value By:	Market	Override
Land (1)	$2,262	N/A
Total	**$2,262**	**$2,262**

Legal Description

OAK CREEK RD CEDAREDGE 81413 S: 20 T: 13S R. 95W Subdivision: RURAL AREA TOTAL AC 160+- E2NW4 AND THE W2NE4 BK 452 PG 603 THRU 605 (R-358903 THRU R-358905) BK 498 PG 641 (R-395731) BK 501 PG 917 BK 525 PG 298 BK 770 PG 174 SVY R-616634 BK 882 PG 541 R-598821 R-615432 R-621781 R-621782 R-621783 R-628558 R-655533-QC R7018216

Public Remarks

Entry Date	Model	Remark
06/20/2008		2008-06-19 SPLIT FROM R004446, 4448, 4449. JW
10/03/2008		TD/INVENTORY FORMS MAILED-10/16/2008-FORMS REC'D-NN
10/24/2008		AG QUEST MAILED-NN
12/02/2008		VISITED WITH OWNER BY PHONE - HE SUBSEQUENTLY FURNISHED RECEIPTS FOR CONTINUING AG OPERATIONS - LEFT IN AG. JW
09/07/2012		2012-09-07 UPDATED 12AG-QUEST INFORMATION AFTER CONVERSATION WITH OWNER AND NEW DOCUMENTATION JW 12AQ - 2012 AG RES AND LAND QUEST NOT RETURNED. JW
10/23/2012		2012-10-17 RECIEVED LEASE, DATED SEPTEMBER 6, 2012, WITH HUGH SANBURG FOR GRAZING RIGHTS ON R022768, R022769, R022770, AND R022771. LIMITED AG OPERATIONS COVERING AN AREA THAT INCLUDED R022768 AND R022769 HAVE BEEN ONGOING SINCE THE PROPERTY WAS PURCHASED IN 2008. R022770 AND R022771 WERE REMOVED FROM AG FOR 2012, BASED ON THE 12AG REVIEW OF INTEGRAL PROPERTIES AND WILL BE RE-CLASSIFIED AS AG IN 2014. JW
10/25/2012		2012-10-25 FURTHER REVIEW OF PROPERTY WITH ASSESSOR AG OPERATIONS HAVE BEEN CONTINUOUS. RETURN R022770 AND R022771 BACK TO CINTINUOUS AG. JW

Sale Data

Doc. #	Sale Date	Deed Type	Validity	Verified	Sale Price	Ratio	Adj. Price	Ratio	Time Adj. Price	Ratio

Property Record Card

DELTA COUNTY Delta County Assessor

Sale Data

628558	08/28/2008	WJ	UV	Y	$1,500,000	0.15	$1,500,000	0 15	$1,500,000	0.15
621781	12/31/2007	WD	UV	Y	$1,500,000	0.15	$1,500,000	0.15	$1,500,000	0.15

Land Occurrence 1

LVal	447200 - GRAZE VII AC	Abstract Code	4472 - 4472 - graze VII
Lot Front	0	Lot Depth	0
Adj 1	100	Adj 2	100
Adj 3	100	Adj 4	100
Neighborhood	60003 - CEDAREDGE WEST ADOBE	Road	2 - R DIRT
TOPO	1 - AVG TOPO	Utilities	0 - N/A
Appr Dist	2 - SURFACE CREEK -KYLE	Ag Subdivision	60000 - SURFACE CREEK RURAL
Use Code	4000	Review Date	201210 - Oct-12

SubArea		ADJUSTED	HEATED	PRIME	ACTUAL
AC		160			160
Total		160.00			160.00
	Value	**Rate**	**Rate**	**Rate**	**Rate**
	$2,262	14.14			14.14

Abstract Summary

Code	Classification	Actual Value	Taxable Value	Actual Override	Taxable Override
4472	4472 - graze VII	$2,262	$656	NA	NA
Total		**$2,262**	**$656**	**NA**	**NA**

EXHIBIT O

OWNERS OF AFFECTED LAND AND MINERAL TO BE MINED

J Graff Enterprises, LLC
7021 1900 Road
Delta, CO 81416

EXHIBIT P MUNICIPALITIES WITHIN TWO MILES

Delta, CO is about one-half mile southwest of the permit area.

City of Delta
360 Main Street
Delta, CO 81416

EXHIBIT Q PROOF OF MAILING OF NOTICES TO THE BOARD OF COUNTY COMMISSIONERS AND SOIL CONSERVATION DISTRICT

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 0663 3508 58

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 0663 3508 69

FEES

Postage per piece	$0.500
Certified Fee	$3.500
Return Receipt Fee	$2.800
Total Postage & Fees:	**$6.800**

ARTICLE ADDRESS TO:

Delta Conservation District
690 Industrial Blvd
Delta CO 81416-2812

Postmark Here

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 0663 3235 86

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 0663 3235 35

FEES

Postage per piece	$0.500
Certified Fee	$3.500
Return Receipt Fee	$2.800
Total Postage & Fees:	**$6.800**

ARTICLE ADDRESS TO:

County Commissioners
Delta County Board Of County Commissione
501 Palmer St Ste 227
Delta CO 81416-1796

Postmark Here

EXHIBIT R **PROOF OF FILING WITH COUNTY CLERK**

Greg Lewicki And Associates, PLLC

11541 Warrington Court
Parker, CO USA 80138

Phone (303) 346-5196 Fax: (303)-346-6934
E-Mail:info@lewicki.biz

March 29, 2019

Delta County Clerk and Recorder
501 Palmer St #211
Delta, CO 81416

Dear Delta County Clerk:

Enclosed is a notice for an amendment application to the Colorado Division of Reclamation, Mining, and Safety for the 112c gravel permit for the pit known as the Best Rock Sand and Gravel Pit 1, located approximately 0.5 miles east of Delta CO. The applicant is J Graff Enterprises, LLC. The Colorado Division of Reclamation, Mining, and Safety requires evidence that the application has been filed with your office. Therefore, please sign and date the box below. Thank you.

Sincerely,

Ben Langenfeld, P. E.
Greg Lewicki and Associates

The application was received on the following date: March 28 2019

by:

EXHIBIT S PERMANENT MAN-MADE STRUCTURES

The following is an inventory of man-made structures within 200 feet of the disturbed area. All of these structures are shown on Map C-1. The landowner boundaries can also be found on Map C-1. Structure agreements are being pursued. In the event that a such agreements are unobtainable, see the Geotechnical Stability Exhibit.

1. Miscellaneous fences.
2. Powerlines and power poles owned by Tri-State Generation.
3. County road to the south owned by Delta County.
4. Sewer line along the north side of the disturbed area owned by the City of Delta.
5. Railroad running along the south side of the operation owned by Union Pacific Railroad.

RULE 1.6.2(1)(B)

Prior to the submittal of the application, a sign was erected at the entrance to the site which contained all the required information regarding Rule 1.6.2(1)(b).

Please see enclosed sign certification.

PUBLIC NOTICE

THIS SITE IS THE LOCATION OF A PROPOSED CONSTRUCTION MATERIALS OPERATION. J GRAFF ENTERPRISES, LLC, WHOSE ADDRESS AND PHONE NUMBER IS 6454 GRAFF ROAD, DELTA, CO 81416, (970) 201-3250, HAS APPLIED FOR A REGULAR 112 CONSTRUCTION MATERIALS OPERATION RECLAMATION PERMIT AMENDMENT WITH THE COLORADO MINED LAND RECLAMATION BOARD. ANYONE WISHING TO COMMENT ON THE APPLICATION MAY VIEW THE APPLICATION AT THE DELTA COUNTY CLERK AND RECORDER'S OFFICE; 501 PALMER STREET, SUITE 211, DELTA, CO 81416 AND SHOULD SEND COMMENTS PRIOR TO THE END OF THE PUBLIC COMMENT PERIOD TO THE DIVISION OF RECLAMATION, MINING, AND SAFETY, 1313 SHERMAN ST., ROOM 215, DENVER, COLORADO 80203.

Certification:

I, Jacci Graff, hereby certify that I posted a sign containing the above notice for the proposed permit area known as the Best Rock Sand and Gravel Pit 1, on 3/29/19.

SIGNATURE

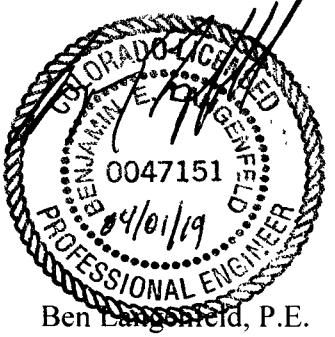
3/29/19
DATE

GEOTECHNICAL STABILITY EXHIBIT

There are no buildings or any structures outside the permit area which could be affected by the excavation. Sufficient buffers will be maintained to neighboring property lines.

The final backfill is best classified as loose sand. This material has an internal angle of friction of approximately 34 degrees and no cohesion. The underlying material placed by dozer push to 2H:1V is the native sand and gravel found onsite. This is classified as Sand and gravel, mixed grain size. It has an internal angle of friction of 45 degrees and no cohesion. Material properties area derived from Table 2.5 in the SME Mining Reference Handbook[1],

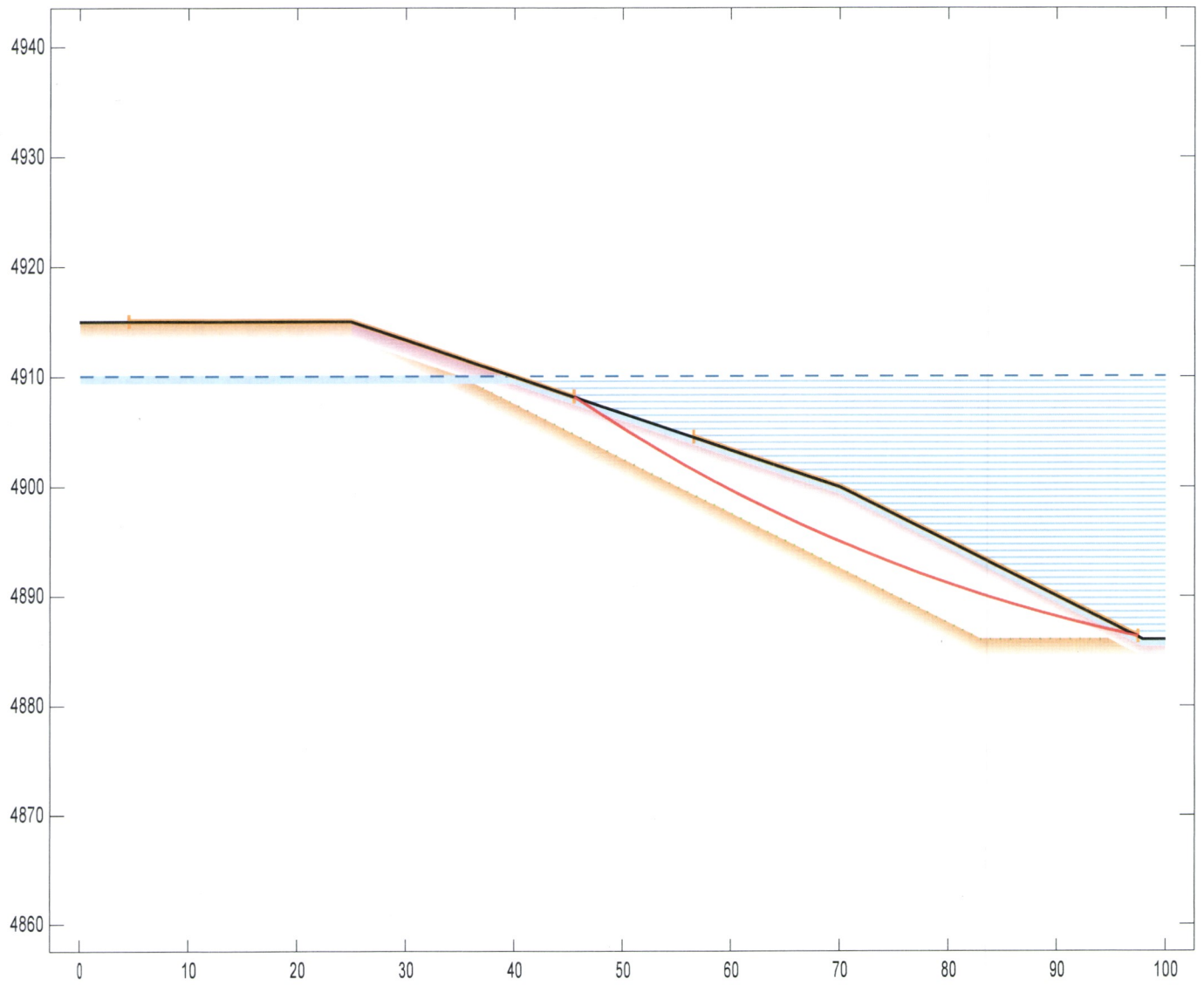
A GALENA software analysis of the permanent slope condition was conducted with the above material properties and assumed a full lake. The lake level is roughly five feet below the natural topography. Final slope conditions are 3H:1V to 10 feet below the lake level, and then 2H:1V down to the lake bottom. The GALENA model used Bishop's method of slices iteratively to find the failure slope with the lowest factor of safety. This analysis showed a FOS of 1.39 for the lowest scenario. The minimum FOS DRMS requires for a slope near non-critical structures is 1.3. Therefore, the slopes at BRS&G Pit 1 are stable in the permanent case.



Ben Langenfeld, P.E.

P.E.# 0047151

[1] Original source: Houk and Bray 1977



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Sand and gravel, mixed grain size

2: Loose sand, mixed grain size

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

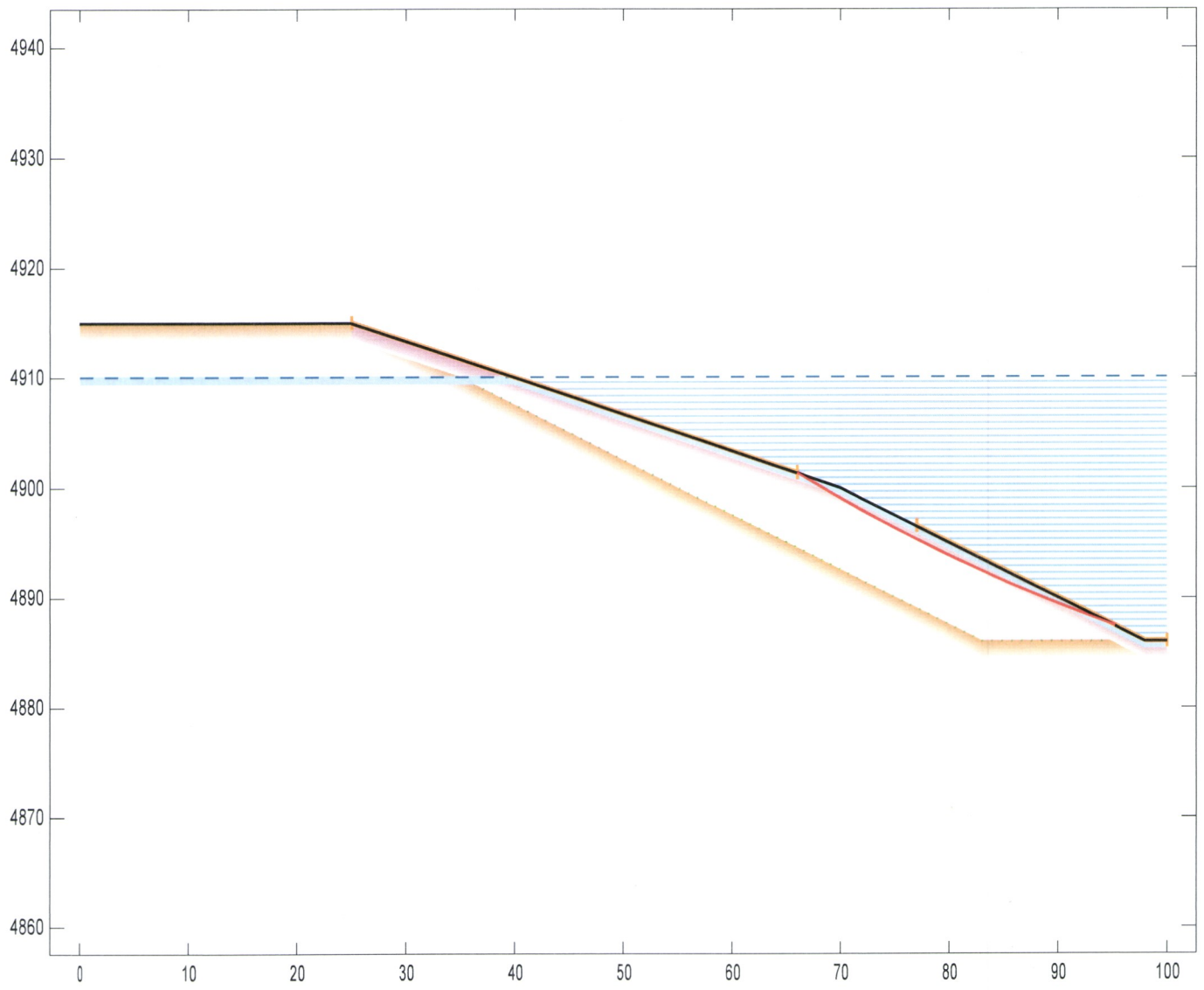
Critical Factor of Safety: 1.63

Project Graff Pit 2
Permanent Slope Condition

File: E:\Work\Dropbox\Graff Gravel\Graff Pit 2\Permanent Slope Stability.gmf

Edited: 30 Nov 2018
Processed: 30 Nov 2018

Greg Lewicki And Associates, PLLC



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Sand and gravel, mixed grain size

2: Loose sand, mixed grain size

Analysis 2

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 1.39

Project Graff Pit 2

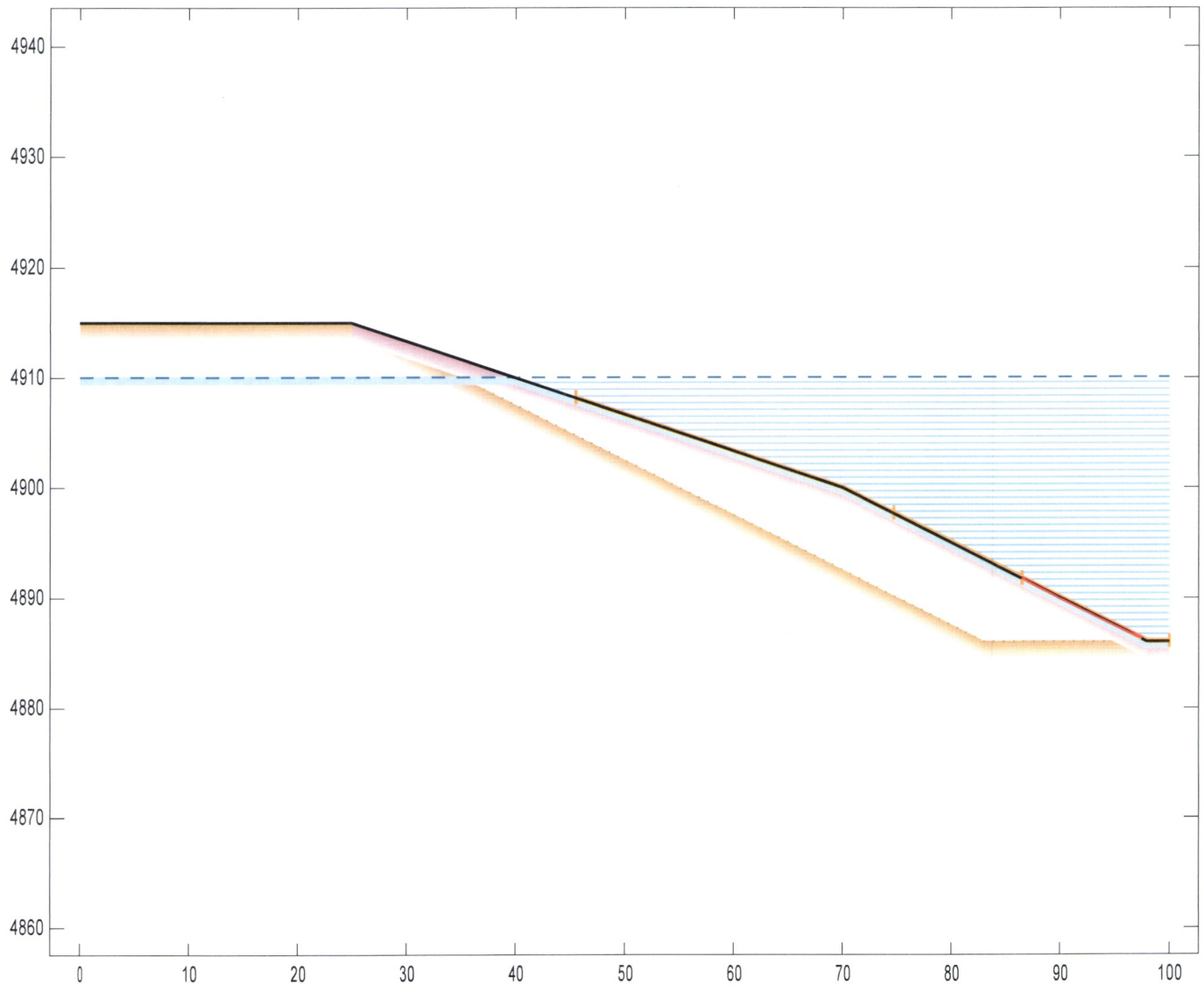
Permanent Slope Condition

File: E:\Work\Dropbox\Graff Gravel\Graff Pit 2\Permanent Slope Stability.gmf

Edited: 30 Nov 2018

Processed: 30 Nov 2018

Greg Lewicki And Associates, PE LLC



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Sand and gravel, mixed grain size

2: Loose sand, mixed grain size

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 1.35

Project Graff Pit 2
Permanent Slope Condition

File: E:\Work\Dropbox\Graff Gravel\Graff Pit 2\Permanent Slope Stability.gmf

Edited: 30 Nov 2018
Processed: 30 Nov 2018

Greg Lewicki And Associates, PLLC

GALENA 7.1 Analysis Results Version: 7.10.1.02 Licensee: Greg Lewicki and Associates

Project: Graff Pit 2
File: E:\Work\Dropbox\Graff Gravel\Graff Pit 2\Permanent Slope Stability.gmf Processed: 30 Nov 2018 12:48:41

DATA: Analysis 1 - Permanent Slope Condition

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 34.0 99.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Sand and gravel, mixed grain size
0.00 4915.00 25.00 4915.00 83.00 4886.00 100.00 4886.00
Profile: 2 (4 points) Material beneath: 2 - Loose sand, mixed grain size
25.00 4915.00 70.00 4900.00 98.00 4886.00 100.00 4886.00

Slope Surface (5 points)

0.00 4915.00 25.00 4915.00 70.00 4900.00 98.00 4886.00 100.00 4886.00

Phreatic Surface (2 points)

0.00 4910.00 100.00 4910.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 25.00 YL: 4915.00 XR: 77.00 YR: 4896.50
Centre: XC: 93.58 YC: 5025.44 Radius: R: 130.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	41.00	41.00	40.00
Trial positions within range:	10	10	10

- -

RESULTS: Analysis 1 - Permanent Slope Condition

Bishop Simplified Method of Analysis - Circular Failure Surface

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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.221

There were: 1001 successful analyses from a total of 1001 trial surfaces

Critical (minimum) Factor of Safety: 1.63

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	45.50	4908.17	97.50	4886.25	128.72	5032.97	150.00	1.626	<-- Critical Surface
2	45.50	4908.17	97.50	4886.25	126.96	5028.79	145.56	1.628	
3	45.50	4908.17	97.50	4886.25	125.20	5024.62	141.11	1.630	
4	45.50	4908.17	97.50	4886.25	123.44	5020.43	136.67	1.633	
5	45.50	4908.17	97.50	4886.25	121.67	5016.24	132.22	1.635	
6	45.50	4908.17	97.50	4886.25	119.90	5012.05	127.78	1.638	
7	45.50	4908.17	97.50	4886.25	118.13	5007.85	123.33	1.641	
8	45.50	4908.17	97.50	4886.25	116.36	5003.63	118.89	1.644	
9	45.50	4908.17	97.50	4886.25	114.58	4999.41	114.44	1.648	
10	45.50	4908.17	97.50	4886.25	112.79	4995.18	110.00	1.652	
11	45.50	4908.17	92.94	4888.53	125.74	5034.90	150.00	1.660	
12	45.50	4908.17	92.94	4888.53	124.02	5030.73	145.56	1.662	
13	45.50	4908.17	92.94	4888.53	122.29	5026.55	141.11	1.663	
14	45.50	4908.17	92.94	4888.53	120.56	5022.38	136.67	1.665	
15	45.50	4908.17	92.94	4888.53	118.83	5018.19	132.22	1.668	
16	40.94	4909.69	97.50	4886.25	125.44	5033.63	150.00	1.669	
17	45.50	4908.17	92.94	4888.53	117.10	5014.00	127.78	1.670	
18	40.94	4909.69	97.50	4886.25	123.70	5029.43	145.56	1.671	
19	45.50	4908.17	92.94	4888.53	115.36	5009.81	123.33	1.673	
20	40.94	4909.69	97.50	4886.25	121.95	5025.23	141.11	1.674	
21	45.50	4908.17	92.94	4888.53	113.62	5005.60	118.89	1.676	
22	40.94	4909.69	97.50	4886.25	120.21	5021.02	136.67	1.677	
23	45.50	4908.17	92.94	4888.53	111.88	5001.40	114.44	1.679	
24	40.94	4909.69	97.50	4886.25	118.46	5016.80	132.22	1.680	
25	45.50	4908.17	92.94	4888.53	110.13	4997.18	110.00	1.683	
26	40.94	4909.69	97.50	4886.25	116.71	5012.58	127.78	1.683	
27	40.94	4909.69	97.50	4886.25	114.96	5008.34	123.33	1.687	
28	40.94	4909.69	97.50	4886.25	113.20	5004.10	118.89	1.691	
29	40.94	4909.69	97.50	4886.25	111.44	4999.84	114.44	1.696	
30	36.39	4911.20	97.50	4886.25	122.26	5034.19	150.00	1.700	
31	36.39	4911.20	97.50	4886.25	120.54	5029.97	145.56	1.703	
32	40.94	4909.69	92.94	4888.53	122.48	5035.59	150.00	1.703	
33	45.50	4908.17	88.39	4890.81	122.55	5036.86	150.00	1.703	
34	45.50	4908.17	88.39	4890.81	120.86	5032.69	145.56	1.705	
35	40.94	4909.69	92.94	4888.53	120.77	5031.40	145.56	1.706	
36	45.50	4908.17	88.39	4890.81	119.17	5028.52	141.11	1.707	
37	40.94	4909.69	92.94	4888.53	119.06	5027.20	141.11	1.708	
38	45.50	4908.17	88.39	4890.81	117.48	5024.34	136.67	1.708	
39	40.94	4909.69	92.94	4888.53	117.35	5023.00	136.67	1.710	
40	45.50	4908.17	88.39	4890.81	115.79	5020.16	132.22	1.710	

41	45.50	4908.17	88.39	4890.81	114.10	5015.97	127.78	1.713
42	40.94	4909.69	92.94	4888.53	115.64	5018.79	132.22	1.713
43	45.50	4908.17	88.39	4890.81	112.40	5011.78	123.33	1.715
44	40.94	4909.69	92.94	4888.53	113.92	5014.57	127.78	1.716
45	45.50	4908.17	88.39	4890.81	110.70	5007.58	118.89	1.718
46	40.94	4909.69	92.94	4888.53	112.21	5010.35	123.33	1.720
47	45.50	4908.17	88.39	4890.81	109.00	5003.38	114.44	1.721
48	40.94	4909.69	92.94	4888.53	110.48	5006.12	118.89	1.723
49	45.50	4908.17	88.39	4890.81	107.29	4999.17	110.00	1.724
50	40.94	4909.69	92.94	4888.53	108.76	5001.87	114.44	1.727
51	40.94	4909.69	92.94	4888.53	107.03	4997.62	110.00	1.732
52	36.39	4911.20	92.94	4888.53	119.33	5036.19	150.00	1.734
53	36.39	4911.20	92.94	4888.53	117.64	5031.97	145.56	1.736
54	36.39	4911.20	92.94	4888.53	115.94	5027.75	141.11	1.739
55	36.39	4911.20	92.94	4888.53	114.25	5023.52	136.67	1.742
56	36.39	4911.20	92.94	4888.53	112.55	5019.29	132.22	1.745
57	40.94	4909.69	88.39	4890.81	119.32	5037.58	150.00	1.747
58	36.39	4911.20	92.94	4888.53	110.85	5015.05	127.78	1.748
59	40.94	4909.69	88.39	4890.81	117.65	5033.39	145.56	1.749
60	40.94	4909.69	88.39	4890.81	115.98	5029.19	141.11	1.751
61	40.94	4909.69	88.39	4890.81	114.31	5024.99	136.67	1.753
62	40.94	4909.69	88.39	4890.81	112.63	5020.79	132.22	1.756
63	40.94	4909.69	88.39	4890.81	110.96	5016.57	127.78	1.758
64	45.50	4908.17	83.83	4893.08	119.07	5038.89	150.00	1.760
65	40.94	4909.69	88.39	4890.81	109.28	5012.36	123.33	1.761
66	45.50	4908.17	83.83	4893.08	117.42	5034.71	145.56	1.762
67	45.50	4908.17	83.83	4893.08	115.78	5030.53	141.11	1.763
68	40.94	4909.69	88.39	4890.81	107.60	5008.13	118.89	1.765
69	45.50	4908.17	83.83	4893.08	114.14	5026.35	136.67	1.765
70	45.50	4908.17	83.83	4893.08	112.49	5022.16	132.22	1.767
71	40.94	4909.69	88.39	4890.81	105.91	5003.90	114.44	1.769
72	45.50	4908.17	83.83	4893.08	110.84	5017.97	127.78	1.769
73	45.50	4908.17	83.83	4893.08	109.19	5013.78	123.33	1.771
74	40.94	4909.69	88.39	4890.81	104.23	4999.66	110.00	1.773
75	45.50	4908.17	83.83	4893.08	107.54	5009.58	118.89	1.773
76	36.39	4911.20	88.39	4890.81	116.21	5038.20	150.00	1.775
77	45.50	4908.17	83.83	4893.08	105.89	5005.38	114.44	1.776
78	31.83	4912.72	88.39	4890.81	113.19	5038.74	150.00	1.777
79	36.39	4911.20	88.39	4890.81	114.55	5033.99	145.56	1.777
80	31.83	4912.72	88.39	4890.81	111.55	5034.51	145.56	1.779
81	45.50	4908.17	83.83	4893.08	104.23	5001.18	110.00	1.779
82	36.39	4911.20	88.39	4890.81	112.90	5029.77	141.11	1.779
83	36.39	4911.20	88.39	4890.81	111.24	5025.55	136.67	1.782
84	36.39	4911.20	88.39	4890.81	109.58	5021.32	132.22	1.785
85	36.39	4911.20	88.39	4890.81	107.92	5017.08	127.78	1.788
86	36.39	4911.20	88.39	4890.81	106.26	5012.84	123.33	1.791
87	36.39	4911.20	88.39	4890.81	104.59	5008.59	118.89	1.795
88	36.39	4911.20	88.39	4890.81	102.92	5004.32	114.44	1.799
89	40.94	4909.69	83.83	4893.08	115.90	5039.62	150.00	1.803
90	36.39	4911.20	88.39	4890.81	101.24	5000.05	110.00	1.804
91	40.94	4909.69	83.83	4893.08	114.27	5035.42	145.56	1.804
92	40.94	4909.69	83.83	4893.08	112.65	5031.22	141.11	1.806
93	40.94	4909.69	83.83	4893.08	111.02	5027.02	136.67	1.808
94	40.94	4909.69	83.83	4893.08	109.39	5022.81	132.22	1.811
95	36.39	4911.20	92.94	4888.53	109.14	5010.79	123.33	1.812
96	40.94	4909.69	83.83	4893.08	107.76	5018.60	127.78	1.813
97	40.94	4909.69	83.83	4893.08	106.13	5014.38	123.33	1.816

98	40.94	4909.69	83.83	4893.08	104.50	5010.16	118.89	1.819
99	31.83	4912.72	83.83	4893.08	109.91	5040.80	150.00	1.820

Critical Failure Surface (circle 1)

Intersects: XL: 45.50 YL: 4908.17 XR: 97.50 YR: 4886.25

Centre: XC: 128.72 YC: 5032.97 Radius: R: 150.00

Generated failure surface: (20 points)

45.50	4908.17	48.00	4906.53	50.54	4904.95	53.10	4903.42	55.70
4901.94								
58.32	4900.51	60.97	4899.13	63.65	4897.81	66.36	4896.54	69.09
4895.33								
71.84	4894.17	74.62	4893.06	77.41	4892.01	80.23	4891.02	83.07
4890.08								
85.92	4889.20	88.79	4888.38	91.68	4887.61	94.58	4886.90	97.50
4886.25								

Slice Geometry and Properties - Critical Failure Surface (circle 1, 39 slices)

Slice		X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	
Factor												
1	45.50	0.25	33.1	1.25	1.49	2	0.00	34.0	24.73	208.97	145.63	0.94
2	46.75	0.75	33.1	1.25	1.49	2	0.00	34.0	74.20	285.07	208.08	0.94
3	48.00	1.25	32.0	1.27	1.49	2	0.00	34.0	123.36	360.02	269.56	0.94
4	49.27	1.71	32.0	1.27	1.49	2	0.00	34.0	169.67	433.74	329.69	0.94
5	50.54	2.19	30.8	1.28	1.49	2	0.00	34.0	216.57	506.28	388.97	0.93
6	51.82	2.62	30.9	1.28	1.49	2	0.00	34.0	259.60	577.78	446.71	0.93
7	53.10	3.07	29.7	1.30	1.49	2	0.00	34.0	304.10	647.94	503.79	0.93
8	54.40	3.47	29.7	1.30	1.49	2	0.00	34.0	343.62	716.95	559.08	0.93
9	55.70	3.89	28.6	1.31	1.49	2	0.00	34.0	385.37	784.74	613.87	0.93
10	57.01	4.26	28.5	1.31	1.49	2	0.00	34.0	421.40	851.20	666.73	0.93
11	58.32	4.65	27.4	1.33	1.49	2	0.00	34.0	460.13	916.64	719.15	0.93
12	59.65	4.97	27.4	1.33	1.49	2	0.00	34.0	492.50	980.82	769.53	0.93
13	60.97	5.33	26.3	1.34	1.49	2	0.00	34.0	527.97	1043.56	819.58	0.93
14	62.31	5.62	26.3	1.34	1.49	2	0.00	34.0	556.53	1105.39	867.39	0.93
15	63.65	5.95	25.1	1.35	1.49	2	0.00	34.0	588.56	1165.62	915.03	0.92
16	65.00	6.19	25.1	1.35	1.49	2	0.00	34.0	613.14	1224.91	960.22	0.92
17	66.36	6.48	24.0	1.36	1.49	2	0.00	34.0	641.46	1282.73	1005.36	
0.92												
18	67.72	6.69	24.0	1.36	1.49	2	0.00	34.0	662.18	1339.58	1048.01	
0.92												
19	69.09	4.58	22.8	0.91	0.99	2	0.00	34.0	453.78	919.51	1083.88	0.92
20	70.00	4.62	22.9	0.92	1.00	2	0.00	34.0	457.21	949.90	1108.09	0.92
21	70.92	4.55	22.9	0.92	1.00	2	0.00	34.0	450.62	974.05	1130.03	0.92
22	71.84	6.72	21.7	1.39	1.49	2	0.00	34.0	665.34	1501.68	1157.30	
0.92												
23	73.23	6.52	21.7	1.39	1.49	2	0.00	34.0	645.88	1553.20	1187.34	
0.92												
24	74.62	6.35	20.6	1.40	1.49	2	0.00	34.0	629.02	1603.34	1217.17	
0.92												
25	76.01	6.11	20.6	1.40	1.49	2	0.00	34.0	604.96	1652.32	1244.45	
0.92												
26	77.41	5.89	19.4	1.41	1.49	2	0.00	34.0	582.68	1700.02	1271.33	
0.93												
27	78.82	5.59	19.4	1.41	1.49	2	0.00	34.0	553.74	1746.12	1295.71	
0.93												

28	80.23	5.31	18.3	1.42	1.49	2	0.00	34.0	526.03	1791.22	1319.65	0.93
29	81.65	4.97	18.3	1.42	1.49	2	0.00	34.0	492.37	1835.16	1341.20	0.93
30	83.07	4.64	17.1	1.43	1.49	2	0.00	34.0	459.21	1877.35	1362.15	0.93
31	84.49	4.25	17.1	1.43	1.49	2	0.00	34.0	420.57	1918.40	1380.76	0.93
32	85.92	3.86	16.0	1.44	1.49	2	0.00	34.0	381.92	1958.26	1398.67	0.93
33	87.36	3.42	16.0	1.44	1.49	2	0.00	34.0	338.33	1996.44	1414.33	0.93
34	88.79	2.97	14.9	1.44	1.49	2	0.00	34.0	294.12	2033.59	1429.12	0.93
35	90.24	2.48	14.9	1.44	1.49	2	0.00	34.0	245.75	2069.36	1441.92	0.93
36	91.68	1.98	13.7	1.45	1.49	2	0.00	34.0	196.01	2103.77	1453.57	0.93
37	93.13	1.44	13.7	1.45	1.49	2	0.00	34.0	142.62	2136.61	1463.32	0.93
38	94.58	0.88	12.6	1.46	1.49	2	0.00	34.0	87.32	2168.45	1471.80	0.94
39	96.04	0.29	12.6	1.46	1.49	2	0.00	34.0	29.11	2198.65	1478.61	0.94

X-S Area: 156.78 Path Length: 56.77 X-S Weight: 15521.69

DATA: Analysis 2 - Permanent Slope Condition

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	34.0	99.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Sand and gravel, mixed grain size

0.00	4915.00	25.00	4915.00	83.00	4886.00	100.00	4886.00

Profile: 2 (4 points) Material beneath: 2 - Loose sand, mixed grain size

25.00	4915.00	70.00	4900.00	98.00	4886.00	100.00	4886.00

Slope Surface (5 points)

0.00	4915.00	25.00	4915.00	70.00	4900.00	98.00	4886.00	100.00	4886.00

Phreatic Surface (2 points)

0.00 4910.00 100.00 4910.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 45.50 YL: 4908.17 XR: 97.50 YR: 4886.25
Centre: XC: 128.72 YC: 5032.97 Radius: R: 150.00

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	41.00	41.00	40.00
Trial positions within range:	10	10	10

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RESULTS: Analysis 2 - Permanent Slope Condition

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 1.626

There were: 501 successful analyses from a total of 1001 trial surfaces
500 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.39

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	66.00	4901.33	95.22	4887.39	151.57	5043.06	165.56	1.393	<-- Critical Surface
2	66.00	4901.33	95.22	4887.39	153.49	5047.09	170.00	1.393	
3	66.00	4901.33	95.22	4887.39	149.65	5039.03	161.11	1.394	
4	66.00	4901.33	95.22	4887.39	147.72	5035.00	156.67	1.394	
5	66.00	4901.33	95.22	4887.39	145.80	5030.96	152.22	1.394	
6	66.00	4901.33	95.22	4887.39	143.87	5026.93	147.78	1.394	
7	66.00	4901.33	95.22	4887.39	141.95	5022.89	143.33	1.394	
8	66.00	4901.33	95.22	4887.39	140.02	5018.85	138.89	1.395	
9	66.00	4901.33	95.22	4887.39	138.09	5014.81	134.44	1.395	
10	66.00	4901.33	95.22	4887.39	136.16	5010.77	130.00	1.396	
11	66.00	4901.33	90.67	4889.67	146.97	5040.62	161.11	1.404	
12	66.00	4901.33	90.67	4889.67	150.79	5048.68	170.00	1.404	
13	66.00	4901.33	90.67	4889.67	145.06	5036.59	156.67	1.405	
14	66.00	4901.33	90.67	4889.67	141.25	5028.52	147.78	1.405	
15	66.00	4901.33	90.67	4889.67	143.16	5032.55	152.22	1.405	
16	66.00	4901.33	90.67	4889.67	148.88	5044.65	165.56	1.405	
17	66.00	4901.33	90.67	4889.67	139.34	5024.48	143.33	1.405	
18	66.00	4901.33	90.67	4889.67	137.43	5020.45	138.89	1.405	
19	66.00	4901.33	90.67	4889.67	135.52	5016.41	134.44	1.405	
20	66.00	4901.33	90.67	4889.67	133.61	5012.37	130.00	1.405	
21	66.00	4901.33	86.11	4891.94	136.51	5026.13	143.33	1.423	
22	66.00	4901.33	86.11	4891.94	132.74	5018.05	134.44	1.423	

23	66.00	4901.33	86.11	4891.94	130.85	5014.00	130.00	1.423
24	66.00	4901.33	86.11	4891.94	134.62	5022.09	138.89	1.423
25	66.00	4901.33	86.11	4891.94	140.28	5034.20	152.22	1.423
26	66.00	4901.33	86.11	4891.94	138.39	5030.16	147.78	1.424
27	66.00	4901.33	86.11	4891.94	142.16	5038.24	156.67	1.424
28	66.00	4901.33	86.11	4891.94	144.05	5042.28	161.11	1.424
29	66.00	4901.33	86.11	4891.94	147.82	5050.35	170.00	1.424
30	66.00	4901.33	86.11	4891.94	145.93	5046.31	165.56	1.424
31	61.44	4902.85	95.22	4887.39	148.67	5048.77	170.00	1.455
32	61.44	4902.85	95.22	4887.39	146.81	5044.70	165.56	1.455
33	61.44	4902.85	95.22	4887.39	144.95	5040.63	161.11	1.455
34	61.44	4902.85	95.22	4887.39	143.09	5036.56	156.67	1.456
35	61.44	4902.85	95.22	4887.39	141.22	5032.49	152.22	1.456
36	61.44	4902.85	95.22	4887.39	139.36	5028.42	147.78	1.456
37	66.00	4901.33	81.56	4894.22	129.56	5019.80	134.44	1.457
38	66.00	4901.33	81.56	4894.22	131.41	5023.85	138.89	1.457
39	61.44	4902.85	95.22	4887.39	137.49	5024.35	143.33	1.457
40	66.00	4901.33	81.56	4894.22	127.71	5015.75	130.00	1.457
41	61.44	4902.85	95.22	4887.39	135.63	5020.27	138.89	1.457
42	66.00	4901.33	81.56	4894.22	135.12	5031.95	147.78	1.457
43	66.00	4901.33	81.56	4894.22	138.82	5040.05	156.67	1.457
44	66.00	4901.33	81.56	4894.22	133.27	5027.90	143.33	1.458
45	66.00	4901.33	81.56	4894.22	136.97	5036.00	152.22	1.458
46	61.44	4902.85	95.22	4887.39	133.76	5016.19	134.44	1.458
47	66.00	4901.33	81.56	4894.22	142.52	5048.14	165.56	1.458
48	66.00	4901.33	81.56	4894.22	144.37	5052.19	170.00	1.458
49	66.00	4901.33	81.56	4894.22	140.67	5044.10	161.11	1.458
50	61.44	4902.85	95.22	4887.39	131.89	5012.11	130.00	1.459
51	61.44	4902.85	90.67	4889.67	145.66	5050.52	170.00	1.478
52	61.44	4902.85	90.67	4889.67	143.83	5046.46	165.56	1.478
53	61.44	4902.85	90.67	4889.67	141.99	5042.38	161.11	1.479
54	61.44	4902.85	90.67	4889.67	140.15	5038.31	156.67	1.479
55	61.44	4902.85	90.67	4889.67	138.31	5034.24	152.22	1.479
56	61.44	4902.85	90.67	4889.67	136.48	5030.17	147.78	1.479
57	61.44	4902.85	90.67	4889.67	134.64	5026.09	143.33	1.479
58	61.44	4902.85	90.67	4889.67	132.80	5022.01	138.89	1.480
59	61.44	4902.85	90.67	4889.67	130.96	5017.93	134.44	1.480
60	61.44	4902.85	90.67	4889.67	129.11	5013.85	130.00	1.480
61	61.44	4902.85	86.11	4891.94	142.31	5052.39	170.00	1.513
62	61.44	4902.85	86.11	4891.94	138.71	5044.23	161.11	1.513
63	56.89	4904.37	95.22	4887.39	144.39	5050.12	170.00	1.513
64	61.44	4902.85	86.11	4891.94	136.90	5040.15	156.67	1.513
65	61.44	4902.85	86.11	4891.94	140.51	5048.31	165.56	1.513
66	61.44	4902.85	86.11	4891.94	135.10	5036.07	152.22	1.513
67	61.44	4902.85	86.11	4891.94	133.29	5031.99	147.78	1.514
68	56.89	4904.37	95.22	4887.39	142.57	5046.03	165.56	1.514
69	61.44	4902.85	86.11	4891.94	131.49	5027.91	143.33	1.514
70	61.44	4902.85	86.11	4891.94	129.68	5023.82	138.89	1.514
71	61.44	4902.85	86.11	4891.94	127.88	5019.74	134.44	1.514
72	56.89	4904.37	95.22	4887.39	140.76	5041.93	161.11	1.514
73	61.44	4902.85	86.11	4891.94	126.07	5015.65	130.00	1.514
74	56.89	4904.37	95.22	4887.39	138.94	5037.83	156.67	1.515
75	56.89	4904.37	95.22	4887.39	137.12	5033.73	152.22	1.515
76	56.89	4904.37	95.22	4887.39	135.31	5029.63	147.78	1.516
77	56.89	4904.37	95.22	4887.39	133.49	5025.52	143.33	1.517
78	56.89	4904.37	95.22	4887.39	131.67	5021.41	138.89	1.518
79	56.89	4904.37	95.22	4887.39	129.84	5017.30	134.44	1.518

80	56.89	4904.37	95.22	4887.39	128.02	5013.18	130.00	1.520
81	66.00	4901.33	77.00	4896.50	123.74	5017.81	130.00	1.525
82	66.00	4901.33	77.00	4896.50	125.53	5021.88	134.44	1.525
83	66.00	4901.33	77.00	4896.50	134.48	5042.24	156.67	1.526
84	66.00	4901.33	77.00	4896.50	136.27	5046.31	161.11	1.526
85	66.00	4901.33	77.00	4896.50	129.11	5030.03	143.33	1.526
86	66.00	4901.33	77.00	4896.50	127.32	5025.95	138.89	1.526
87	66.00	4901.33	77.00	4896.50	130.90	5034.10	147.78	1.526
88	66.00	4901.33	77.00	4896.50	138.06	5050.39	165.56	1.526
89	66.00	4901.33	77.00	4896.50	139.85	5054.46	170.00	1.527
90	66.00	4901.33	77.00	4896.50	132.69	5038.17	152.22	1.527
91	56.89	4904.37	90.67	4889.67	141.23	5051.97	170.00	1.544
92	56.89	4904.37	90.67	4889.67	139.45	5047.87	165.56	1.544
93	56.89	4904.37	90.67	4889.67	137.66	5043.77	161.11	1.545
94	56.89	4904.37	90.67	4889.67	135.88	5039.67	156.67	1.545
95	56.89	4904.37	90.67	4889.67	134.09	5035.56	152.22	1.546
96	56.89	4904.37	90.67	4889.67	132.30	5031.46	147.78	1.546
97	56.89	4904.37	90.67	4889.67	130.51	5027.35	143.33	1.547
98	56.89	4904.37	90.67	4889.67	128.72	5023.24	138.89	1.547
99	56.89	4904.37	90.67	4889.67	126.93	5019.13	134.44	1.548

Critical Failure Surface (circle 1)

Intersects: XL: 66.00 YL: 4901.33 XR: 95.22 YR: 4887.39

Centre: XC: 151.57 YC: 5043.06 Radius: R: 165.56

Generated failure surface: (20 points)

66.00	4901.33	67.47	4900.46	68.94	4899.60	70.42	4898.75	71.92 4897.93
73.42	4897.11	74.93	4896.31	76.44	4895.53	77.97	4894.77	79.50 4894.01
81.04	4893.28	82.59	4892.56	84.14	4891.86	85.71	4891.17	87.28 4890.50
88.85	4889.84	90.44	4889.21	92.02	4888.58	93.62	4887.98	95.22 4887.39

Slice Geometry and Properties - Critical Failure Surface (circle 1, 39 slices)

Slice		X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	66.00	0.07	30.8	0.73	0.85	2	0.00	34.0	7.01	473.10	557.19	0.90
2	66.73	0.21	30.8	0.73	0.85	2	0.00	34.0	20.97	496.52	589.92	0.90
3	67.47	0.35	30.2	0.74	0.85	2	0.00	34.0	34.86	519.51	622.40	0.90
4	68.20	0.49	30.3	0.74	0.85	2	0.00	34.0	48.33	542.57	654.50	0.90
5	68.94	0.43	29.6	0.53	0.61	2	0.00	34.0	42.85	401.29	681.87	0.90
6	69.47	0.50	29.7	0.53	0.61	2	0.00	34.0	49.38	412.91	704.24	0.90
7	70.00	0.43	29.6	0.42	0.49	2	0.00	34.0	42.74	338.55	723.40	0.90
8	70.42	0.79	29.0	0.75	0.85	2	0.00	34.0	77.82	609.74	745.01	0.90
9	71.17	0.82	29.1	0.75	0.85	2	0.00	34.0	80.89	631.99	772.07	0.90
10	71.92	0.85	28.5	0.75	0.85	2	0.00	34.0	84.03	653.80	798.87	0.90
11	72.67	0.87	28.5	0.75	0.85	2	0.00	34.0	86.43	675.49	825.22	0.90
12	73.42	0.90	27.9	0.75	0.85	2	0.00	34.0	88.87	696.89	851.30	0.90
13	74.17	0.91	27.9	0.75	0.85	2	0.00	34.0	90.51	718.33	876.82	0.90
14	74.93	0.93	27.3	0.76	0.85	2	0.00	34.0	92.29	739.22	902.19	0.90
15	75.68	0.94	27.3	0.76	0.85	2	0.00	34.0	93.13	760.02	926.90	0.90
16	76.44	0.95	26.7	0.76	0.85	2	0.00	34.0	94.17	780.65	951.46	0.90
17	77.20	0.95	26.7	0.76	0.85	2	0.00	34.0	94.36	801.09	975.48	0.90

18	77.97	0.96	26.1	0.77	0.85	2	0.00	34.0	94.58	821.30	999.20	0.90
19	78.73	0.95	26.1	0.77	0.85	2	0.00	34.0	93.99	841.30	1022.40	0.90
20	79.50	0.94	25.5	0.77	0.85	2	0.00	34.0	93.49	861.10	1045.39	0.90
21	80.27	0.93	25.5	0.77	0.85	2	0.00	34.0	92.22	880.71	1067.87	0.90
22	81.04	0.92	24.9	0.77	0.85	2	0.00	34.0	90.92	900.15	1090.03	0.90
23	81.81	0.90	24.9	0.77	0.85	2	0.00	34.0	88.86	919.10	1111.69	0.90
24	82.59	0.88	24.3	0.78	0.85	2	0.00	34.0	86.76	938.11	1133.06	0.90
25	83.37	0.85	24.3	0.78	0.85	2	0.00	34.0	83.90	956.83	1153.88	0.90
26	84.14	0.82	23.7	0.78	0.85	2	0.00	34.0	81.04	975.23	1174.48	0.90
27	84.93	0.78	23.7	0.78	0.85	2	0.00	34.0	77.38	993.73	1194.46	0.90
28	85.71	0.74	23.1	0.78	0.85	2	0.00	34.0	73.70	1011.69	1214.25	0.90
29	86.49	0.70	23.1	0.78	0.85	2	0.00	34.0	69.23	1029.52	1233.40	0.90
30	87.28	0.65	22.5	0.79	0.85	2	0.00	34.0	64.73	1047.12	1252.35	0.90
31	88.06	0.60	22.6	0.79	0.85	2	0.00	34.0	59.55	1064.81	1270.77	0.90
32	88.85	0.55	22.0	0.79	0.85	2	0.00	34.0	54.18	1081.94	1288.85	0.90
33	89.64	0.49	22.0	0.79	0.85	2	0.00	34.0	48.21	1098.96	1306.45	0.90
34	90.44	0.42	21.4	0.79	0.85	2	0.00	34.0	42.03	1115.70	1323.73	0.90
35	91.23	0.36	21.4	0.79	0.85	2	0.00	34.0	35.23	1132.25	1340.48	0.90
36	92.02	0.28	20.8	0.80	0.85	2	0.00	34.0	28.12	1148.50	1356.84	0.90
37	92.82	0.21	20.8	0.80	0.85	2	0.00	34.0	20.52	1164.63	1372.76	0.90
38	93.62	0.13	20.2	0.80	0.85	2	0.00	34.0	12.62	1180.48	1388.32	0.90
39	94.42	0.04	20.2	0.80	0.85	2	0.00	34.0	4.22	1196.41	1403.40	0.90

X-S Area: 25.50 Path Length: 32.43 X-S Weight: 2524.15

DATA: Analysis 3 - Permanent Slope Condition

Material Properties (2 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	34.0	99.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (4 points) Material beneath: 1 - Sand and gravel, mixed grain size

0.00 4915.00 25.00 4915.00 83.00 4886.00 100.00 4886.00

Profile: 2 (4 points) Material beneath: 2 - Loose sand, mixed grain size

25.00 4915.00 70.00 4900.00 98.00 4886.00 100.00 4886.00

Slope Surface (5 points)

0.00 4915.00 25.00 4915.00 70.00 4900.00 98.00 4886.00 100.00 4886.00

Phreatic Surface (2 points)

0.00 4910.00 100.00 4910.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 66.00 YL: 4901.33 XR: 95.22 YR: 4887.39
Centre: XC: 151.57 YC: 5043.06 Radius: R: 165.56

Variable Restraints

Parameter descriptor:	XL	XR	R
Range of variation:	41.00	41.00	40.00
Trial positions within range:	10	10	10

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RESULTS: Analysis 3 - Permanent Slope Condition

Bishop Simplified Method of Analysis - Circular Failure Surface
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Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 1.393

There were: 501 successful analyses from a total of 1001 trial surfaces
500 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 1.35

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	86.50	4891.75	97.50	4886.25	172.95	5050.90	181.11	1.350	<-- Critical Surface
2	81.94	4894.03	97.50	4886.25	172.61	5055.92	185.56	1.350	
3	86.50	4891.75	97.50	4886.25	161.01	5027.03	154.44	1.350	
4	86.50	4891.75	97.50	4886.25	166.98	5038.96	167.78	1.350	
5	81.94	4894.03	97.50	4886.25	164.65	5040.00	167.78	1.351	
6	81.94	4894.03	97.50	4886.25	166.64	5043.98	172.22	1.351	
7	81.94	4894.03	97.50	4886.25	170.62	5051.94	181.11	1.351	
8	81.94	4894.03	97.50	4886.25	162.66	5036.02	163.33	1.351	
9	81.94	4894.03	97.50	4886.25	158.68	5028.06	154.44	1.351	
10	86.50	4891.75	97.50	4886.25	159.03	5023.05	150.00	1.351	
11	86.50	4891.75	97.50	4886.25	174.94	5054.88	185.56	1.351	
12	81.94	4894.03	97.50	4886.25	168.63	5047.96	176.67	1.351	
13	86.50	4891.75	97.50	4886.25	157.04	5019.07	145.56	1.351	
14	81.94	4894.03	97.50	4886.25	160.67	5032.04	158.89	1.351	
15	81.94	4894.03	97.50	4886.25	156.69	5024.08	150.00	1.351	
16	86.50	4891.75	97.50	4886.25	164.99	5034.99	163.33	1.351	
17	86.50	4891.75	97.50	4886.25	168.97	5042.94	172.22	1.351	
18	81.94	4894.03	92.94	4888.53	156.46	5029.31	154.44	1.352	
19	81.94	4894.03	97.50	4886.25	154.70	5020.10	145.56	1.352	
20	81.94	4894.03	92.94	4888.53	164.42	5045.22	172.22	1.352	
21	77.39	4896.31	92.94	4888.53	168.06	5058.20	185.56	1.352	
22	86.50	4891.75	97.50	4886.25	163.00	5031.01	158.89	1.352	

23	86.50	4891.75	97.50	4886.25	170.96	5046.92	176.67	1.352
24	72.83	4898.58	92.94	4888.53	161.74	5051.25	176.67	1.352
25	77.39	4896.31	92.94	4888.53	160.10	5042.28	167.78	1.352
26	72.83	4898.58	92.94	4888.53	165.72	5059.22	185.56	1.352
27	77.39	4896.31	97.50	4886.25	162.31	5041.01	167.78	1.352
28	72.83	4898.58	88.39	4890.81	163.50	5060.48	185.56	1.352
29	72.83	4898.58	92.94	4888.53	163.73	5055.23	181.11	1.352
30	72.83	4898.58	83.83	4893.08	155.30	5049.78	172.22	1.352
31	77.39	4896.31	97.50	4886.25	170.28	5056.94	185.56	1.352
32	72.83	4898.58	83.83	4893.08	147.35	5033.86	154.44	1.352
33	72.83	4898.58	83.83	4893.08	145.36	5029.88	150.00	1.353
34	81.94	4894.03	92.94	4888.53	168.39	5053.18	181.11	1.353
35	72.83	4898.58	92.94	4888.53	157.75	5043.28	167.78	1.353
36	77.39	4896.31	97.50	4886.25	166.29	5048.97	176.67	1.353
37	72.83	4898.58	79.28	4895.36	141.13	5027.12	145.56	1.353
38	77.39	4896.31	97.50	4886.25	164.30	5044.99	172.22	1.353
39	72.83	4898.58	79.28	4895.36	151.07	5047.00	167.78	1.353
40	77.39	4896.31	92.94	4888.53	166.07	5054.22	181.11	1.353
41	77.39	4896.31	92.94	4888.53	164.08	5050.24	176.67	1.353
42	77.39	4896.31	92.94	4888.53	158.11	5038.30	163.33	1.353
43	72.83	4898.58	92.94	4888.53	159.75	5047.27	172.22	1.353
44	77.39	4896.31	97.50	4886.25	158.32	5033.04	158.89	1.353
45	77.39	4896.31	92.94	4888.53	156.12	5034.32	158.89	1.353
46	77.39	4896.31	97.50	4886.25	168.28	5052.96	181.11	1.353
47	72.83	4898.58	83.83	4893.08	151.33	5041.82	163.33	1.353
48	81.94	4894.03	92.94	4888.53	154.47	5025.33	150.00	1.353
49	77.39	4896.31	92.94	4888.53	162.09	5046.26	172.22	1.353
50	77.39	4896.31	97.50	4886.25	160.32	5037.02	163.33	1.353
51	72.83	4898.58	92.94	4888.53	153.77	5035.31	158.89	1.353
52	72.83	4898.58	88.39	4890.81	161.51	5056.50	181.11	1.353
53	81.94	4894.03	92.94	4888.53	160.44	5037.26	163.33	1.353
54	77.39	4896.31	97.50	4886.25	156.33	5029.05	154.44	1.353
55	72.83	4898.58	92.94	4888.53	155.76	5039.30	163.33	1.353
56	72.83	4898.58	83.83	4893.08	159.28	5057.73	181.11	1.353
57	77.39	4896.31	92.94	4888.53	152.14	5026.35	150.00	1.353
58	72.83	4898.58	88.39	4890.81	155.54	5044.56	167.78	1.353
59	72.83	4898.58	88.39	4890.81	149.57	5032.61	154.44	1.353
60	77.39	4896.31	88.39	4890.81	163.84	5055.45	181.11	1.353
61	72.83	4898.58	92.94	4888.53	151.78	5031.33	154.44	1.353
62	77.39	4896.31	97.50	4886.25	154.34	5025.06	150.00	1.353
63	72.83	4898.58	88.39	4890.81	157.53	5048.54	172.22	1.353
64	77.39	4896.31	97.50	4886.25	152.34	5021.08	145.56	1.353
65	72.83	4898.58	97.50	4886.25	165.93	5053.94	181.11	1.353
66	72.83	4898.58	92.94	4888.53	149.78	5027.34	150.00	1.353
67	81.94	4894.03	92.94	4888.53	162.43	5041.24	167.78	1.353
68	72.83	4898.58	97.50	4886.25	167.92	5057.92	185.56	1.354
69	72.83	4898.58	88.39	4890.81	159.52	5052.52	176.67	1.354
70	72.83	4898.58	88.39	4890.81	153.55	5040.58	163.33	1.354
71	72.83	4898.58	88.39	4890.81	151.56	5036.60	158.89	1.354
72	72.83	4898.58	88.39	4890.81	147.58	5028.63	150.00	1.354
73	72.83	4898.58	92.94	4888.53	147.79	5023.36	145.56	1.354
74	72.83	4898.58	97.50	4886.25	163.93	5049.95	176.67	1.354
75	77.39	4896.31	92.94	4888.53	150.15	5022.37	145.56	1.354
76	72.83	4898.58	79.28	4895.36	145.11	5035.07	154.44	1.354
77	72.83	4898.58	79.28	4895.36	143.12	5031.10	150.00	1.354
78	72.83	4898.58	97.50	4886.25	159.95	5041.97	167.78	1.354
79	72.83	4898.58	97.50	4886.25	161.94	5045.96	172.22	1.354

80	77.39	4896.31	92.94	4888.53	154.13	5030.34	154.44	1.354
81	72.83	4898.58	83.83	4893.08	143.37	5025.91	145.56	1.354
82	77.39	4896.31	88.39	4890.81	151.90	5031.59	154.44	1.354
83	81.94	4894.03	92.94	4888.53	152.48	5021.35	145.56	1.354
84	81.94	4894.03	92.94	4888.53	158.45	5033.29	158.89	1.354
85	72.83	4898.58	88.39	4890.81	145.59	5024.65	145.56	1.354
86	72.83	4898.58	83.83	4893.08	153.32	5045.80	167.78	1.354
87	72.83	4898.58	83.83	4893.08	149.34	5037.84	158.89	1.354
88	72.83	4898.58	79.28	4895.36	153.06	5050.98	172.22	1.354
89	81.94	4894.03	92.94	4888.53	166.40	5049.20	176.67	1.354
90	72.83	4898.58	97.50	4886.25	155.96	5033.99	158.89	1.354
91	77.39	4896.31	88.39	4890.81	155.88	5039.54	163.33	1.355
92	77.39	4896.31	88.39	4890.81	157.87	5043.52	167.78	1.355
93	72.83	4898.58	97.50	4886.25	157.95	5037.98	163.33	1.355
94	72.83	4898.58	97.50	4886.25	151.97	5026.01	150.00	1.355
95	77.39	4896.31	88.39	4890.81	149.91	5027.61	150.00	1.355
96	72.83	4898.58	79.28	4895.36	159.02	5062.91	185.56	1.355
97	72.83	4898.58	83.83	4893.08	157.29	5053.75	176.67	1.355
98	77.39	4896.31	88.39	4890.81	147.93	5023.63	145.56	1.355
99	72.83	4898.58	97.50	4886.25	153.96	5030.00	154.44	1.355

Critical Failure Surface (circle 1)

Intersects: XL: 86.50 YL: 4891.75 XR: 97.50 YR: 4886.25
Centre: XC: 172.95 YC: 5050.90 Radius: R: 181.11
Generated failure surface: (20 points)

86.50	4891.75	87.07	4891.44	87.64	4891.14	88.21	4890.83	88.78
4890.53								
89.36	4890.23	89.93	4889.93	90.51	4889.64	91.09	4889.34	91.66
4889.05								
92.24	4888.76	92.82	4888.47	93.40	4888.19	93.99	4887.91	94.57
4887.62								
95.15	4887.35	95.74	4887.07	96.32	4886.79	96.91	4886.52	97.50
4886.25								

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice		X-S	---------- Base ----------						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress
Factor											
1	86.50	0.00	28.4	0.28	0.32	2	0.00	34.0	0.17	370.17	1143.78	0.89
2	86.78	0.01	28.4	0.28	0.32	2	0.00	34.0	0.50	373.55	1153.72	0.90
3	87.07	0.01	28.2	0.29	0.32	2	0.00	34.0	0.81	376.31	1163.64	0.89
4	87.35	0.01	28.2	0.29	0.32	2	0.00	34.0	1.10	379.38	1173.47	0.89
5	87.64	0.01	28.0	0.29	0.32	2	0.00	34.0	1.37	382.52	1183.25	0.89
6	87.93	0.02	28.1	0.29	0.32	2	0.00	34.0	1.62	385.87	1192.98	0.89
7	88.21	0.02	27.8	0.29	0.32	2	0.00	34.0	1.87	388.64	1202.68	0.89
8	88.50	0.02	27.8	0.29	0.32	2	0.00	34.0	2.09	391.70	1212.35	0.89
9	88.78	0.02	27.6	0.29	0.32	2	0.00	34.0	2.29	394.80	1221.91	0.89
10	89.07	0.03	27.6	0.29	0.32	2	0.00	34.0	2.48	397.83	1231.49	0.89
11	89.36	0.03	27.4	0.29	0.32	2	0.00	34.0	2.65	400.83	1240.99	0.89
12	89.65	0.03	27.4	0.29	0.32	2	0.00	34.0	2.79	403.83	1250.40	0.89
13	89.93	0.03	27.2	0.29	0.32	2	0.00	34.0	2.94	406.91	1259.84	0.89
14	90.22	0.03	27.2	0.29	0.32	2	0.00	34.0	3.03	409.88	1269.14	0.89
15	90.51	0.03	26.9	0.29	0.32	2	0.00	34.0	3.14	412.57	1278.45	0.89
16	90.80	0.03	27.0	0.29	0.32	2	0.00	34.0	3.22	415.83	1287.70	0.89
17	91.09	0.03	26.8	0.29	0.32	2	0.00	34.0	3.27	418.86	1296.86	0.89

18	91.38	0.03	26.7	0.29	0.32	2	0.00	34.0	3.31	421.51	1306.01	0.89
19	91.66	0.03	26.5	0.29	0.32	2	0.00	34.0	3.33	424.43	1315.08	0.89
20	91.95	0.03	26.6	0.29	0.32	2	0.00	34.0	3.33	427.65	1324.13	0.89
21	92.24	0.03	26.3	0.29	0.32	2	0.00	34.0	3.32	430.35	1333.11	0.89
22	92.53	0.03	26.4	0.29	0.32	2	0.00	34.0	3.30	433.56	1342.07	0.89
23	92.82	0.03	26.1	0.29	0.32	2	0.00	34.0	3.23	436.13	1350.93	0.89
24	93.11	0.03	26.1	0.29	0.32	2	0.00	34.0	3.16	439.02	1359.76	0.89
25	93.40	0.03	25.9	0.29	0.32	2	0.00	34.0	3.07	441.98	1368.53	0.89
26	93.70	0.03	25.9	0.29	0.32	2	0.00	34.0	2.95	444.84	1377.25	0.89
27	93.99	0.03	25.7	0.29	0.32	2	0.00	34.0	2.83	447.68	1385.93	0.89
28	94.28	0.03	25.7	0.29	0.32	2	0.00	34.0	2.68	450.52	1394.55	0.89
29	94.57	0.03	25.6	0.29	0.32	2	0.00	34.0	2.51	453.43	1403.12	0.89
30	94.86	0.02	25.6	0.29	0.32	2	0.00	34.0	2.33	456.25	1411.65	0.89
31	95.15	0.02	25.4	0.29	0.32	2	0.00	34.0	2.14	459.06	1420.14	0.89
32	95.45	0.02	25.3	0.29	0.32	2	0.00	34.0	1.89	461.55	1428.51	0.89
33	95.74	0.02	25.1	0.29	0.32	2	0.00	34.0	1.66	464.44	1436.89	0.89
34	96.03	0.01	25.2	0.29	0.32	2	0.00	34.0	1.39	467.52	1445.18	0.89
35	96.32	0.01	25.0	0.29	0.32	2	0.00	34.0	1.12	470.27	1453.47	0.89
36	96.62	0.01	24.9	0.29	0.32	2	0.00	34.0	0.81	472.72	1461.65	0.89
37	96.91	0.01	24.8	0.29	0.32	2	0.00	34.0	0.51	475.82	1469.85	0.89
38	97.21	0.00	24.7	0.29	0.32	2	0.00	34.0	0.17	478.24	1477.94	0.89

X-S Area: 0.85 Path Length: 12.30 X-S Weight: 84.38

APPENDIX 1 – SOIL REPORT

United States Department of Agriculture

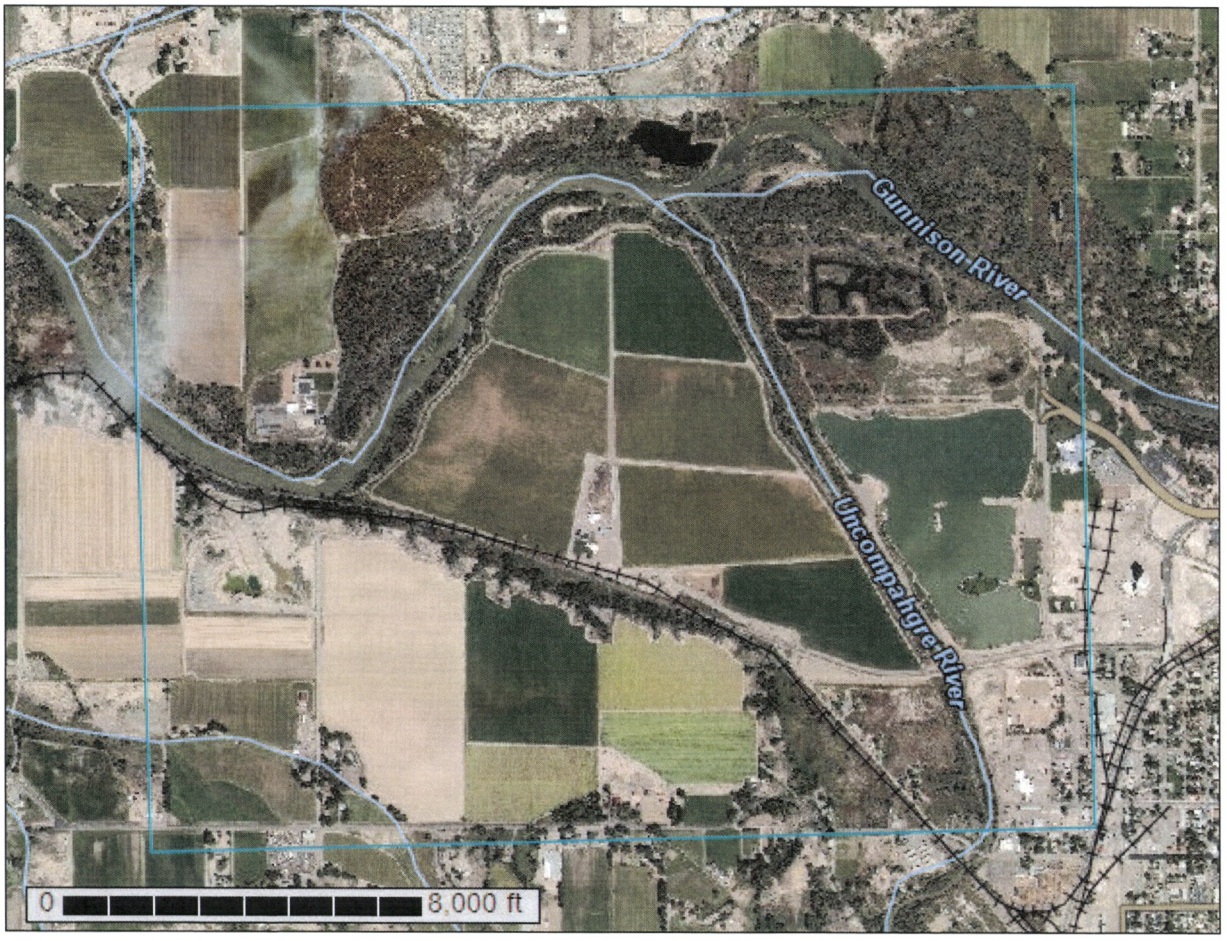
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and Ouray Counties

BRS&G Pit 2



November 20, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


108° 6' 54" W
108° 4' 11" W
38° 45' 41" N
38° 44' 18" N
750900
751300
751700
752100
752500
752900
753300
753700
754100
754500
4293900
4293500
4293100
4292700
4292300
4291900
4294300
900
701
703
731a
731a
701
701
1550 Rd
1375 Rd
701
Gunnison River
795
4wd Road
Gunnison River
999
901
1400 Rd
801
Uncompahgre River
900
760
764
901
765
765
764
764
G 25 Rd
50
Alley
G 50 Rd
790
809
764
760
G Rd
348
Map Scale: 1:18,000 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 250 500 1000 1500
Feet
0 500 1000 2000 3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and Ouray Counties
Survey Area Data: Version 10, Sep 10, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Jul 7, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
701	Montrose silty clay loam, 0 to 2 percent slopes	135.8	10.3%
703	Sagers silty clay loam, 2 to 7 percent slopes	1.1	0.1%
731a	Persayo-Killpack complex, 0 to 6 percent slopes	4.3	0.3%
760	Mesa clay loam, 0 to 2 percent slopes	197.6	15.0%
764	Mesa gravelly loam, 2 to 5 percent slopes	74.5	5.7%
765	Mesa gravelly clay loam, 5 to 12 percent slopes	13.3	1.0%
790	Briny clay loam, 0 to 3 percent slopes, rarely flooded	0.9	0.1%
795	Waterdog, occasionally flooded-Riverwash complex, 0 to 2 percent slopes	667.5	50.7%
801	Persayo-Badland complex, 25 to 75 percent slopes	53.1	4.0%
809	Persayo-Briny, rarely flooded complex, 0 to 25 percent slopes	6.0	0.5%
900	Urban land	73.8	5.6%
901	Gravel pits	27.2	2.1%
999	Water	60.7	4.6%
Totals for Area of Interest		**1,315.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made

up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Ridgway Area, Colorado, Parts of Delta, Gunnison, Montrose, and Ouray Counties

701—Montrose silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k2f9
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Montrose and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Montrose

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from shale

Typical profile

Ap - 0 to 4 inches: silty clay loam
Bt - 4 to 13 inches: silty clay
Btz - 13 to 36 inches: silty clay
C - 36 to 65 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.07 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 4 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 8.0
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Desert Clay (Shadscale) (R034BY104UT)
Hydric soil rating: No

Minor Components

Fruita

Percent of map unit: 10 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Loam (Shadscale) (R034BY106UT)
Hydric soil rating: No

Briny, rarely flooded

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: Alkali Flat (Greasewood) (R034BY006UT)
Hydric soil rating: Yes

Killpack

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: **ARCHIVE** Clayey Saltdesert (R034BY403CO)
Hydric soil rating: No

703—Sagers silty clay loam, 2 to 7 percent slopes

Map Unit Setting

National map unit symbol: k2fd
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Sagers and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sagers

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from shale

Typical profile

A - 0 to 4 inches: silty clay loam
Bw - 4 to 15 inches: silty clay loam
Bk - 15 to 24 inches: silt loam
BCk1 - 24 to 49 inches: silt loam
BCk2 - 49 to 63 inches: silt loam

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 4 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 8.0
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Desert Clay (Shadscale) (R034BY104UT)
Hydric soil rating: No

Minor Components

Montrose

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Clay (Shadscale) (R034BY104UT)
Hydric soil rating: No

Persayo

Percent of map unit: 5 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Loamy Clay (Shadscale) (R034BY109UT)
Hydric soil rating: No

Briny, rarely flooded

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Alkali Flat (Greasewood) (R034BY006UT)
Hydric soil rating: Yes

731a—Persayo-Killpack complex, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: jy81
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Persayo and similar soils: 70 percent
Killpack and similar soils: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Persayo

Setting

Landform: Strath terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: silt loam
C - 4 to 16 inches: silty clay loam
Cr - 16 to 36 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 4 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 4 percent
Salinity, maximum in profile: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 8.0
Available water storage in profile: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: Desert Loamy Clay (Shadscale) (R034BY109UT)

Hydric soil rating: No

Description of Killpack

Setting

Landform: Strath terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium over residuum weathered from shale

Typical profile

Ap - 0 to 8 inches: silty clay loam
Bw - 8 to 28 inches: silty clay loam
BCy - 28 to 36 inches: silty clay loam
Cr - 36 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 6 percent
Salinity, maximum in profile: Nonsaline to slightly saline (1.0 to 5.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: **ARCHIVE** Clayey Saltdesert (R034BY403CO)
Hydric soil rating: No

Minor Components

Montrose

Percent of map unit: 5 percent
Landform: Strath terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Clay (Shadscale) (R034BY104UT)
Hydric soil rating: No

760—Mesa clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k2fc
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Mesa and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mesa

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 12 inches: clay loam
Btk1 - 12 to 17 inches: clay loam
Btk2 - 17 to 30 inches: clay loam
Bk1 - 30 to 38 inches: very gravelly clay
Bk2 - 38 to 44 inches: very gravelly clay
BCk - 44 to 80 inches: extremely cobbly sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.07 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.5 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 3.0
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Desert Loam (Shadscale) (R034BY106UT)
Hydric soil rating: No

Minor Components

Mack

Percent of map unit: 10 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Loam (Shadscale) (R034BY106UT)
Hydric soil rating: No

Gyprockmesa

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Bottom (Basin Big Sagebrush) (R034BY009UT)
Hydric soil rating: No

764—Mesa gravelly loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: q0r0
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Mesa and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mesa

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

A - 0 to 5 inches: gravelly loam
Btk1 - 5 to 11 inches: gravelly loam
Btk2 - 11 to 23 inches: cobbly sandy clay loam
BCk - 23 to 83 inches: extremely cobbly sandy loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 3.0
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Desert Loam (Shadscale) (R034BY106UT)
Hydric soil rating: No

Minor Components

Gyprockmesa

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Bottom (Basin Big Sagebrush) (R034BY009UT)
Hydric soil rating: No

Fruitland

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Sandy Loam (Indian Ricegrass) (R034BY115UT)
Hydric soil rating: No

Montrose

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Clay (Shadscale) (R034BY104UT)

Hydric soil rating: No

765—Mesa gravelly clay loam, 5 to 12 percent slopes

Map Unit Setting

National map unit symbol: v50v
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Mesa and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mesa

Setting

Landform: Stream terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

Ap1 - 0 to 4 inches: gravelly clay loam
Ap2 - 4 to 13 inches: clay loam
Bt - 13 to 15 inches: gravelly clay loam
Btk1 - 15 to 22 inches: cobbly clay loam
Btk2 - 22 to 36 inches: very gravelly silty clay loam
Btk3 - 36 to 48 inches: very gravelly sandy loam
BCk - 48 to 66 inches: extremely gravelly sandy loam
C - 66 to 77 inches: extremely cobbly loamy sand

Properties and qualities

Slope: 5 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to slightly saline (1.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 3.0
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Desert Loam (Shadscale) (R034BY106UT)
Hydric soil rating: No

Minor Components

Gyprockmesa

Percent of map unit: 10 percent
Landform: Stream terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Bottom (Basin Big Sagebrush) (R034BY009UT)
Hydric soil rating: No

Fruitland

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Sandy Loam (Indian Ricegrass) (R034BY115UT)
Hydric soil rating: No

790—Briny clay loam, 0 to 3 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: k2fq
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Briny, rarely flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Briny, Rarely Flooded

Setting

Landform: Drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Cretaceous source alluvium derived from shale

Typical profile

Az - 0 to 8 inches: clay loam
Bzg - 8 to 26 inches: silty clay loam
Czg1 - 26 to 42 inches: silty clay
Czg2 - 42 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 14 percent
Gypsum, maximum in profile: 4 percent
Salinity, maximum in profile: Strongly saline (30.0 to 50.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 100.0
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 7s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Alkali Flat (Greasewood) (R034BY006UT)
Hydric soil rating: Yes

Minor Components

Killpack

Percent of map unit: 5 percent
Landform: Strath terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: **ARCHIVE** Clayey Saltdesert (R034BY403CO)
Hydric soil rating: No

Mesa

Percent of map unit: 5 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Loam (Shadscale) (R034BY106UT)
Hydric soil rating: No

795—Waterdog, occasionally flooded-Riverwash complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: k2g2
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Waterdog, occasionally flooded, and similar soils: 50 percent
Riverwash: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waterdog, Occasionally Flooded

Setting

Landform: Flood-plain steps
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 4 inches: loam
Cg1 - 4 to 14 inches: sandy loam
Cg2 - 14 to 22 inches: sandy loam
Cg3 - 22 to 60 inches: very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.71 to 2.13 in/hr)
Depth to water table: About 0 to 7 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 14 percent
Salinity, maximum in profile: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w

Hydrologic Soil Group: B/D
Ecological site: River Floodplain (Fremont Cottonwood) (R034BY011UT)
Hydric soil rating: Yes

Description of Riverwash

Interpretive groups
Land capability classification (irrigated): 8
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Water
Percent of map unit: 10 percent
Hydric soil rating: Unranked

Briny, rarely flooded
Percent of map unit: 10 percent
Landform: Flood-plain steps
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Alkali Flat (Greasewood) (R034BY006UT)
Hydric soil rating: Yes

801—Persayo-Badland complex, 25 to 75 percent slopes

Map Unit Setting
National map unit symbol: k2fs
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition
Persayo and similar soils: 60 percent
Badland: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Persayo

Setting
Landform: Pediments
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Cretaceous source colluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: loam
C1 - 4 to 13 inches: silty clay loam
C2 - 13 to 16 inches: silty clay loam
Cr - 16 to 59 inches: bedrock

Properties and qualities

Slope: 25 to 75 percent
Depth to restrictive feature: About 16 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 4 percent
Salinity, maximum in profile: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 8.0
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 8
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Ecological site: Desert Loamy Clay (Shadscale) (R034BY109UT)
Hydric soil rating: No

Description of Badland

Interpretive groups

Land capability classification (irrigated): 8
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: No

Briny, rarely flooded

Percent of map unit: 5 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Alkali Flat (Greasewood) (R034BY006UT)
Hydric soil rating: Yes

809—Persayo-Briny, rarely flooded complex, 0 to 25 percent slopes

Map Unit Setting

National map unit symbol: r9rz
Elevation: 4,500 to 5,800 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Persayo and similar soils: 65 percent
Briny, rarely flooded, and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Persayo

Setting

Landform: Escarpments
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Cretaceous source colluvium over residuum weathered from shale

Typical profile

A - 0 to 4 inches: loam
C1 - 4 to 13 inches: silty clay loam
C2 - 13 to 16 inches: silty clay loam
Cr - 16 to 59 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: About 16 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 4 percent
Salinity, maximum in profile: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 8.0
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Desert Loamy Clay (Shadscale) (R034BY109UT)
Hydric soil rating: No

Description of Briny, Rarely Flooded

Setting

Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Cretaceous source alluvium derived from shale

Typical profile

Az - 0 to 8 inches: clay loam
Bzg - 8 to 26 inches: silty clay loam
Czg1 - 26 to 42 inches: silty clay
Czg2 - 42 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 14 percent
Gypsum, maximum in profile: 4 percent
Salinity, maximum in profile: Strongly saline (30.0 to 50.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 100.0
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 7s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Alkali Flat (Greasewood) (R034BY006UT)
Hydric soil rating: Yes

Minor Components

Gyprockmesa

Percent of map unit: 10 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Bottom (Basin Big Sagebrush) (R034BY009UT)
Hydric soil rating: No

Mesa

Percent of map unit: 5 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Desert Loam (Shadscale) (R034BY106UT)

Hydric soil rating: No

900—Urban land

Map Unit Composition

Urban land: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): 8

Land capability classification (nonirrigated): 8

Hydric soil rating: No

901—Gravel pits

Map Unit Composition

Gravel pits: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gravel Pits

Interpretive groups

Land capability classification (irrigated): 8

Land capability classification (nonirrigated): 8

Hydric soil rating: No

999—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

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APPENDIX 2 - MAPS

Division of Reclamation, Mining, and Safety

Fee Receipt for M2019018

J Graff Enterprises, LLC
Jard Graff
6454 Graff Road

Delta CO 814160000

Receipt #: 28439
Date: 04/09/2019
Permit: M2019018

Payment Method	Revenue Code	Fee Description/Notes	Amount
Check #1006	4300-MAPP	Minerals Application Fees User: sdt	$2,696.00
		Receipt Total:	**$2,696.00**

ORIGIN ID:APAA (303) 346-5196
BEN LANGENFELD
GREG LEWICKI AND ASSOCIATES
4654 SOUTH ESPANA ST

CENTENNIAL, CO 80015
UNITED STATES US

SHIP DATE: 08APR19
ACTWGT: 3.00 LB
CAD: 110679588/INET4100

BILL SENDER

TO **RECORDS**
DRMS - DENVER
1313 SHERMAN STREET
ROOM 215
DENVER CO 80203

(303) 866-3567 REF: BRSG 1 DRMS SUBMITTAL
INV:
PO: DEPT:

565J1/D7E5/23AD

FedEx Express

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**** 2DAY ****

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